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FINAL ENVIRONMENTAL ASSESSMENT

BRIDGEPORT, ALABAMA, POWER SUPPLY UPGRADE

Jackson County, Alabama

TENNESSEE VALLEY AUTHORITY

FEBRUARY 2008

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ACRONYMS AND GLOSSARY OF TERMS USED

acre	A unit measure of land area equal to 43,560 square feet
APE	Acronym for area of potential effect, i.e., the area within which potential effects are considered and evaluated
BMP	Acronym for best management practice, i.e., accepted construction practices designed to reduce environmental effects
CR	Acronym for County Road
cultural resources	Archaeological and historic resources
danger tree	A tree located outside the right-of-way that could pose a threat of grounding a line if allowed to fall near a transmission line or a structure
EMF	Acronym for electric and magnetic field
endangered species	A species in danger of extinction throughout all or a significant part of its range
EO	Acronym for Executive Order
GIS	Acronym for geographic information system
groundwater	Water held underground in the soil or in pores and crevices in rock
guy	A cable connecting a structure to an anchor that helps support the structure
kV	Symbol for kilovolt (one kV equals 1,000 volts)
load	That portion of the entire electric power in a network consumed within a given area
n.d.	Indicates “no date,” or date Web site was accessed is unknown
NEPA	Acronym for National Environmental Policy Act
NRHP	Acronym for National Register of Historic Places
NRI	Acronym for Nationwide Rivers Inventory
outage	An interruption of the electric power supply to a user
right-of-way	A corridor containing a transmission line
riparian	Related to or located on the banks of a river or stream
SMZ	Acronym for Streamside Management Zone
SR	Acronym for State Route
structure	A pole or tower that supports a transmission line
substation	A facility connected to a transmission line used to reduce voltage so that electric power may be delivered to a local power distributor or user
tap line	An electric power line that connects an existing transmission line (at a tap point) to a substation

tap point	A connection point between a tap line and an existing transmission line
threatened species	A species likely to become endangered within the foreseeable future
TRM	Acronym for Tennessee River Mile
TVARAM	Acronym for the TVA Rapid Assessment Method, a version of the Ohio Rapid Assessment Method designed specifically for the TVA region
US	Acronym for U.S. Highway
USACE	Acronym for the U.S. Army Corps of Engineers
USEPA	Acronym for the U.S. Environmental Protection Agency
wetland	A marsh, swamp, or other area of land where the soil near the surface is saturated or covered with water, especially one that forms a habitat for wildlife

CHAPTER 1

1.0 PURPOSE OF AND NEED FOR ACTION

1.1. Proposed Action – Improve Power Supply

The Tennessee Valley Authority (TVA) proposes to provide an alternate supply of electric power to industries in the Bridgeport, Alabama area by constructing a new 4.8-mile 161-kV transmission line from TVA's existing Widows Creek-Winchester 161-kV Transmission Line to TVA's existing Beaulieu #2 Substation. At the Beaulieu #2 Substation, the line would connect to TVA's existing Reese Ferry 161-kV Tap Line. The proposed in-service date is January 2009. The right-of-way for the new transmission line would be 100 feet wide and would occupy approximately 58 acres. A switch structure would be placed at each end of the line. Two additional line switches would be added in the existing Reese Ferry Tap Line immediately north of the Beaulieu #1 Tap and just southeast of the Tennessee Alloys (Oxbow) Tap.

1.2. Need for and Objectives of the Proposed Action

The primary industrial power supply in the Bridgeport area is from a single transmission line connected to the TVA Widows Creek-Raccoon Mountain No. 1 Transmission Line, which receives power from the TVA Widows Creek Fossil Plant. This Reese Ferry 161-kV Tap Line is the only source of power for four industrial sites that collectively use 70 megawatts[1] (MW) of power. These industries (AimCor, Beaulieu #1 and #2, and U.S. Gypsum) are sensitive to any power outage. A vicinity map of the area is provided as Figure 1.

The older parts of the Reese Ferry Tap Line are wood pole structures with fiberglass crossarms, and some structures have been damaged by woodpeckers and are at risk of failure. These structures are located on very steep terrain that cannot be accessed by heavy construction equipment without major road construction across a floodplain and up a steep hillside. Failure of these poles would result in the loss of electrical power to the local industries mentioned above. Due to the steep terrain, such a failure could last up to 48 hours, causing customer dissatisfaction and high outage costs. Eight transmission line structures near the tap point have been replaced with steel poles but still stand in water in the Tennessee River floodplain near the site of Reese Ferry. The switches for the Widows Creek-Raccoon Mountain line are on high ground, but access to them is along a 1.5-mile dirt road. Considerable electrical load is at risk because of the single line feed and especially because of the condition of the existing line and the lack of isolating switches in the Reese Ferry Tap Line.

[1] A megawatt, a measure of power, is equal to one million watts. A watt is equivalent to one volt flowing at one ampere of current.

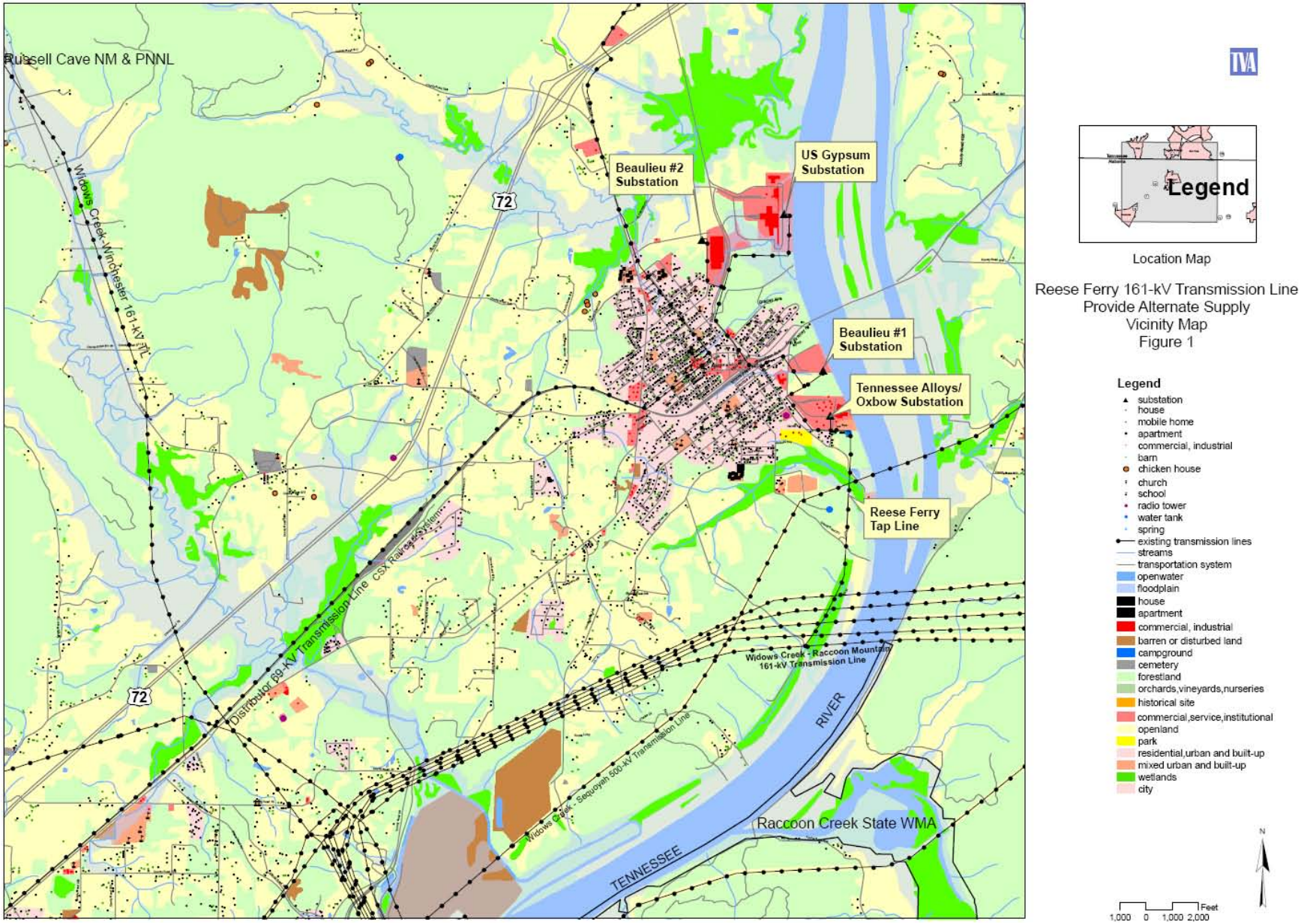

Figure 1. Vicinity Map of the Bridgeport Area

1.3. Decisions

The primary decision before TVA is whether to provide an alternate electric power supply to the Bridgeport, Alabama, area by constructing a new 161-kV transmission line from the TVA Widows Creek-Winchester 161-kV Transmission Line to an industrial area northeast of downtown Bridgeport. If the proposed transmission line is built, other secondary decisions are involved. These include the following considerations:

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

1.4. Other Pertinent Environmental Reviews or Documentation

The following environmental reviews have been prepared for federal actions in the Bridgeport area.

USG Pipeline Project Environmental Assessment. July 1997. Federal Energy Regulatory Commission, Office of Pipeline Regulation.

United States Gypsum Company – Application for Proposed Barge Unloading Facility and Associated Channel Excavation on the Back Shute Side of Long Island at Tennessee River Mile 415.0, North of Bridgeport in Jackson County, Alabama, Environmental Assessment and Finding of No Significant Impact. August 22, 1997. U.S. Army Corps of Engineers and Tennessee Valley Authority.

TVA adopted the above documents on October 28, 1997, in the report entitled *United States Gypsum Company – Section 26a Approvals, Industrial Easement Approvals, Approvals for Dredging on TVA Land, Approvals for Gas Line Easements, and Construction of Transmission Line – Adoption and Supplementation of the Environmental Assessments Prepared by the U.S. Army Corps of Engineers and Federal Energy Regulatory Commission and Finding of No Significant Impact*.

1.5. The Scoping Process and Public Involvement

The following federal, state, and local agencies and other organizations were contacted concerning this project:

- Alabama Department of Agriculture and Industry
- Alabama Department of Conservation and Natural Resources
- Alabama Department of Economic and Community Affairs
- Alabama Department of Environmental Management
- Alabama Department of Transportation
- Alabama Historical Commission
- U.S. Army Corps of Engineers

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

A public meeting in the form of an open house was held on November 16, 2006, in Stevenson, Alabama. A map showing the network of potential routes TVA considered for the proposed transmission line was made available to the public at that meeting.

Five public officials and 108 potentially affected property owners within these corridor routes were invited to the meeting. TVA also invited other interested members of the public through newspaper advertisements and local news outlets. Total attendance at the meeting was 72.

During a 30-day public comment period following the open house, TVA accepted public comments on potential transmission line routes, switching station site locations, and other issues. Toll-free phone and fax numbers were made available to facilitate comments. Comments were primarily related to the location of the transmission line relative to current or planned land uses. Many of those commenting provided information and land use updates that enhanced TVA's understanding of route issues and usage constraints. Of the potential route options presented at the public meeting, Routes 1 and 4 were preferred by the majority of those expressing an opinion. Additional information about the various routes is presented in Section 2.4.3.

1.6. Necessary Federal Permits or Licenses

A permit would be required from the State of Alabama for construction site storm water discharge from 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.

The U.S. Army Corps of Engineers (USACE) determined that the proposed work has been previously permitted under the authority of Nationwide Permit #12 (see Appendix A). The Alabama Department of Environmental Management issued a conditional water quality certification for Nationwide Permit #12 pursuant to Section 401(a)(1) of the Clean Water Act (see Appendix A).

CHAPTER 2

2.0 ALTERNATIVES INCLUDING THE PROPOSED ACTION

The various feasible alternatives developed by TVA to meet the need for action are described and compared in this chapter. A detailed description of the process of constructing a new transmission line is also provided. The preferred alternative is identified in this chapter.

2.1. Alternatives

Two feasible alternatives were developed. These include the No Action Alternative and the Action Alternative, which are described in detail below.

2.1.1. The No Action Alternative

Under the No Action Alternative, TVA would not provide an alternate power supply to the existing Reese Ferry 161-kV Tap Line. Implementation of this alternative would not reduce the reliability risks for the four industrial customers. Loss of the only existing line serving these customers would result in long, expensive outages.

2.1.2. The Action Alternative – Construct the Proposed 161-kV Transmission Line

Under the Action Alternative, TVA would construct a transmission line connection from its Widows Creek-Winchester 161-kV Transmission Line to its existing Beaulieu #2 Substation (see Figure 2). The new transmission line would be approximately 4.8 miles long and occupy a right-of-way with a width of 100 feet and an area of approximately 58 acres. A switch structure would be placed at each end of the line. Two additional line switches would be added in the existing Reese Ferry Tap Line just north of the Beaulieu #1 Tap and just southeast of the Tennessee Alloys (Oxbow) Tap.

This new 161-kV transmission line connection would enhance the reliability of the power supply to the loads served from the Reese Ferry Tap Line by providing an alternate supply line connection. This would eliminate the risk of expensive outages at four industrial plants.

2.2. Alternatives Eliminated From Detailed Study

2.2.1. Minor Relocation of Reese Ferry Tap Line

This alternative involves a minor relocation between Structures 8 and 11 in the existing Reese Ferry Tap Line. This relocation would require a substantial outage of the line. Structures 2 through 8 are located in standing water, and several of the new structures would have to be located in standing water or in a wetland. Hybrid concrete-base poles, rather than steel poles, would be required to avoid corrosion in these conditions.

