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ENVIRONMENTAL ASSESSMENT

SOUTH PITTSBURG 161-KV DELIVERY POINT

Marion County, Tennessee

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August 2014

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Acronyms, Abbreviations, and Glossary of Terms Used

Acre	A unit measure of land area equal to 43,560 square feet
Access road	A dirt, gravel, or paved road, either temporary or permanent, used to access the right-of-way and transmission line structures for construction, maintenance or decommissioning activities
APE	Area of potential effect
BMPs	Best management practices or accepted construction practices designed to reduce environmental effects
conductors	Cables that carry electrical current
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
easement	A legal agreement that gives TVA the right to use property for a purpose such as a right-of-way for constructing and operating a transmission line
endangered species	A species in danger of extinction throughout all or a significant part of its range
EO	Executive Order
ESA	Endangered Species Act
GIS	Geographic Information System
groundwater	Water located beneath the ground surface in the soil pore spaces or in the pores and crevices of rock formations
guy	A cable connecting a structure to an anchor that helps support the structure
hydric soil	A soil that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop conditions of having no free oxygen available in the upper part.
hydrophytic vegetation	Aquatic and wetland plants that have developed physiological adaptations allowing a greater tolerance to saturated soil conditions including with limited or absence of oxygen.
kV	Symbol for kilovolt (1 kV equals 1,000 volts)
load	That portion of the entire electric power in a network consumed within a given area; also synonymous with “demand” in a given area
MOA	Memorandum of Agreement
NEPA	National Environmental Policy Act
NERC	North American Electric Reliability Corporation
NRHP	National Register of Historic Places
NRI	Nationwide Rivers Inventory
outage	An interruption of the electric power supply to a user
riparian	Related to or located on the banks of a river or stream
ROW	Right-of-way, a corridor containing a transmission line
runoff	That portion of total precipitation that eventually enters a stream or river
SHPO	State Historic Preservation Officer

SMZ	Streamside management zone
SR	State Highway
structure	A pole or tower that supports a transmission line
substation	A facility connected to a transmission line used to reduce voltage so that electric power may be delivered to a local power distributor or user
surface water	Water collecting on the ground or in a stream, river, lake, or wetland; it is naturally lost through evaporation and seepage into the groundwater
SVEC	Sequatchie Valley Electric Cooperative
switch	A device used to complete or break an electrical connection
TDOT	Tennessee Department of Transportation
threatened species	A species likely to become endangered within the foreseeable future
TRM	Tennessee River Mile
TVA	Tennessee Valley Authority
TVARAM	TVA Rapid Assessment Method, a version of the Ohio Rapid Assessment Method for categorizing wetlands, designed specifically for the TVA region
TWRA	Tennessee Wildlife Resources Agency
U.S.	United States
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
wetland	A marsh, swamp, or other area of land where the soil near the surface is saturated or covered with water, especially one that forms a habitat for wildlife
WHO	World Health Organization

CHAPTER 1 – PURPOSE AND NEED FOR ACTION

1.1 Proposed Action – Improve Power Supply

Sequatchie Valley Electric Cooperative (SVEC), a distributor of Tennessee Valley Authority (TVA) power, plans to construct a new 161-kilovolt (kV) substation in Marion County, Tennessee. The substation would be located in South Pittsburg on a vacant property on 10th Street, near the existing 69-kV substations. TVA proposes to supply electric power to SVEC's new substation by constructing and operating approximately 4 miles of new 161-kV transmission line that would connect the planned substation to TVA's existing Nickajack-Jasper-Raccoon Mountain (tap to Tennol section) 161-kV Transmission Line (Figure 1-1). The proposed transmission line would be completed by June 2015 or as soon as possible after that date.

The proposed transmission line would be built on a 100-foot-wide right-of-way (ROW) and would occupy approximately 50 acres. Construction would utilize single steel poles except for two river crossing towers, which would be less than 200 feet tall.

This proposal also includes the installation of two switch structures – one in the Nickajack-Jasper-Raccoon Mountain (tap to Tennol section) 161-kV Transmission Line, and one within the proposed new ROW. A short, permanent road may be constructed to facilitate access to these switches. TVA would also provide metering equipment to SVEC for installation at their new South Pittsburg 161-kV Substation. The TVA map board displays would be updated to reflect the new facilities. Additionally, TVA would retire their metering at SVEC's Sixth Street and South Pittsburg 69-kV Substations.

1.2 Need for the Proposed Action

SVEC currently serves the South Pittsburg, Tennessee area through a series of 69-kV substations. These substations are fed power from TVA's existing Jasper 161-kV Substation via SVEC's Jasper-South Pittsburg 69-kV Transmission Line. Lodge Manufacturing, a local industry in the South Pittsburg area, is planning a major expansion which will increase SVEC's industrial load in the area. This addition would result in overloading SVEC's substations and transmission lines. As a result, SVEC has requested a new delivery point.

The delivery point request would ensure the South Pittsburg area has a continuous, reliable source of electric power for continued economic health and residential and commercial growth in the area. This request would require TVA construct a new transmission line to SVEC's new substation.

