Document Type: EA-Administrative Record
Index Field: Final Environmental Document
Project Name: Ranger, NC, 161-kV Transmission System Upgrade
Project Number: 2004-80

FINAL ENVIRONMENTAL ASSESSMENT

RANGER, NORTH CAROLINA, SUBSTATION PROVIDE 161-KV DELIVERY POINT

Cherokee County, North Carolina

TENNESSEE VALLEY AUTHORITY

APRIL 2005

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ACRONYMS, ABBREVIATIONS, AND SYMBOLS

°F	Degree Fahrenheit
>	Greater Than
APE	Area of Potential Effect
BRMEMC	Blue Ridge Mountain Electric Membership Corporation
BMP	Best Management Practice
CFR	Code of Federal Regulations
e.g.	Latin term exempli gratia meaning “for example”
EIS	Environmental Impact Statement
EMF	Electric and Magnetic Fields
EO	Executive Order
et al.	Latin term, et alii (masculine), et aliae (feminine), or et alia (neutral) meaning “and others”
etc.	Latin term et cetera meaning “and other things” “and so forth”
GIS	Geographic Information System
IBI	Index of Biotic Integrity
i.e.	Latin term, id est, meaning “that is”
kV	Kilovolt
mgd	Million Gallons per Day
MW	Megawatt
NFS	National Forest System
NRHP	National Register of Historic Places
OSHA	Occupational Safety and Health Administration
PU	Purchase Unit
SMZ	Streamside Management Zone
SR	State Route
TVA	Tennessee Valley Authority
U.S.	United States
US 19	U.S. Highway 19
US 19/129	U.S. Highway 19/129
US 64	U.S. Highway 64
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
USFS	U.S. Forest Service
USGS	U.S. Geological Survey

CHAPTER 1

1. PURPOSE OF AND NEED FOR ACTION

1.1. Proposed Action: Improve Power Supply

Tennessee Valley Authority (TVA) is proposing to serve Blue Ridge Mountain Electric Membership Corporation's (BRMEMC) planned substation at Ranger by building a 4.9-mile, 161-kilovolt (kV) transmission line connecting the planned substation to TVA's existing Murphy-Weaver 161-kV Transmission Line located east of Ranger, North Carolina (Figure 1-1). TVA would also add switches on each side of the tap point in the Murphy-Weaver 161-kV Transmission Line, install revenue metering at the Ranger Substation, and add Ranger Substation information to the mapboard at TVA's Systems Operations Center. The proposed transmission line would be completed by December 2005.

1.2. Need

BRMEMC lies on the southeastern edge of TVA's service area and is supplied by a delivery point from TVA's 161-kV transmission system to BRMEMC's Weaver 161-69-kV Substation. The Ranger Community is served by two radial distribution lines originating from BRMEMC's Nottely 69-kV Substation, which in turn is supplied by a radial line from the Weaver 161-69-kV Substation. The Ranger area is experiencing steadily increasing electrical loads of almost 10 percent per year as a result of residential and small commercial growth. The increasing loads in the Ranger area are expected to reach 33.2 megawatts (MW) by summer 2006, which exceeds the substation's calculated capacity of 28.6 MW. The increasing loads in the Ranger area are overloading the two radial distribution lines, which are expected to exceed their thermal limits by summer 2006. This increasing load is also creating system loading and voltage problems on the distributor's system serving this area.

Reliability, as well as capacity, is a concern in providing adequate service to the area. Since reliability decreases as loading and distribution line length increase, the peak load conditions predicted would result in a system even more likely to experience outage. To address these issues, BRMEMC is planning to build a new 161-kV substation west of Ranger at the intersection of U.S. Highway 64 (US 64) and Wingate Road.

1.3. Decisions That Must Be Made

The primary decision before TVA is whether to build a new 161-kV transmission line to serve BRMEMC's planned substation that is needed to improve the electrical service in the BRMEMC service area. A detailed description of the alternatives is provided in Section 2.2.

If service to the area is to be improved, other, secondary decisions are involved. These include the following considerations:

- The timing of improvements
- The best route for a transmission line
- Determining any necessary mitigation and/or monitoring measures to implement to meet TVA standards and minimize potential damages to resources

1.4. Public Involvement

The following Federal and state agencies have been contacted to date by TVA concerning this project.

- U.S. Army Corp of Engineers
- U.S. Fish and Wildlife Service
- North Carolina Department of Agriculture and Consumer Services
- North Carolina Department of Commerce
- North Carolina Department of Environment and Natural Resources
- North Carolina Department of Transportation
- North Carolina State Historic Preservation Officer
- North Carolina Wildlife Resources Commission

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

TVA held a public meeting in the project area on November 18, 2003. Two potential transmission line route options were presented to the public for comment. These are described in Section 2.5.3 of this document as the North Route and the South Route (Figure 1-2).

Eight public officials and 341 potentially affected property owners within these corridor routes were specifically invited to the meeting. TVA also invited other interested members of the public through newspaper advertisements and local news outlets. TVA issued a news release to local news outlets. Total attendance at the meeting was 161.

During a 30-day public comment period following the open house, TVA accepted public comments on potential line routes and other issues. A toll-free phone number and fax number were made available to facilitate comments. Comments were primarily related to the location of the transmission line relative to current or planned land issues. The project-planning phase had utilized aerial photography collected in 1998 to develop the two transmission line options. Several property owners indicated that new developments, such as houses and roads, had been constructed after the 1998 aerial photographs were taken. As a result, new aerial photography was obtained to identify the more recent developments and reassess route issues and constraints. Of the potential route options presented at the public meeting, the North Route was the preference of the majority of those expressing an opinion. This preference was due to the increased impact potential of the South Route on existing homes and future development.

1.5. Necessary Permits or Licenses

A permit would be required from the state of North Carolina for construction site storm water discharge for the transmission line construction. TVA's Transmission Construction organization would prepare the required erosion and sedimentation control plans and coordinate them with the appropriate state and local authorities. A permit would also be required for burning trees and other combustible materials removed during transmission line construction.

CHAPTER 2

2. ALTERNATIVES INCLUDING THE PROPOSED ACTION

2.1. Introduction

Chapter 2: Alternatives Including the Proposed Action is the *heart* of this Environmental Assessment. This chapter has the following five major sections:

- Description of Alternatives
- Alternative Eliminated From Detailed Study
- Description of Construction, Operation, and Maintenance of the Proposed 161-kV Transmission Line
- Project and Siting Alternatives
- Identification of the Preferred Alternative

This chapter describes all of the alternatives explored and provides a detailed description of the necessary steps in constructing a transmission line and substation. Chapter 2 also identifies TVA's preferred alternative.

2.2. Description of Alternatives

2.2.1. Alternative 1 – Do Not Build Transmission Line (No Action)

Under the No Action Alternative, TVA would not construct a new transmission line. As a result, the BRMEMC could decide to build the transmission line itself. Absent this, the increasing load due to ongoing and already planned development could not be met by BRMEMC, and system outages, especially at times of high electricity use, would occur or some other action would have to be taken.

2.2.2. Alternative 2 – Construct Transmission Line (Action)

Under the Action Alternative, TVA would tap the Murphy-Weaver 161-kV Transmission Line located east of Ranger, add switches on each side of the tap point, construct a new 161-kV transmission line from the tap point to BRMEMC's new Ranger Substation, provide BRMEMC revenue-metering equipment for installation at the substation, and add Ranger Substation information to the mapboard at the Systems Operations Center. This alternative would meet the growing power needs in the Ranger area and improve the transmission system's reliability. It would require the purchase and clearing of new transmission line right-of-way for a distance ranging from approximately 4.5 to 5.0 miles, depending on the final route option. All of the new transmission line right-of-way would be located on private land.

2.3. Alternative Eliminated from Detailed Study - Increase Capacity at Nottely 69-kV Substations and Construct Distribution Lines

Under this alternative, BRMEMC would not build its planned substation. Instead, BRMEMC would increase the transformer capacity at the Nottely 69-kV Substation, renovate and

expand the 13-kV switchyard, and construct two three-phase 13-kV distribution circuits to the Ranger area. While this alternative is technically feasible for the short term, it was not the most economical alternative and did not address the long-term solution to the area problems. Significant capital expenditures including additional distribution lines and a potential 161-kV delivery point would still be required in 6 to 8 years. Therefore, BRMEMC decided to build its planned substation instead.

Moreover, the long length, approximately 7 miles, of the two existing radial distribution lines would continue to make them very susceptible to outages due to the increased line exposure. Additionally, with no voltage increase in the distribution system, the anticipated load growth within the service area is expected within a few years to redevelop overload conditions even with the implementation of this alternative. Additional new transmission line right-of-way, as well as changes to transmission lines on existing right-of-way, would be required for this alternative and, therefore, it has increased potential for environmental impacts. While this alternative would not require a large expenditure of money by TVA, it would result in costs to BRMEMC of about $1.1 million greater than Alternative 2. As a result of these identified issues, it was determined that this alternative would not address the reliability or capacity concerns in the BRMEMC service area for the long term and, therefore, was eliminated as a viable alternative.

2.4. Description of Construction, Operation, and Maintenance of the Proposed 161-kV Transmission Line

2.4.1. Transmission Line Construction

2.4.1.1. Right-of-Way Acquisition and Clearing

New right-of-way 100 feet wide would be needed for the transmission line. TVA would purchase easements from landowners for the new right-of-way on private land. These easements would give TVA the right to construct, operate, and maintain the transmission line, as well as remove danger trees off the right-of-way. Danger trees are those trees that are located away from the cleared right-of-way, but are tall enough to pass within 5 feet of a conductor or strike a structure should it fall toward the transmission line. Fee title, i.e., ownership, for the land within the right-of-way remains with the landowner, and a number of activities may be continued on the property by the landowner. However, the easement agreement prohibits certain activities such as the construction of buildings and any other activities within the right-of-way that could interfere with the transmission line or create a hazardous situation.

Because of the need to maintain adequate clearance between tall vegetation and transmission line conductors, as well as to provide access for construction equipment, most trees and shrubs would be initially removed from the entire width of the right-of-way. Equipment used during this right-of-way 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 right-of-way to serve as sediment barriers. Vegetation removal in streamside management zones (SMZs) and wetlands would be restricted to trees tall enough, or with the potential soon to grow tall enough, to interfere with conductors. Clearing in SMZs would be accomplished using hand-held equipment or remote handling equipment, such as a feller-buncher, in order to limit ground disturbance. TVA Right-of-

Way Clearing Specifications, Environmental Quality Protection Specifications for Transmission Line Construction, and Transmission Construction Guidelines Near Streams (Appendices II, III, and IV) would be followed in clearing and construction activities.

Subsequent to clearing and construction, the right-of-way would be restored as much as is possible to its state prior to construction. Pasture areas would be reseeded with suitable grasses. Wooded areas would be restored using native grass and other low-growing species. Erosion controls would remain in place until the plant communities were fully established. Streamside areas would be revegetated as described in Appendices II through IV.

2.4.1.2. Access Roads

Permanent access roads would be needed to allow vehicle access to each structure and other points along the right-of-way. Two new access roads were identified along the proposed transmission line and were included in the environmental field review. TVA would obtain the necessary rights for these access roads from landowners. Existing roads including privately built, farm and field roads, some of which may need upgrading, would be used where possible. Access roads used for transmission lines are located on the right-of-way wherever possible and designed to avoid severe slope conditions and to minimize stream crossings. Access roads are typically about 20 feet wide and are surfaced with dirt or gravel.

Culverts and other drainage devices, fences, and gates would be installed as necessary. Culverts installed in any permanent streams would be removed following construction. However, in wet-weather conveyances, they would be left or removed, depending on the wishes of the landowner or any permit conditions that might apply. If desired by the property owner, new temporary access roads would be restored to previous conditions. Additional applicable right-of-way clearing and environmental quality protection specifications are listed in Appendices II and III.

2.4.1.3. Construction Assembly Areas

A construction assembly area (laydown area) would be required for worker assembly, vehicle parking, and material storage. Two sites were identified and reviewed that were approximately 3 acres in size, level and cleared, and have existing road access, but only one of these would be selected for use as the construction assembly area. No environmental impacts were identified with either potential construction assembly area site. One site considered is located on U.S. Highway 19/129 (US 19/129). It is, however, the second site considered that is TVA's preferred site. This site, located on Gold Branch Road at an active log yard, is TVA's preferred site because it is easily accessible, would least affect the traffic flow while in use, and would not conflict with the possible uses by the property owner. Installation of some drainage structures may be required. The site selected would be leased for the duration of the construction period, approximately 12 months. The site would be graveled and fenced so that trailers used during the construction process for material storage and office space could be parked at this location. Following the completion of construction activities, all trailers, unused materials, and construction debris would be removed from the site. Removal of the fence and restoration would be at the discretion of the landowner.

2.4.1.4. Structures and Conductors

The proposed transmission line would use single-steel poles and double poles (H-frame) (Figure 2-1). Structure heights would vary according to the terrain and would average between 90 and 115 feet. At river or highway crossings, taller double poles (H-frame) may be used in order to meet clearance requirements.

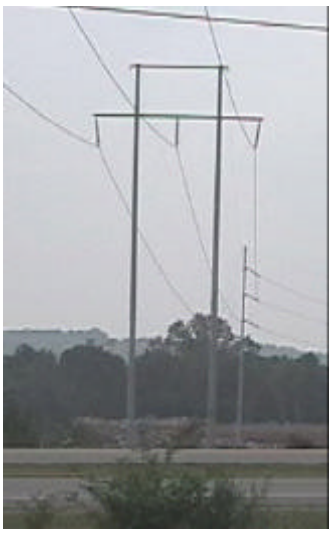
a  b 

Figure 2-1. Single-Pole (a) and H-Frame (b) 161-kV Transmission Structures

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

Poles at angles in the transmission line may require supporting guy wires. 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. The holes would normally be back-filled with the excavated material. In some cases, gravel or a cement and gravel mixture might be necessary. Some structures may be self-supporting (non-guyed) poles fastened to a concrete foundation that is formed and poured into an excavated hole. The two tap point switches would be installed on each side of the tap point on the Murphy-Weaver 161-kV Transmission Line between existing Structures 46 and 47. The switch structures, 7-foot-by-10-foot laced steel, would be 35 feet above ground level and fastened on two concrete foundations.

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.

2.4.1.5. Conductor and Ground Wire Installation

Reels of conductor and ground wire would be delivered to various staging areas along the right-of-way, and temporary clearance poles would be installed at road and railroad crossings to reduce interference with traffic. Installation of conductors would begin with a small rope being pulled from structure to structure. This rope would then be connected to the conductor and ground wire and used to pull them down the line through pulleys suspended from the insulators mounted on the structures. A bulldozer and specialized tensioning equipment would be used to pull conductors and ground wires to the proper tension. Finally, the wires would be clamped to the insulators and the pulleys removed.

2.4.2. Operation and Maintenance

2.4.2.1. Inspection

Periodic inspections of TVA's transmission lines are performed from the ground and by aerial surveillance using a helicopter. These inspections, which occur on approximately 5-year cycles after operation begins, are conducted to locate damaged conductors, insulators, or structures, and to report any abnormal conditions that might hamper the normal operation of the line or adversely impact the surrounding area. During these inspections, the condition of vegetation within the right-of-way, as well as immediately adjoining the right-of-way, is noted. These observations are then used to plan corrective maintenance or routine vegetation management.

2.4.2.2. Vegetation Management

Management of vegetation along the right-of-way would be necessary to ensure access to structures and to maintain an adequate distance between transmission line conductors and vegetation. The transmission line would be designed to meet a 24-foot minimum clearance as required by the National Electric Safety Code standards for a 161-kV transmission line.