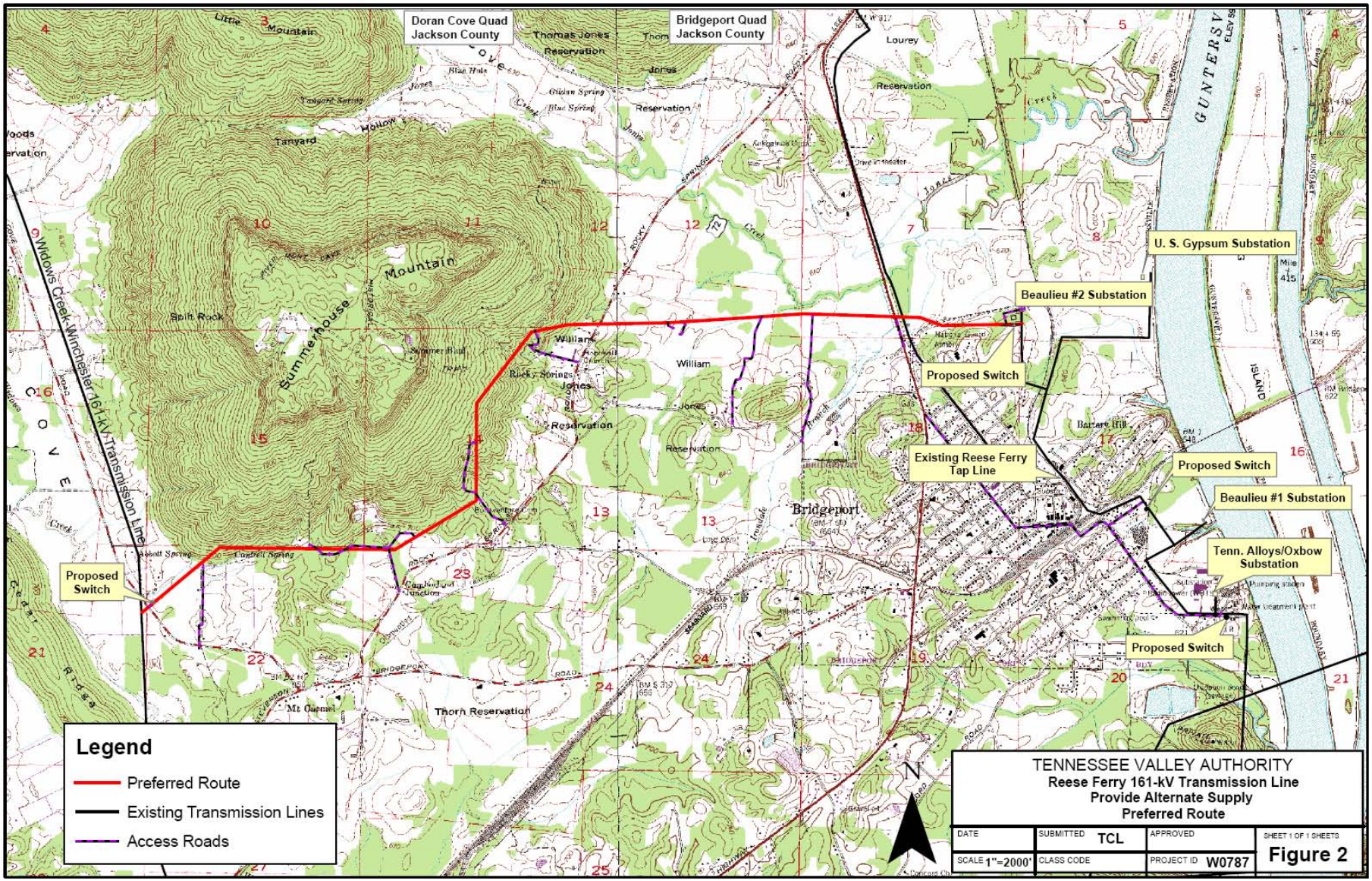

Figure 2. Preferred Route for the Widows Creek-Winchester Alternate Tap to Beaulieu #2 Substation

Besides requiring construction in a forested wetland, this option presents several other environmental concerns. Because the right-of-way would be located in a floodplain, the power line construction design would have to be capable of withstanding periods of high water, which would subject the guy wires to flood hazards. The location is also likely to have archaeological resources associated with Native Americans and the Civil War. Most importantly, the relocation would still involve a transmission line in a risky location. For these reasons, this alternative was eliminated from further consideration.

2.2.2. Construct Alternate 161-kV Feed from the Widows Creek-Nickajack 161-kV Transmission Line

Under this alternative, TVA would construct a transmission line that would tap the Widows Creek-Nickajack 161-kV Transmission Line at Structure 41 in the Bryant Community, which is approximately 4 miles east of Bridgeport. It would descend the western escarpment of the mountain, cross under the Widows Creek-Raccoon Mountain 500-kV line, and cross the Tennessee River at Long Island. It would intercept the existing Reese Ferry Tap Line along the southern boundary of the U.S. Gypsum Plant. This potential route would be approximately 4 miles long.

Construction of this line would be very expensive because of the river crossing and the steepness of the right-of-way over a large portion of the route. In addition, construction would likely affect wetlands and archaeological resources. Towers necessary at the river crossing could be tall enough to require aircraft warning beacons. This could be visually disruptive to the community. For these reasons, this alternative was eliminated from further consideration.

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

2.3.1. Transmission Line Construction

Structures and Conductors

The proposed transmission line would utilize mostly single steel pole structures similar to those shown as Figure 3. The structure height would vary according to the terrain but would average 80 to 100 feet. At creek or highway crossings, taller double poles may be used in order to maintain adequate clearance. These taller structures would average between 100 and 120 feet tall but would not require safety beacons.

Additionally, switch structures such as those shown as Figure 4 would be placed in the right-of-way at each end of the line, and two additional line switches would be added in the existing Reese Ferry Tap Line immediately north of the Beaulieu #1 Tap and just east of the Tennessee Alloys (Oxbow) Tap. These structures would be 25 to 35 feet tall.

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.

Figure 3. Single-Pole Transmission Structure

Figure 4. Typical Switch Structure

Poles at angles (i.e., angle points) in the transmission line may require supporting guys. Some structures for larger angles could require two or three poles. Most poles would be imbedded directly in holes augured into the ground to a depth equal to 10 percent of the pole's length plus an additional 2 feet. Normally, the holes would be back-filled with the excavated material, but in some cases, gravel or a cement and gravel mixture might be used. Some structures may be self-supporting (non-guyed) poles fastened to a concrete foundation that is formed and poured into an excavated hole.

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 to reduce the potential for environmental impacts. Construction is anticipated to require about 4 to 6 months.

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 new right-of-way located on private land. The

proposed route would affect about 25 landowners. These easements and land 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 include any trees that are located off the cleared right-of-way and are tall enough to pass within 5 feet of a conductor or structure should they fall toward the transmission line. Fee simple ownership of the land within the right-of-way would normally remain with the landowner, and a number of activities could be continued on the property by the landowner. The terms of the easement would prohibit 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 removed initially from the entire width of the right-of-way that crosses forested areas. Equipment used during this right-of-way clearing would include chain saws, skidders, bulldozers, 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 short-term potential 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. Measures used routinely by TVA to reduce environmental impacts during construction are provided as Appendices B, C, and D.

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 seeded using native grass and other low-growing species. Erosion controls would remain in place until the ground cover is fully established. Streamside areas would be revegetated as described in Appendices B, C, and D.

Access Roads

To the extent possible, existing streets, roads, and the right-of-way itself would be used as access for construction and maintenance crews. At some points along the right-of-way, off right-of-way access would be acquired. These new access roads would be about 20 feet wide and surfaced with dirt or gravel if necessary. Temporary culverts and other drainage devices, fences, and gates would be installed as necessary. Access points and roads used by construction and maintenance crews would be restored to previous conditions. If the temporary access roads were graveled, gravel would remain at the discretion of the landowner, and the area would be planted with approved seed mixtures following construction. Additional applicable right-of-way clearing and environmental quality protection specifications are listed in Appendices B and C.

Construction Assembly Area

A construction assembly area would be required for worker assembly, vehicle parking, and material storage. The site identified for this project is located at 519 East 12th Street in South Pittsburg, Tennessee (see Figure 5). The site, which is approximately 1 acre in size, would be leased for the duration of the construction period (approximately six months). It consists of a relatively flat and previously cleared location adjacent to an existing paved road near the transmission line. Depending on site conditions, some minor grading and

installation of drainage structures may be required. The area is graveled, and TVA would install a fence 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. No potential significant environmental effects associated with the use of this site were identified, and no other location was identified that would have lesser impacts.

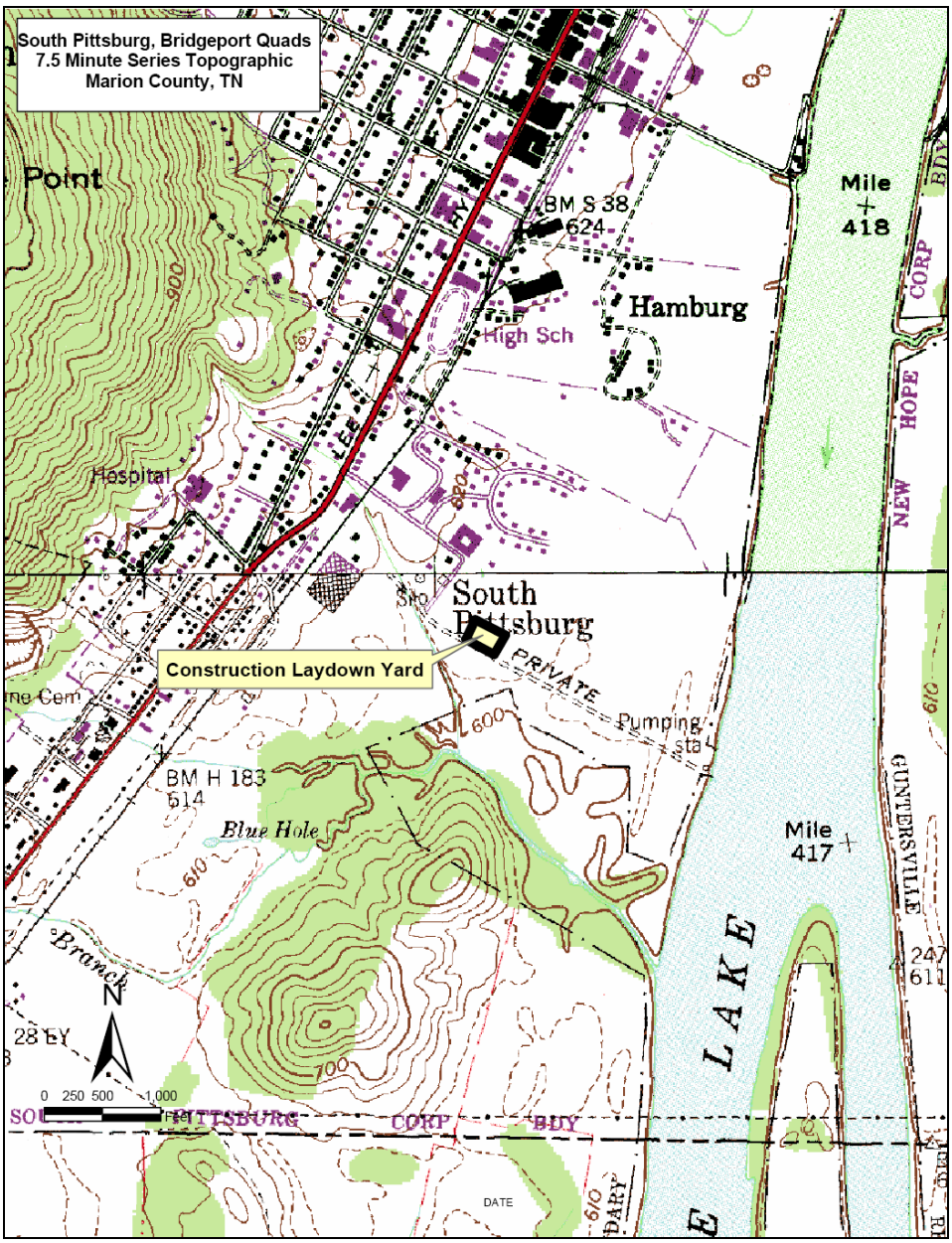

Figure 5. Location of Construction Laydown Yard

<u>Conductor and Ground Wire Installation</u>

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. A small rope would be pulled from structure to structure. It would be connected to the conductor and ground wire and used to pull them down the line through pulleys suspended from the insulators. A bulldozer and specialized tensioning equipment would be used to pull conductors and ground wires to the proper tension. Crews would then clamp the wires to the insulators and remove the pulleys.

2.3.2. Operation and Maintenance

Inspection

Periodic inspections of 161-kV transmission lines are performed from the ground and by aerial surveillance from a helicopter. These inspections, which occur on approximately five-year cycles after operation begins, are conducted to locate damaged conductors, insulators, or structures, and to discover any abnormal conditions that might hamper the normal operation of the line or adversely affect the surrounding area. During these inspections, the condition of vegetation within the right-of-way, as well as immediately adjoining the right-of-way, is noted. These observations are then used to plan corrective maintenance and routine vegetation management.

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. For a 161-kV transmission line, National Electrical Safety Code standards require a minimum clearance of 24 feet.

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

In those areas within the cleared right-of-way where vegetation management is necessary, TVA would use an integrated vegetation management approach designed to encourage the low-growing plant species while discouraging tall-growing plant species. A vegetation reclearing plan would be developed for each transmission line segment based on the results of the periodic inspections described above. The two principal management techniques are mechanical mowing, using tractor-mounted rotary mowers, and herbicide application. Herbicides are normally applied in areas where heavy growth of woody vegetation is occurring on the right-of-way and mechanical mowing is not practical. Herbicides would be selectively applied from the ground with backpack sprayers or vehicle-mounted sprayers; however, in some cases it would be applied aerially by helicopter.