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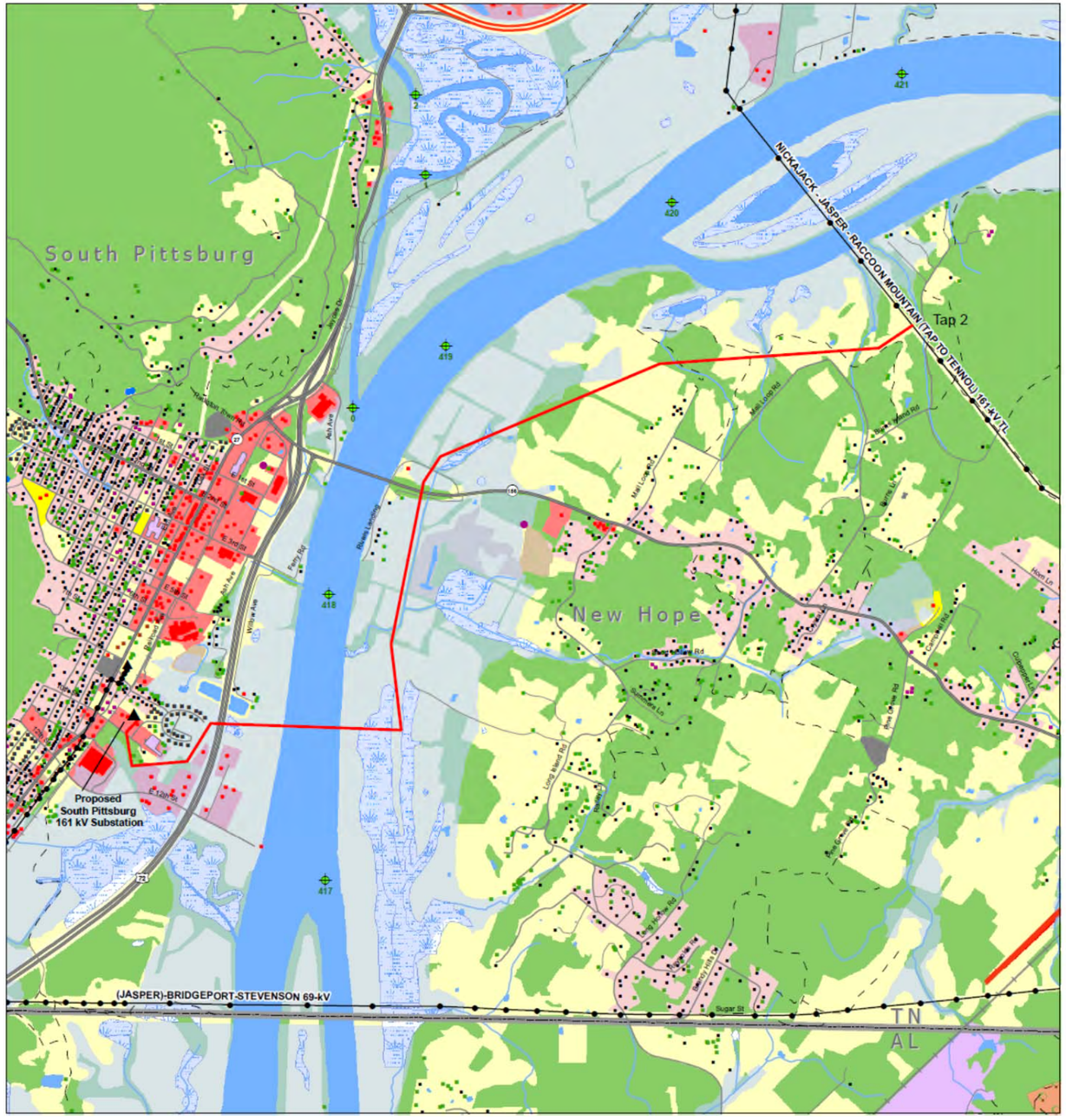

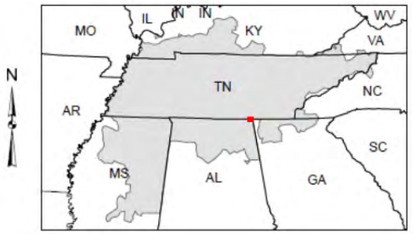

Location Map

Marion County, TN

Legend

- substation
- preferred route
- house
- mobile home
- apartment
- commercial, industrial
- barn
- church auxiliary building
- school auxiliary building
- radio tower
- water tank
- spring
- river mile
- existing transmission lines
- streams
- transportation system
- railroad system
- openwater
- floodplain
- house, apartment structures
- population density areas
- commercial, industrial structures
- school
- church
- residential
- barren or disturbed land
- community park
- cemetery
- forestland
- openland
- wetland

Figure 1-1. Map of the South Pittsburg 161-kV Transmission Project

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1.3 Decisions to be Made

The primary decision before TVA is whether to provide additional electric service to the South Pittsburg area by constructing a new 161-kV transmission line between SVEC's proposed South Pittsburg 161-kV Substation and TVA's existing Nickajack-Jasper-Raccoon Mountain (tap to Tennol section) 161-kV Transmission Line. If the proposed transmission line is to be built, other secondary decisions are involved. These include the considerations listed below. A detailed description of the alternatives is provided in Section 2.1.

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

1.4 Related Environmental Reviews and Consultation Requirements

In 2011, TVA completed the Integrated Resource Plan: TVA's Environmental & Energy Future (TVA 2011a) to determine how TVA will meet the electric power demands of its customers over the next 20 years while fulfilling TVA's mission of providing low-cost, reliable power, environmental stewardship, and economic development. TVA released the accompanying Environmental Impact Statement for TVA's Integrated Resource Plan: TVA's Environmental & Energy Future in March 2011 (TVA 2011b).