Management of vegetation along the right-of-way would consist of two different activities: the felling of danger trees adjacent to the cleared right-of-way, as described in Section 2.4.1.1, and the control of vegetation within the cleared right-of-way.

Management of vegetation within the cleared right-of-way 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. Given the land use in the area of this project, right-of-way maintenance is expected to be minimal. 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 right-of-way and mechanical mowing is not practical. Herbicides would be selectively applied from the ground with backpack sprayers or vehicle-mounted sprayers.

Any herbicides used would be applied in accordance with applicable state and Federal laws and regulations and the commitments listed in this document. Only herbicides registered with the U.S. Environmental Protection Agency (USEPA) would be used. A list of the herbicides currently used by TVA in right-of-way management is presented in Appendix V. This list may change over time as new herbicides are developed or new information on presently approved herbicides becomes available.

Other than vegetation management, little other maintenance work would normally be required. The transmission line structures and other components typically last several decades. In the event that a structure must be replaced, the structure would normally be lifted out of the ground by crane-like equipment and the replacement structure 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, if any, additional area disturbance when compared to the initial installation of the structure.

2.5. Project and Siting Alternatives

The process of siting this transmission line adhered to the following basic steps used by TVA to determine a transmission line route:

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

2.5.1. Definition of Study Area

The first task in defining the study area was to identify the power sources that could supply the identified need. The most practical power source was the Murphy-Weaver 161-kV Transmission Line and was located approximately 5 miles east of the planned substation. Therefore, based on this location, the study area was defined as an area that encompasses approximately 23 square miles or 14,720 acres and is located entirely within Cherokee County. The study area boundary consists of the north/south line 0.5 mile west of BRMEMC's planned Ranger Substation. It runs from a bend in the Nottely River northward for 3.7 miles to the Letitia Community. The north border of the area runs generally west to east at a distance of 6.25 miles between Letitia and the southeast limits of Fort Butler Mountain. The eastern boundary then turns directly south for 3.7 miles to a point southwest of Beaver Gap. The south boundary then turns directly west at that point for 6.25 miles to the beginning point in the bend in the Nottely River.

A Geographic Information System - (GIS) based routing map and color orthophotography were developed. The GIS data generated a "constraint" model that served to guide the routing process by identifying obvious routing conflicts or sensitive areas including, but not limited to, houses, rivers, historical sites, and wetlands (Figure 1-2). Following is a brief description of other aspects of the study area:

- Natural Features: The study area is characterized by mostly low mountain formations, ranging in elevation from 1,530 to 2,300 feet, and smaller hills and valleys. Approximately 80 percent of the study area is wooded. There are a few small streams that flow into the Nottely River, which empties into the Hiwassee Reservoir. Other streams in the east quarter of the study area flow directly into the Hiwassee River southeast of Murphy. There are only a few small, scattered wetlands occurring in the broad floodplain of the Nottely River and along a stream emptying into the southern portion of Lake Wells.

- Cultural Features: The study area includes at least six churches and cemeteries, a community center and baseball field along the Nottely River, a commercial area at the intersection of US 64 and 19/129, and private recreational areas along the Nottely River. There are no known historical or archaeological areas of any significance in the study area.

- Land Use: The land uses of the study area are dictated by terrain features. The level lands associated with the floodplain of Martin Creek are cleared of trees and support development of small pasturelands and home sites with garden areas. The majority of hilly lands were originally used for timber production. Recently, however, these land types have been used for development of retirement and weekend homes due to their scenic nature and proximity to the area's lakes and streams. Some land in the study area is owned by the U.S. Forest Service (USFS) and part of the Nantahala National Forest. Private lands adjacent to USFS properties are attractive selling points to prospective buyers of retirement or second homes. Commercial development is growing at a steady pace along the US 64 corridor between the Copper Basin area and Murphy. The study area is uniformly developed with residential use. This is largely because nearly all vacant land has been divided into residential tracts in the past few years and sold to those in other areas who contemplate retiring in this area.

- Transportation: Major transportation routes in the study area include US 64 and 19/129, State Route (SR) 60, and Hedden Road. Other roads include Ranger Road, Sneed Road, Snow Hill Ridge Road, Cook Bridge Road, Gold Branch Road, and Taylor Henson Road.

2.5.2. Collect Data

Geographic data, such as topography, land use, transportation, environmental features, cultural resources, near-term future development, and land conservation information were collected for the entire study area. Analysis of the data was aided by using GIS. 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.

Maps were created to show regional opportunities and constraints clearly. Sources included 1 inch = 500 feet aerial photography, 1 inch = 2,000 feet aerial photography, county tax maps/property boundaries, U.S. Geological Survey (USGS) digital line graphs, digital elevation models, National Wetlands Inventory, and cultural resource data, among others. Aerial photography was interpreted to obtain land use and land cover data such as forests, agriculture, wetlands, houses, barns, commercial and industrial buildings, churches, and cemeteries. Data were analyzed both manually and with GIS. Manual calculations from aerial photographs, tax maps, and other sources included the number of road crossings, stream crossings, and property parcels.

The siting team used GIS to analyze multiple factors when defining and comparing alternative route options. GIS displays and analyzes multiple layers of information simultaneously using geographically referenced digital information.

For this project, GIS data analysis included steep slope crossings, land cover, land use, and other data. A 1:100,000 GIS database was developed and used for regional opportunity and constraint analysis, while a 1:24,000 database was developed for more complex computations, such as acreage of wetlands and percent slope.

2.5.3. Develop General Route Options and Potential Routes

From the information gathered during the system's studies and data development phases, two tap-point locations were identified on the Murphy-Weaver 161-kV Transmission Line that would accommodate a 40-foot-square steel structure. TVA's original plan was to place circuit breakers on the structures in the future. However, in examining the Murphy-Weaver 161-kV Transmission Line, only two appropriate areas for that structure were identified. One area was about 900 feet south of the transmission line's crossing of Hedden Road and the other was about 4,800 feet south of that area. From the two tap-point locations, two corridors were identified using 1998 aerial photographs.

The northernmost tap point could provide a beginning point for a corridor that would follow the valley area along the Hedden Road/Cane Creek location while avoiding Mary King Mountain to the south and the Bell Mountain and Fort Butler Mountain areas to the north. This corridor would then continue westward avoiding the commercial areas to the north along US 64 and the new residential areas to its south. This corridor is approximately 5 miles long and is referred to as the North Route (Figure 1-2).

The southern tap point is on a flat hilltop accessible from Martin Creek Road or SR 1556. Any location south of that point would require crossing over the 69-kV transmission line that parallels the west side of the source line. From this tap point northward, the source line is on the west side of the lower voltage line, and a line crossing would not be needed. A corridor from this tap point would head directly west passing south of Mary King Mountain and north of Yates Top. The corridor then continues westward, staying north of the Nottely River and passing through the Lake Wells area and terminating at the substation site. This corridor is about 4.4 miles long and is referred to as the South Route (Figure 1-2).

Using topographic and tax maps for study and comparisons, two 1,000-foot-wide corridors were identified for a potential transmission line route. The centerlines of these two corridors (the North Route and South Route) are shown in Figure 1-2.

2.5.3.1. North Route Option

The North Route begins at Point A, about 900 feet south of the transmission line crossing of Hedden Road. It proceeds northwest for 2,000 feet to Point B. This segment crosses a public gravel road and Hedden Road, a paved state road. It passes closely to New Martin Creek Church and cemetery and east of a mobile home park on the north side of Hedden Road. This segment is mostly wooded.

At Point B, the corridor turns southwest to Point C with one angle to avoid a house. This segment is 2,800 feet long, is entirely wooded, and crosses one private, gravel road.

At Point C, on the north side of Hedden Road, the route closely parallels the 60-foot-wide highway right-of-way. This section is crossing recently cut pulpwood lands and one small horse pasture area.

Between Points D and E, the route turns slightly west-northwest to avoid a new house on Hedden Road. This segment is entirely wooded.

From Point E to Point F, the route passes through an area of scattered homes. This area is all wooded and easily accessible from a private gravel road if needed.

At Point F, the route turns west-southwest for a distance of 5,600 feet, avoiding scattered home sites and an operating pulpwood business on Gold Branch Road. About 90 percent of this segment is forested.

At Point G, the route turns west for 0.5 mile to avoid existing homes. This section is forested.

At Point H, the route turns northwest, crossing SR 60, a large area being prepared for residential development, a crossing of the Nottely River, passing southwest of the Ranger Community Center and volunteer fire department.

At Point J the route turns further northwest to avoid a new commercial center with future building locations and terminates in the BRMEMC's Ranger Substation site.

2.5.3.2. South Route Option

The South Route begins at the tap Point A in the source line then turns south-southwest to follow the existing line for 1,000 feet, and then turns sharply to the northwest for 1,600 feet to Point B. This alignment would avoid impacting a higher, steep area of Mary King Mountain.

The B to C segment was selected to avoid new homes to the north, near the upper elevations of Mary King Mountain and new homes to the south on Yates Top. At Point C, the route turns southwest to traverse a less-developed northwest-facing slope of Mary King Mountain, crossing US 19/129 at a point 800 feet south of Gold Branch.

At Point D, the route turns west in order to cross Gold Branch at a location northeast of a known wetland.

At Point E, the route turns southwest to avoid the dam of Upper Lake Wells. The entire area around Upper Lake Wells is dense residential development.

At Point F, the route turns slightly west-northwest to avoid existing homes and to avoid a bend area in the Nottely River.

The segment from G to H, which crosses SR 1596 or Cook Bridge Road, was chosen to avoid the homes built in a residential development called Preserve on the Nottely River.

At Point H, the route turns northwest to avoid several homes to the west and to tie back into the North Route just west of SR 60 at Point I.

2.5.4. Establish and Apply Siting Criteria

TVA has long employed a set of evaluation criteria that represent opportunities and constraints for development of transmission line routes. The criteria are oriented toward 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 right-of-way acquisition cost being the most important elements. Information gathered and comments made at the public meeting and subsequent comment period were taken into account, while refining criteria to be specific to the study area.

Each of the transmission line route options was evaluated according to these criteria relating to engineering, environmental, land use, and cultural concerns. Specific criteria are described below; for each category described, a higher score means a bigger constraint. 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 worse score.

- *Engineering Criteria*: total length of the transmission route, length of new right-of-way and rebuilt right-of-way, primary and secondary road crossings, pipeline and transmission line crossings, and total line cost

- *Environmental Criteria*: slopes greater than 30 percent (steeper slopes mean more potential for erosion and potential water quality impacts), slopes between 20 and 30 percent, visual aesthetics, forested acres, open water crossings, sensitive stream (those supporting endangered or threatened species) crossings, perennial and intermittent stream crossings, wetlands, rare species habitat, natural area crossings, and wildlife management areas

- *Land Use Criteria*: the number of fragmented property parcels, schools, houses, commercial or industrial buildings, barns, and parkland crossings

- *Cultural Criteria*: archaeological and historic sites, churches, and cemeteries

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

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

2.5.5. Route Evaluation and Identification

Following the public open house and subsequent comment period, each tap point and route option was evaluated using the updated constraint model and new aerial photographs taken in January 2004, along with the modified routing criteria obtained during the public involvement.

The North Route would be about 5.0 miles long, requiring 60 acres of right-of-way easement. Approximately 4.5 acres of this easement would be highway easement due to paralleling Hedden Road and the crossings of SR 60 and US 19/129 and 64. This route would require 11 line angles, would cross rolling, hilly terrain, and would require clearing 41 acres of woodlands. Much of the need for right-of-way access for construction and maintenance of the transmission line on the North Route option would be met from a

parallel section of Hedden Road and the numerous public roads that would be crossed by the transmission line. Approximately 0.8 mile of other off-right-of-way access would be needed. The construction difficulty would be low due to the ease of access, the avoidance of steep slopes, and a minimum number of stream crossings. There would be 10 public road crossings and 10 private road crossings on this route. The North Route would cross through two residential development areas, two planned residential areas, and one commercial development.

Access to the tap point and switches for the North Route would be easily accomplished. This tap point would be located 200 feet from a graveled public road along the proposed easement for the transmission line. The tap structure and both switches would affect one landowner.

There are no schools near the North Route. There are 19 houses within 300 feet of the centerline of the route, including one small cabin that would have to be purchased and removed. There are two old, unoccupied houses along the North Route that would be visible from the route. No wetlands would be crossed by the North Route. Due to the low number of streams and perpendicular crossing of the Nottely River, the overall environmental constructability issues should be few.

The South Route, located approximately 0.75 mile south of the North Route, would be approximately 4.5 miles long, requiring 53 acres of right-of-way easement. This route would require 13 line angles, would cross wooded, hilly terrain (some of which is steep sloped), and would require clearing 43 acres of woodlands. Right-of-way access for this route would include 3.4 miles of narrow, private roads and some new access roads. Some of these existing private roads are one-lane paved roads on steep terrain. There are three man-made lakes with residential development in close proximity to this route. Construction difficulty for this route would be high due to unfavorable access points along the transmission line route. Many steep ravine-type areas along the route would prevent following the right-of-way easement boundary during construction. There would be 7 public road crossing and 12 private road crossings on this route.

Access to the tap point and switches for the South Route would be from SR 1556 or Martin Creek Road. The tap point would be at the top of a small hill and the switches would be on different landowners' property.

The South Route would cross Gold Branch approximately 400 feet upstream of a wetland. The route would cross four streams and one river. There were no obvious nearby historical sites. There are no schools in the vicinity of the South Route. The South Route would cross four existing residential developments and two that are planned. Although 23 homes are located within 300 feet of the proposed transmission line centerline, no homeowners would need to be relocated. Visibility of the transmission line would be expected to be moderately high due to crossing down-slope from many homes built on Mary King Mountain and around the Lake Wells development. Environmental constructability issues associated with the South Route would be slightly greater than the North Route, because this route would cross steeper slopes and impact more private roadways.

In summary, the overall scoring of the two route options indicated that the North Route was the best alternative for minimizing impacts. In addition, the North Route was the preference of the majority of those expressing an opinion at the meeting and during the 30-day public comment period. The terrain along the North Route would provide better access to

accommodate the construction and maintenance activities and would be less visible to the residential developments in the area.

2.6. Identification of the Preferred Alternative

Alternative 2: Construct Transmission Line (Action) is TVA's preferred alternative for this proposed project. TVA would build a 161-kV transmission line to the planned Ranger Substation along the North Route, which is TVA's preferred route option (Figure 1-1).

After the public information day and landowner comments were received, new aerial photography was incorporated into the decision process. As a result, the North Route was modified to avoid recent development and included three section changes. The first would move the proposed transmission line section identified on Figure 1-2 as A through C to avoid several homes. From the switch structures, this section of the transmission line route would proceed in a northwesterly direction across open pastureland between Martin Creek Road and Hedden Road. North of Hedden Road right-of-way, the route would turn west and follow the northern edge of the Hedden Road right-of-way. The second modification would be located on Sections D through F, which would be moved closer to the Hedden Road right-of-way to avoid existing homes and minimize potential impacts to several vacant home sites. The third modification would be between Sections G and H. This section of the transmission line route would be moved north approximately 600 feet near US 19/129 to avoid a business and houses.

With these transmission line route modifications, the overall scoring then indicated the North Route as the best Alternative 2 route option for minimizing impacts. The South Route option was eliminated from further review or consideration. The proposed transmission line would affect approximately 60 acres.

CHAPTER 3

3. AFFECTED ENVIRONMENT

3.1. Introduction

This chapter succinctly describes the existing condition of the environmental resources and factors of the Cherokee County, North Carolina, project area that would affect or that would be affected by implementing either Alternative 1 or Alternative 2.