Any herbicides used would be applied in accordance with applicable state and federal laws and regulations. Only herbicides registered with the U.S. Environmental Protection Agency (USEPA) would be used. Appendix E contains a list of the herbicides and adjuvants (ingredients added to the herbicide solution to increase its effectiveness) currently used by TVA in right-of-way management.

Other than vegetation management, only minor additional 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 releveling the area surrounding the replaced structures, but there would be little, if any, additional area disturbance compared to the initial installation of the structure.

2.4. Project and Siting Process

TVA used the following basic steps in siting the proposed transmission line:

- Determine potential existing power sources
- 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

2.4.1. Definition of the 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 is the TVA Widows Creek-Winchester 161-kV Transmission Line, which is located approximately 4 miles west of the Reese Ferry Tap Line (see Figure 2). Therefore, based on this location, the study area was defined as an area that encompasses approximately 15 square miles (9,600 acres) and is located entirely within Jackson County. The study area boundary consists of the Widows Creek-Winchester 161-kV line to the west, Summerhouse Mountain to the north, the Beaulieu #2 Substation to the east, and the distributor's 69-kV line along the CSX Railroad to the south (see Figures 1 and 2).

General guidelines in routing this particular transmission line included avoidance of known major constraints (including wetlands), existing and potential residential and commercial development areas, and severance of property parcels if possible. TVA tries to avoid running transmission lines parallel to streams and creeks because this requires cutting trees or low-growing vegetation along the stream banks for the entire length of the right-of-way adjacent to the water body, and this can have adverse environmental effects. An important routing concern is accessibility by construction and maintenance crews to the final route chosen. Other important factors are engineering requirements, paralleling or utilizing existing utility corridors, following property lines, maintaining separation from existing homes along new rights-of-way, and accommodating landowner requests about the line location, if possible, during the final stages of the project. As general guidelines, deviations from these constraints can and do occur, depending on local circumstances. Following is a brief description of other aspects of the study area.

- **Natural and Cultural Features**: The Tennessee River is the predominant water feature in the study area. Flood potential from the river requires transmission line design that would accommodate periods of high water. Widows Creek flows through Doran Cove, and the floodplain in this valley limits available locations for new transmission line taps and switches.

  Summerhouse Mountain forms one side of Doran Cove and its steep, rocky sides present a serious constraint to transmission line location. Several springs flow from the lower slopes of Summerhouse Mountain.

- **Land Use**: The urbanized area of Bridgeport is on a rectilinear street grid that is primarily east of Lee Highway—State Route (SR) 277 (old U.S. Highway [US] 72). Industries are built along the west bank of the Tennessee River. The existing Reese Ferry Tap Line had been routed with great difficulty through the town of Bridgeport along industrial property edges and railroad corridors, extended one section at a time, to serve new industries as they built in Bridgeport, both north and south of town. No parallel path is feasible for a new transmission line. A new US 72 about a mile west of town has supplemented Lee Highway. The area along the newer highway is mostly former farmland that has now experienced limited residential development. Otherwise, most property is on the market for larger developments.

  West of US 72, the Rocky Springs Road and Doran Cove Road circle the base of Summerhouse Mountain. This area has scattered residences that are generally associated with larger land tracts that are mainly mountain woodlands, open pasture, or fallow fields. An old limestone quarry exists on the south slope of Summerhouse Mountain, but it is not currently in operation.

  North of the town of Bridgeport is a broad level area along SR 277 that is mostly pasture. It is unsuited to development because it is subject to flooding from the Tennessee River. The local industries are located south of this lowland area.

- **Transportation**: The major transportation route in the area is US 72, which is a four-lane, divided highway. The CSX railway system maintains a rail line that enters Bridgeport from a bridge over the Tennessee River. The line then leaves town in a southwest direction and generally parallels US 72.

2.4.2. Data Collection

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. Data analysis was aided by using a geographic information system (GIS) that allowed simultaneous examination of multiple factors. From this analysis, the route that would best meet the project objectives was determined.

Maps were created to show regional opportunities and constraints. Sources included 1 inch = 500 feet true-color aerial photography, county parcel data/property boundaries, U.S. Geological Survey topographic data, Digital Elevation Models, National Wetlands Inventory data, and cultural resource data. 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 the GIS. Manual calculations from aerial photographs, tax maps, and other sources included the numbers of road crossings, stream crossings, and property parcels.

The siting team used the GIS to analyze multiple factors when defining and comparing alternative routes. The GIS was used to display and analyze multiple layers of information simultaneously using geographically referenced digital information. The GIS data analysis included engineering, environmental, land use/land cover, and cultural features.

2.4.3. Development of General Route Options and Potential Routes

Using the GIS maps, U.S. Geological Survey topographic maps, and information from field visits, TVA developed a network of 12 alternative routes comprised of 17 separate route segments. These 17 segments are shown as Figure 6. Several paths from five potential tap locations in the Widows Creek-Winchester Transmission Line were considered in developing these routes. Tap Points A and B are located on the southwest side of Summerhouse Mountain. Tap Points C and D involved routes along either side of US 72. Tap Point E is located at the railroad crossing. The 12 alternative routes listed in Table 1 ranged in length from 5.1 to 5.8 miles.

Routes 1, 2, and 3 would begin at the Widows Creek-Winchester 161-kV Transmission Line at Tap Point A located between Structures 23 and 24 at the southwest side of Summerhouse Mountain. Routes 4, 5, and 6 would begin at Tap Point B, which is located approximately 2,000 feet south of Tap Point A between Structures 21 and 22. Routes 1 through 6 would skirt the southern toe of the mountain, cross US 72, and enter the Beaulieu #2 property near their guardhouse. The line would connect to the existing Reese Ferry Tap Line immediately south of the existing Beaulieu Substation. Because of environmental concerns (primarily wetland areas) to the north and the presence of urban development to the south, Segment 1 is the only reasonable alignment that would allow the line to connect to the Reese Ferry Tap Line (see Figure 5). The lengths of Routes 1 through 6 are between 5.1 and 5.8 miles.

Routes 7 and 8 would begin at Tap Point C, which is located immediately north of structure 14 on the Widows Creek-Winchester 161-kV Transmission Line north of US 72. Routes 9 and 10 would begin at Tap Point D, located south of the highway approximately 250 feet south of Structure 13. Routes 7, 8, 9, and 10 would parallel either side of the highway for approximately 1.25 miles, then turn east and parallel the CSX railroad before turning north to join the common route (Segment 1) into the Beaulieu plant. Routes 7 through 10 are each approximately 5.6 miles long.

Routes 11 and 12 would begin at Tap Point E located near a railroad crossing approximately 400 feet north of Structure 11 on the Widows Creek-Winchester 161-kV Transmission Line. These routes would run along the existing 69-kV line parallel to the railroad. Just outside Bridgeport, the route would diverge from the railroad and the 69-kV line and head north to join the common route (Segment 1) into the Beaulieu plant. Routes 11 and 12 would be approximately 5.6 miles long.

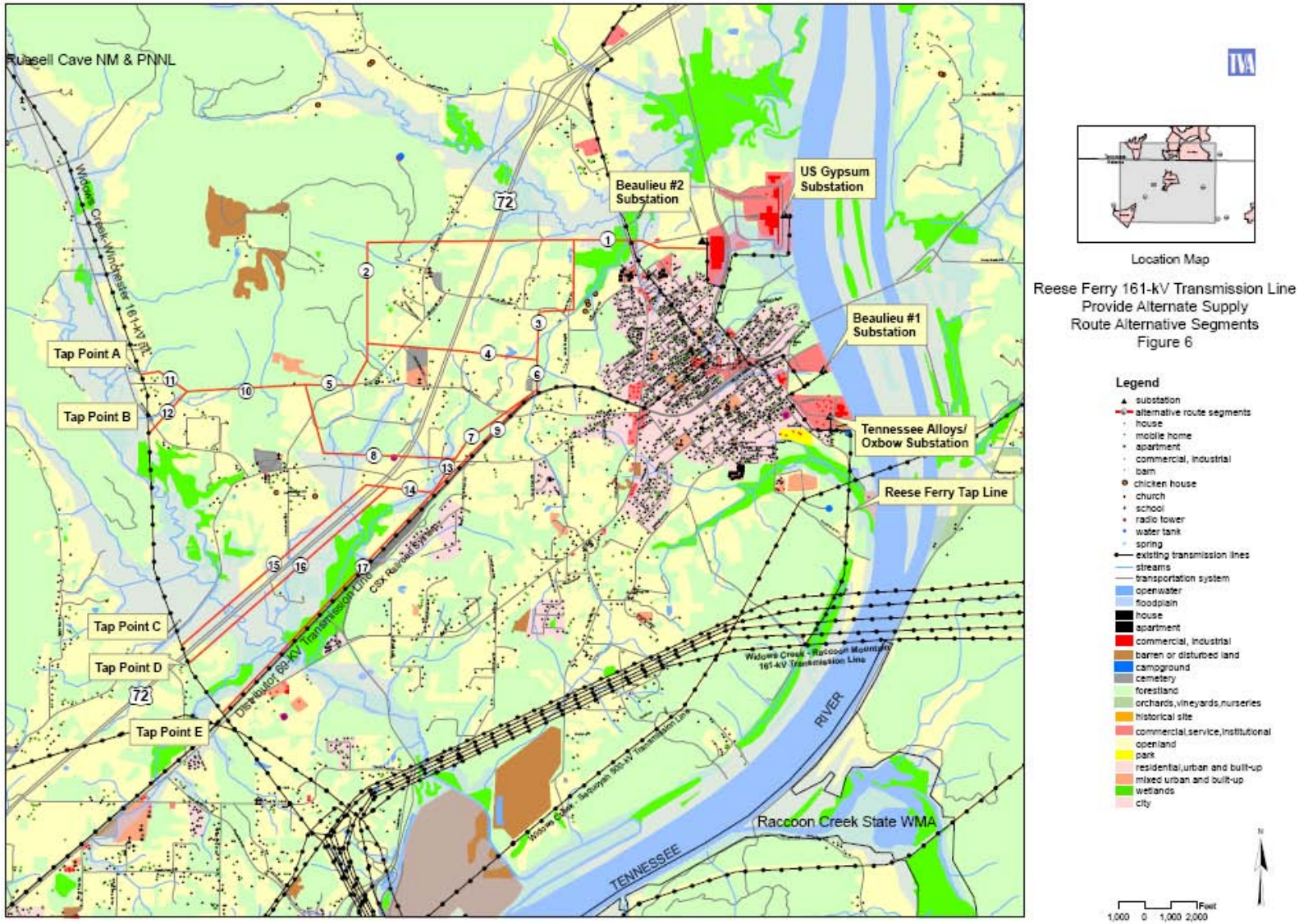

Figure 6. Route Segments for the Widows Creek-Winchester Alternate Tap to Beaulieu #2 Substation

Table 1. Transmission Line Route Alternatives and Constituent Segments

Route	Tap Point	Constituent Segments
1	A	11, 10, 5, 2, 1
2	A	11, 10, 5, 4, 3, 1
3	A	11, 10 , 8, 7, 6, 3, 1
4	B	12, 10, 5, 2, 1
5	B	12, 10, 5, 4, 3, 1
6	B	12, 10 , 8, 7, 6, 3, 1
7	C	15, 14, 13, 7, 6, 3, 1
8	C	15, 14, 9, 6, 3, 1
9	D	16, 14, 13, 7, 6, 3, 1
10	D	16, 14, 9, 6, 3, 1
11	E	17, 13, 7, 6, 3, 1
12	E	17, 9, 6, 3, 1

2.4.4. Establishment and Application of Siting Criteria

TVA uses 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. Identifying feasible transmission line routes involves weighing and balancing of these criteria with adjustments to them as specific conditions dictate. Information gathered and comments made at the public meeting and the subsequent comment period were taken into account while refining criteria to be specific to the study area.

Each of the transmission line alternative routes was evaluated according to these criteria relating to engineering, environmental, land use, and cultural concerns. Specific criteria are described below. A numeric score was assigned to each category, with a higher score indicating a greater 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 an alternative transmission line route a higher (i.e., a less desirable) score.

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

- *Environmental Criteria* include the presence of slopes greater than 20 percent (steeper slopes mean more potential for erosion and water quality impacts) and consideration of visual quality. The number of forested acres occupied by the proposed right-of-way and the number of open water crossings are considered. In addition, the presence of sensitive stream (those supporting endangered or threatened species) crossings, the number of perennial and intermittent stream

crossings, the presence of wetlands or rare species habitat, natural area crossings, and proximity to wildlife management areas are important environmental criteria taken into account.

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

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

Scores for each of the alternative routes were calculated by adding individual criterion values for each potential 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 (i.e., engineering, environmental, land use, and cultural).

A weighted score was produced for each potential transmission line route in each subcategory. Thus, those routes that would have the lowest and highest impacts on engineering, environmental, land use, and cultural resources were identified. Finally, to determine total impacts, the scores from each category were combined for an overall score.

2.4.5. Route Evaluation and Selection

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

TVA uses several tools to evaluate alternative routes for new transmission lines and to identify a preferred route. Included are information from the property owners in the study area, interest groups, elected officials, and subject matter experts; aerial photography; topographic maps; GIS constraint maps; field surveys; and professional experience. In making a final route decision, TVA weighs and balances public input and all pertinent environmental, engineering, and land use considerations. The objective of the process is to ensure that overall project impacts, as well as impacts to the community at large, are reduced.

Land use was the most important concern of the private landowners who attended the public meeting or submitted comments. Routes 7 through 10 along either side of US 72 would interfere with plans to develop a hospital on the north side of the highway. These routes would also be near existing homes, and construction would affect wetlands along the south side of the highway. Conflicts with planned residential development near County Road (CR) 206 was a concern for Segments 3 and 4 that were common to all the routes except the northernmost routes near the base of Summerhouse Mountain (Routes 1 and 4). Furthermore, Routes 11 and 12, which would use Segment 17 along the railroad, would require rebuilding an existing customer 69-kV distribution line that provides service to downtown Bridgeport. Use of route 11 or 12 would require substantial clearing and construction in wetlands (see Figure 5).