1.5 Scoping Process and Public Involvement

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

- Absentee Shawnee Tribe of Oklahoma
- Alabama-Coushatta Tribe of Texas
- Alabama-Quassarte Tribal Town
- Cherokee Nation
- Chickasaw Nation
- Eastern Band of Cherokee Indians
- Eastern Shawnee Tribe of Oklahoma
- Kialegee Tribal Town
- Muscogee (Creek) Nation
- Shawnee Tribe
- Tennessee Division of Archaeology
- Tennessee Historical Commission
- Thlopthlocco Tribal Town
- United Keetoowah Band of Cherokee Indians in Oklahoma
- U.S. Fish and Wildlife Service (USFWS)

This proposal was reviewed to ensure conformity with Executive Order (EO) 11988 (Floodplain Management), EO 11990 (Protection of Wetlands), the Farmland Protection Policy Act, the National Historic Preservation Act (NHPA), the Endangered Species Act (ESA), Section 404 of the Clean Water Act, and EO 12372 (Intergovernmental Review).

Correspondence received from other agencies related to this review and coordination is contained in Appendix A.

TVA developed a public communication plan that included a web site with information about the project, a map of the alternative routes, and feedback mechanisms. Public officials were briefed on the project. The 190 property owners who could potentially be affected by any of the route alternatives or had property near the route alternatives, along with nine public officials, were invited to a project open house. TVA used local news outlets and notices placed in the local newspapers to notify other interested members of the public of the open house. TVA held the open house on April 25, 2013, in the fellowship hall of the First Baptist Church on 306 5th Street in South Pittsburg, Tennessee, which was attended by 73 people.

At the open house, TVA presented a network of 12 alternative transmission line routes comprised of 15 different line segments to the public for comment (see Figure 1-2).

The alternative transmission line segments are described in Section 2.3.5.1. The primary concern expressed by the public was the impact of the proposed transmission line to residential development and farmland in the area. Owners also voiced concerns relative to health issues, property value, and impacts of the proposed line on visual quality and natural, historical, and cultural resources.

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

At the conclusion of the comment period, TVA made minor adjustments to some of the proposed transmission line route segments in response to the comments received. TVA then announced a preferred route to the public in July 2013. Letters were sent to affected property owners and information was provided to the public through TVA's Web site.

As a result of information obtained following this announcement from both public and agency comments as well as field surveys, TVA made adjustments to the preferred transmission line route (Figure 1-1). These adjustments are described in Section 2.4.3 and are listed in Table 2-3.

1.6 Issues to be Addressed

TVA identified resources that could potentially be affected by the construction, operation and maintenance of the proposed transmission line through an early internal scoping process (see Section 2.3). This list of resource issues was refined based on comments received during the public review process. Potential impacts to the following environmental resources are addressed in this environmental assessment.

- Water quality for both groundwater and surface water
- Aquatic ecology
- Vegetation
- Wildlife
- Endangered and threatened species and their critical habitats

- Floodplains
- Wetlands
- Aesthetic resources (including visual, noise, and odors)
- Archaeological and historic resources
- Recreation, parks, and natural areas
- Land use and prime farmland
- Socioeconomics and environmental justice