This description of the existing environment in Chapter 3, the description of the activities of Alternative 1: Do Not Build Transmission Line (No Action) in Chapter 2, and the predicted effects of Alternative 1 in Chapter 4 combine to establish the baseline conditions against which the decision maker and the public can compare the potential effects of Alternative 2: Construct Transmission Line (Action).

3.2. Alternative 1 – Do Not Build Transmission Line (No Action)

If TVA decided not to build the proposed transmission line, BRMEMC would continue to have the current transmission capabilities, which are projected to be exceeded by 2006. Outage rates, measured in the average number of minutes a typical customer experiences in a year, would not improve. In addition, with current growth projections, an overloading of the BRMEMC system in Cherokee County is anticipated due to the increasing load demands by ongoing and already planned development. This would result in an increase in system outages, especially at times of high electricity use and could occur as early as 2006. BRMEMC could decide to build the transmission line itself to connect to its new substation. BRMEMC has not indicated that it would do this and if it did, the potential impacts would be similar to those described below if TVA were to build the transmission line.

3.3. Alternative 2 – Construct Transmission Line (Action)

3.3.1. Terrestrial Ecology

3.3.1.1. Terrestrial Plants

The proposed transmission line route is located within the Blue Ridge Physiographic Province as described by Fenneman (1938). This is a region of broad, high, and rounded mountains. Soils are acidic and generally shallow to moderately shallow. Boulders and bedrock outcrops are common on upper slopes, but are not extensive. Most of the agriculture and urban development takes place in the broad valleys between mountain ranges.

Botanically, the proposed route lies within the Oak-Chestnut Forest Region as defined by Braun (1950). Forests of this region have a large component of various oak species and, until it was decimated by a fungal blight, American chestnut. With the virtual elimination of the chestnut from these forests, there has been an increase in dominance of various trees, particularly oaks, hickories, pines, and tulip tree. Within the Oak-Chestnut Forest Region, the proposed route is in the Southern Appalachians Section. In this section, the canopy

dominance is shared by numerous tree species including several oaks, hickories, hemlock, and various pines. Mesophytic species such as tulip tree, red maple, northern red oak, and sweet and cherry birch dominate the valleys and moist slopes.

The proposed transmission line route would cross forested areas on steep slopes, ridge tops, and valleys. Plant communities observed during field surveys include grass/forbs habitats, xeric upland mixed forest, broadleaf deciduous forests, and rich, moist forests. In addition, approximately 3 percent of the proposed transmission line route crossing areas, such as roads, lacks vegetation.

Grass/forbs habitats include lands that are in the early successional stage, are predominately maintained as lawns, or are old fields and thickets intergrading into immature forests. This habitat type occupies approximately 30 percent of the transmission line route evaluated. Lawns are mostly comprised of Bermuda grass and fescue. Old fields and thickets intergrading into immature forests are dominated by broomsedge, Indian grass, and Johnson grass. Representative species of forbs within this vegetation type include Joe Pye weed, jewelweed, Japanese honeysuckle, downy lobelia, Queen Anne's lace, tall thoroughwort, dog fennel, Canada goldenrod, and white heath aster.

Xeric upland mixed forests occupy approximately 65 percent of the transmission line route evaluated. This habitat type occurs on the lower to mid-elevations of the mountains. Common trees include the deciduous southern red oak, white oak, dogwood, pignut hickory, sourwood, black gum, and the evergreen American holly and white pine. Common understory vegetation includes mainly mountain laurel and low bush blueberry. Dominant herbaceous groundcover includes galax, whorled yam, rattlesnake orchid, pinesap, trailing arbutus, wild ginger, Christmas fern, and fan club moss. Scattered populations of pink lady's slipper are also present.

Broadleaf deciduous forests occupy approximately 1 percent of the transmission line route. This habitat type occurs on slightly moister sites as compared to the other community types present. Common mesophytic species include tulip tree, red maple, Fraser magnolia, and sweet and cherry birch.

Rich moist forests occupy approximately 1 percent of the transmission line route and are associated with stream banks and wet areas. These areas are supplied by the many springs and tributaries that follow the valleys. Common trees and shrubs include American holly, tulip tree, white oak, red maple, and mountain laurel. Dominant herbaceous groundcover includes New York fern, cinnamon fern, Indian cucumber, foamflower, galax, and cowbane.

In addition to the proposed transmission line route, two locations were identified as potential sites for a laydown area. These sites include a log yard and a concrete plant, both of which have been severely altered and possess little to no vegetation.

The plant communities observed along the proposed transmission line route and laydown areas are common and representative of the region.

About a third of the proposed project is on land in which the native vegetation has been extensively altered as a result of previous land use history (e.g., clear-cuts, roadsides, and grass-dominated areas maintained by mowing). Invasive exotic species encountered along the proposed route include Japanese honeysuckle, Johnson grass, sericea lespedeza, and

kudzu. All of these species have the potential to spread rapidly and displace native vegetation.

3.3.1.2. Terrestrial Animals

Habitats in the project area have been moderately impacted by previous agricultural and forestry practices and by residential development. Primary habitat types in the project area consist of mixed forest (66 percent), grass/forb-dominated habitats (30 percent), nonvegetated lands (3 percent), and deciduous forest (1 percent). Much of the proposed route would cross areas of steep slopes, ridge tops, and valleys, which include 13 perennial and intermittent streams.

Dominant tree species in the mixed forest community included various oak and hickory species, along with white pines. Approximately 1 percent of this habitat type was comprised of mixed forest associated with small valley streams, making up a rich, moist forest component. Bird species observed during field surveys include Carolina wren, blue jay, American crow, blue-gray gnatcatcher, downy woodpecker, pileated woodpecker, white-breasted nuthatch, and eastern tufted titmouse. Other animal species observed were gray squirrel, raccoon, white-tailed deer, and box turtle. Terrestrial animals not observed, but likely to occur, include eastern chipmunk, white-footed mouse, red bat, American toad, black rat snake, and slimy salamander. Several salamander species occurred in the small streams (spring salamander and species within the *Desmognathus* complex). Other amphibian species likely to occur in these streams are northern cricket frog, spring peeper, green frog, and wood frog.

Grass/forb-dominated habitats are represented by early successional habitats, such as old fields, mowed grass near residential areas, and clear-cuts, and are surrounded by immature forests. Common bird species observed during field surveys were American goldfinch, red-tailed hawk, Carolina wren, and indigo bunting. Other wildlife present includes white-tailed deer, eastern cottontail, and fence lizard. Animals not observed, but likely to occur, include northern mockingbird, eastern bluebird, five-lined skink, house mouse, Virginia opossum, and big brown bat.

Predominant trees occurring in the deciduous forest habitat include tulip trees and red maples. White-tailed deer, white-footed mouse, eastern cottontail, red bat, and American toad are often associated with this habitat type. Possible bird species include American crow, blue jay, northern cardinal, and Carolina wren.

The remaining area consisted of nonvegetated habitat and included roads and two sites identified for a potential laydown area. The proposed sites for the laydown area are located in a log yard and at a concrete plant, both of which have been severely disturbed and contain little to no wildlife habitat.

3.3.2. Threatened and Endangered Species

3.3.2.1. Terrestrial Plants

The TVA Natural Heritage database indicated that one candidate for federal listing, monkey-face orchid (*Platanthera integrilabia*), has been reported in Cherokee County, North Carolina. One Georgia state-listed species, pink lady's slipper, (*Cypripedium acaule*), is known within a 5 mile radius of the proposed transmission line route and laydown areas; however, this species is not on the state list of sensitive species in North Carolina. These

species, as well as federally and/or other state-listed species not presently known within the 5-mile radius, were sought within areas that could be impacted by the proposed project. No occurrences of these or other rare plant species were observed on or immediately adjacent to the proposed transmission line route or laydown areas during field surveys.

3.3.2.2. Terrestrial Animals

The TVA Natural Heritage database indicated that one federally listed and 15 North Carolina state-listed animal species have been reported from Cherokee County (Table 3-1).

Table 3-1. Federally and State-Listed Terrestrial Animal Species Reported From Cherokee County, North Carolina

Common name	Scientific name	Federal status	State status
Amphibian			
Mole Salamander	*Ambystoma talpoideum*	-	SPCO
Eastern Hellbender	*Cryptobranchus alleganiensis*	-	SPCO
Seepage Salamander	*Desmognathus aeneus*	-	STUN
Junaluska Salamander	*Eurycea junaluska*	-	SPCO
Four-toed Salamander	*Hemidactylium scutatum*	-	SPCO
Tellico Salamander	*Plethodon aureolus*	-	STUN
Mountain Chorus Frog	*Pseudacris brachyphona*	-	SPCO
Bird			
Northern Saw-whet Owl	*Aegolius acadicus*	-	SPCO
Blue-winged Warbler	*Vermivora pinus*	-	STUN
Mammals			
Eastern Big-eared Bat	*Corynorhinus rafinesquii*	-	SPCO
Northern Long-eared Bat	*Myotis septentrionalis*	-	SPCO
Fox Squirrel	*Sciurus niger*	-	STUN
Reptiles			
Bog Turtle	*Clemmys mulenbergii*	THR	THR
Northern Pine Snake	*Pithophis melanoleucus*	-	SPCO
Stripeneck Musk Turtle	*Sternotherus minor*	-	SPCO

Status abbreviations: SPCO = Special Concern; STUN = Status Unknown; THR = Threatened

The mole salamander is a burrowing salamander encountered under moist debris or in vernal (temporary) woodland pools in hardwood or mixed forests. The species has been reported from three localities within a 3-mile radius of the proposed transmission line route. Individuals from these records occurred in small temporary pools surrounded by rich forest. Several forested valleys containing small streams within the project area provide suitable habitat for this species.

The eastern hellbender is a large, aquatic salamander typically inhabiting cool, well-oxygenated small streams or tributaries to rivers and infrequently occurring in sections of larger rivers. The species has been reported from the tailwaters just below the Nottely Dam, where water quality conditions would likely mimic their preferred habitat. Neither the section of the Nottely River within the project area nor any of the small valley streams crossed by the proposed transmission line provide suitable habitat for this species.

The seepage salamander is found under leaf litter or debris in moist, well-shaded forests, near seepages, springs, or small streams. This salamander nests in moss clumps, rotting logs or other moist debris. Seepage salamanders have been reported from one locality within a 3-mile radius of the project area, and suitable habitat for the species exists within the forested ravines of the project area.

The Junaluska salamander is an uncommon salamander with a restricted range on the North Carolina/Tennessee border. Individuals are found beneath rocks and woody debris both in and around streams, and eggs are often attached under submerged rocks. Although no individuals were located during field surveys, several forested streams were identified that could provide suitable habitat for this species within the project area.

The four-toed salamander occurs around bogs, marshes, or vernal pools, usually within forested habitats. This species is most often associated with sphagnum-dominated, temporary pools. Four-toed salamanders have been reported from the Nottely River floodplain. Although forested streams occur along the proposed transmission line route, little suitable habitat for this species was observed during field surveys.

Limited information is available on the life history and habitat requirements for the Tellico salamander. This species is known from a very restricted range on the North Carolina/Tennessee border in both mountainous and lowland habitats. Although the presence of this species was not confirmed, suitable habitat for it is likely available in the project area.

The mountain chorus frog inhabits forests up to elevations of 3,500 feet. The species breeds in small, vernal pools within or near woodlands. The species has been reported within 3-miles of the project area. Although evidence of this species was not found during field surveys, suitable habitat exists in the project area.

Southern populations of the northern saw-whet owl reach their southeast-breeding-range limit in the high elevation coniferous and mixed forests of the Tennessee and North Carolina mountains. Records of this small, elusive owl are rare in this region, but it has been reported within 5 miles of the project area. Suitable habitat for the species does not exist along the proposed route.

The blue-winged warbler inhabits a broad range of successional habitats, but occurs primarily in early to mid-successional habitats such as brushy meadows and pastures and second-growth woodlands. The species has been reported from four localities within a 3-mile radius of the project area, and some suitable habitat for this species occurs within the project area.

Eastern big-eared bats roost in caves, abandoned buildings or mines, bridges, or large hollow trees. Summer roosts are often near wooded and riparian areas. Suitable habitat for this species likely exists within the project area.

The northern long-eared bat is a small bat that hibernates in caves and mines during the winter; during the summer, it roosts in buildings, behind tree bark, or in tree cavities. Foraging occurs over water and forested areas. Suitable habitat for this species is abundant in the project area.

The fox squirrel prefers the pine forests in the southern United States, but occurs in most types of forested habitat. Although not observed during field surveys, suitable habitat for this species exists in the project area.

The bog turtle occupies bogs, marshes, and swamps with clear, slow-moving streams and substrates that are muddy or soft with high organic content. This specialized habitat was not observed within the project area.

Northern pine snakes often burrow, preferring the sandy soils in pine barrens or dry mountain ridges that allow this activity. Some suitable habitat for this species is available within this project area.

The stripeneck musk turtle inhabits a variety of ponds, creeks, streams, and rivers. Preferring shallow water and soft substrates, this turtle is often found around fallen wood debris. Marginal habitat for this species was observed during field surveys, and this turtle may occur within the project area.

One federally listed species, the Indiana bat, has not been recorded in Cherokee County but does occur in the region. Because there have been recent discoveries of maternal colonies in nearby counties, field surveys for listed species in the project area included this species. Habitat suitability for Indiana bats was assessed using the protocol of Romme et al. (1995). Five forest variables were estimated at 10-meter circular plots at eight locations where large segments of forest occurred. Average canopy cover, average height to bottom of canopy, and average diameter at breast height of overstory trees were used to indicate forest maturity. Subcanopy density was categorized as open (less than 5 percent), moderately dense (5-20 percent), dense (20-60 percent), and very dense (greater than [>] 60 percent). Potential roost trees included snags >3 meters, hollow trees or trees with large cavities, and trees with exfoliating bark. Percent exfoliating bark was used to categorize quality of potential roost trees. High quality trees exhibited >25 percent of the remaining bark exfoliating, moderate trees at 11-25 percent, and low up to 10 percent. High quality habitat plots contained a mature forest with a relatively open sub-canopy and at least one moderate or high quality potential roost tree. Low quality habitat plots consisted of either an undeveloped forest or dense subcanopy or lacked potential roost trees. All eight habitat samples at this site were of low quality for Indiana bats; therefore, this species is not expected to occur in the project area.

3.3.2.3. Aquatic Animals

The TVA Natural Heritage database indicated that no federally listed and one state-listed (special concern) crayfish (Hiwassee crayfish, *Cambarus hiwasseensis*) is known from tributary streams to the Nottely River in the vicinity of the proposed transmission line. This species could potentially occur in some of the streams crossed by the proposed transmission line.

3.3.3. Wetlands

Activities in certain wetlands are regulated under the Clean Water Act. Section 404 implementation requires authorization through either a Nationwide General Permit or an Individual Permit from the U.S. Army Corps of Engineers (USACE) in order to conduct specific activities in wetlands. Section 401 gives states the authority to certify whether activities permitted by the Federal government are in accordance with state water quality standards (Strand, 1997). Additionally, EO 11990 requires all federal agencies to minimize

the destruction, loss, or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands in carrying out the agency's responsibilities.

Wetland determinations were performed in the proposed project area according to USACE standards (Environmental Laboratory, 1987), which require documentation of hydrophytic vegetation (Reed, 1997), hydric soil, and wetland hydrology. Broader definitions of wetlands such as the wetland definition used by the U.S. Fish and Wildlife Service (Cowardin et al., 1979) were also considered in this review.