Because TVA favors a least impact route, those routes having the most likelihood for potential impacts were not preferred. All routes except those using some form of Segment 2 would have had unavoidable impacts on planned residential development. Routing along

Segment 2 was adjusted to minimize potential impacts to properties and on steep mountain slopes.

2.5. Identification of the Preferred Route Alternative

In March 2007, TVA announced its preference of Route 4 along the lower slopes of Summerhouse Mountain. This preferred route would utilize Segment 12 (and Tap Point B), which would provide the best operational access to the switch. This route would avoid potential construction impacts to a mountain spring that would have been crossed by Segment 11 (Tap Point A). The preferred route was also adjusted toward property lines in several places to accommodate the steep mountain terrain and the interests of property owners. These adjustments also reduced the length of the preferred route, especially on the steep, forested mountain slopes. The adjusted preferred route is shown as Figure 2.

TVA's preferred route would originate near Structure 22 in the Widows Creek-Winchester Transmission Line. It would cross CR 94 to a transmission line switch and continue along Segment 12 outside a wooded stream buffer toward the base of Summerhouse Mountain. The line route would climb the boulder-strewn mountain slope to an angle point that makes the 100-foot right-of-way follow a property section line due east for approximately 4,000 feet. Just east of the quarry access road, the route would turn northeast along the base of the mountain slope for approximately 600 feet. It would cross a mountain stream in a bend to reduce impacts on streamside vegetation. The route would then make an angle to turn north along a property line for about 2,600 feet. This section is on a less-steep part of the eastern mountain slope that is also less rocky than higher or lower areas. In both the west-east and south-north sections described, the proposed right-of-way would occupy the extreme end of large properties that extend onto the mountain slope from the county roads that go around the base of Summerhouse Mountain. The route would angle northeastward to cross down slope from an area planned for development by the property owners. Near CR 189, the route would turn eastward to proceed down the mountain slope and across Rocky Springs Road (CR 74). From this point, the route would cross relatively level, undeveloped property on each side of US 72 and across a lowland area partially used as pasture, toward a crossing of SR 277. The new transmission line would cross the highway and go over a customer-owned 69-kV line along the east side of the highway. It would angle to follow near the southern boundary of the Beaulieu factory property and intersect the existing Reese Ferry Tap Line immediately south of the substation serving the factory. A transmission line switch would be added to the new line in the last span prior to the line intersection.

The preferred route is approximately 4.8 miles long, and the right-of-way would occupy approximately 58 acres.

2.6. Comparison of Alternatives

If the No Action Alternative were adopted, the reliability of electric power in the Bridgeport area would likely decrease. Because of the number of industrial and commercial power users in the Bridgeport area, outages could be extremely costly for these users. Without measures to improve reliability and reduce the likelihood of power outages, long-term effects to industrial and commercial users could be substantial. This could also have effects to the local economy if industries left the area.

Under the Action Alternative, TVA would build a 161-kV transmission line from its Widows Creek-Winchester 161-kV Transmission Line to the existing TVA Beaulieu #2 Substation. The new transmission line would be approximately 4.8 miles long and would be built on a 100-foot-wide right-of-way. The right-of-way would occupy approximately 58 acres. A switch structure would be placed at each end of the line. Two additional line switches would be added in the existing Reese Ferry Tap Line immediately north of the Beaulieu #1 Tap and just southeast of the Tennessee Alloys (Oxbow) Tap. This would enhance the power supply to the loads served from the Reese Ferry Tap Line by providing an alternate power supply. Construction of the proposed line would also eliminate the risk of high-cost power outages at four industrial plants.

2.7. The Preferred Alternative

TVA's preferred alternative is the Action Alternative. Under that alternative, TVA would construct a 4.8-mile-long transmission line from its Widows Creek-Winchester 161-kV Transmission Line to its existing Beaulieu #2 Substation, and two additional line switches would be added in the existing Reese Ferry Tap Line immediately north of the Beaulieu #1 Tap and just southeast of the Tennessee Alloys (Oxbow) Tap.

2.8. Summary of Mitigation Measures

TVA has not identified the need for any nonroutine mitigation measures. The following routine measures would be applied during construction and operation of the proposed transmission line.

- Best management practices (BMPs) as described by Muncy (1999) would be applied during construction and operation of the proposed transmission line.
- Environmental quality protection specifications as described in Appendices B, C, D, and E would be implemented during construction and operation of the proposed transmission line.

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CHAPTER 3

3.0 AFFECTED ENVIRONMENT

Various environmental resources could be affected by the proposed action described in Chapter 2. Their statuses are described in this chapter. Potentially affected environmental resources include groundwater, surface water, terrestrial life (animals and plants), aquatic life, threatened and endangered species, natural areas, wetlands, floodplains, historical and archaeological resources, visual and aesthetic quality, recreation, and socioeconomics.

3.1. Groundwater and Geology

The project area is located in a narrow section of the Valley and Ridge Physiographic Province known as the Sequatchie Valley. The Sequatchie Valley is an isolated long, narrow valley trending northeast to southwest and bordered on the either side by the Cumberland Plateau. The Sequatchie Valley is underlain by Mississippian and Ordovician rocks of the Valley and Ridge aquifer.

The Valley and Ridge aquifer consists of folded and faulted carbonate, sandstone, and shale. Soluble carbonate rocks and some easily eroded shales underlie the valleys in the province, and more erosion-resistant siltstone, sandstone, and cherty dolomite underlie ridges. The arrangement of the northeast-trending valleys and ridges are the result of a combination of folding, thrust faulting, and erosion. Compressive forces from the southeast have caused these rocks to yield, first by folding and subsequently by repeatedly breaking along a series of thrust faults. The result of the faulting is that geologic formations are repeated several times across the region (Miller 1990).

The aquifers in the Sequatchie Valley are recharged by precipitation falling on outcrop areas on either side of the valley. The precipitation percolates downward through the Pennsylvanian rocks primarily as flow along steeply inclined fractures. Shale beds retard the vertical flow and cause much of the water to move laterally through beds of sandstone and conglomerate until it emerges as springs along the face of steep slopes. A small proportion of the water leaks downward across shale beds and into the Mississippian limestone, where it is joined by groundwater that originated as precipitation that fell directly on the limestone exposed along the valley floor. Water in the limestone moves mostly along openings that have developed as the rock dissolved along joints, cracks, and bedding planes. Eventually, the water from the limestone discharges into surface streams as baseflow[2] (Miller 1990). Forty-nine known caves occur within 3 miles of the proposed transmission line. The closest two caves are approximately 350 and 1,340 feet, respectively, from the proposed right-of-way (see Section 4.3.2.2).

Surface water is the primary source of water supply for Jackson County within the project area (USEPA 2006). However, groundwater supplies a couple of small communities south of the project area. Groundwater is also used for private water supply within the project area. Many named springs are located in Jackson County.

[2] Baseflow is that portion of a stream's total volume that comes from groundwater rather than from surface runoff.

3.2. Surface Water

Precipitation in the project area averages about 63 inches per year with the wettest month in March at 6.8 inches and the driest month in October at 3.7 inches. The average annual air temperature is 59 degrees Fahrenheit (°F). Temperature ranges from a monthly average of 38°F in January to 78°F in July. Stream flow varies with rainfall and averages about 29 inches of runoff per year or approximately 2.1 cubic feet per second per square mile of drainage area.

The project area drains to the Tennessee River at Guntersville Reservoir and to its tributaries: Jones Creek (and its tributary Irondale Branch) and Widows Creek. Guntersville Reservoir is classified by the Alabama Department of Environmental Management for public water supply, swimming and other whole body water-contact sports, and fish and wildlife. Widows Creek is classified for swimming and other whole body water-contact sports, and fish and wildlife. The remaining streams are classified for fish and wildlife. No streams listed under Section 303(d) of the Clean water Act would be crossed by the proposed transmission line right-of-way or access roads.

3.3. Terrestrial Life

Terrestrial life is described below in terms of vegetation (i.e., terrestrial plants) and wildlife (i.e., terrestrial animals).

3.3.1. Vegetation

The proposed project occurs in the northeastern section of Jackson County, Alabama, within the Sequatchie Valley and the Plateau Escarpment level IV ecoregions (Griffith et al. 2001). The Sequatchie Valley extends almost 100 miles from near Crossville, Tennessee, into north central Alabama. The part of the valley where the proposed project occurs has rolling, open topography and contains productive agricultural land. Within the Plateau Escarpment region, oak-hickory forest is common on the drier ridge tops, while mesic forest types comprised of American beech, basswood, sugar maple, yellow-poplar, and other species are common on lower slopes.

The land in the immediate area of the proposed project is characterized by two main vegetation types: forest (60 percent) and herbaceous vegetation (40 percent). Forest observed in the proposed tap line right-of-way is deciduous in composition. This deciduous forest is characterized by trees with overlapping crowns where deciduous species account for more than 75 percent of the canopy cover. Deciduous forests occurring along the proposed transmission line route are further subdivided into mesic forest, oak-hickory forest, disturbed upland forest, and limestone boulder forest.

Patches of mesic forest were observed along the proposed tap line at lower elevations in the Sequatchie Valley. These stands are early successional and have a sizable component of nonnative, invasive species. Canopy tree species in these even-age forests include boxelder, cherrybark oak, hackberry, red maple, sweetgum, sycamore, and willow oak. Several shrub species inhabit these forests including Carolina holly and spicebush, but the invasive Chinese privet forms dense stands and is the most common shrub species. The nonnative, invasive Japanese stilt grass is also common in this vegetation type.

Oak-hickory forest along the proposed tap line is situated on the eastern side of Summerhouse Mountain at lower and midslope landscape positions. Mature oak-hickory

forest inhabits the portion of right-of-way that traverses the eastern slope of the mountain, and it contains numerous overstory trees that approach 30 inches in diameter at breast height. Common overstory species in this section include black gum, black oak, chestnut oak, pignut hickory, shortleaf pine, and southern red oak. Herbaceous plants in this vegetation type include asters, bearded shorthusk, devil's grandmother, goldenrods, nakedflower tick trefoil, and slender oats. Few nonnative species were observed in mature oak-hickory stands.

Disturbed upland forest occurs on the southern side of Summerhouse Mountain along the lower slopes. These forest stands are younger than the oak-hickory forest type, have fewer oaks and hickories, and contain more early successional species in the overstory. Common overstory species include black cherry, loblolly pine, yellow-poplar, and white oak.

Limestone boulder forest occurs along the proposed right-of-way on areas of Summerhouse Mountain that have a south to southwestern aspect. These areas are typified by exposed limestone, steep slopes, and overstory trees that average 12 to 18 inches in diameter at breast height. The aspect and bedrock geology make the areas very dry during the summer months. Common overstory species are chinkapin oak, eastern redcedar, and southern shagbark hickory along with redbud, hophornbeam, and fragrant sumac in the understory.

Areas of herbaceous vegetation along the proposed tap line right-of-way occur in pastures, hayfields, and developed areas, including the industrial sites on the eastern portion of the project area. Herbaceous vegetation is characterized by greater than 75 percent cover of forbs[3] and grasses and less than 25 percent cover of other types of vegetation. The herbaceous vegetation located in the project area is chiefly comprised of grass and forb species typical of heavily disturbed sites. Disturbances observed in the proposed project area include cattle grazing, mowing, and construction. Common species in the herbaceous vegetation type are bitter sneezeweed, dog fennel, horseweed, ironweed, Johnson grass, prickly fanpetals, purpletop, Queen Anne's lace, and tall fescue. Wet areas in the herbaceous vegetation type harbored species indicative of moist areas including black willow, buttonbush, Frank's sedge, iris, roundfruit hedge hyssop, soft rush, and water plantain.

Invasive terrestrial plants are common in areas of mesic forest and in areas maintained as herbaceous vegetation. Extensive areas of the mesic forest have been colonized by Chinese privet. Patches of Japanese stilt grass are present in mesic forest especially near waterways or depressions. Areas of herbaceous vegetation are dominated by nonnative plants including the invasive species Johnson grass and sericea lespedeza.

3.3.2. Wildlife

Terrestrial habitats within the route for the proposed tap line have been heavily impacted by previous agricultural practices, timber harvest, and development. Overall, forested habitats make up 60 percent of the area (see Section 3.3.1), with the remaining 40 percent consisting of early successional or herbaceous habitats. Along the southern slope of Summerhouse Mountain, the proposed tap line route is predominantly deciduous forest, while the area east of Summerhouse Mountain is mostly early successional vegetation with

[3] A forb is a herbaceous plant other than a grass or fern.

small sections of deciduous forests. Approximately 3 acres of wetlands occur within early successional habitat.

Deciduous forested areas provide habitat for wild turkey, downy woodpecker, pileated woodpecker, white-breasted nuthatch, and American crow, as well as migratory birds such as wood thrush, red-eyed vireo, ovenbird, hooded warbler, and black-and-white warbler. White-tailed deer and eastern gray squirrels are mammals frequently found in deciduous forests, and scattered rock outcrops within these forests provide potential habitat for woodrats and other small mammals. Northern zigzag and slimy salamanders likely inhabit the floor of deciduous forests. Common reptiles include the eastern box turtle, northern ringneck snake, rat snake, and northern copperhead.

Early successional habitats along the route include hayfields, managed pastures, and old fields. Common birds occurring in these early successional habitats include Carolina wren, eastern bluebird, American robin, brown thrasher, northern cardinal, American kestrel, mourning dove, indigo bunting, white-eyed vireo, and gray catbird. Common mammals in this habitat type include striped skunk, eastern cottontail rabbit, white-tailed deer, Virginia opossum, and various rodents such as white-footed mouse. Reptiles often found in early successional habitats include black racer, rat snake, milksnake, and eastern garter snake. Wetlands within early successional habitats provide habitats for amphibians including American and Fowler's toads, green frog, northern cricket frog, upland chorus frog, and red-spotted newt.