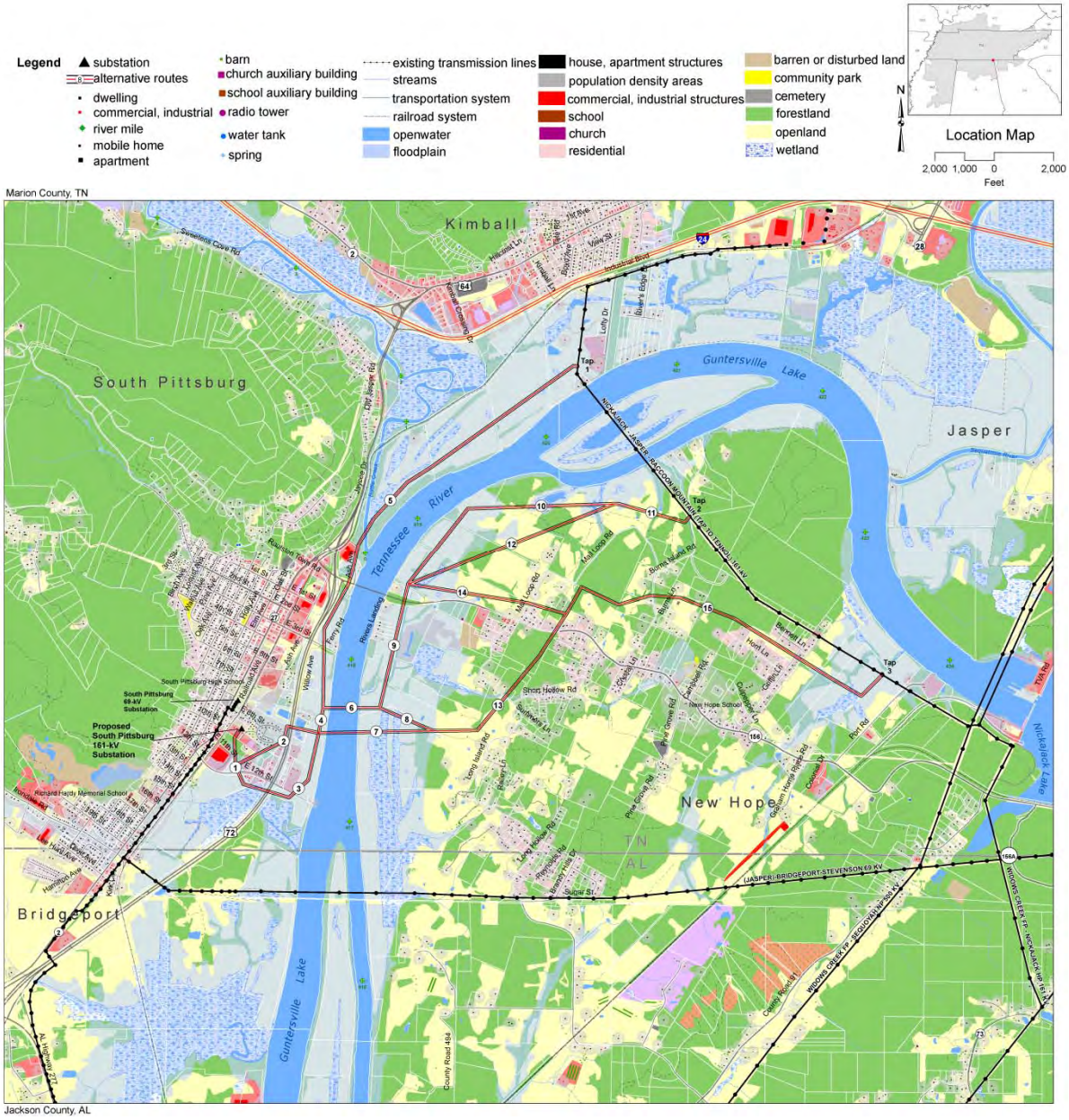

Figure 1-2. Alternate Route Segments for the Proposed South Pittsburg 161-kV Transmission Line Route

Potential effects related to air quality, hazardous and nonhazardous wastes, and health and safety were considered. However, because of the nature of the action, any potential effects to these resources would be minor and insignificant. Thus, potential effects to these resources are not analyzed in detail.

1.7 Necessary Permits or Licenses

A permit would be required from the state of Tennessee and Marion County for the discharge of construction site storm water associated with the construction of the transmission line project. TVA would prepare the required erosion and sedimentation control plans and coordinate them with the appropriate state and local authorities. A permit may also be required for burning trees and other combustible materials removed during construction of the proposed transmission line. A Section 401 Water Quality Certification or an Aquatic Resource Alteration Permit would be obtained as required for physical alterations to waters of the State. Proposed activities in wetlands would fall within the parameters of USACE Nationwide Permit 12 for Utility Line Activities. A permit would be obtained from the Tennessee Department of Transportation (TDOT) for crossing state highways during transmission line construction.

CHAPTER 2 - ALTERNATIVES

As described in Chapter 1, TVA proposes to connect SVEC's planned South Pittsburg 161-kV Substation to TVA's existing Nickajack-Jasper-Raccoon Mountain (tap to Tennol section) 161-kV Transmission Line. This connection would be accomplished by constructing, operating, and maintaining approximately 4 miles of new 161-kV transmission line. Additionally, TVA would install a switch structure in the Nickajack-Jasper-Raccoon Mountain (tap to Tennol) 161-kV Transmission Line and another switch structure in the proposed transmission line. TVA also proposes to provide SVEC with metering equipment for SVEC's new South Pittsburg Substation. TVA would retire its metering equipment at SVEC's Sixth Street and South Pittsburg 69-kV Substations, and update the TVA map board displays to reflect the current transmission assets.

This chapter contains the following six major sections that provide the following information. This chapter also provides additional background information about transmission line construction, operation, and maintenance.

- A description of alternatives
- A description of the construction, operation, and maintenance of the proposed transmission line
- A description of the transmission line siting process
- A comparison of the alternative transmission line routes
- A comparison of anticipated environmental impacts of the proposed alternatives
- Identification of the Preferred Alternative.

2.1 Description of Alternatives

Two alternatives (i.e., the No Action Alternative and the Action Alternative) are addressed in this environmental assessment. Under the No Action Alternative, TVA would not undertake the proposed action. The Action Alternative involves the construction, operation, and maintenance of the proposed transmission line as well as the retirement of certain TVA transmission facilities.

2.1.1 The No Action Alternative – Do Not Provide the Delivery Point

Under the No Action Alternative, TVA would not construct the proposed transmission line to serve SVEC's planned South Pittsburg 161-kV Substation. The TVA power system in the local area would continue under the current operating conditions. As a result, due to the growing industrial load in the area, the TVA power system would be at increasing risk for loss of service.

However, if TVA elected not to provide a delivery point to SVEC via their Nickajack-Jasper-Raccoon Mountain (tap to Tennol section) 161-kV Transmission Line, the local power company, i.e., SVEC, would likely construct a new transmission line to serve its new substation. In addition, SVEC would upgrade approximately 5 miles of its existing 69-kV transmission lines in the area.

If SVEC were to independently construct a new transmission line to a TVA connection point, the potential environmental effects of implementing the No Action Alternative likely would be comparable to those resulting from the adoption of the Action Alternative, depending on various factors, such as the route chosen and the construction methods used by SVEC.