Field surveys, the U.S. Department of Agriculture (USDA) Soil Survey for Cherokee County (Perkins, 1941), and National Wetland Inventory maps indicated an absence of wetlands in the proposed project area. The generally steep terrain in the majority of the project area does not support the development of wetlands, and while the proposed transmission line would cross several streams and associated hydric soil units, these areas are deeply dissected and no wetlands are associated with them.

3.3.4. Aquatic Ecology

The proposed transmission line would be located in the Nottely River watershed within the Blue Ridge Physiographic Province. Streams within this province typically have dendritic (forked branching) drainage patterns (Etnier and Starnes, 1993). Small streams are high gradient with numerous riffles and falls over bedrock and boulder substrates, with interspersed bedrock and sand and gravel pool areas. They generally have very low productivity and excellent clarity, and in-stream vegetation is nearly absent.

Field surveys conducted in September 2004 identified 13 perennial and intermittent streams and 30 wet-weather conveyances (Appendix VI) that would be crossed by the proposed transmission line right-of-way. Two of these crossings were complex stream systems that consisted of multiple channels. Typically, perennial streams can support a permanent assemblage of aquatic life, including invertebrates, reptiles, amphibians, and fish. Intermittent streams can also support these assemblages for part of the year, but they may also support them permanently in pools and if surface water flows year-round. Wet-weather conveyances, also known as ephemeral streams, typically only flow for approximately 24 to 48 hours after a rain event, receive negligible subsurface flow, and maintain weak to moderate bed and bank structure. These factors make it difficult for aquatic life to survive in these channels.

The Nottely River is not identified on the 2004 draft state 303 (d) list (North Carolina Department of Environment and Natural Resources, 2004) as being impaired. TVA conducted biological sampling at Nottely River Mile (NRM) 11.0, approximately 1 mile upstream of the proposed transmission line crossing in March 2004. Karr et al. (1986) developed the Index of Biological Integrity (IBI) using 12 criteria to describe the fish community of streams to evaluate water quality. The fish IBI rated the fish community as "poor/fair," while the IBI for the benthic (bottom dwelling) invertebrate community rated as "good." These ratings were based on species diversity and the occurrence of species intolerant or tolerant of degraded conditions. The number of intolerant fish and darter species was considered low and the percentage of fish that are classified as specialized insectivores (insect eaters) and piscivores (fish eaters) was also considered low. In addition, although a total of 13 fish species, including trout, were collected, the total number of fish captured during sampling was considered low. The Georgia Department of Natural Resources Wildlife Division stocks trout in the Nottely River upstream of the Nottely

reservoir; however, the trout collected probably entered the river from tributaries in the Nantahala National Forest that are stocked by the North Carolina Wildlife Resources Commission.

3.3.5. Managed Areas

The TVA Natural Heritage database indicated that the proposed transmission line route would not be located within or immediately adjacent to any managed areas or ecologically significant sites. Additionally, no streams in the project area are listed on the Nationwide Rivers Inventory. There are, however, three managed areas and/or ecologically significant sites within 3 miles of the project site.

These three National Forest areas consist of privately owned tracts intermixed with land owned by the USFS. A proclamation boundary is established by Executive Order and delineates areas of allowable purchase by the USFS. A purchase unit is an area designated by the Secretary of Agriculture "to create a new boundary or to adjust or expand an existing boundary within which federally acquired lands will become a part of the National Forest System" (USDA, 2004a). USFS tracts are managed for multiple uses including forest products, recreation, and water quality.

Nantahala National Forest lies approximately 1.5 miles north of the proposed transmission line. This area contains over 530,000 acres in North Carolina and is managed for water quality, forest products, and recreation.

Nantahala State Game Land coincides with USFS tracts that are appropriate for hunting activities within the Nantahala National Forest. Hunting and fishing are administered under the North Carolina Wildlife Resources Commission.

Chattahoochee National Forest lies 3.1 miles southeast of the proposed transmission line. This area contains almost 750,000 acres across 18 counties in northern Georgia. The Chattahoochee Purchase Unit (PU) boundary in Union County, Georgia, is 2.7 miles south of the proposed transmission line; however, National Forest System (NFS)-purchased tracts within the PU are 4.3 miles southeast of the proposed transmission line. The PU, which consists of disjunct tracts, is a 69,302-gross-acre area, of which 195 acres is owned by the NFS (USDA, 2004b). Recreational opportunities include both developed and primitive camping, hunting, fishing, boating, swimming, and picnicking. An extensive trail system gives hikers the opportunity to view both mountain scenery and wildlife.

3.3.6. Recreation

The proposed transmission line right-of-way would cross the Nottely River and the headwaters of Nottely Reservoir. The river and reservoir support very limited recreational boating and recreational fishing. The nearest developed recreation facility is a recreational-vehicle park at NRM 37.5.

Other recreational activities in the area are generally unorganized and dispersed and occur on private land, USFS land and on Nantahala State Game Land. Activities consist of deer and small game hunting, recreational target shooting, and wildlife viewing.

3.3.7. Floodplains

The proposed transmission line right-of-way would cross the identified 100-year floodplain of the Nottely River and several minor floodplain areas in Cherokee County, North Carolina.

Construction of the tap point, modifications at the Ranger Substation, and construction of the access roads would not involve work within the 100-year floodplain. The two sites identified for a potential laydown area are both located outside the 100-year floodplain.

3.3.8. Groundwater

As previously stated, the proposed transmission line route would lie within the western Blue Ridge Physiographic Province and run from west to east across two geologic subdivision sections known as the Blue Ridge Belt and the Murphy Belt.

The western portion of the proposed transmission line right-of-way would intersect the Blue Ridge Belt. This area is composed of sedimentary and metamorphic rocks consisting of slate, metasiltstone, schist, metagraywacke, quartzite, and felsic metavolcanic rock of late Proterozoic age.

The right-of-way would continue eastward and cross the Murphy Belt. This area is composed of clastic and carbonate metasedimentary rock formations consisting of schist, phylite, quartzite, marble, slate, and metasiltstone. Most of the rocks in the area were originally sediments that have been exposed to various degrees of metamorphism. These formations include highly mineralized zones that may contain pyrite, a potentially acid-forming mineral.

Fractured bedrock aquifers and surficial aquifers are the two major aquifer systems in the area, and they usually interact with one another. Fractured bedrock aquifers, also known as crystalline-rock aquifers, are widely used for home water supply in the Blue Ridge Physiographic Province. Usually, 6-inch wells are drilled to intercept water-bearing fractures which are more common in valleys. Thick sequences of near-surface unconsolidated material, called regolith, often overlie fractured bedrock and can improve yields to 200 gallons per minute or more. However, wells typically yield 5 to 35 gallons per minute.

The surficial aquifer is widely used throughout North Carolina for individual home wells. Regolith forms the unconfined surficial aquifer, while the underlying fractured bedrock is the unconfined to semiconfined fractured bedrock aquifer. Regolith consists of soils, saprolite (weathered bedrock), and alluvium (transported weathered bedrock). Usually the surficial aquifer feeds the fractures in the bedrock aquifer. The surficial aquifer is the shallowest and is susceptible to contamination from septic tank systems and other pollution sources. Commonly, large diameter wells (up to 3 feet in diameter) are drilled up to 60 feet deep to store large quantities of water in the well casing. The surficial aquifer is very sensitive to variations in rainfall amounts and is the first to dry up in a drought. Wells typically yield 25-200 gallons per minute.

Groundwater obtained from fractured bedrock and surficial aquifers in most cases is suitable for drinking and other uses. However, iron, manganese, and sulfate can occur in objectionable concentrations. The water tends to be slightly acidic and may require treatment to decrease iron and manganese levels. The water is classified as a calcium plus magnesium bicarbonate type (Trapp and Horn, 1997).

In 1995, overall public water systems in the Hiwassee River Basin including Murphy, Andrews, and Marble supplied 1.4 million gallon per day (mgd) of surface water and 0.25 mgd of groundwater for residential and nonresidential uses. The towns of Murphy and Andrews are supplied by surface water. The town of Marble is supplied by groundwater from the fractured bedrock aquifer, and future water demands are expected to continue to be met by groundwater sources. The remaining residential water demand was met by 1 mgd of self-supplied groundwater, from fractured bedrock and surficial aquifers, and an additional 0.9 mgd was withdrawn for nonresidential uses (North Carolina Department of Environment and Natural Resources, 2001).

3.3.9. Surface Water

Precipitation in the project area averages about 57 inches per year with the wettest month in March at 6.0 inches and the driest month in October at 3.3 inches. The average annual air temperature is 56 degrees Fahrenheit (°F), ranging from a monthly average of 36°F in January and February to 74°F in July. Stream flow 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 Martin Creek and the Nottely River (and its tributaries Cane Creek and Rominger Creek) of the Hiwassee River in the Tennessee River Basin. These receiving streams are classified by North Carolina Department of Water Quality as Class C (fishable/swimmable) waters. Class C waters are protected for secondary recreation, fishing, wildlife, fish and aquatic life propagation and survival, agriculture, and other uses. None of the streams are identified on the 2004 draft state 303 (d) list (North Carolina Department of Environment and Natural Resources, 2004) as being impaired.

3.3.10. Visual

Visual resources are evaluated based on existing landscape character, distances of available views, sensitivity of viewing points, human perceptions of landscape beauty/sense of place (scenic attractiveness), and the degree of visual unity and wholeness of the natural landscape in the course of human alteration (scenic integrity). Views of a landscape are described in terms of what is seen in foreground, middleground, and background distances. In the foreground, an area within 0.5 mile of the observer, details of objects are easily distinguished in the landscape. In the middleground, normally between 0.5 mile and 4 miles from the observer, objects may be distinguishable, but their details are weak and they tend to merge into larger patterns. Details and colors of objects in the background, the distant part of the landscape, are not normally discernible unless they are especially large and standing alone. The impressions of an area's visual character can have a significant influence on how it is appreciated, protected, and used. The general landscape character of the study area is described in this section with additional details in Section 4.3.10.

The proposed transmission line route traverses portions of rural Cherokee County, North Carolina. The route would connect via a tap point in the existing Murphy-Weaver 161-kV Transmission Line near the intersection of Hedden Road and New Martin Church Road. From this proposed tap point, the transmission line route would move west along Hedden Road, cross U.S. Highway 19 (US 19) and SR 60, and transition into more moderate topography before crossing the Nottely River and US 64, terminating at a cooperative substation near the small town of Ranger, North Carolina. The existing visual resources along the proposed route have been evaluated in this manner, and potential impacts

associated with the proposed project are discussed in Section 4.3.10. Scenic attractiveness along the proposed route, at present, is common. Scenic integrity is moderate to low.

The proposed tap point would be located near a hilltop above the New Martin Church cemetery. From the tap point, the proposed route would leave a thin screen of mature pine trees and travel to the northwest across pastureland, cross Hedden Road, and arrive at the first turn in the transmission line route. The area is characterized by moderate residential development along the roadway amidst stretches of dense mature vegetation. Views along the roadway are kept, primarily, within the foreground-viewing distance, as topography and vegetation prevent views into the middleground-viewing distance. Occasionally, and through breaks in the roadside vegetation, views are available upward slightly and into the background, where specific features are not normally discernable and details and colors become weak and muted. The proposed transmission line route would continue from this point on the north side parallel to Hedden Road and an existing distribution line to the south of Hedden Road. After following the roadway for a little more than 1 mile, the proposed route would maintain its westerly course as Hedden Road bends south and away from view.

The proposed transmission line route would leave the moderately developed roadside and would move into the slightly steeper and more thickly vegetated terrain along the southern side of Bell Mountain. Views of this section of the transmission line route would be primarily from the foreground of the few homes that are scattered about the hillside. Approaching US 19, the mature vegetation along the hillside would allow for limited views of the transmission line route. After a short distance, the transmission line route would leave the thickly forested slope and emerge in the immediate foreground view of Brawley Timber Company, where views would be void of mature vegetation in the foreground and the landscape character becomes more industrial.

Upon crossing Gold Branch Road, the transmission line route would continue west, hidden from view by mature vegetation for just over 0.25 mile before reaching Clayton Hollow Road, which is a small residential access roadway that services approximately five homes set just off Snow Hill Ridge Road. Existing distribution lines and associated right-of-way lie parallel to a short segment of the unimproved roadway where surrounding vegetation is heavy and views are concentrated within the foreground-viewing distance.

The proposed transmission line route would continue westward and into lower elevations and cross at Sneed Road where vegetation remains consistent and residential development randomly appears from the roadway. A small church, which appears to be at a lapsed stage in construction, lies just to the north of the Sneed Road crossing and within the foreground of the proposed transmission line route. Few residences lie within this section of the proposed transmission line route, even to the Cook Bridge Road crossing where an existing distribution line is visible over the roadway and vegetation remains dense to the west approaching SR 60, a primary four-lane roadway.

At the proposed SR 60 crossing, views would be available into the background as Bruce Mountain rises to the south. Views would be intermixed with sparse pockets of residential development and agricultural operations. Similar views would continue to the west through mature vegetation until a break in the topography would allow views of a narrow valley below. Within the valley, the proposed transmission line route would cross down a slope of partially denuded vegetation and continue across the Nottely River and within the

immediate foreground of the Ranger Community Center and Volunteer Fire Department. These community facilities are set just to the northwest of the Nottely River, and views from the valley floor would include a modest amount of residential development in addition to recreational fields that accompany the community center. The proposed transmission line route would cross just behind the community center and a private residence before rising up the western slope toward US 64 where vegetation and topography remain typical to the proposed transmission line route.

Approaching Dickey Road, the proposed transmission line route would travel through maturing hardwood vegetation. There are few residences in the immediate area just south of US 64, a primary east-to-west roadway. The proposed transmission line would cross Dickey Road, a secondary roadway, and drop away to the south from US 64 where commercial buildings are noticeable from just off the primary route. The proposed transmission line route would parallel the Shops of Peddlers Village, turn to the north, cross US 64, and terminate into the planned substation facility.

3.3.11. Cultural Resources

Human occupation of the region has likely occurred continuously for the last 12,000 years. Prehistoric chronology is generally broken into four broad time periods: Paleo-Indian, Archaic, Woodland, and Mississippian. 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 Historic Period is represented by settlement in the region by Europeans, European-Americans, and African-Americans and the subsequent removal of Native American tribes.

Cherokee County, North Carolina, was formed from Macon County in 1839, and the county seat was placed at Murphy. During this time, the primary agricultural product was corn, over 167,000 bushels of which were produced in 1850. Livestock was also an important farm product. Cattle and hogs were often driven on foot to markets or railroad heads in Georgia for distribution. Iron production and timber were the two earliest industries in the county. The mountain region was not a major theater of the Civil War, but in 1863 and 1864, the valley was the scene of several raids by soldiers as well as by loosely organized bands of bushwhackers. Following the Civil War, large sections of the county were taken to form Clay and Graham Counties. In 1890, a railroad was built between Andrews and Murphy that provided markets for surplus farm products and improved access to markets and raw materials for the timbering and mining industries. In the early 1940s, TVA purchased land for the construction of Hiawassee Dam and Reservoir. The decline of small-scale farming and the timber industry prompted many people to leave Cherokee County after World War II, and the population did not increase significantly until an influx of retirees and others seeking a more relaxed lifestyle began to move into the mountains of western North Carolina in the last few decades.