No unique and important terrestrial habitats, such as heronries and caves, were identified during field investigations. However, the TVA Natural Heritage database contains records of 49 caves and two heron colonies within 3 miles of the proposed route. The closest cave records are 350 and 1,340 feet from the proposed route, and the two heron colonies are 2.0 and 2.8 miles away.

3.4. Aquatic Life

The proposed transmission line would be located in the Guntersville Reservoir section of the Tennessee River watershed in the Sequatchie Valley and Plateau Escarpment ecoregions. Streams documented in an August 2007 field survey consisted of sandy silt substrates in the Sequatchie Valley district and mainly cobble substrates with bedrock and gravel interspersed in the Plateau Escarpment district.

The Guntersville Reservoir section of the Tennessee River supports approximately 80 native fish species (NatureServe 2007). A 2001 TVA stream survey conducted at Poplar Springs Branch, approximately 2.5 miles north of the project area, recorded 13 native fish species. This stream was given a "poor/fair" rating and is representative of perennial streams in the vicinity of the proposed activities due to its proximity. Aquatic insects, mussels, snails, and other aquatic organisms are similarly diverse in these drainages. Additionally, representative fish and mussels occupying streams in the drainages are described in Boschung and Mayden (2004) and Parmalee and Bogan (1998). Aquatic animal species listed as endangered or threatened occur in these watersheds (see Section 3.5.3). The Guntersville Reservoir State Mussel Sanctuary is located from Tennessee River Mile (TRM) 424.5 (Nickajack Dam) to TRM 416.5 approximately 2 miles upstream of Bridgeport (see Section 3.6).

Because transmission line construction and maintenance activities may affect riparian conditions, TVA evaluated in-stream and riparian habitat conditions at each stream crossing and assigned riparian condition to one of three classes (see Table 2). TVA assigns SMZs and BMPs based upon these evaluations and other considerations (such as federally and state-listed statuses). Appropriate implementation of these BMPs reduces the potential for impacts to water quality and to in-stream habitat for aquatic organisms.

Table 2. Stream Riparian Conditions at Perennial and Intermittent Stream Crossings Within the Study Area

Stream Crossing Type[1]	Number of Perennial Streams	Number of Intermittent Streams	Total Number of Streams
Nonforested	0	3	3
Partially forested	0	1	1
Forested	1	3	4
Total	**1**	**7**	**8**

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

TVA identified 18 watercourses on the proposed Reese Ferry Transmission Line during an August 2007 field survey. These included one perennial, seven intermittent, and 10 wet-weather conveyances. The intermittent streams located along the project area do not support persistent aquatic communities and do not contain any unique or important aquatic habitat. Similarly, the single perennial stream does not contain unique or important aquatic habitat.

3.5. Threatened and Endangered Species

3.5.1. Terrestrial Animals

No federally or state-listed terrestrial animal species were observed during field investigations in August 2007. Two federally listed terrestrial animal species (the gray bat and the Indiana bat) are reported from Jackson County, Alabama. Those terrestrial animal species that are federally listed or state-listed in Alabama or Tennessee are listed in Table 3.

Table 3. Federally Listed Animals Known From Jackson County and State-Listed Animals Known From Within 3 Miles of the Proposed Actions

Common Name	Scientific Name	Federal Status	Alabama Status[1] (Rank[2])	Tennessee Status[1] (Rank[2])
Amphibians				
Green salamander	*Aneides aeneus*	-	PROT (S3)	NOST (S3S4)
Reptiles				
Northern pine snake	*Pituophis melanoleucus melanoleucus*	-	NOST (S3)	THR (S3)
Birds				
Bald eagle	*Haliaeetus leucocephalus*	-	PROT (S3)	NMGT (S3)
Mammals				
Gray bat	*Myotis grisescens*	END	END (S2)	PROT (S2)
Indiana bat	*Myotis sodalis*	END	END (S1)	PROT (S2)
Invertebrates				
A cave obligate pseudoscorpion	*Apochthonius russelli*	-	NOST (S1)	-
A cave obligate bristletail	*Litocampa valentinei*	-	NOST (SNR)	NOST (S1S2)
A cave obligate spider	*Nesticus barri*	-	NOST (S3)	NOST (S3)

- Not applicable

[1]Status codes: **END** = Endangered; **NMGT** = Deemed in Need of Management; **NOST** = No Status; **PROT** = Protected; **THR** = Threatened

[2]Rank Codes: **S1** = Extremely rare and critically imperiled in the state with 5 or fewer occurrences; or very few remaining individuals; or because of some special condition, where the species of some factor(s) make it vulnerable to extinction; **S2** = Very rare and imperiled within the state, 6 to 20 occurrences; **S3** = Rare or uncommon with 21 to 100 occurrences; **SNR** = Unranked (state conservation status not yet assessed); **S#S#** = Denotes a range of ranks because the exact rarity of the element is uncertain (e.g., S2S3)

Green salamanders are historically known from Sand Mountain, approximately 2.5 miles east of the proposed route, and are typically found in sandstone or limestone outcrops within mesic forests but are occasionally arboreal. During field investigations, several areas of small rocky outcrops within dry oak-hickory forests were found along the proposed right-of-way route. These areas provide marginally suitable habitat for green salamanders.

Northern pine snakes inhabit well-drained sandy or loamy soils with dense vegetation and often live underground. They have been found in a variety of habitats, including pine barrens, mixed scrub pine and oak woods, dry rocky mountain ridges, sand hills, and old fields (Ernst and Ernst 2003). Habitat for northern pine snakes exists along the proposed route.

Bald eagles have been removed recently from the endangered species list, but they are still protected by the National Bald Eagle Management Guidelines and the Bald and Golden Eagle Protection Act. The U.S. Fish and Wildlife Service has also issued guidelines for management of bald eagles (U.S. Fish and Wildlife Service 2007). This species typically nests near large bodies of water, including lakes, rivers, and riparian wetlands. The closest bald eagle nest record occurs along Guntersville Reservoir, approximately 2.2 miles from

the proposed route; however, this nest has not been active since 2004. Nesting and foraging habitat exists all along Guntersville Reservoir and the Tennessee River, which is located approximately 0.5 mile to the east of the proposed route. However, no suitable bald eagle habitat exists for this species along the proposed transmission line route itself.

Gray bats roost in caves year-round and typically forage over streams, rivers, and reservoirs. Foraging habitat exists over nearby Guntersville Reservoir, located approximately 0.5 mile from the eastern end of the proposed transmission line route, as well as over a few streams crossed by the proposed transmission line route. The closest cave used by gray bats is approximately 2.8 miles east of the proposed route. No previously unreported caves were found during field investigations, and all others are at least 350 feet from the proposed route. No suitable gray bat roosting habitat is located along the proposed route. However, a small amount of marginal foraging habitat for this species occurs along the proposed route.

Indiana bats roost in caves during the winter and typically form summer roosts under the bark of dead or dying trees (Menzel et al. 2001). Their summer roosts are found usually near water in forests with an open understory and available roost trees (Romme et al. 1995). Indiana bats forage primarily in forested areas along streams or other corridors. The closest recorded occurrences of Indiana bats are in caves approximately 6.5 and 15 miles from the proposed project area.

The suitability of forested habitat for Indiana bats was assessed following the protocol of Romme et al. (1995). Five forest variables were estimated at 10-meter (33-foot) circular plots at locations with forested habitat. 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 either open (i.e., less than 5 percent), moderately dense (5 to 20 percent), dense (20 to 60 percent), and very dense (greater than 60 percent). Potential roost trees included snags greater than about 10 feet high, 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 greater than 25 percent of the remaining bark exfoliating, moderate trees 11 to 25 percent, and low less than 10 percent. High-quality habitat plots contained a mature forest with a relatively open subcanopy 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. Six points along the proposed route were assessed; five scored low-quality habitat, and one exhibited moderate-quality habitat.

Forty-nine caves are known from within 3 miles of the proposed transmission line route. Three cave obligate invertebrates[4] are known from some of these caves. The closest cave with records of a cave obligate invertebrate listed in Table 3 is approximately 0.9 mile from the proposed route, although other caves that are closer to the route also provide potential suitable habitat. The closest known cave occurs approximately 350 feet away from the proposed transmission line right-of-way. No previously unknown caves were found during field investigations.

[4] A cave obligate invertebrate is an animal without a backbone (e.g., insects, worms, snails, etc.) that live only in cave environments.

3.5.2. Plants

Four federally listed plant species are known from Jackson County; 11 Alabama and Tennessee state-listed species are known from within 5 miles of the proposed project activities (see Table 4). During field surveys conducted in August of 2007, TVA botanists did not observe any federally or state-listed plant species within the proposed right-of-way or any other areas that would be affected by construction of the proposed line. Forests containing suitable habitat for three-parted violet, wall-rue spleenwort, and Wister coral-root are present in the proposed right-of-way. No designated critical habitat for listed plants is located within the proposed right-of-way or other areas that would be affected by the project.

Table 4. Federally Listed Plant Species Known From Jackson County, Alabama, and State-Listed Plant Species Known From Within 5 Miles of the Proposed Actions

Common Name	Scientific Name	Federal Status[1]	Alabama Status[1] (Rank[2])	Tennessee Status[1] (Rank[2])
Sweetflag	*Acorus calamus*		NOST(S1)	-
Price's potato-bean	*Apios priceana*[3]	THR	NOST(S2)	END(S2)
Wall-rue spleenwort	*Asplenium ruta-muraria*		NOST(S2)	-
American hart's-tongue fern	*Asplenium scolopendrium* var. *americanum*	THR	NOST(S1)	END(S1)
Wister coral-root	*Corallorhiza wisteriana*		NOST(S2)	-
Featherfoil	*Hottonia inflata*		NOST(S2)	SPCO(S2)
Goldenseal	*Hydrastis canadensis*		NOST(S2)	S-CE(S3)
Large whorled pogonia	*Isotria verticillata*		NOST(S2)	-
Horsemint	*Monarda clinopodia*		NOST(S2)	-
American pinesap	*Monotropa hypopithys*		NOST(S2)	-
Great yellow wood-sorrel	*Oxalis grandis*		NOST(S1)	-
Monkey-face orchid	*Platanthera integrilabia*[3]	CAND	NOST(S2)	END(S2S3)
Green pitcher plant	*Sarracenia oreophila*[3]	END	NOST(S2)	E-P(SX)
Royal catchfly	*Silene regia*		-	E-P(SH)
Three-parted violet	*Viola tripartita* var. *tripartita*		-	SPCO(S2S3)

- Not applicable

[1]Status codes: **CAND** = Candidate for listing; **END** = Endangered; **E-P** = Endangered, possibly extirpated; **NOST** = Listed by the State of Alabama but not assigned a status; **S-CE** = Special Concern-Commercially Exploited; **SPCO** = Special Concern; **THR** = Threatened

[2]Rank Codes: **S1** = Extremely rare and critically imperiled in the state with 5 or fewer occurrences; or very few remaining individuals; or because of some special condition, where the species of some factor(s) make it vulnerable to extinction; **S2** = Very rare and imperiled within the state, 6 to 20 occurrences; **S3** = Rare or uncommon with 21 to 100 occurrences; **S#S#** = Denotes a range of ranks because the exact rarity of the element is uncertain (e.g., S2S3); **SX** = Believed to be extirpated from Tennessee, with virtually no likelihood that it will be rediscovered; **SH** = Of historical occurrence in Tennessee

[3]Populations of federally listed plant species known from Jackson County, Alabama, that are not known from within 5 miles of the proposed project area.

3.5.3. Aquatic Animals

Eleven federally- and 23 state-listed aquatic species are known to occur in Jackson County, Alabama, and within a 10-mile radius of the project area. Of these, the orange-foot pimpleback, shiny pigtoe, slabside pearlymussel, sheepnose mussels (all of which are federally listed), one state-listed fish, and five state-listed mussels are historic records. Species occurring in affected watersheds along the proposed transmission line are identified in Table 5. Descriptions of the federally and state-listed species that occur within the watersheds affected by the proposed project are provided as Appendix F.