Without a new substation in the area and a new transmission line to supply power to it, these increasing power loads would cause overloaded transformers and other electrical equipment to be damaged or to fail completely. The amount of damage depends on how heavily the equipment is overloaded. If a transformer and/or transmission line fails, the result is a power outage. Overloading of a transmission line can cause alternating heating and cooling of the conductor material, which weakens the transmission line over time. Overloading can also cause a transmission line to sag in excess of design criteria, resulting in inadequate clearance between the transmission line and the ground.

2.1.2 The Action Alternative – Construct, Operate, and Maintain a New 161-kV Transmission Line

Under the Action Alternative, TVA would serve SVEC's planned South Pittsburg 161-kV Substation in Marion County by building a 4-mile long 161-kV transmission line. The route of the proposed line is shown as Figure 1-1. The proposed transmission line would connect the planned substation to TVA's existing Nickajack-Jasper-Raccoon Mountain (tap to Tennol section) 161-kV Transmission Line. TVA would install two switch structures – one within the ROW of TVA's source line (i.e., the Nickajack-Jasper-Raccoon Mountain (tap to Tennol section) 161-kV Transmission Line) and one within the new tap line ROW. Additionally, under the Action Alternative TVA would undertake measures to facilitate the operation of the new transmission line. These include providing metering equipment to SVEC for installation at the new South Pittsburg 161-kV Substation, and modifying the TVA system's map boards to include the names and numbers of the new transmission line and the SVEC substation.

The proposed transmission line would be built on a 100-foot-wide ROW and would occupy approximately 50 acres. Temporary access roads would be required for construction and maintenance of the proposed transmission line. TVA would also construct new permanent access roads to the switch locations.

Additional information detailing the implementation of the Action Alternative, as well as how the preferred transmission line route was determined is provided in the following sections.

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

2.1.3 Alternative Considered but Eliminated From Further Discussion

During the development of this proposal, other alternatives were considered. However, upon further study, TVA determined that these other alternatives would not meet project needs. One alternative, which was considered but not selected for further consideration, is described briefly below.

2.1.3.1 Underground Utility Lines

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

Power lines can be buried. However, most buried lines tend to be low-voltage distribution lines (lines that are 13-kV or less) rather than high-voltage transmission lines, which tend to be 69-kV and above. Although low-voltage distribution lines can be laid into trenches and buried without the need for special conduits, some lines require armor casings for safety reasons. Burying higher voltage lines in the 69-kV, 161-kV, and 500-kV range requires extensive excavation as these lines must be encased in special conduits or tunnels. Additionally, measures to ensure proper cooling and to provide adequate access are required. Usually, a road along or within the ROW for buried lines must be maintained for routine inspection and maintenance.

Although buried lines are much less susceptible to catastrophic storm damage, especially wind damage, they tend to be very expensive to install and maintain. Depending on the type of cable system used, special equipment or ventilation systems may be required to provide adequate cooling for the underground conductors. Similarly, they must be protected from flooding, which could cause an outage. Repairs of buried lines often require excavation, and the precise location of problem areas can be difficult to determine.

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

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

2.2.1 Transmission Line Construction

2.2.1.1 Right-of-Way Acquisition and Clearing

A ROW utilizes an easement that would be designated for a transmission line and associated assets. The easement requires maintenance to avoid the risk of fires and other accidents. The ROW provides a safety margin between the high-voltage conductors and surrounding structures and vegetation. The proposed transmission line would be built utilizing a new 100-foot-wide ROW.

TVA would purchase easements from landowners for the new ROW. These easements would give TVA the right to construct, operate, and maintain the transmission line, as well as remove “danger trees” adjacent to the ROW. Danger trees include any trees that are located beyond the ROW, but that are tall enough to potentially impact a transmission line structure or conductor should the trees fall toward the transmission line. The fee simple ownership of the land within the ROW would remain with the landowner, and many activities and land uses could continue to occur on the property. However, the terms of the easement agreement prohibit certain activities, such as construction of buildings and any other activities within the ROW that could interfere with the transmission line or create a hazardous situation.

Because of the need to maintain adequate clearance between tall vegetation and transmission line conductors, as well as to provide access for construction equipment, all trees and most shrubs would be removed from the entire width of the ROW. Equipment used during this ROW clearing would include chain saws, skidders, bulldozers, tractors, and/or low ground-pressure feller-bunchers[1]. Marketable timber would be salvaged where feasible. Otherwise, woody debris and other vegetation would be piled and burned, chipped, or taken off site. In some instances, vegetation may be windrowed along the edge of the ROW to serve as sediment barriers. Vegetation removal in streamside management zones (SMZs) and wetlands would be restricted to trees tall enough, or with the potential to soon grow tall enough, to interfere with conductors. Clearing in SMZs would be accomplished using handheld equipment or remote-handling equipment, such as a feller-buncher, in order to limit ground disturbance.

TVA ROW Clearing Specifications, Environmental Quality Protection Specifications for Transmission Line Construction, Transmission Construction Guidelines Near Streams (Appendices B, C, and D), and Best Management Practices for Tennessee Valley Authority Transmission Construction and Maintenance Activities (Muncy 2012) would provide guidance for clearing and construction activities. The emission of criteria pollutants or their precursors would not exceed de minimis levels specified in 40 CFR § 93.153(b). Thus, consistent with Section 176(c) of the Clean Air Act, project activities would be in conformity with the requirements under the State Implementation Plan for attaining air quality standards.