The Area of Potential Effects (APE) for the project was determined for archaeological resources as the proposed 100-foot-wide, 4.9-mile-long transmission line corridor, for a total survey area of 0.9 square miles. The architectural APE includes a 0.5-mile area surrounding the proposed transmission line route. A records search indicated that no archaeological resources were located within the APE. Two historic/architectural resources were indicated within 1 mile of the proposed project corridor, but the resources were not assigned official North Carolina state site numbers. The first of these is the Ranger

Community, located south of US 64 and north of the Nottely River. The location has a gentle mound rising approximately 3 feet above the surrounding field. A single ground stone fragment was found from the clearing of the field. The area is now developed, and it is unknown whether the resource was or is eligible for listing on the National Register of Historic Places (NRHP). The proposed transmission line route would not intersect the previously identified site area. The second previously recorded site, Martin Creek, is located south of Old Martin Creek Cemetery, approximately 1 mile east of the eastern terminus of the proposed project corridor. This resource was represented by the remains of a collapsed frame cabin, a historic scatter, and a 1940s-era automobile chassis. This resource is probably not eligible for NRHP listing and is located well outside the proposed project area. Ellijay Road, which was part of the Trail of Tears, formerly ran northeast-southwest across the proposed project corridor east of Nottely River. Two early nineteenth-century farmsteads (the Lowdermilk and Boleyn properties) also are known to have existed well outside of the proposed transmission line corridor in the Nottely valley to the north and south. No historic structures were recorded with the State Historic Preservation Office in the vicinity of the proposed transmission line route.

An archaeological survey was conducted in September 2004 (D'Angelo and Carr, 2004). Six dirt-road segments were recorded and mapped as a part of an effort to determine if a portion of the historic Ellijay Road could be identified within the proposed project corridor. One of these six segments is a road cut that was identified as the Ellijay Road corridor, but evidence of the road itself has been mostly destroyed by recent construction. If other portions of the historic Ellijay Road are intact, it may be considered eligible for the NRHP. However, previous impacts to the portion of the Ellijay Road within the proposed project area have compromised the resource's integrity such that the proposed construction would have no adverse effect on the resource. Investigations were carried out to explore the possible location of the historic William Lowdermilk and Anna Boleyn homesteads. It was determined that these former house sites are not located within the proposed project area.

A historic/architectural survey was conducted in July 2004. The survey indicated that within 0.5 mile of the proposed project route, there are 19 properties at least 50 years of age. Of these properties, 18 are recommended not eligible for listing on the NRHP, while one (CE47) is considered potentially eligible for NRHP listing. Site CE47 is a one-story, frame structure that was used as a blacksmith shop around 1900. It is a good example of its construction and use and retains its original form and design.

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CHAPTER 4

4. ENVIRONMENTAL CONSEQUENCES

4.1. Introduction

Chapter 4: Environmental Consequences and Chapter 3: Affected Environment form the detailed scientific and analytic basis for the summary comparisons presented in Chapter 2, Section 2.5 Project and Siting Alternatives.

Section 2.5 contains by option the predicted attainment and nonattainment of the purpose and need defined in Chapter 1. This chapter presents the detailed predicted effects of implementing Alternative 1: Do Not Build Transmission Line (No Action) and Alternative 2: Construct Transmission Line (Action).

4.2. Effects of Alternative 1: Do Not Build Transmission Line (No Action)

In general, factors outside of TVA's control are expected to continue to influence the landscape of the region. Irrespective of the decision TVA makes about constructing the proposed line, environmental conditions in the area will continue to change.

Should the proposed TVA transmission line not be built to the planned Ranger Substation, BRMEMC would not be able to meet the projected increased load demands on its system, and system outages in the project area would increase. This would have adverse economic consequences. BRMEMC could build the proposed transmission line itself. Should it do so, the kinds of environmental impacts TVA describes below associated with a TVA-built transmission line would be similar to those associated with a BRMEMC-built transmission line. However, there is no indication that BRMEMC would build the transmission line itself, so subsequent impact discussions assume that under the No Action Alternative, no transmission line would be built.

4.3. Effects of Alternative 2: Construct Transmission Line (Action)

4.3.1. Terrestrial Ecology

4.3.1.1. Terrestrial Plants

No Action Alternative
Adoption of the No Action Alternative would not result in any project-related impacts to the terrestrial ecology of the region.

Action Alternative
No rare or uncommon plant communities were identified along the proposed transmission line route or laydown areas. Approximately 41 acres of forested areas would be cleared for the proposed transmission line right-of-way. Because the vegetation occurring along the proposed transmission line route is common and representative of the region, project-related impacts to the terrestrial plant ecology of the region are expected to be insignificant as a result of the proposed Action Alternative.

Due to the previous level of disturbance to the native plant communities along the proposed transmission line route, no significant impacts to native plant communities resulting from the introduction and spread of invasive terrestrial plant species are expected with the implementation of the proposed Action Alternative. With little to no invasive species in the xeric upland mixed forests (which harbor the pink lady's slipper), broadleaf deciduous forests, and rich moist forests, the introduction and spread of invasive terrestrial plant species could occur as a result of the project. Measures such as the planting of native noninvasive species in the right-of-way following construction (Appendix V) would help to prevent the introduction and spread of invasive species in the project vicinity.

4.3.1.2. Terrestrial Animals

No Action Alternative
Under the No Action Alternative, the proposed 4.9-mile transmission line between the BRMEMC's planned substation and the Murphy-Weaver 161-kV Transmission Line would not be constructed, and the project area would likely remain in its current state. Therefore, terrestrial animals and their habitats would not be affected.

Action Alternative
The majority of the habitats along the proposed route consist of a matrix of grass/forb habitats interspersed within a predominantly forested area. Temporary fluctuations in populations of terrestrial animal species are anticipated during the construction of the transmission line corridor, laydown area, and access roads. Construction of the transmission line would remove some of these forested habitats. Clearing would result in minimal habitat fragmentation and would slightly increase the percentage of forest edge in the vicinity. Although some species prefer edge habitat, other species could be negatively affected by these habitat changes. Small animals with relatively small home ranges or habitat area requirements of specific structural habitat characteristics may be negatively affected by these conditions. However, these effects are expected to be minimal because of the high amount of habitat fragmentation that already exists along the proposed routes. The similarity of nearby undisturbed forested areas within the Nantahala National Forest would provide suitable, alternative habitat for mobile species, and overall, there should be little disturbance to forest-associated terrestrial animals. Several forested valleys contain small streams and seepages throughout the proposed transmission line route; best management practices (BMPs) and SMZs would reduce impacts to streamside wildlife. No unique terrestrial features, such as caves or heronries, have been recorded or were found during field surveys within Cherokee County and no effect to these resources are expected. Therefore, the Action Alternative would not significantly displace or disrupt area wildlife, and impacts to terrestrial animals and their habitats would be insignificant.

4.3.2. Threatened and Endangered Species

4.3.2.1. Terrestrial Plants

No Action Alternative
No project-related impacts to listed plant species would result from the adoption of the No Action Alternative.

Action Alternative
No occurrences of federally or state-listed plant species were identified in or adjacent to the proposed transmission line route, laydown areas, or access roads. Therefore, no impacts to any federally or state-listed plant species are anticipated as a result of the proposed action.

4.3.2.2. Terrestrial Animals

No Action Alternative
Under the No Action Alternative, the new 4.9-mile, 161-kV transmission line between BRMEMC's planned Ranger Substation and the Murphy-Weaver Transmission Line would not be constructed, and the project area would likely remain in its current state. Therefore, this alternative would not result in adverse impacts to listed terrestrial animal species or their habitats.

Action Alternative
Suitable habitat for the eastern hellbender, four-toed salamander, bog turtle, nesting saw-whet owls, and the Indiana bat does not exist within the proposed project area. Therefore, these species would not be affected by the proposed project.

Habitat for several salamander species (mole, seepage, Junaluska, and Tellico), mountain chorus frog, and stripeneck musk turtle occurs within the proposed project area immediately around the streams or the Nottely River. The small size and specific habitat requirements of these species limit their mobility. Although there would be some loss of forested riparian vegetation, this would not result in adverse impacts to these species. In addition, adverse effects due to construction of the proposed transmission line are not expected because SMZs would buffer the streams, preventing disruption to these species or their habitat.

Forested habitat for the fox squirrel, eastern big-eared bat, and northern long-eared bat exists in several large tracts of land within the proposed project area. These species could occur in suitable habitat along the corridor. Temporary disturbance to individuals of these species could occur during construction of the proposed transmission line. However, due to their mobility and the abundance of suitable habitat in the surrounding area, the proposed project is not likely to result in adverse impacts to these species.

The construction of the proposed transmission line could temporarily disturb blue-winged warblers and northern pine snakes, but both species would be able to utilize the habitat created by the transmission line right-of-way.

No federally listed terrestrial animal species were identified on or near identified transmission line routes, and no effect on such species is anticipated.

With the implementation of BMPs and SMZs, no significant impacts are anticipated to state-listed terrestrial animal species or their habitats within the proposed project area as a result of the proposed project.

4.3.2.3. Aquatic Animals

No Action Alternative
Under the No Action Alternative, the proposed transmission line would not be constructed, and the project area would likely remain in its current state. Therefore, aquatic animals and their habitats would not be affected.

Action Alternative
No federally listed aquatic species are known or are likely to occur in the project area; therefore, none would be affected by the construction, operation, or maintenance of the proposed transmission line. Clearing of riparian vegetation and soil disturbance associated with construction of stream crossings and other construction or maintenance activities could result in sediment entering these waterways during storm water runoff. Short-term impacts as a result of these activities could potentially occur to local populations of the state-listed Hiwassee crayfish. Increased sedimentation in the streams could affect habitat availability, and canopy cover/riparian removal could lead to increased water temperatures.

These potential changes of the physical habitat in affected streams could in the long term disrupt or eliminate nearby populations of this species. However, with the implementation of stream protection measures as described in Sections 4.3.4 and 4.3.9 during construction and maintenance, no impacts to protected aquatic animals or to the viability of any aquatic species' populations in the project area are anticipated as a result of the proposed project.

4.3.3. Wetlands

No Action Alternative
Adoption of the No Action Alternative would not result in any project-related impacts to wetlands.

Action Alternative
The implementation of the Action Alternative is anticipated to have no significant impact because no wetlands occur in the project area.

4.3.4. Aquatic Ecology

No Action Alternative
Under the No Action Alternative, the proposed project would not be constructed, and the project area would likely remain in its current state. Therefore, aquatic ecology would not be affected.

Action Alternative
Watercourses in the project area considered to convey only surface water during storm events (i.e., wet-weather conveyances or ephemeral streams) would be protected by standard BMPs as identified in Muncy (1999). These BMPs are designed to minimize erosion and subsequent sedimentation in streams. Appendix VI lists the approximate locations of wet-weather conveyances.

With the exception of the Nottely River, intermittent and perennial streams and their riparian habitats that occur within the project area would qualify for Standard Stream Protection (Category A) as designated by TVA Transmission Construction Guidelines Near Streams

(Muncy, 1999). The Standard Stream Protection designation is based on the variety of species and habitats that exist in intermittent and perennial streams and the state and Federal requirements to avoid harming them. Criteria for the Standard Stream Protection designation included evidence of aquatic life and/or the presence of a well-defined channel with rock or soil substrate. These criteria and the presence of an important sport fish (trout) would qualify the Nottely River for Protection of Important Permanent Streams (Category B). SMZ width is determined by category and slope of land adjacent to the stream (Muncy, 1999). Streams identified for Standard Stream Protection and Protection of Important Permanent Streams along the proposed transmission line right-of-way are noted in Appendix VI. Because of local topography, SMZs would extend 50 feet on either side of the proposed crossing (measured from the edge of the stream), but may extend further based on SMZ guidelines as outlined in Muncy (1999). These exceptions in width are noted in Appendix VI.

By following the appropriate stream protection requirements on streams identified in Appendix VI, the design, construction, and maintenance of the proposed project would not result in significant impacts to aquatic life. Support structures are normally located as far as possible from surface waters to minimize water-related impacts. All construction and maintenance work, especially near streams, would be conducted following the requirements and recommendations presented in TVA's guidelines for environmental protection during transmission line construction (Muncy, 1999).

Road access to transmission line construction sites would be planned and constructed to minimize erosion and sedimentation effects. Use of existing access points would reduce access-related impacts. If no practicable alternative exists, trees along streams within the transmission line corridor and danger trees adjacent to the corridor would be cut; however, their stumps would not be removed and understory vegetation would be disturbed as little as possible. These initial clearing/felling activities (including danger trees) within the SMZ areas along streams would be accomplished by using either hand-held equipment or other appropriate clearing equipment (e.g., feller-buncher), which would result in minimal soil disturbance and damage to low-lying vegetation. During transmission line maintenance activities, trees and other vegetation within the SMZ would be controlled with backpack-applied spot use herbicide to remove tree seedlings and other regrowth. Maintenance activities along streams would be by mechanical cutting or by selective use of USEPA-registered herbicides. Permanent and temporary stream crossings would comply with appropriate Federal and state permitting requirements as well as any applicable designations and BMPs. Where herbicides are used, these chemicals would be applied following USEPA label restrictions and TVA BMPs.

4.3.5. Managed Areas

No Action Alternative
Under the No Action Alternative, TVA would not build the transmission line, and no laydown yards would be required. Therefore, no impacts would occur to the managed areas in the project area.

Action Alternative
Three managed areas and/or ecologically significant sites occur within 3 miles of the proposed project site. No impacts are anticipated to occur to these areas as a result of the proposed actions because the distance from the project area is sufficient. Therefore, the

implementation of the Action Alternative is expected to have no impact on any managed area or ecologically significant site.

4.3.6. Recreation

No Action Alternative
Under the No Action Alternative, the proposed project would not be constructed, and the project area would likely remain in its current state. Therefore, recreation would not be affected.

Action Alternative
There would be little to no impact on recreation activities or the resource related to this project. The National Forest areas are a sufficient distance from the proposed transmission line project, and the affected portion of the Nottely River receives little recreational use.

4.3.7. Floodplains

No Action Alternative
Under the No Action Alternative, the proposed transmission line would not be constructed. Therefore, no floodplains would be affected.

Action Alternative
The proposed transmission line right-of-way would cross several floodplain areas in Cherokee County, North Carolina. For compliance with EO 11988, an overhead transmission line and related support structures are considered to be a repetitive action in the 100-year floodplain. The construction of the support structures for the transmission line would not be expected to result in any increase in flood hazard as a result of either increased flood elevations or changes in flow-carrying capacity of the streams being crossed. To minimize adverse impacts on natural and beneficial floodplain values, the rights-of-way would be revegetated where natural vegetation is removed, and the removal of unique vegetation, if any, would be avoided. BMPs would be used during construction activities. The TVA subclass review criteria for transmission line location in floodplains would be followed to ensure floodplain impacts would be minimized.

4.3.8. Groundwater

No Action Alternative
Under the No Action Alternative, the proposed project would not be implemented, and the project area would likely remain in its current state. Therefore, groundwater would not be affected.

Action Alternative
The proposed right-of-way construction lies within an area where most of the public water supply is provided by surface water. The town of Marble lies to the north and is supplied by groundwater. In addition, some private wells may occur in the project area, but disturbance of the quantity or quality of these wells would depend on the type of aquifer in which the well is developed. BMPs as described in Muncy (1999) would be used to avoid contamination of groundwater sources. Transfer of surface contaminants to the fractured bedrock aquifers is very unlikely due to the depth and confined or semiconfined nature of

these aquifers. Therefore, no impacts are anticipated to the aquifer that supplies drinking water to Marble. Transfer of surface contaminants to the surficial aquifers would be minimal and transient due to the nature of the proposed action and the use of BMPs. The project area could contain pyritic rock that, if disturbed and exposed to weathering, could form acidic runoff. The nature of the proposed action, however, would result in only minor disturbances of pyrite-bearing rocks if encountered along the right-of-way. Any formation of acidic runoff would therefore be minor and insignificant. During revegetation and maintenance activities, fertilizers and herbicides would be avoided in areas that flow to sinkholes and springs or used sparingly to avoid contamination of groundwater. With the use of these BMPs, impact on groundwater from the proposed Action Alternative would be insignificant.