Table 5. Federally Listed Aquatic Species Known From Jackson County, Alabama, and State-Listed Aquatic Species Known From Within 10 Miles of the Proposed Actions

Common Name	Scientific Name	Federal Status[1]	Alabama Status[1] (Rank[2])	Tennessee Status[1] (Rank[2])
Fish				
Blotchside logperch	*Percina burtoni*	-	NOST(S1)	-
Flame chub[3]	*Hemitremia flammea*	-	-	NMGT (S3)
Palezone shiner	*Notropis albizonatus*	END	PROT(S1)	-
Snail darter	*Percina tanasi*	THR	-	THR (S2S3)
Southern cavefish	*Typhlichthys subterraneus*	-	PROT (S3)	-
Mussels				
Alabama lampmussel	*Lampsilis virescens*	END	PROT (S1)	-
Cumberland moccasinshell	*Medionidus conradicus*	-	PROT (S1)	-
Deertoe	*Truncilla truncata*	-	NOST (S1)	-
Fine-rayed pigtoe	*Fusconaia cuneolus*	END	PROT (S1)	-
Kidneyshell[3]	*Ptychobranchus fasciolaris*	-	NOST (S1)	-
Monkeyface	*Quadrula metanevra*	-	NOST (S3)	-
Ohio pigtoe	*Pleurobema cordatum*	-	NOST (S2)	-
Orange-foot pimpleback[3]	*Plethobasus cooperianus*	END	PROT (S1)	-
Painted creekshell	*Villosa taeniata*	-	NOST (S3)	-
Pale lilliput	*Toxolasma cylindrellus*	END	PROT (S1)	-
Pink mucket	*Lampsilis abrupta*	END	-	END (S2)
Purple lilliput	*Toxolasma lividus*	-	NOST (S2)	-
Rabbitsfoot[3]	*Quadrula cylindrica cylindrica*	-	PROT (S1)	-
Rainbow	*Villosa iris*	-	NOST (S3)	-
Round hickorynut	*Obovaria subrotunda*	-	NOST (S2)	-
Sheepnose[3]	*Plethobasus cyphyus*	CAN	PROT (S1)	-
Shiny pigtoe[3]	*Fusconaia cor*	END	PROT (S1)	-
Slabside pearlymussel[3]	*Lexingtonia dolabelloides*	CAN	PROT (S1)	-
Slippershell mussel[3]	*Alasmidonta viridis*	-	PROT (S1)	-
Snuffbox[3]	*Epioblasma triquetra*	-	NOST (S1)	-
Spike	*Elliptio dilatata*	-	NOST (S1)	-
Tennessee clubshell	*Pleurobema oviforme*	-	NOST (S1)	-
Tennessee heelsplitter[3]	*Lasmigona holstonia*	-	NOST (S1S2)	-
Tennessee pigtoe	*Fusconaia barnesiana*	-	NOST (S1)	-

Common Name	Scientific Name	Federal Status[1]	Alabama Status[1] (Rank[2])	Tennessee Status[1] (Rank[2])
Wavy-rayed lampmussel	*Lampsilis fasciola*	-	NOST (S1S2)	-
Snails				
Anthony's river snail	*Athearnia anthonyi*	END	PROT (S1)	-
Corpulent hornsnail	*Pleurocera corpulenta*	-	NOST (S1)	-
Spiny riversnail	*Io fluvialis*	-	-	NOST (S2)
Varicose rocksnail	*Lithasia verrucosa*	-	NOST (S3)	-

- Not applicable

[1]Status codes: **CAND** = Candidate for listing; **END** = Endangered; **NOST** = Listed by the State of Alabama but not assigned a status; **THR** = Threatened

[2]Rank Codes: **S1** = Extremely rare and critically imperiled in the state with 5 or fewer occurrences; or very few remaining individuals; or because of some special condition, where the species of some factor(s) make it vulnerable to extinction; **S2** = Very rare and imperiled within the state, 6 to 20 occurrences; **S3** = Rare or uncommon with 21 to 100 occurrences; **S#S#** = Denotes a range of ranks because the exact rarity of the element is uncertain (e.g., S2S3)

[3]Historic record

3.6. Managed Areas

The proposed transmission line and switching structures are not within or adjacent to any managed areas and/or ecologically significant sites or Nationwide Rivers Inventory (NRI) streams. However, three managed areas and/or ecologically significant sites are within 3 miles of the proposed action. No NRI streams are in the vicinity.

The west end of the proposed line is approximately 2.3 miles southeast of Russell Cave National Monument. Managed by the National Park Service, this 310-acre tract provides recreational experiences for visitors and preserves the unique geological and biological elements of the cave and adjacent area. The site is listed in the National Register of Historic Places (NRHP).

The tap near Beaulieu #2 Substation is approximately 2.0 miles southwest of Guntersville Reservoir State Mussel Sanctuary. Managed by the Tennessee Wildlife Resources Agency, the sanctuary is that section of the Tennessee River from Nickajack Dam at TRM 424.7 downstream to the Tennessee-Alabama state line at TRM 416.5. The taking of aquatic mollusks by any means, and/or the destruction of their habitat, is prohibited in the sanctuary at all times.

The switches to be added south of the Tennessee Alloys (Oxbow) Tap are approximately 1.5 miles northwest of Raccoon Creek Wildlife Management Area. The Alabama Department of Conservation and Natural Resources manages this 7,080-acre tract near Stevenson for hunting of waterfowl and for small and big game hunting.

3.7. Wetlands

Wetlands are areas inundated by surface water or groundwater such that vegetation adapted to saturated soil conditions are prevalent. Examples include swamps, marshes, bogs, wet meadows, and lacustrine or palustrine shoreline fringes. On August 22, 2007, a ground survey was conducted to delineate wetland areas within the proposed transmission line right-of-way.

Wetland determinations were performed according to the USACE standards, which require documentation of hydrophytic (i.e., wet-site) vegetation, hydric soil, and wetland hydrology (Environmental Laboratory 1987; Reed 1997; U.S. Department of Defense and USEPA 2003). Broader definitions of wetlands, such as that used by the U.S. Fish and Wildlife Service (Cowardin et al. 1979), the Alabama definition (Title 22, Section 22-22-9(g), Code of Alabama), and the TVA Environmental Review Procedures definition (TVA 1983), were also considered in this review. Using a TVA-developed modification of the Ohio Rapid Assessment Method (Mack 2001) specific to the TVA region (TVARAM), wetlands were categorized by their functions, sensitivity to disturbance, rarity, and irreplaceability. The categorization was used to evaluate impacts and to determine the appropriate levels of mitigation for wetland impacts.

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

The Reese Ferry project area is located within the Guntersville Watershed, whose major hydrologic feature in the project area includes Jones Creek, Widows Creek, and Guntersville Reservoir. The proposed right-of-way traverses a landscape dominated by agricultural fields and upland forests. Several roads, creeks, drainage ways, and five wetlands are crossed by the proposed right-of-way. A total of 2.30 acres of wetland are located within the project footprint (see Table 6).

Table 6. Wetlands on the Reese Ferry Proposed Right-of-Way and on Access Roads

Wetland Identification	Type[1]	Wetland Acreage on Right-of-Way	Location	TVARAM Category (score)
W001	PEM1B	0.13	Access road	1 (22)
W002	PEM1B/PSS1B	0.31	Right-of-way	1 (27)
W003	PEM1F/PSS1F	0.25	Right-of-way	2 (44.5)
W004	PEM1B	1.49	Right-of-way	2 (35.5)
W005	PSS1B	0.12	Right-of-way	1 (26)
Total Acres		**2.30**		

[1]Classification codes as defined in Cowardin et al. 1979: PEM1 = palustrine emergent, persistent vegetation; PSS1 = palustrine scrub-shrub, broadleaf deciduous; B = saturated; F = semipermanently flooded

Wetland 001 (W001) is a small wetland dominated by herbaceous plants on a potential access road to the proposed transmission line right-of-way. It is located in a hayfield that is mowed regularly. The wetland exhibits hydric soils and is connected hydrologically to Jones Creek via an old floodplain drainage channel. W001 is dominated by hydrophytic vegetation, including buttonbush saplings, soft rush, and redtop panic grass. W001 scored in Category 1 using TVARAM, which indicates impaired wetland condition and impaired provision of wetland functions.

Wetland 002 (W002) is a palustrine emergent/scrub-shrub wetland located in a cow pasture. The wetland exhibits hydric soils and is connected hydrologically to Jones Creek. Dominant vegetation includes tall fescue, hop sedge, green bulrush, paleyellow iris, sweetgum, green ash, and buttonbush saplings. W002 scored in Category 1 using TVARAM, which indicates impaired wetland condition and impaired provision of wetland functions.

Wetland 003 (W003) is a palustrine emergent/scrub-shrub wetland located in the same cow pasture as W002. It exhibits hydric soils and is connected hydrologically to Jones Creek. Dominant vegetation includes black willow, hop sedge, soft rush, paleyellow iris, lizard's-tail, shortbristle horned beakrush, and buttonbush saplings. Hydrology of this wetland is enhanced considerably by a broken water line. W003 scored in Category 2 using TVARAM, which indicates moderate wetland condition and moderate provision of wetland functions.

Wetland 004 (W004) is a palustrine emergent wetland located in the same cow pasture as W002 and W003. The wetland exhibits hydric soils and is connected hydrologically to Jones Creek. Dominant vegetation in the emergent portion includes buttonbush saplings, hop sedge, soft rush, smartweed, lizard's-tail, roundfruit hedge hyssop, and giant ironweed. W004 scored in Category 2 using TVARAM, which indicates moderate wetland condition and moderate provision of wetland functions.

Wetland 005 (W005) is a palustrine scrub-shrub wetland located in the right-of-way of SR 277. This wetland exhibits hydric soils and is connected hydrologically to Jones Creek. Dominant vegetation in the emergent portion includes buttonbush, green ash, slippery elm, black willow, sweetgum, and Chinese privet. W005 scored in Category 1 using TVARAM, which indicates impaired wetland condition and impaired provision of wetland functions.

All of the wetlands identified within the proposed transmission line right-of-way and access roads function in storm water retention, erosion control, toxicant absorption, and flood control and offer wildlife habitat. W001, W002, and W005 were considered Category 1 using the TVARAM. This indicates that these wetlands are in poor condition and are functioning far below optimum levels. W003 and W004 were scored as Category 2 using the TVARAM, which indicates these wetlands are in good condition and provide beneficial wetland functions to a moderate extent. No wetlands were scored as Category 3 using the TVARAM. W001, W002, W003, and W004 have been heavily impacted by ongoing agricultural activities. W005 has been altered drastically by previous highway construction.

W001 is located along a proposed access road to the new right-of-way. Portions of W002, W003, W004, and W005 are located within the proposed right-of-way. All of the identified wetlands appear to be jurisdictional and, thus, would be subject to requirements under the Clean Water Act. Total wetland area identified within the proposed project right-of-way or within access roads is 2.30 acres.

3.8. Floodplains

The proposed transmission line route crosses the identified 100-year floodplain of Jones Creek along with several minor floodplain areas in Jackson County, Alabama.

3.9. Historical and Archaeological Resources

Human occupation of northern Alabama has occurred from the Paleo-Indian to the Historic period. In northern Alabama, prehistoric archaeological chronology is generally broken into five broad periods: Paleo-Indian, Archaic, Gulf Formational, 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. European interactions with Native Americans associated with the fur trading industry in this area began in the 17th and 18th centuries. The first permanent occupation of northern Alabama by Europeans, European Americans, and African Americans occurred in the late 18th century. Various excursions and temporary settlements by the British, French, and Spanish occurred prior to this period. From the 1840s to the mid-20th century, northern Alabama was a major cotton growing area. Settlement and land use of the area remained primarily rural until the mid-20th century, at which time industry and urbanization increased.

Jackson County was created in 1819. The earliest seat of government in the county was known simply as Jackson Courthouse. In 1821, Bellefonte was laid out and selected as the county seat. It was located northeast of present-day Scottsboro but faded from existence when its citizens rejected the Memphis & Charleston Railroad in 1858, fearing it would hurt the town's river traffic and disturb the peace. The community of Scott's Station, later renamed Scottsboro, a few miles from Bellefonte, arose on the strength of the rail trade, and the county seat was moved there in 1868 (Jackson County Heritage Book Committee, 1998). Pioneers in Jackson County concerned themselves principally with clearing land to grow corn to feed themselves and their livestock. However, those who could afford the high priced lands along the Tennessee River and its major tributaries devoted much of their land to the production of cotton, which fetched a high price in the years during which the county was being settled and attracted many farmers to the Tennessee Valley (Kennamer 1935). The damage caused by the Civil War took a toll on the population of Jackson County during the second half of the 1860s. The war nevertheless brought changes to the agricultural economy of the South, despite the fact that cotton continued to dominate most southern farms. The Franklin D. Roosevelt Administration and the TVA-Civilian Conservation Corps era produced the greatest changes in the area. Guntersville Reservoir inundated a large portion of the county's fertile farmland but made electric power available to the local population. The availability of inexpensive power provided by TVA attracted more industries to the Jackson County area.

The area of potential effect (APE) for archaeological resources was determined as all areas in which land-disturbing activities would take place. The APE for architectural resources included a 0.5-mile area surrounding the proposed transmission line route, as well as any areas where the project would alter existing topography or vegetation in view of a historic resource.

Prior to any survey, background research was conducted. The Bridgeport Historic District, located in the downtown section of Bridgeport, is listed in the NRHP. The historic district is located approximately 0.5 mile from the proposed right-of-way. No previously recorded archaeological sites were identified. No previously recorded historic architectural properties were identified within the proposed APE.

The archaeological survey (Thomas 2007) identified one previously unrecorded archaeological resource (1JA1106), which consisted of a small lithic scatter. Site 1JA1106

is considered ineligible for listing in the NRHP because the site is sparse, plowzone scatter of debitage,[5] with no indications of intact buried deposits.

The historic architectural survey (Thomas 2007) identified 10 previously unrecorded architectural resources (HS1 through HS10) within the proposed APE. These resources include a dwelling constructed in 1900, a church constructed in 1924, a community center, and dwellings dating from the 1920s to 1955. All of these resources are considered ineligible for listing in the NRHP because the resources have been altered, and none exhibit unique or distinct architectural features.

3.10. Visual and Aesthetic Quality

The physical, biological, and cultural features of an area combine to make the visual landscape character both identifiable and unique. Scenic integrity indicates the degree of unity or wholeness of the visual character. Scenic attractiveness is the evaluation of outstanding or unique natural features, scenic variety, seasonal change, and strategic location. Where and how the landscape is viewed affect the more subjective perceptions of its aesthetic quality and sense of place. Views of a landscape are described in terms of what is seen in foreground, middleground, and background distances. In the foreground, an area within 0.5 mile of the observer, details of objects are easily distinguished in the landscape. In the middleground, normally between 0.5 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 4.10.

The proposed line route would begin at the existing Widows Creek-Winchester Transmission Line on the southwest side of Doran Cove Road. The existing transmission line is located in a valley with steeper terrain in the middleground distances. Summerhouse Mountain lies to the northeast and Montague Mountain to the northwest. Several residents to the northeast of the tap point have views of the existing laced-steel towers on the Widows Creek-Winchester 161-kV Transmission Line.

The line route would cross level terrain to the base of Summerhouse Mountain. From there, the line would continue to the east through a forested area. Just north of Cumberland Junction, the line would turn to the north and cross steep forested terrain to CR 189 and 74 (Rocky Springs Road) near Hopewell Church. There are several homes along CR 74 in the foreground of the proposed line route.

East of CR 74 the proposed line route would traverse mainly level terrain and US 72 to Lee Highway (SR 277). There are a few homes in the area, and public access is limited to minor roads for residential access. At Lee Highway, there are numerous residential and commercial structures in the foreground of the proposed line route. To the immediate west of Lee Highway, approximately 1,000 feet south of the proposed crossing of Lee Highway, there are multifamily developments and several currently unoccupied commercial buildings.