Following clearing and construction, vegetative cover on the ROW would be restored to its condition prior to construction, to the extent practicable, utilizing appropriate seed mixtures as described in Muncy (2012). Erosion controls would remain in place until the plant communities become fully established. Streamside areas would be revegetated as described in Appendices B, C, and D, and in Muncy (2012). Failure to maintain adequate clearance can result in dangerous situations, including ground faults. Native vegetation or plants with favorable growth patterns (e.g., slow growth and mature heights less than 15 feet) would be maintained within the ROW following construction.

2.2.1.2 Access Roads

Access roads would be needed to allow vehicular access to each structure and other points along the ROW. Typically, new permanent or temporary access roads used for transmission lines are located on the ROW wherever possible and are designed to avoid severe slope conditions and to minimize stream crossings. Access roads are typically about 20 feet wide and are surfaced with dirt, mulch, or gravel. TVA would construct a permanent access road in the ROW of the Nickajack-Jasper-Raccoon Mountain (tap to Tennol section) 161-kV Transmission Line (i.e., the source line) as well as the proposed ROW in order to access the switches.

Culverts and other drainage devices, fences, and gates would be installed as necessary. Culverts installed in any permanent streams would be removed following construction. However, in wet-weather conveyances (streams that run only following a rainfall), culverts would be left or removed, depending on the wishes of the landowner or any permit

[1] A feller-buncher is a piece of heavy equipment that grasps a tree while cutting it, which can then lift the tree and place it in a suitable location for disposal. This equipment is used to prevent trees from falling into sensitive areas, such as a wetland.

conditions that might apply. If desired by the property owner, TVA would restore new temporary access roads to previous conditions. Additional applicable ROW clearing and environmental quality protection specifications are listed in Appendices C and E.

2.2.1.3 Construction Assembly Areas

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

2.2.1.4 Structures and Conductors

The proposed transmission line would utilize mostly single steel-poles similar to those shown in Figure 2-1. Structure heights for the steel-pole structures would vary according to the terrain but would average about 95 feet tall (about 83 feet above ground).

Figure 2-1. Example of Single Steel-pole 161-kV Transmission Structure

Two self-supporting, galvanized, lattice-steel tower structures would be required for the river crossing. The electrical conductors would consist of three sets of three, 954,000 circular mil aluminum-steel-reinforced cables suspended from 6-foot long insulators. Two single ground wires would be placed on the two highest points of the structures to provide lightning protection. These ground wires may carry fiber optic or other communication circuits. These two towers would be approximately 193 feet tall (i.e., a 10-foot above-grade foundation and 183-foot tall structure on top of the foundation. The tower foundations would be buried concrete slabs with columns extending approximately 10 feet out of the ground. Figure 2-2 shows a sketch of a river crossing tower. Aircraft warning spheres would be placed on the highest wires (ground wires).

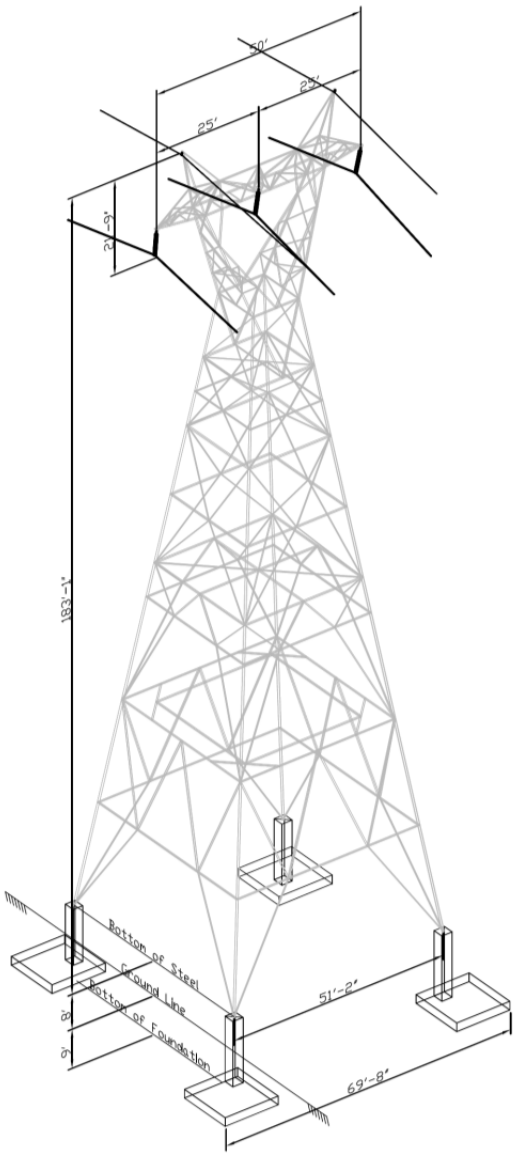

Figure 2-2. Example of a 161-kV River Crossing Transmission Structure

Construction activities to complete the river crossing, i.e., string the conductors across the river, are expected to last two or three days.

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

Poles at angles (angle points) in the transmission line may require supporting screw, rock, or log-anchored guys. Some angle structures may be self-supporting poles or steel towers, which would require concrete foundations. Most poles would be directly imbedded in holes augured into the ground to a depth equal to 10 percent of the pole's length plus an additional 2 feet. Normally, the holes would be backfilled with the excavated material, but, in some cases, gravel or a concrete-and-gravel mixture would be used, depending on local soil conditions.