4.3.9. Surface Water

No Action Alternative
Under the No Action Alternative, the proposed project would not be constructed. Therefore, no surface waters would be affected.

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

However, TVA routinely includes precautions in the design, construction, and maintenance of its transmission line projects to minimize these potential impacts. Permanent stream crossings 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. Right-of-way maintenance would employ manual and low-impact methods wherever possible. In areas requiring chemical treatment, only USEPA-registered herbicides would be used in accordance with label directions designed in part to restrict applications in the vicinity of receiving waters and to prevent unacceptable aquatic impacts.

4.3.10. Visual

No Action Alternative
Under the No Action Alternative, the proposed project would not be constructed. Therefore, no visual impacts would occur.

Action Alternative
Visual consequences are examined in terms of visual changes between the existing landscape and the proposed actions, sensitivity of viewing points available to the general public, their viewing distances, and visibility of proposed changes. The potential effects to visual resources are described as the existing visual resources previously were in Section 3.3.10, from east to west along the proposed transmission line route.

From the proposed tap point in the existing Murphy-Weaver 161-kV Transmission Line, the proposed transmission line would be visible from vantage points along Hedden Road as motorists and residents would have foreground views of the transmission line and structures against a backdrop of vegetation. Views of the transmission line and predominantly single-pole transmission line structures would be viewed in context with views of the existing Murphy-Weaver 161-kV Transmission Line and the BRMEMC distribution line, which currently parallels the roadway. Residents in the vicinity of Yellow Pine Road would have views of the transmission line structures from within the immediate foreground, as a portion of roadside vegetation would likely be lost due to the required right-of-way acquisition and clearing. The use of steel single-pole structures would reduce impacts, and as the new structures weather with time, the transmission line route would be viewed in direct context with the existing distribution line, which lies across Hedden Road to the south. Potential impacts remain similar along the northern right-of-way of Hedden Road to the Rockridge Road intersection where alternatives for the proposed transmission line and right-of-way exist.

Within this section of proposed transmission line, the route would maintain its westerly course along the northern right-of-way. Residents to the north and south of the roadway would have views of the proposed transmission line and associated structures. Portions of existing roadside vegetation would be lost from the proposed acquisition and maintenance of the 100-foot right-of-way. The proposed route would not result in a significant impact to the existing visual resources.

Motorists and residents would have continued foreground views of the proposed transmission line and associated single-pole structures along the north of Hedden Road, which would be viewed in context with existing distribution lines and would be seen against a background of mature vegetation.

Views available to motorists as the proposed route leaves the road right-of-way would transition as the proposed right-of-way moves on axis with the roadway and then would be lost to sight as Hedden Road winds to the south. Upon crossing the small hill between structures nine and ten, views would be confined to the foreground distance of the few residences that are scattered about the proposed line route in this segment, where a dispersed area of vegetation would remain to buffer the right-of-way and structures. A proposed access roadway would be installed in this section off US 19 near a private residence. The proposed roadway would be located at a break in the roadside vegetation where intermittent access has occurred in the past. Views of access roadway improvements would not contrast with the existing landscape character. The proposed transmission line within this section would be viewed against a backdrop of mature vegetation and the single-pole structures would weather over time to reduce potentially adverse impacts to visual resources. The proposed transmission line would remain screened, somewhat, from view until reaching the roadway crossings at US 19 where motorists would have brief views of the proposed line between structures at the road crossing. Motorists on Gold Branch Road would have views of longer durations due to the lack of mature vegetation and the moderation in topography. Views would be similar to those of nearby residents with proposed transmission line and single-pole structures against a denuded landscape, where discordant views are predominate.

The proposed transmission line and associated structures would again recede into mature vegetation and be somewhat obscured from view until reaching Clayton Hollow Road, where residents would have foreground views of the single-pole structures and

transmission line in context with existing distribution lines. Right-of-way in this section would be discernable at the roadway crossing and down the slope to Sneed Road, where motorists would have brief views of the proposed route from between structures. Nearby residents would have views of a longer duration, but the transmission line/structures would be viewed amidst mature vegetation, causing the line to recede somewhat from foreground view. Similar impacts would be perceivable up the slope and to the Cook Bridge Road crossing, where views would remain limited, primarily, to motorists traveling the route. Views would be brief and would be in context with views of existing distribution lines and structures along the roadway.

Few residents would have views of the proposed transmission line in the section reaching SR 60. Generally, views of proposed structures would be similar in context to those of distribution line structures currently in place. A proposed access roadway lies just north of the proposed transmission line crossing off SR 60. The location of the proposed access roadway is void of mature vegetation and exhibits signs of intermittent access in the recent past. Improvements to the proposed access roadway at its location would generally not be readily discernable to motorists and residents nearby. At the proposed transmission line crossing of SR 60, motorists would have views of the proposed line and structures perpendicular to existing line, which travels the western right-of-way along the primary route. Views of structures within this section would not differ greatly from views of existing distribution lines, right-of-way, and support structures. Views upon crossing the roadway are generally not available until the proposed line reaches the downslope to the valley of the Nottely River, where views would be available to residents, motorists, and visitors to the Ranger Community Center/Volunteer Fire Department. These views would be typical throughout the valley floor from within the foreground-viewing distance. The proposed line would be seen, in slightly larger scale, intersecting with existing distribution lines that follow the river and service structures and homes along Little Ranger Road. Views would also be available to residents and motorists to the north in the vicinity of the Ranger United Methodist Church, which lies just less than 0.5 mile away. Views from this distance would include the proposed line against a background of vegetation, causing elements of the line to recede somewhat into the darker landscape background.

Nearing the Dickey Road crossing, views of the proposed transmission line and support structures would largely be obscured by mature vegetation. Since very few residences lie within this final stretch, the majority of available views would exist as the proposed route reaches Dickey Road and through to the point of termination. Motorists traveling Dickey Road would have views of the proposed line briefly and from between structures. Motorists traveling US 64 and visitors to the Shops of Peddlers Village would have foreground views of varying durations; however, those views of proposed structures would remain in context with existing distribution line and structures that currently traverse the primary roadway.

The proposed route would travel east to west through the rural North Carolina countryside and over land that is generally sparsely habited. The project would include acquisition and clearing of right-of-way, construction of two access roadways, and placement of predominantly single-pole 161-kV structures, 161-kV transmission line, and other associated structures. Temporary visual discord would be evident during periods of construction as residents, motorists, and visitors would notice an increase in personnel and equipment throughout the proposed route. Additionally, the use of temporary material and equipment staging areas would be perceivable from vantage points throughout the proposed route. These temporary alterations to the visual character would be minor, and primary impacts associated with these discordant elements would be confined to the

construction period. The introduction of 161-kV single-pole structures, guying structures, and dead end structures would result in an increase in the number of discordant vertical elements in the landscape, but when viewed in context with existing distribution lines, structures, and associated right-of-way would not contribute to a depreciable loss of established landscape character and would not result in a significant impact to existing visual resources.

4.3.11. Cultural Resources

No Action Alternative
Under the No Action Alternative, the proposed project would not be constructed. Therefore, no impacts to cultural resources would occur.

Action Alternative
The Phase I Cultural Resources Survey for the proposed transmission line identified one historic property potentially eligible for listing on the NRHP. Historic property CE47 (structure) was recommended potentially eligible for listing on the NRHP due to its high level of integrity as related to location, design, setting, workmanship, feeling, and association. Woodlands buffer the site from the proposed construction such that the viewshed of this property would not be adversely affected, and the proposed project would not adversely affect any historic properties (archaeological sites, historic sites, and historic structures) potentially eligible, eligible, or currently listed on the NRHP. TVA formally consulted the North Carolina State Historic Preservation Officer regarding the findings and received a letter of agreement dated December 10, 2004 (see Appendix I). Therefore, TVA has fulfilled its compliance obligations under the National Historic Preservation Act and its implementing regulations at 36 CFR Part 800.

4.4. Post Construction Impacts

4.4.1. Electric and Magnetic Fields

TVA recognizes there is public concern about whether any adverse health effects are caused by electric and magnetic fields (EMF) that result from generation, transmission, distribution, and use of electricity. Many scientific research efforts and other studies examining the potential health and other effects of EMF have been and are being done. TVA is aware of, and ensures that it stays aware of, published research and study results and directly supports some of the research and study efforts.

Studies, interpretations, and research to date are far from conclusive about potential associations between EMF and possible health impacts. A few studies have been interpreted as suggesting a weak statistical relationship between EMF and some rare forms of cancer. During the summer of 2001, the International Association for Research on Cancer reviewed available epidemiological studies and concluded that childhood leukemia appears to be associated with magnetic fields but that there was not a cause and effect relationship. It was concluded that the risk is small but may in some circumstances of higher exposure result in one type of childhood leukemia. The association also concluded that electric fields do not have a connection with cancer.

However, equal or greater numbers of similar studies show no association or cannot reproduce data interpreted as demonstrating an association. No laboratory research has

found cause and effect health impacts from EMF and certainly none that are adverse. Neither has any concept of how these fields could cause health effects achieved scientific consensus.

There is also no agreement in the scientific or EMF research community as to what if any electric or magnetic field parameters might be associated with potential health effects. There are no scientifically or medically defined safe or unsafe field strengths, although state regulatory bodies in Florida and New York have established edge of right-of-way magnetic field strength limits for 230-kV and larger power transmission lines.

TVA has analyzed and continues to analyze the fields associated with its typical line designs using the best available models and has measured actual fields for a large number of locations along its transmission line easements. Both model data and measurements show that the field strengths for TVA transmission lines are well within Florida and New York limits. Based on such models, expected field strengths for the proposed lines discussed in this document would also be within those existing state guidelines.

TVA's standard location practice has the effect of minimizing continuous public exposures to transmission line EMF. The transmission line route selection team uses a constraint model that places a 300-foot-radius buffer around occupied buildings, except schools, for which a 1200-foot buffer is used. The purpose of these buffers is to reduce potential land use conflicts with yard trees, outbuildings, and ancillary facilities and potential visual impacts as well as exposures to EMF. Although not absolute location constraints, these buffers weigh heavily in location decisions, influencing selection of route options and alignments. Because EMF diminishes quickly with distance from the conductors, the routing of transmission lines using constraint buffers effectively reduces potential continuous public exposure to EMF. Crossing under lines or otherwise being near them for short periods may increase overall EMF exposure but only minutely.

4.4.2. Other Impacts

No significant impacts are expected to result from the relatively short-term activities of construction, such as noise, solid waste, etc. Appendices II and III contain procedures for dealing with these issues.

4.5. Irreversible and Irretrievable Commitment of Resources

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

The rights-of-way used for the transmission lines would not be irreversibly committed and could be returned to other uses upon retirement of the line. In the interim, compatible uses of the right-of-way could continue.

Forest products and related wildlife that might have grown on the presently forested portions of the right-of-way would be lost for the life of the project. No locally or regionally significant lost forest or agricultural production would be expected.

4.6. Unavoidable Adverse Effects

As previously stated, clearing for this transmission line would result in the removal of approximately 41 acres of forest. After completion of the transmission line:

- Trees would not be permitted to grow within the right-of-way or to a determined height adjacent to the right-of-way that would endanger the transmission line.
- Clearing and construction would result in the disruption of some wildlife, but no permanent habitat changes would occur except in the wooded areas previously described.
- Any burning of cleared material would result in some short-term air pollution.
- Clearing, tree removal, and excavation for pole erection would result in a small amount of localized siltation.
- Transmission line visibility would be minimized through the location; however, there would be some degree of visual effect on the landscape in the project area.

4.7. Relationship Between Local Short-Term Uses of the Environment and Long-Term Productivity

The construction and operation of the proposed transmission line would supply electricity to meet the present and foreseeable expected loads in the Ranger, North Carolina, area. This would be accomplished by a localized shift of a small amount of land to use for electric power transmission. If, during the useful life of the transmission line, it is no longer needed or technology renders it obsolete, it can be removed with relatively little difficulty. The land encumbered by the right-of-way could be returned to its previous use or used for other purposes.

The principal change in short-term use of the right-of-way would be the exclusion of trees and permanent structures. The amount of forest being lost is relatively small, approximately 41 acres within the right-of-way area, and areas removed from production are dispersed along the length of the transmission line. The right-of-way cannot support building construction for the life of the project, but the social and economic benefits of the project should outweigh this small loss.

4.8. Summary of TVA Commitments and Proposed Mitigation Measures

To support the preceding conclusions, TVA would commit to the following additional actions to avoid or mitigate possible environmental impacts:

<u>Protection of Aquatic Resources</u>

- With the exception of the Nottely River, all intermittent and perennial watercourse crossings would be designated as Category A, Standard Stream Protection, as outlined in Muncy (1999). The Nottely River would be designated as Category B, Protection of Important Permanent Streams.

- Watercourses that convey only surface water during storm events (i.e., wet-weather conveyances or ephemeral streams) and that could be affected by the proposed transmission line route would be protected by standard BMPs as identified in Muncy (1999). These BMPs are designed to minimize erosion and subsequent sedimentation in streams.

General Best Management Practices for Clearing, Construction, and Maintenance

- TVA practices detailed in Appendices II, III, IV, and V would be used during clearing, construction, and maintenance. EO 13112 directs all Federal agencies to prevent and control the introduction and spread of invasive species resulting from their activities. TVA would use reseeding mixes that are certified free of invasive, exotic plant seeds when replanting disturbed areas.

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CHAPTER 5

5. SUPPORTING INFORMATION

5.1. List of Preparers

John T. Baxter
Position: Biologist - Aquatic
Involvement: Threatened and Endangered Species - Aquatic Animals

David M. Bennett
Position: Electrical Engineer - Transmission System Planning
Involvement: Project Need and Alternatives

W. Nannette Brodie
Position: Environmental Specialist, Professional Geologist
Involvement: Groundwater

Kimberly D. Choate
Position: Environmental Engineer - Siting and Environmental Design
Involvement: Purpose of and Need for Action; Alternatives Including Proposed Action

J. Leo Collins
Position: Senior Botanist
Involvement: Terrestrial Ecology - Terrestrial Plants; Threatened and Endangered Species - Terrestrial Plants

Jenny K. Fiedler
Position: Contract Zoologist
Involvement: Terrestrial Ecology - Terrestrial Animals; Threatened and Endangered Species - Animals

T. Hill Henry
Position: Senior Zoologist
Involvement: Terrestrial Ecology - Terrestrial Animals; Threatened and Endangered Species - Animals

John M. Higgins
Position: Water Quality Specialist
Involvement: Surface Water

George M. Humphrey
Position: Land Use and Recreation Specialist
Involvement: Recreation

Marianne M. Jacobs
Position: Archaeologist Technician
Involvement: Cultural Resources

Anita E. Masters
Position: Senior NEPA Specialist
Involvement: NEPA Compliance and Document Preparation

Roger A. Milstead
Position: Floodplain Specialist
Involvement: Floodplains

David T. Nestor
Position: Contract Biologist
Involvement: Terrestrial Ecology - Terrestrial Plants; Threatened and Endangered Species - Terrestrial Plants

Kim Pilarski
Position: Senior Wetlands Biologist
Involvement: Wetlands

Steve Pitt
Position: MESA Associates, Siting and Environmental Design
Involvement: Project and Siting Alternatives

Jon C. Riley
Position: Landscape Architect
Involvement: Visual

Eric D. Romaniszyn
Position: Contract Aquatic Biologist
Involvement: Aquatic Ecology

Ed Scott
Position: Biologist - Aquatic
Involvement: Aquatic Ecology

Jan K. Thomas
Position: Contract Natural Areas Specialist
Involvement: Managed Areas

W. Richard Yarnell
Position: Archaeologist
Involvement: Cultural Resources

5.2. List of Agencies Consulted

Federal Agencies

U.S. Army Corp of Engineers
U.S. Fish and Wildlife Service

State Agencies

North Carolina Department of Agriculture and Consumer Services
North Carolina Department of Commerce
North Carolina Department of Environment and Natural Resources
North Carolina Department of Transportation
North Carolina State Historic Preservation Officer
North Carolina Wildlife Resources Commission

5.3. Literature Cited

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APPENDIX I - CORRESPONDENCE

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December 10, 2004, Correspondence from North Carolina State Historic Preservation Officer to J. Bennett Graham, TVA (page 1 of 2)

North Carolina Department of Cultural Resources
State Historic Preservation Office
Peter B. Sandbeck, Administrator

Michael F. Easley, Governor
Lisbeth C. Evans, Secretary
Jeffrey J. Crow, Deputy Secretary

Office of Archives and History
Division of Historical Resources
David Brook, Director

December 10, 2004

Mr. J. Bennett Graham
Cultural Resources
Tennessee Valley Authority
P. O. Box 1589
Norris, TN 37828-1589

Re: Murphy-Blairsville 161-KV Transmission Line, Cherokee County, ER 04-2890

Dear Mr. Graham:

Thank you for your letter of October 22, 2004 transmitting the archaeological survey report by James D'Angelo and Jeffrey Carr for the above project.