[5] Debitage is lithic (rock) debris and discarded materials found at the sites where stone tools and weapons were made.

The proposed transmission line would continue east through industrial development to the existing Beaulieu #2 Substation. This area is reserved for employees and deliveries to the industrial areas with access through a security checkpoint. Physical features in the landscape include numerous service poles, signage, and laydown storage areas.

3.11. Recreation

Recreation activities in the project area are informal and dispersed, and they include hunting, walking, off-road vehicle use, and nature viewing. There are no developed public recreational facilities within the immediate area of the proposed activities. However, the Bridgeport Community Park, located on the southeast side of Bridgeport, is near the existing Reese Ferry Tap Line and is approximately 0.25 mile from the proposed switch near the Tennessee Alloys/Oxbow Substation. The Bridgeport Community Park contains various recreation facilities, including ball fields, tennis courts, and a swimming pool.

Russell Cave National Monument is located about 2.5 miles from the project area. Russell Cave, which is operated by the National Park Service, offers an on-site museum, a bookstore, interpretive tours, and a prehistoric tools and weapons exhibit. The facility also sponsors an annual Native American festival. The North Alabama Birding Trail and Nature Trail is also a part of the site.

3.12. Socioeconomics

According to census data (U.S. Census Bureau 2007a), the estimated population of Jackson County in 2006 was 53,745. Within the county, 92.6 percent of the population is white, and 3.8 percent is black. The balance of the population is reported to be Native American, Hispanic, or Latino, and persons of mixed race. Median household income in Jackson County in 2000 was $33,733, which is lower than the state median household income of $37,062. Per capita income in Jackson County in 1999 was $16,000; the Alabama per capita income was $18,189. Within Jackson County, 15.3 percent of the population is below the poverty level, which is lower than the state level of 16.1 percent.

Within Bridgeport, 2000 census data (U.S. Census Bureau 2007b) indicate that 89.9 percent of the population is white, and 8.5 percent is black. Median household income for the Bridgeport area is $28,981, while per capita income was $15,778 in 2000. According to census data, 13.4 percent of the population of the Bridgeport area was below the poverty level in 1999. Manufacturing-related jobs comprise 43 percent of the occupational opportunities.

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CHAPTER 4

4.0 ENVIRONMENTAL CONSEQUENCES

The potential effects to the various resources described in Chapter 3 are provided in this chapter. Potential effects likely to occur under the No Action Alternative and the Action Alternative are described for each resource. This chapter is organized in the same order as Chapter 3.

4.1. Groundwater and Geology

Potential impacts to groundwater could result if sediments from excavated materials enter or clog sinkholes or springs and from the transport of contaminants such as herbicides and fertilizers into sinkholes. Such contamination could eventually also contaminate groundwater resources.

4.1.1. No Action Alternative

Under the No Action Alternative, the proposed transmission line would not be constructed, and there would be no effects to groundwater resources or geological features. No additional effects to these resources are expected.

4.1.2. Action Alternative

Several springs occur along the side of Summerhouse Mountain. However, no sinkholes were found along the proposed right-of-way. BMPs (Muncy 1999) would be used to avoid contamination of groundwater in the project area and to control sediment infiltration from storm water runoff. With the use of BMPs, impacts to groundwater from the proposed action would be insignificant. For similar reasons, no indirect or cumulative effects to groundwater or geological resources are anticipated under the Action Alternative.

4.2. Surface Water

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, algal growth, dissolved oxygen depletion, and adverse impacts to aquatic biota. Improper use of herbicides to control vegetation could result in runoff to streams and subsequent aquatic impacts.

4.2.1. No Action Alternative

Under the No Action Alternative, TVA would not undertake the proposed action. Thus, there would be no effects to surface water quality because there would be no change from the current situation. For similar reasons, no additional or cumulative effects to surface waters are expected from implementing the No Action Alternative.

4.2.2. Action Alternative

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 near receiving waters and to prevent unacceptable aquatic impacts. Proper implementation of these controls is expected to result in only minor temporary impacts to surface waters. No cumulative impacts are anticipated.

4.3. Terrestrial Life

4.3.1. No Action Alternative

4.3.1.1. Vegetation

Adoption of the No Action Alternative would not significantly affect vegetation, including invasive species, in the project area because no project-related changes to the terrestrial environment of the region would occur.

4.3.1.2. Wildlife

Under the No Action Alternative, the proposed tap line and associated actions would not occur, and the project area would likely remain in its current condition. Wildlife and their habitats would not be affected directly or indirectly by any project-related actions.

4.3.2. Action Alternative

4.3.2.1. Vegetation

Adoption of the Action Alternative would require clearing of approximately 16 acres of early to midsuccessional mesic and disturbed upland forest, 10 acres of mature oak-hickory forest, and 5 acres of limestone boulder forest. These communities are common and well represented throughout the region. No rare plant communities occur in the project right-of-way. Any impacts to terrestrial vegetation are expected to be minor and regionally insignificant.

Most of the project area currently has a large component of invasive species, and adoption of the Action Alternative would not change the situation. Implementation of the Action Alternative would fragment a large section of continuous mature forest on Summerhouse Mountain. Forest fragmentation has been closely associated with increased susceptibility to invasion by nonnative species (Rejmanek 1989). To reduce the potential for the introduction and spread of invasive species at the project site, only noninvasive species would be planted in the proposed right-of-way in those sections where revegetation is necessary. Overall impacts associated with the Action Alternative are expected to be insignificant at the regional level.

4.3.2.2. Wildlife

Under the Action Alternative, clearing of forested habitat along the route would increase the amount of forest edge habitat, particularly along the southeastern edge of Summerhouse Mountain. The remaining project area is already largely fragmented by agricultural practices. Overall, forest conversion would be regionally insignificant. Some wildlife species, such as several neotropical migrant songbirds, are dependent on large forested areas and are affected negatively by forest clearing and fragmentation. Conversely, several animal species require early successional habitats. However, most species that would be affected by these changes are locally and regionally common.

Forty-nine caves and two heron colonies are known to occur within 3 miles of the proposed tap line route. The closest caves are 350 and 1,340 feet from the proposed tap line route, and both heron colonies are 2 miles or greater in distance. These are adequate distances from the proposed route, and neither of these caves nor the heron colonies would be affected by the proposed actions. Implementation of the Action Alternative is not expected to result in significant direct or indirect impacts to terrestrial wildlife or habitats.

4.4. Aquatic Life

4.4.1. No Action Alternative

Under the No Action Alternative, the Reese Ferry 161-kV Transmission Line would not be built. Therefore, no additional or incremental environmental impacts to the aquatic ecology of the area would occur.

4.4.2. Action Alternative

Under the Action Alternative, aquatic life could be affected by the proposed action either directly by the alteration of habitat conditions within the stream or indirectly due to modification of the riparian zone and storm water runoff resulting from construction and maintenance activities along the transmission line corridor. Potential impacts due to removal of streamside vegetation within the riparian zone include increased erosion and siltation, loss of in-stream habitat, and increased stream temperatures. Other potential construction and maintenance impacts include alteration of stream banks and stream bottoms by heavy equipment and runoff of herbicides into streams.

Siltation has a detrimental effect on many aquatic animals adapted to riverine environments. Turbidity caused by suspended sediment can negatively affect spawning and feeding success of many fish species (Sutherland et al. 2002). Pollution resulting from silt deposits has been observed to destroy or greatly diminish crayfish populations in many localities in the eastern part of the United States (Hobbs and Hall 1974). Likewise, mussel species adapted to a sand and gravel bottom environment cannot survive in bottom environments having fine sediment, as the sediment clogs the gills, smothering the animal (Parmalee and Bogan 1998).

In order to minimize the potential for impacts to aquatic life, TVA would implement BMPS at all watercourses along the proposed transmission line route and access roads. These BMPs (Muncy 1999) are designed in part to minimize disturbances of riparian areas and subsequent erosion and sedimentation that can be carried to streams. Watercourses that convey only surface water during storm events (i.e., wet-weather conveyances) and that

could be affected by the proposed transmission line route would be protected by standard BMPs as identified in Muncy (1999).

All perennial and intermittent streams along the proposed transmission line, with the exception of one spring located within the right-of-way, would be protected by Standard Stream Protection (Category A) as defined in Muncy (1999). One spring within the right-of-way would receive Category B protection. These categories of protection are based on the variety of species and habitats that exist in the streams as well as the state and federal requirements to avoid harming certain species. The width of the SMZs is determined by the type of watercourse, primary use of the water resource, topography, or other physical barriers (Muncy 1999). Any impacts to aquatic life resulting from the proposed action would be insignificant, and implementation of appropriate BMPs and SMZ protection during construction, operation, and maintenance activities would help ensure this.

4.5. Threatened and Endangered Species

Adoption of either alternative is not expected to affect listed species. Discussion of the rationale for this determination follows.

4.5.1. No Action Alternative

4.5.1.1. Terrestrial Animals

Under the No Action Alternative, the proposed tap line and associated actions would not occur. Thus, no federally listed or state-listed terrestrial animals or their habitats would be affected by any project-related actions. For similar reasons, no indirect or cumulative effects to such species are expected.

4.5.1.2. Plants

Adoption of the No Action Alternative would have no effect on federally or state-listed plant species in the project area or to their habitats because no project-related work would take place. No additional effects to such species or their habitats are expected.

4.5.1.3. Aquatic Animals

Adoption of the No Action Alternative would cause no noticeable changes to the environmental conditions in the Guntersville Reservoir section of the Tennessee River or its tributaries. Thus, no effects to sensitive aquatic species, including any state-listed and federally listed aquatic animals, or their habitats would occur from the adoption of the No Action Alternative.

4.5.2. Action Alternative

4.5.2.1. Terrestrial Animals

No suitable cave habitat for three cave obligate invertebrates known from nearby caves occurs in the proposed project area. These species would not be affected by the proposed actions. Nesting and foraging habitat for bald eagles also does not exist along the proposed tap line route but does occur along Guntersville Reservoir approximately 0.5 mile to the east. Bald eagles would not be affected due to the distance between existing nests

and the project site (2.2 miles or greater) and the lack of habitat along the proposed tap line.

Only marginally suitable habitat for green salamanders occurs along the proposed tap line route, and similarly suitable habitat exists on the adjacent Summerhouse Mountain. The proposed tap line may displace a few individuals, but populations of green salamanders would not be affected by the proposed project. In contrast, the northern pine snake habitat occurs in a variety of habitats, and suitable habitat is abundant throughout the project area. If present, northern pine snakes would likely move from the construction area and would not be impacted because they spend most of their time underground. The proposed actions would not affect northern pine snake populations due to the abundance of habitat in the area as well as their burrowing nature.

The nearest cave with gray bat records is approximately 2.8 miles away from the proposed tap line route. All other cave records are 350 feet or greater from the proposed route, and no new caves were found along the proposed tap line route during an August 2007 field survey. A few streams crossed by the proposed route provide marginal foraging habitat for this species, but adoption of the Action Alternative would not affect any gray bat roosting or foraging habitat.

Indiana bats have been recorded in a cave approximately 6.5 miles from the proposed tap line route. All other caves with Indiana bat records are 15 miles or more away, and no previously unreported caves were found along the proposed tap line route. Therefore, caves used by this species would not be affected under the Action Alternative. Potential summer roosting habitat within the right-of-way for the proposed line is mostly low quality with one area of moderate-quality habitat. Given the overall low suitability of summer forested habitat and the distance from caves where this species has been recorded hibernating, implementation of the Action Alternative would not affect Indiana bat roosting or foraging habitat. Adoption of the Action Alternative would not directly or indirectly affect any state- or federally listed terrestrial animal species or their habitats.

4.5.2.2. Plants

No endangered or threatened plant species were observed within the proposed transmission line right-of-way or in the immediate area of the right-of-way area during field surveys. Therefore, adoption of the Action Alternative would have no direct, indirect, or cumulative effects on federally or state-listed plants or their habitats.

4.5.2.3. Aquatic Animals

Within a 10-mile radius of the proposed transmission line in Jackson County, 23 state-listed and 11 federally listed aquatic species are known to occur. Of these, 10 are historic records and may no longer occur in the area (see Table 5). No habitat for the remaining aquatic species listed in Table 5 occurs in the immediate vicinity of the project area. However, clearing of riparian vegetation and soil disturbance associated with construction of stream crossings and other construction or maintenance activities have the potential to result in runoff entering watercourses and affecting downstream areas. Because appropriate BMPs and SMZ protection would be implemented to reduce runoff and in-stream impacts, there would be no effects to state-listed or federally listed aquatic species or their habitats.

4.6. Managed Areas

4.6.1. No Action Alternative

Under the No Action Alternative, the proposed action would not be undertaken, and there would be no project-related effects to managed areas in the proposed project area. Changes to these features as well as their management objectives would nonetheless occur over time as other factors such as population trends, land use and development, quality of air/water/soil, recreational patterns, cultural, and ecological and educational interests within the area change.

4.6.2. Action Alternative

Because the proposed work is at a sufficient distance (1.5 to 2.3 miles) from the three managed areas, i.e., Russell Cave National Monument, Guntersville Reservoir State Mussel Sanctuary, and Raccoon Creek Wildlife Management Area, no impacts to these areas are anticipated from the proposed action.

4.7. Wetlands

4.7.1. No Action Alternative

Under the No Action Alternative, the proposed transmission line would not be built, and there would be no disturbance to wetlands within the proposed transmission line right-of-way. Maintenance on the existing Reese Ferry Tap Line would continue, but no additional effects to wetlands along that segment of the line located in wet areas (see Section 1.2) are expected.