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

2.2.1.5 Conductor and Ground Wire Installation

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

2.2.2 Operation and Maintenance

2.2.2.1 Inspection

Periodic inspections of 161-kV transmission lines are performed by helicopter aerial surveillance after operation begins. Foot patrols or climbing inspections are performed in order to locate damaged conductors, insulators, or structures, and to discover any abnormal conditions that might hamper the normal operation of the line or adversely affect the surrounding area. During these inspections, the condition of vegetation within the ROW, as well as that immediately adjoining the ROW, is noted. These observations are then used to plan corrective maintenance and routine vegetation management.

2.2.2.2 Vegetation Management

Management of vegetation along the ROW is necessary to ensure access to structures and to maintain an adequate distance between transmission line conductors and vegetation. National Electric Safety Code requirements require a minimum vegetation clearance of 24 feet for a 161-kV transmission line. Vegetation management along the ROW would consist of two different activities: felling of danger trees adjacent to the ROW (as described in Section 2.2.1.1), and vegetation control within the ROW. These activities occur on approximately 3- to 5-year cycles.

Management of vegetation within the ROW would include an integrated vegetation management approach designed to encourage the low-growing (i.e., less than 15 feet tall) plant species and discourage tall-growing plant species. A vegetation re-clearing plan would be developed for each transmission line connection, based on the results of the

periodic inspections described above. The two principal management techniques are mechanical mowing (using tractor-mounted rotary mowers) and herbicide application. Herbicides are normally applied in areas where heavy growth of woody vegetation is occurring on the ROW and mechanical mowing is not practical. Herbicides would be selectively applied from the ground with backpack sprayers or vehicle-mounted sprayers. In rare cases, helicopters could be used.

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

2.2.2.3 Structure Replacement

Other than vegetation management, only minor maintenance work is generally required. The transmission line structures and other components typically last several decades. In the event that a structure needs to be replaced, the structure would normally be lifted out of the ground by crane-like equipment, and the replacement structure would be inserted into the same hole or an adjacent hole. Access to the structures would be via existing roads. Replacement of structures may require leveling the area surrounding the replaced structures, but additional area disturbance would be minor compared to the initial installation of the structure.

2.3 Siting Process

The process of siting the proposed transmission line followed the basic steps used by TVA to determine a transmission line route. These include the following steps.

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

2.3.1 Definition of the Study Area

The first task in defining the study area was to identify the power sources that could supply SVEC's planned substation. TVA's Nickajack-Jasper-Raccoon Mountain (tap to Tennol section) 161-kV Transmission Line is the most practical source due to its proximity to the new SVEC substation. The other possible sources in the area were further away from the new SVEC substation site. The Nickajack-Jasper-Raccoon Mountain (tap to Tennol section) 161-kV Transmission Line would also serve as the most reliable power source because it has fewer delivery points than the other transmission lines to the new substation.

The study area boundaries were chosen to allow for the establishment of corridors between the selected power source and SVEC's planned South Pittsburg 161-kV Substation. These corridors would eventually yield a preferred transmission line route on which to construct the transmission line. The study area is shown in Figure 1-2.

The study area contains approximately 43 square miles. The study area is defined to the west by the outcroppings of Lodge Point and Whitacre Point on Orme Mountain, a part of the Cumberland Plateau. Orme Mountain rises just to the west of South Pittsburg, making it a natural border for the study area. The western border runs from southwest to northeast to mirror the rising slopes of Orme Mountain.

The northern border of the study area lies just north of Tennol connection of the Nickajack-Jasper-Raccoon Mountain (tap to Tennol section) 161-kV Transmission Line.

The eastern border is defined by the natural topography and features of the area. The eastern border includes Nickajack Dam since several potentially strong sources originate out of the 161-kV switchyard at the dam. As with the western border, the eastern border also runs from northeast to southwest since a straight line would significantly increase the acreage of the study area with no tangible benefits.

The southern border of the study area is angled from the west to east in an eastern, slightly northeastern fashion. This border was devised to take advantage of Hogjaw Ridge. Although routing transmission lines across this ridge was not desirable, the area was included because multiple existing transmission lines (i.e., potential power sources) are in the area.

The corners of the study area are defined by the intersections of the borders described above.

2.3.2 Characterization of the Study Area

2.3.2.1 Natural and Cultural Features

The entire project lies in Marion County, Tennessee. As described in the previous section, the study area is confined on the west by Orme Mountain. This mountain climbs sharply just west of the downtown South Pittsburg area. The Tennessee River/Guntersville Lake runs in a northeast to southwest direction through the middle of the study area. Nickajack Dam is located in the eastern portion of the study area.

As described in the previous section, Hogjaw Ridge runs along the southeastern portion of the study area.

The overall study area contains many wet weather conveyances and perennial waterways. Battle Creek, which is located in the northeast portion of the study area, is the largest waterway besides the Tennessee River.

The Tennessee River not only drains the study area, but also divides it. Kimball is located north of the Tennessee River, and South Pittsburg is located to the west. New Hope lies east of the Tennessee River, in the middle and eastern portion of the study area.

Because the entire area is drained by the Tennessee River, the land consists of mostly bottomland and wetlands nearer the river, with small ridges and hills forming as the distance from the river increases.

2.3.2.2 Land Use

Land in the study area is a mixture of industrial, commercial, and agricultural. Kimball is a retail-related, interstate highway interchange support area with restaurants and retail stores. South Pittsburg is an industrial town, with multiple manufacturers located in the area. Lodge Manufacturing is the largest single manufacturer in South Pittsburg. New Hope is mostly agricultural property, with some small retail locations.