During the course of the survey, one archaeological site and a portion of a historic road were located within the project area. The report authors have recommended that no further archaeological investigation be conducted in connection with this project. We concur with this recommendation since the project will not involve significant archaeological resources.

For purposes of compliance with Section 106 of the National Historic Preservation Act, we concur that 31CE675 is not eligible for listing in the National Register of Historic Places. We also concur that portions of the historic Ellijay Road that are outside the APE are potentially eligible for listing in the National Register of Historic Places; however, the road segment within the current project area lacks integrity, and thus the proposed transmission line project would have no adverse effect on this resource.

Since the documented location of this portion of the historic Ellijay Road may provide evidence relevant to establishing other portions of the road which may be intact, and since the embankment is subject to ongoing destruction associated with modern development, please contact our office for a permanent state site number and submit a completed North Carolina archaeological site form.

The above comments are made pursuant to Section 106 of the National Historic Preservation Act and the Advisory Council on Historic Preservation's Regulations for Compliance with Section 106 codified at 36 CFR Part 800.

	Location	Mailing Address	Telephone/Fax
ADMINISTRATION	507 N. Blount Street, Raleigh NC	4617 Mail Service Center, Raleigh NC 27699-4617	(919)733-4763/733-8653
RESTORATION	515 N. Blount Street, Raleigh NC	4617 Mail Service Center, Raleigh NC 27699-4617	(919)733-6547/715-4801
SURVEY & PLANNING	515 N. Blount Street, Raleigh, NC	4617 Mail Service Center, Raleigh NC 27699-4617	(919)733-6545/715-4801

12/21/04

December 10, 2004, Correspondence from North Carolina State Historic Preservation Officer to J. Bennett Graham, TVA (page 2 of 2)

Thank you for your cooperation and consideration. If you have questions concerning the above comment, please contact Renee Gledhill-Earley, environmental review coordinator, at 919/733-4763. In all future communication concerning this project, please cite the above-referenced tracking number.

Sincerely,

Renee Gledhill-Earley

for Peter Sandbeck

December 23, 2004, Correspondence from W. S. Varnedoe, North Carolina Department of Transportation, to Kimberly D. Choate, TVA (page 1 of 1)

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

MICHAEL F. EASLEY
GOVERNOR

LYNDO TIPPETT
SECRETARY

December 23, 2004

Ms. Kimberly D. Choate, PE
Tennessee Valley Authority
1101 Market Street
Chattanooga, Tennessee 37402-2801

Dear Ms. Choate:

Secretary Tippett asked me to respond to your letter regarding the 161,000-volt transmission line being planned in Cherokee County.

The North Carolina Department of Transportation appreciates the opportunity to comment on this project. I am forwarding the original letter and site maps to Division Engineer Joel Setzer for review and comments. Once Mr. Setzer reviews this information, he will prepare the Department's response to you. If you need further information, you may contact Mr. Setzer in Sylva at (828) 586-2141.

If I can be of further assistance, please let me know.

Sincerely,

W. S. Varnedoe, PE
Chief Engineer-Operations

WSV:sh

cc: Lyndo Tippett, Secretary of Transportation
J. B. Setzer, PE, Division Engineer, Attachment

MAILING ADDRESS:
NC DEPARTMENT OF TRANSPORTATION
CHIEF ENGINEER'S OFFICE
1537 MAIL SERVICE CENTER
RALEIGH NC 27699-1537

TELEPHONE: 919-733-7621
FAX: 919-733-4141

WEBSITE: WWW.DOH.DOT.STATE.NC.US

LOCATION:
TRANSPORTATION BUILDING
1 SOUTH WILMINGTON STREET
RALEIGH NC

January 12, 2005, Correspondence from James T. Fain, III, North Carolina Department of Commerce, to Kimberly D. Choate, TVA (page 1 of 1)

North Carolina
Department of Commerce

Michael F. Easley, Governor **James T. Fain III, Secretary**

January 12, 2005

Ms. Kimberly D. Choate, P.E.
Tennessee Valley Authority
Transmission Line Projects
Siting and Environmental Design Department
1101 Market Street, MR 4G-C
Chattanooga, Tennessee 37402-2801

RANGER, NC 161-KV DELIVERY POINT

Dear Ms. Choate:

This is in reference to Tennessee Valley Authority's project that was mailed to me on December 7, 2004.

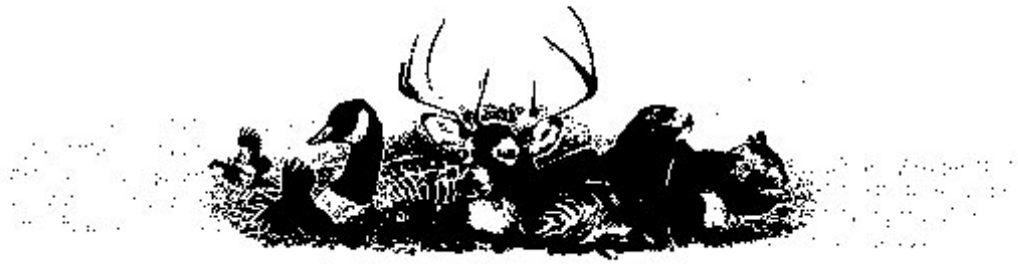
The project as described by the project summary creates no incompatibility in our area of planning at this time.

Sincerely,

James T. Fain, III

North Carolina: The State of Minds
301 North Wilmington Street•4301 Mail Service Center•Raleigh, North Carolina 27699-4301
Tel: (919) 733-4151•Fax: (919) 733-8356
An Equal Opportunity/Affirmative Action Employer

January 18, 2005, Correspondence From Dave McHenry, North Carolina Wildlife Resources Commission, to Kimberly D. Choate, TVA (page 1 of 3)



North Carolina Wildlife Resources Commission

Richard B. Hamilton, Executive Director

January 18, 2005

Kimberly D. Choate, P.E.
Tennessee Valley Authority
Transmission Line Projects
Siting and Environmental Design Department
1101 Market Street, MR 4G-C
Chattanooga, Tennessee 37402-2801

SUBJECT: Ranger, North Carolina 161 KV Delivery Point project, Cherokee County.

Dear Ms. Choate:

Biologists with the North Carolina Wildlife Resources Commission (Commission) reviewed the information for the subject project in your December 7, 2004 letter. You requested that we identify any areas of probable conflict with our planning. Our comments are provided in accordance with provisions of the National Environmental Policy Act (42 U.S.C. 4332(2)(c)) and the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661-667d).

The project includes approximately 5.1 miles of transmission line and attendant structure construction in Cherokee County, North Carolina.

We did not note records for threatened or endangered animals directly within the transmission line right of way as depicted in the provided map. Please note our review utilized documented occurrence data for various rare species of plants, animals, and special habitats or plant communities from the NC Division of Parks and Recreation, Natural Heritage Program. The lack of documented occurrences does not preclude the possibility of rare species occurring in the project area. Rather, in lieu of targeted field surveys, the review serves as a screening-level indicator for the likelihood of presence. We recommend contacting the Natural Heritage Program for a complete list of rare species, including plants, in the project area and for any additional information they may wish to provide. Similarly, the U.S. Fish and Wildlife Service should be contacted regarding federally listed species that may occur in the region.

We do not anticipate major concerns with the project, however, additional information would aid with a more thorough evaluation of its potential effects on fish and wildlife resources. If an environmental report or similar document is prepared, we recommend evaluating and discussing the following standard list of information, some of which may not be applicable:

1. Include descriptions of fish and wildlife resources within the project area including a listing of federally or state designated threatened, endangered or special concern species. When practicable, potential borrow areas to be used for project construction should be included in the

Mailing Address: Division of Inland Fisheries • 1721 Mail Service Center • Raleigh, NC 27699-1721
Telephone: (919) 733-3633 ext. 281 • Fax: (919) 715-7643

inventories. A full listing of designated species can be developed through consultation with: The Natural Heritage Program, NC Division of Parks and Recreation.

2. Include descriptions of any streams or wetlands affected by the project.
3. Include project maps identifying wetland areas. Identification of wetlands may be accomplished through coordination with the U.S. Army Corps of Engineers (COE). If the COE is not consulted, the person delineating wetlands should be identified and criteria listed.
4. Provide a description of project activities that will occur within wetlands or streams, such as fill or channel alteration. Acreage of wetlands impacted by alternative project designs should be listed.
5. Provide a description and a cover type maps showing acreage of upland wildlife habitat impacted by the project.
6. Discuss the potential cumulative and secondary effects on habitats from the infrastructure improvement project, as well as any mitigative measures necessary to offset those effects.
   (a) Include specific measures that will be used to address stormwater runoff. Include specific requirements for residential, commercial and industrial developments and BMPs that will be required.
   (b) Include specific measures that will be used to protect stream corridors, riparian habitat, and a minimum of the 100-year floodplain from filling and development. Commitments by the project sponsors to protect area streams with riparian buffers through purchase or conservation easement are of particular interest.
   (c) Include specific measures that will help mitigate the impacts to fish and wildlife of the region.
7. Discuss the extent to which the project will result in loss, degradation or fragmentation of wildlife habitat (wetlands and uplands).
8. Discuss any measures proposed to avoid or reduce impacts of the project or to mitigate unavoidable habitat losses.
9. Include a list of document preparers that shows each individual's professional background and qualifications.

We note from the project map that some stream crossings may be needed for the project. The ACOE should be contacted if any fill material will be required in these streams for road crossings. Since Cherokee County is considered a "trout county", the Commission will review any 404 permit application that may be necessary and provide comments on ways to reduce the potential harmful effects of the proposed activity on trout and other resources.

The Commission has general recommendations that we typically provide on similar utility projects in order to minimize or mitigate their effects on fish and wildlife resources and the use of those resources by the public. For example, erosion from construction and maintenance of right of ways that cross or approach streams can degrade aquatic habitats. We recommend that the following measures be implemented to the extent practicable to protect and enhance aquatic and terrestrial habitats and to enhance public use in the project area:

1. New utility lines should be placed in upland areas and outside of riparian zones along streams whenever possible. Any stream crossings should be made perpendicular to streams and native trees and shrubs should be retained or reestablished in the riparian zone. Undisturbed vegetated buffers should also remain along intermittent drains or streams as well.
2. Vegetation maintenance with mechanical cutting is recommended instead of herbicide treatment. Cutting should be conducted in February and March to avoid small game and birds that nest later in the year. If required, herbicide treatment should be conducted selectively (not broadcast) and be avoided entirely in and around wetlands, streams, and riparian zones. Maintaining shrubs and

January 18, 2005, Correspondence From Dave McHenry, North Carolina Wildlife Resources Commission, to Kimberly D. Choate, TVA (page 3 of 3)

other understory vegetation is recommended in all areas to provide erosion control and food and cover for wildlife.

3. Adequate sedimentation and erosion control measures should be implemented and maintained in riparian areas to avoid impacts to aquatic resources. Temporary or permanent herbaceous vegetation should be planted on all bare soil as soon as possible and within 15 days of ground disturbing activities to provide long-term erosion control. Erosion control matting should be used in riparian areas, instead of straw mulch, and tall fescue should not be used. Native grasses should be seeded to provide erosion control or rye grain, oats, wheat, or other annuals should be seeded to provide temporary cover until native vegetation becomes established.
4. Powerline right of ways often provide valuable early successional habitat for wildlife, particularly if forage plants are maintained. If desired, a Commission wildlife biologist (Mike Carraway, 828/646-9913) can be contacted regarding additional vegetation management prescriptions to enhance wildlife habitat in the project area.
5. Public boating access to some waterways, including the Nottely River in Cherokee County, is currently limited. Utility right-of-ways can provide public access to help off-set resource impacts. If there is an interest in allowing access to some streams in the service area through or across existing right of ways, we would be interested in a comprehensive ownership map or listing of stream crossings to cooperatively pursue such opportunities further. Please contact our fish biologist regarding any interest in this effort (Scott Loftis, 828/452-0422).

Thank you for the opportunity to provide the review and comments on the proposed project. If there are any questions regarding these comments, please contact me at (828) 452-0422 extension 24.

Sincerely,

Dave McHenry
Mountain Region Coordinator
Habitat Conservation Program

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APPENDIX II – 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 Practice (BMP) manual (Muncy, 1992, and revisions thereto). The contractor will protect areas that are to be left unaffected by access or clearing work at and adjacent to all work sites. In sensitive areas and their buffers, the contractor will retain as much native ground cover and other vegetation as possible.

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

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

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

plants or grasses to meet the criteria of regulatory agencies or commitments to special program interests.

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

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

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

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

Open burning debris will be kept away from streams and ditches and shall be incorporated into the soil.

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

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

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

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

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

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

from burning will be disposed of according to permit stipulations. No fuel starters or enhancements other than kerosene will be allowed.

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

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

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

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

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

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

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

19. Brush and Timber Disposal (Reclearing) - The reclearing contractor shall place felled tree boles in neat stacks at the edge of the right-of-way, with crossing breaks at least every 100 feet. Property owner requests shall be reviewed with the project manager or right-of-way specialist before accepting them. Lop and drop activities must be specified in the contract

and on plan and profile drawings with verification with the right-of-way specialist before conducting such work. When tree trimming and chipping is necessary, disposal of the chips on the easement or other locations on the property must be with the consent of the property owner and the approval of the right-of-way specialist. No trees, branches, or chips shall remain in a surface water body or be placed at a location where washing into a surface water or groundwater source might occur.

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

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

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

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

    C. All disturbed areas will initially be seeded with a temporary ground cover such as winter wheat, rye, or millet, depending on the season. Perennials may also be planted during initial seeding if proper growing conditions exist. Final restoration and final seeding will be performed as line construction is completed. Final seeding will consist of permanent perennial grasses such as those outlined in TVA's "A Guide for Environmental Protection and 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 III – TENNESSEE VALLEY AUTHORITY ENVIRONMENTAL QUALITY PROTECTION SPECIFICATIONS FOR TRANSMISSION LINE CONSTRUCTION

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

17. Vehicle Servicing - Routine maintenance of personal vehicles will not be performed on the right-of-way. However, if emergency or "have to" situations arise, minimal/temporary

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

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

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

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

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

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APPENDIX IV – 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 TVA Construction and Maintenance Activities."