4.7.2. Action Alternative

Activities in wetlands are regulated under Section 404 and Section 401 of the Clean Water Act and EO 11990. Pursuant to Section 404, activities in jurisdictional wetlands require authorization through a Nationwide General Permit or Individual Permit issued by the USACE. Likewise, in accordance with Section 401, projects permitted by the federal government require water quality certification by the respective state (Strand 1997). EO 11990 requires agencies to minimize wetland destruction, loss, or degradation and preserve and enhance natural and beneficial wetland values while carrying out agency responsibilities. TVARAM can be used as an aid in guiding wetland mitigation decisions consistent with TVA's independent responsibilities under the National Environmental Policy Act (NEPA) and EO 11990.

Construction of the proposed Reese Ferry Transmission Line under the Action Alternative would have the potential to affect wetland areas due to the following activities:

- Locating one structure in a wetland
- Accessing portions of all five wetlands for construction of the proposed transmission line and/or access to the right-of-way
- Clearing small portions of scrub-shrub and scattered trees from W002, W003, W004, and W005
- Maintaining the new transmission lines long term

Most of the wetlands in the proposed right-of-way have been cleared previously for agriculture. Very little, if any, additional clearing would be required. Potential impacts to all wetland areas resulting from possible access across these wetlands during the proposed transmission line construction would be reduced sufficiently with the implementation of BMPs. Similarly, BMPs would be used during all maintenance activities to help ensure that potential wetland impacts are temporary and insignificant. Potential impacts to 2.30 acres of emergent and scrub-shrub wetlands would be minimal and insignificant, and the use of BMPs to minimize impacts associated with vehicular access and long-term maintenance would help ensure this.

4.8. Floodplains

4.8.1. No Action Alternative

Under the No Action Alternative, the proposed transmission line would not be constructed. Therefore, no floodplains would be affected under this alternative. The existing Reese Ferry Tap Line (see Figure 2) would remain in service. Portions of this line are located in floodplain areas. However, no new or additional effects to floodplains or their functions are expected under the No Action Alternative.

4.8.2. Action Alternative

The proposed transmission line route crosses several floodplain areas in Jackson County, Alabama. Consistent with EO 11988, an overhead transmission line and related support structures are considered a repetitive action in the 100-year floodplain. The construction of the support structures for the power line are not expected to result in any increase in flood hazard either as a result of increased flood elevations or changes in flow-carrying capacity of the streams being crossed. To help reduce potentially adverse impacts on natural and beneficial floodplain values, the right-of-way would be revegetated where natural vegetation is removed. BMPs would be used during construction activities.

The proposed switches would not be located within the 100-year floodplain. Thus, this portion of the proposed action would be consistent with EO 11988. Some of the access roads would involve construction in the 100-year floodplain. Any road construction would be done in such a manner that upstream flood elevations would not be increased. Thus, any effects to floodplain functions under the Action Alternative would be minor and insignificant.

4.9. Historical and Archaeological Resources

4.9.1. No Action Alternative

Under the No Action Alternative, there would be no changes from the current situation. Thus, there would be no direct or additional effects to any historical or archaeological resources.

4.9.2. Action Alternative

The cultural resources survey (Thomas 2007) identified one previously unrecorded archaeological resource (1JA1106) and 10 previously unrecorded architectural resources (HS1 through HS10) within the APE. All of these resources are considered ineligible for listing in the NRHP.

Based on a review of aerial maps and information from the Tennessee Division of Archaeology, TVA determined that construction of the proposed construction laydown area does not have the potential to affect any historic properties eligible for listing in the NRHP. Likewise, TVA has determined that the proposed undertaking, including construction of the proposed transmission line and construction laydown area, would have no effect on any historic properties that are potentially eligible or currently listed in the NRHP. The Alabama Historical Commission opined that the project activities would have no adverse effects on cultural resources eligible for or listed on the National Register of Historic Places (see Appendix A).

4.10. Visual and Aesthetic Quality

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

4.10.1. No Action Alternative

Under this alternative, the new transmission line would not be constructed, and there would be no project-related effects on the visual resources of the project area.

4.10.2. Action Alternative

The proposed line route would begin at the existing Widows Creek-Winchester Transmission Line on the southwest side of Doran Cove Road. Several residents to the northeast of the tap point have views of the existing laced-steel towers. New single steel poles would add to the number of discordantly contrasting elements seen in the landscape. However, these new poles would be visually similar to other structures seen in the landscape now and would likely lower the scenic value class by one level. Because the threshold of significance is two levels, the potential visual effect would not be significant.

The line route would follow level terrain to the base of Summerhouse Mountain. Along the base of the mountain, the new line route would be visible for brief periods from local roads to motorists when the road alignment creates views down the right-of-way. In most cases, intervening topography and vegetation would obscure views of the right-of-way and the transmission line. As the line turns west near Rocky Springs Road, heavy vegetation and distance would obscure details for area residents and motorists.

East of CR 74, the proposed line route would traverse mainly level terrain to Lee Highway (SR 277). For residents and motorists, the new poles and lines would be visually similar to the numerous steel and wood service poles seen along road right-of-way now. The proposed transmission line would continue east through industrial development to the existing Beaulieu #2 Substation. This area is industrial, and line would be seen only by employees and delivery personnel east of Lee Highway.

Operation, construction, and maintenance of the proposed transmission line would be visually insignificant. There could be some minor visual discord during the construction period due to an increase in personnel and equipment and the use of laydown and

materials storage areas. These minor visual obtrusions would be temporary until the proposed 100-foot-wide right-of-way and laydown areas have been restored through the use of TVA standard BMPs (Muncy 1999). No significant visual impacts are anticipated because of this project.

4.11. Recreation

4.11.1. No Action Alternative

Because there would be essentially no change from the current situation, implementation of the No Action Alternative is not expected to cause any effects to recreational resources or opportunities in the Bridgeport area.

4.11.2. Action Alternative

No developed facilities would be impacted by the project activity. The Bridgeport Community Park is over 0.25 mile from a proposed switch structure, and this structure would not be located within the existing right-of-way of the Reese Ferry Tap Line. Thus, no effects to this recreation facility are expected. Any indirect impacts to recreation activities and opportunities are anticipated to be temporary and insignificant if the Action Alternative is implemented. Cumulative effects of the proposed action would also be insignificant.

4.12. Socioeconomics

4.12.1. No Action Alternative

If the No Action Alternative were implemented, the local power supply would remain subject to reliability problems. In the event of outages, local industries would be subject to financial losses. Over time, the lack of a reliable power source could result in the loss of area jobs in those industries that depend heavily on reliable power if those industries were to relocate.

4.12.2. Action Alternative

Implementation of the Action Alternative would provide residential, commercial, and industrial power users with a more reliable power supply. Because voltage fluctuations or power interruptions can require restarting industrial equipment and interrupt production, loss of power can be costly to industries. Although power outages cannot be eliminated, implementation of the Action Alternative would reduce outages and lost industrial income. Thus, industrial users would realize the greatest economic benefit from adoption of the Action Alternative.

Over the long term, provision of a reliable electric power source could attract additional industries and more jobs to the Bridgeport area. Because numerous economic factors, as well as power supply, are involved, the direct economic effects of the Action Alternative cannot be determined accurately.

Adoption and implementation of the Action Alternative would not disproportionately affect any minority or economically disadvantaged populations.

4.13. Post-Construction Effects

For the planning of new transmission line rights-of-way, TVA's transmission line route selection team uses a constraint model that places a 300-foot-radius buffer around occupied buildings, except schools, for which a 1,200-foot buffer is used. The purposes of these buffers are to reduce potential land use conflicts with yard trees, outbuildings, and ancillary facilities; to reduce potential visual impacts; and to reduce exposure to the magnetic field produced by the transmission line. Application of these constraints typically requires trade offs and balancing, and TVA can and does deviate from the constraints. These constraints are not applied to the use of existing transmission line rights-of-way. Property owners are free to build houses and other structures up to the edge of TVA's rights-of-way within these constraint distances.

Electric and Magnetic Fields

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

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

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

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

Under certain weather conditions, high-voltage transmission lines, such as the proposed 161-kV line, may produce an audible low-volume hissing or crackling noise. This noise is generated by the corona resulting from the dissipation of energy and heat as high voltage is applied to a small area. Under normal conditions, corona-generated noise is not audible. The noise may be audible under some wet conditions, and the resulting noise level off the right-of-way would be well below the levels that can produce interference with speech. Corona is not associated with any adverse health effects in humans or livestock.

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

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

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

TVA substations and transmission lines are built with overhead ground wires that would lead a lightning strike into the ground for dissipation. Thus, a safety zone is created under the ground wires at the top of structures and along a line, for at least the width of the right-of-way. The National Electrical Safety Code is strictly followed when installing, repairing, or upgrading TVA lines, substations, or equipment.

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

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

TVA follows medical and health research related to EMFs, along with media coverage and reports, that may not have been peer reviewed by scientists or medical personnel. No controlled laboratory research has demonstrated a cause-and-effect relationship between low-frequency electric or magnetic fields and health effects or adverse health effects even

when using field strengths many times higher than those generated by power transmission lines. Statistical studies of overall populations and increased use of low-frequency electric power have found no associations (WHO 2007b).

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

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

Although no federal standards exist for maximum EMF strengths for transmission lines, two states (New York and Florida) do have such regulations. Florida's regulation is the more restrictive of the two with field levels being limited to 150 milligauss (mG) at the edge of the right-of-way for lines of 230-kV and less. The expected magnetic field strengths at the edge of the proposed right-of-way would fall well within these standards.

In light of all of the above, the construction and operation of the proposed transmission line are not anticipated to cause any significant EMF-related impacts.

Lightning Strike Hazard

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

Transmission Structure Stability

The pole structures (see Figure 3) that would be used on the proposed 161-kV transmission line have demonstrated a good safety record. They are not prone to rot or crack, like wooden poles, nor are they subject to substantial storm damage due to their low cross-section in the wind.

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

Noise and Odor
During construction of the proposed transmission line, equipment would generate noise above ambient levels. Because of the short construction period, noise-related effects are expected to be temporary and insignificant. In the more densely populated areas along the right-of-way, construction techniques would be used to limit noise as much as possible. For similar reasons, noise related to periodic line maintenance is also expected to be insignificant. In residential areas, the need for periodic right-of-way vegetation maintenance, i.e., mowing, would be limited or nonexistent. Construction and operation of the line is not expected to produce any noticeable odors.

Other Impacts
No significant impacts are expected to result from the relatively short-term activities of construction, such as noise, air quality, and solid waste. Appendices B and C contain procedures for dealing with these issues.

4.13.1. No Action Alternative

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

4.13.2. Action Alternative

EMFs would be produced along the length of the proposed transmission line. The strength of the fields within and near the right-of-way would vary with the electric load on the line as well as with the terrain. Public exposure to EMFs would be determined by final routing decisions and would change over time after the line is completed as adjacent land uses change. As described above, TVA would minimize public exposure to EMFs through engineering features and line routing decisions. No significant impacts from EMFs are anticipated.

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

The structures that would be used on the proposed transmission line have demonstrated a good safety record. All TVA transmission structures are examined visually at least once a year. Thus, the proposed structures do not pose any significant physical danger. For this reason, TVA does not typically construct barricades or fences around structures.

During construction of the proposed transmission line, equipment would generate some noise above ambient levels. Because of the general lack of nearby sensitive receptors and the short construction period, noise-related effects are expected to be temporary and insignificant. For similar reasons, noise related to periodic line maintenance is also expected to be insignificant. Construction and operation of the line is not expected to produce any noticeable odors.

4.14. Summary of TVA Commitments and Proposed Mitigation Measures

The following routine measures would be applied during construction and operation of the proposed transmission line.

- Best management practices as described by Muncy (1999) would be applied during construction and operation of the proposed transmission line.
- Environmental quality protection specifications as described in Appendices B, C, D, and E would be implemented during construction and operation of the proposed transmission line.

CHAPTER 5

5.0 LIST OF PREPARERS

5.1. NEPA Project Management

Todd C. Liskey

Position:	Senior Environmental Engineer – Siting and Environmental Design, TVA Power System Operations, Chattanooga, Tennessee
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5.2. Other Contributors

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Experience:	6 years in Environmental Education; 10 years in Resource Stewardship
Involvement:	Document Layout and Publishing Coordinator

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Position:	Recreation Representative, TVA Environmental Stewardship and Policy, Chattanooga, Tennessee
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Experience:	5 years Recreation Research and Administration
Involvement:	Recreation Resources

Roger A. Milstead

Position:	Manager, TVA Flood Risk and Data Management, Knoxville, Tennessee
Education:	B.S., Civil Engineering; Registered Professional Engineer
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Involvement:	Floodplains

Jason M. Mitchell

Position:	Natural Areas Biologist, TVA Environmental Stewardship and Policy, Knoxville, Tennessee
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Involvement:	Natural Areas

David T. Nestor

Position:	Contract Biologist/Botany, TVA Environmental Stewardship and Policy, Knoxville, Tennessee
Education:	M.S., Botany; B.S., Aquaculture, Fisheries, Wildlife Biology
Experience:	3 years in Threatened and Endangered Plant Species and Rare Habitats Surveying
Involvement:	Terrestrial Ecology (Terrestrial Plants); Threatened and Endangered Species (Terrestrial Plants)

W. Chett Peebles

Position:	Specialist, Landscape Architect, TVA Environmental Stewardship and Policy, Knoxville, Tennessee
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Involvement:	Visual Resources

Kim Pilarski-Brand

Position:	Wetlands Biologist Specialist, TVA Environmental Stewardship and Policy, Knoxville, Tennessee
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Experience:	12 years in Watershed Assessment and Wetland Regulation and Assessment
Involvement:	Wetlands

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Position:	Archaeologist Technician, TVA Environmental Stewardship and Policy, Knoxville, Tennessee
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Experience:	6 years in Middle Eastern Archaeology; 5 years in Southeastern United States Archaeology
Involvement:	Cultural Resources

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Involvement:	Managed Areas and Sensitive Ecological Sites

CHAPTER 6

6.0 LITERATURE CITED

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