Three Levels of Protection

During the preconstruction review of a proposed transmission line, TVA Resource Stewardship 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 TVA 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 TVA 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 Resource Stewardship 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 Electric 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 TVA 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 Resource Stewardship 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 Resource Stewardship 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 Resource Stewardship staff.

Additional Help

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

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Comparison of Guidelines Under the Three Stream and Waterbody 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 TVA 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 TVA 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 TVA 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 Resource Stewardship 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 Resource Stewardship 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 Waterbody 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 an impacts to the SMZ and surrounding area. • Cutting of trees near permanent streams must be limited to those meeting National Electric 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 Resource Stewardship 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 one 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 Resource Stewardship staff

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APPENDIX V – TENNESSEE VALLEY AUTHORITY RIGHT-OF-WAY VEGETATION MANAGEMENT

Tennessee Valley Authority (TVA) must manage its rights-of-way and easements to ensure emergency maintenance access and routine access to structures, switches, conductors, and communications equipment. In addition, TVA must ensure National Electrical Safety Code electrical clearances between tall-growing vegetation and any other structures. Trees located off right-of-way trees that could fall or be cut into a transmission line are also very important.

These requirements are imperative to the maintenance of the transmission system and, in some cases, underbuilt distribution lines. It is seldom understood by customers or the general public that electricity must continuously be produced and transmitted on an instant-to-instant basis to serve the demand placed on the system by continuously changing electrical load. When a switch is turned on, electricity must flow instantaneously. With increasingly complex and diverse electronic equipment controlled by computers, microchips, and other systems that respond to microsecond interruptions, any disturbance on transmission or distribution lines instantaneously affects the overall reliability of critical devices, especially production devices; security systems; process controls; medical devices; water purification and sewage treatment systems; fire and safety protection systems; communication and control systems; etc. These systems have little tolerance of even a few microseconds of interruption.

Each year, TVA must assess the conditions of the vegetation on and along its rights-of-way. This is accomplished by aerial inspections of each line, periodic walking inspections, information from aerial photographs, information from TVA field personnel, property owners, and the general public. Information is developed regarding vegetation species present, the mix of 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 that may be adjacent to the right-of-way and that may be a danger to the line or structures. TVA right-of-way program administrators develop a vegetation-reclearing plan that is specific to each line segment; it is based on terrain conditions, species mix, growth, and density. They evaluate accessibility, right-of-way, and adjacent sensitive areas, land use and development, and a series of additional parameters. To the maximum extent possible, line segments from substation busbar to substation busbar should be recleared in the same year so a line can be made as reliable as reasonably possible.

Complicating factors are the rich diversity of tall-growing and climbing vegetation species in the power service area. The long growing season with abundant rain greatly accelerates growth in the moderate to rich soils of the TVA power service area. In addition, many rapid growing species are accelerated growers when competing vegetation is removed or reduced. Diverse geographic features, slopes, and conditions along line easements create many sensitive environmental and public interest areas on or adjacent to rights-of-way.

For the above reasons, TVA uses an integrated vegetation management approach. In farming areas of right-of-way crops and pasture, TVA encourages property owner management of the right-of-way using low-growing crops year after year. In dissected terrain with rolling hills and interspersed woodlands traversed by the rights-of-way, TVA uses mechanical mowing to a large extent.

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 segments of tall-growing vegetation are present but accessibility along the right-of-way is difficult or the path to such segments is very long compared to the amount present, herbicides may be used.

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

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

TVA's experience initially was completely with hand clearing. World War II manpower shortages forced TVA to look toward developments in herbicide research. An era of near exclusive use of herbicides existed. Then, because of the discovery of residue accumulations with many pesticides and price increases of herbicides, high-volume applications lost favor, and TVA sought other modes of vegetation control. Farm equipment of greater power and efficiency allowed use of tractor-mounted rotary mowers. These mowers not only cut the tall saplings and seedlings on the right-of-way, they 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 produce a multistem dense stand in the immediate area. Repeated use of the mowers on short-cycle reclearing with many original stumps regrowing in the above manner creates a single-species thicket or monoculture. With the original large root system and multiple stems, the resistant species can and usually do 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 created, dense, monoculture stands can become nearly impenetrable for even large tractors. Such stands have low diversity, little wildlife food or nesting potential, and become a property owner concern. They tend to spread off the right-of-way into more desirable species areas. Increasingly, TVA is receiving complaints about the shatter sapling debris density. The potential exists for insect invasion or fungus infection resulting from the easy invasion of damaged specimens or debris. Once started, such infestations or invasions can spread into valuable timber of the same or related species off the right-of-way.

Therefore, TVA has been working with universities (such as Mississippi State University, University of Tennessee, Purdue University, and others), chemical companies, other utilities, and personnel of the U.S. Department of Transportation, U.S. Fish and Wildlife Service, and U.S. Forest Service to explore other means of dealing with problem vegetation. The results have been strong recommendations to use species-specific, low-volume herbicide applications in more situations. Research, demonstrations, and other right-of-way programs show a definite improvement of rights-of-way treated with selective low-volume applications of new herbicides using a variety of application techniques and timing.

The above-named universities strongly recommend low-volume herbicide applications since their research demonstrates much wider plant diversity after such applications. They report better ground erosion protection and the development of more wildlife food plants and cover plants. 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.

Wildlife managers are specifically requesting the use of herbicides in place of rotary mowing in order to avoid damage to nesting and tunneling wildlife. This method retains groundcover 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).

Property owners interested in tree production are requesting 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 rights-of-way. The insect and fungus invasions such as pine tip moth, oak leaf blight, sycamore and dogwood blight, etc., are becoming widespread across the nation.

Some property owners have special interests. In those cases, TVA attempts to work with them to either have them sign agreements in which they maintain the right-of-way in right-of-way crops or pasture or they do the actual right-of-way maintenance. Some may choose to use low-growing trees or fruit trees, sod, vegetable crops, or other low vegetation types.

TVA discusses with property owners the potential to sign an agreement to manage their land for wildlife under the auspices of "Project Habitat," a joint TVA/American Cyanamid wildlife organization. The property owner maintains the right-of-way in wildlife food and cover with emphasis on quail, turkey, deer, or related forms. A variation used in or adjacent to developing suburban areas is to sign agreements with the developer and residents to plant and maintain wildflowers on the right-of-way.

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

Approved Herbicides for Usage on TVA Rights-of-Way

Trade Name	Active Ingredients	Label Signal Word
Accord	Glyphosate/Liquid	Caution
Arsenal	Imazapyr/Liquid/Granule	Caution
Escort	Metsulfuron Methyl/dry flowable	Caution
Garlon	Triclopyr/Liquid	Caution
Garlon 3A	Triclopyr/Liquid	Danger
Diuron	Diuron/Flowable powder	Caution
Spike 40P	Tebuthiuron/Pellet	Caution
Spike 80W	Tebuthiuron/Wettable powder	Caution
Transline	Clopyralid/Liquid	Caution
Pathfinder II	Triclopyr/RTU	Caution
Krenite UT	Fosamine Ammonium	Warning
Vanquish	Diglycolamine	Caution

Approved Herbicides for Bare Ground Areas

Trade Name	Active Ingredients	Label Signal Word
Chopper	Imazapyr/RTU	Caution
Topsite	Diuron/Imazapyr	Caution
Roundup	Glyphosate/Liquid	Caution
SpraKil SK-26	Tebuthiuron and Diuron	Caution
Sahara	Diuron/Imazapyr	Caution
Roundup Pro	Glyphosate	Caution
Endurance	Prodiamine	Caution
Predict	Norflurazon	Caution

Tree growth regulators (TGRs) are being considered for use on tall trees that have special circumstances where they must be trimmed on a regular cycle.

Approved TGRs for Use on TVA Property

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

The herbicide Pathway is being considered for use following initial clearing. Test plots have been established to determine the effectiveness of Pathway. Pathway is a mix of Picloram and 2,4-D and carries a "Warning" signal word.

These herbicides have been evaluated in extensive studies at universities in support of registration applications and label requirements. Most have been reviewed in the U.S. Forest Service (USFS) Vegetation Management Environmental Impact Statements (EISs), and those evaluations are incorporated here by reference. 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 to resources (including buffer zones for listed threatened or endangered species) when applied by trained applicators following the label and registration procedures.

Those not addressed in the USFS EISs or their supporting research have been peer reviewed in university research, addressed in U.S. Environmental Protection Agency (USEPA) literature reviews, or are discussed in documents on file at USEPA and U.S. Fish and Wildlife Service libraries. On the basis of this literature and TVA's reviews, the approved list above has been compiled and is reviewed again each year as new information is published.

The rates of application utilized are those listed on the USEPA-approved label and consistent with the revised application rates of the USFS Vegetation Management EIS Record of Decision. These typical application rates, in pounds/acre of active ingredient, are as follows:

Herbicide	Application Method					
	Aerial Liquid	Aerial Granule	Mechanical Liquid	Mechanical Granule	Manual Hand	Manual Foliar
2,4-D amine	2.0		2.5			2.0
2.4-D ester	2.5		4.0			2.0
2.4-DP	3.0		4.0			1.0
Dicamba			2.0			2.0
Krenite	6.0		7.8			
Glyphosate	1.5		1.5			1.0
Hexazinone	4.0	4.0	4.0	4.0	4.0	4.0
Imazapyr	0.75		0.75			0.75
Fuel oil	0.5		2.0			1.5
Limonene	0.9		0.9			0.9
Picloram	0.5		0.7			0.4
Sulfomet	0.13		0.17			0.06
Tebuthiuron	1.0	1.0	1.0	1.0		4.0
Triclopyr amine	4.0		4.0			4.0
Triclopyr ester	4.0		4.0			4.0

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.

Accord, labeled for vegetation management in forestry and utility rights-of-way applications, has a full aquatics label and can be applied to emergent weeds in all bodies of fresh and brackish water. There is no restriction on the use of treated water for irrigation, recreation, or domestic purposes.

Accord is applied to the foliage of actively growing plants. The active ingredient is absorbed through the leaves and rapidly moves throughout the plant. Glyphosate prevents the plant from producing amino acids that are unique to plants and are building blocks of plant proteins. The plant, unable to make proteins, stops growing and dies.

The favorable environmental fate characteristic of Accord herbicide and its major metabolite (breakdown product) aminomethylphosphonic acid (AMPA) is well known. Continuing research is underway with more than 400 studies conducted to date in the laboratory and under field use conditions. These studies show rapid breakdown, little soil or plant debris retention, and little vertical movement into soil below the surface.

Glyphosate is naturally degraded by microbes in soil and water under both aerobic (with oxygen) and anaerobic (without oxygen) conditions. AMPA is further degraded in soil and sediments to phosphorus, nitrogen, hydrogen, and carbon dioxide. Glyphosate binds

rapidly and completely to a wide range of soils and sediment when introduced into the environment. This essentially eliminates movement in the soil. The average half-life of glyphosate in soils is less than 45 days. Half-life for the dissipation of glyphosate in environmental waters ranges from 1.5 to 14 days.

Glyphosate is nontoxic to birds, mammals, and bees and has been shown not to bioaccumulate since it acts in plants through an enzyme system that does not exist in animals or humans.

Arsenal (Imazapyr) has been similarly tested, and it is found to have low-leaching potential in soils. When available on or in the soil, it is broken down rapidly by soil microbes to naturally occurring compounds. When not available, Imazapyr is bound tightly to soil colloids and is unavailable for movement. The half-life in soil is 25 to 65 days.

Extensive chronic and acute toxicity studies have made Arsenal a USEPA-classified herbicide as practically nontoxic to humans, mammals, birds, fish, aquatic invertebrates, and insects. The chronic studies demonstrate that Imazapyr is non-teratrogenic, non-mutagenic, and not a carcinogen.

The mode of action suppresses amino acids of the plant via an enzyme system containing acetohydroxy acid synthase. This enzyme system does not exist in other forms of life including humans and animals.

Revision July 2003

APPENDIX VI - APPROXIMATE LOCATIONS AND LEVELS OF PROTECTION FOR WATERCOURSES WITHIN THE RIGHT-OF-WAY OF THE PROPOSED TRANSMISSION LINE

Crossing Number	Approx. Watercourse Location/Station Nos.	Watercourse Type	Commitments	SMZ Widths (feet)
1	11+50	WWC*	Standard BMPs	N/A**
2	17+56 to 18+57	Unnamed Perennial	Category A SMZ	50
3	13+66.7	WWC	Standard BMPs	N/A
4	23+70	WWC	Standard BMPs	N/A
5	28+66 to 29+67	Unnamed Perennial	Category A SMZ	50
6	36+10	WWC	Standard BMPs	N/A
7	36+90	WWC	Standard BMPs	N/A
8	38+70	WWC	Standard BMPs	N/A
9	42+60	WWC	Standard BMPs	N/A
10	60+50 to 65+30	Cane Creek***	Category A SMZ	50
11	79+10	WWC	Standard BMPs	N/A
12	87+22 to 87+56	WWC	Standard BMPs	N/A
13	92+89.6	WWC	Standard BMPs	N/A
14	94+70 to 96+30	Unnamed Perennial	Category A SMZ	75 east; 50 west
15	102+65 to 104+45	Unnamed Perennial	Category A SMZ	75 east; 100 west
16	109+50 to 111+75	Unnamed Perennial***	Category A SMZ	75 east; 50 west
17	111+89.6	WWC	Standard BMPs	N/A
18	112+73.2	WWC	Standard BMPs	N/A
19	125+25	WWC	Standard BMPs	N/A
20	129+90 to 132+85	WWC	Standard BMPs	N/A
21	132+85 to 134+40	Unnamed Perennial	Category A SMZ	75
22	137+29.1	WWC	Standard BMPs	N/A
23	140+14.2	WWC	Standard BMPs	N/A
24	141+50 to 143+02	Unnamed	Category A SMZ	75

Crossing Number	Approx. Watercourse Location/Station Nos.	Watercourse Type	Commitments	SMZ Widths (feet)
		Perennial		
25	143+87.4	WWC	Standard BMPs	N/A
26	147+68.2	WWC	Standard BMPs	N/A
27	154+80 to 155+69	WWC	Standard BMPs	N/A
28	155+69 to 156+70	Unnamed Perennial	Category A SMZ	50
29	160+53.8	WWC	Standard BMPs	N/A
30	162+36.6	WWC	Standard BMPs	N/A
31	164+61.1	WWC	Standard BMPs	N/A
32	168+22 to 169+23	Unnamed Perennial	Category A SMZ	50
33	172+50.5	WWC	Standard BMPs	N/A
34	175+39.9	WWC	Standard BMPs	N/A
35	179+70 to 181+21	Unnamed Perennial	Category A SMZ	75
36	189+28 to 190+29	Unnamed Perennial	Category A SMZ	50
37	196+55	WWC	Standard BMPs	N/A
38	199+62.6	WWC	Standard BMPs	N/A
39	203+65	WWC	Standard BMPs	N/A
40	214+85.4	WWC	Standard BMPs	N/A
41	217+73	WWC	Standard BMPs	N/A
42	229+47.6 to 231+74.7	Nottely River	Category B SMZ	50
43	240+36 to 240+46.1	WWC	Standard BMPs	N/A

*WWC=wet-weather conveyance. Perennial or intermittent stream type determined by level of flow and evidence of aquatic life at time of site visit in September 2004.

** N/A = not applicable.

***Complex stream systems with multiple channels.