2.3.2.3 Transportation

Interstate 24 and U.S. Highway 72 intersect in the area between Kimball and South Pittsburg. Interstate 24 runs east to west across the northern portion of the study area. U.S. Highway 72 runs north to south, west of the Tennessee River. Tennessee State Highway (SR) 156 crosses over the Tennessee River and also crosses the study area from east to west. SR 156 connects South Pittsburg and New Hope. Numerous other secondary roads are in the area. In addition, there is barge traffic along the Tennessee River.

2.3.3 Data Collection

TVA first collected geographic data, such as topography, land use, transportation, environmental features, and cultural resources for the study area. Information sources used in the transmission line study included design drawings for area transmission lines, data collected into a geographic information system (GIS), including United States Geological Survey digital line graphs, and Marion County tax maps. Various data maintained by TVA were also used.

Additionally, during November 2012, TVA took new aerial color orthophotography of the study area. These images were geo-referenced to produce an accurate image of the Earth by removing the distortions caused by camera tilt and topographic relief displacements, and then digitized for use in the GIS. This aerial photography was then interpreted to obtain land use and land cover data, such as forests, agriculture, wetlands, houses, barns, commercial and industrial buildings, churches, and cemeteries.

Data were then analyzed both manually and with GIS. The use of GIS allows substantial flexibility in examining various types of spatially superimposed information. This system allowed the multitude of study area factors to be examined simultaneously for developing and evaluating numerous options and scenarios to select the site or sites that would best meet project needs, which included avoiding or reducing potential environmental impacts.

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

2.3.4 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 include engineering, social, and environmental. Each of the criteria has several factors that are evaluated in the process. Factors include existing land use, ownership patterns, streams, cultural resources, and cost. Application of these constraints is flexible, and TVA can, and does, deviate from them. Identifying feasible transmission line routes involves weighing and balancing these factors and making adjustments to them as specific conditions dictate.

Each of the transmission line route options was evaluated according to criteria related to engineering, social, and environmental criteria. Factors related to the specific criteria are described below. For each factor identified as occurring along a proposed route option, specific considerations related to these factors were identified and scored. In the evaluation, a higher score means a bigger constraint or obstacle for locating a transmission line. For example, a greater number of streams crossed, a longer transmission line route length, or a greater number of historic resources affected would produce a higher (and thus worse) score.

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

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

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

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

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

2.3.5 Development of General Route Segments and Potential Transmission Line Routes

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

The straight-line distance from the TVA source (Nickajack-Jasper-Raccoon Mountain (tap to Tennol section) 161-kV Transmission Line) to the planned SVEC substation site is about 3.5 miles. That distance, along with the location of Interstate 24, the presence of several

existing transmission line ROWs in the area, and the amount of residential and commercial development, limited the number of practicable alternative corridors that could be identified for the project. Using information gathered during the system's studies and data development phases, several potential tap point locations were identified that could be utilized on the existing Nickajack-Jasper-Raccoon Mountain (tap to Tennol section) 161-kV Transmission Line. Switch locations and feasible access roads were required to be located near the tap point. These locations must meet line engineering requirements and must be accessible by road in all weather conditions, including high water. Three potential tap point locations were identified that would meet these requirements.

Fifteen route segments, as shown in Figure 1-2, were developed using the identified tap point locations, SVEC's planned substation location, and the GIS-based land use/land cover model, aerial photography and other data layers, such as property boundaries, digital elevation model results (which were used to identify steepness and terrain characteristics). Known transportation corridors were then evaluated and incorporated to identify opportunities for development of the various segments.

All of the alternative tap point locations are located along the existing Nickajack-Jasper-Raccoon Mountain (tap to Tennol section) 161-kV Transmission Line. Tap Point 1 is located north of the Tennessee River near Lofty Drive, approximately 250 feet north of Structure 26. Tap Point 2 is south of the Tennessee River, near Burns Island Road, approximately 475 feet northwest of existing Structure 20. Tap Point 3 is located at existing Structure 10, which would be replaced with the tap structure(s), about 875 feet west of Port Road.

2.3.5.1 Development of Potential Route Segments

Segment 1 connects the proposed SVEC substation site to segments 2 and 3. The segment is approximately 1,200 feet long, located on the old National Guard Armory property and heads southwest from the planned substation site to 10th Street. This segment then crosses 10th street and terminates into Segments 2 and 3. The terrain is fairly flat with little elevation change. Segment 1 is visible from an assisted living facility and is also to the east and south of an existing manufacturing facility (Shaw Flooring).

Segment 2 begins at the end of Segment 1 and heads northeast to the west side of U.S. Highway 72, then turns north before turning east and crossing U.S. Highway 72 and terminating west of the Tennessee River at the intersection of Segments 3, 4 and 7. Segment 2 is approximately 3,900 feet long. The terrain is fairly flat with little elevation change. Segment 2 is near some businesses and two housing facilities (an assisted living facility and a City of South Pittsburg housing facility).

Segment 3 also begins at the end of Segment 1 and terminates at the intersection of Segments 2, 4 and 7, just west of the Tennessee River. This segment initially heads in a southeast direction, and then turns east, crossing U.S. Highway 72 before turning north-northeast and ending. The terrain along this segment is fairly flat with little elevation change. Segment 3 crosses mostly undeveloped land and cropland and is approximately 4,800 feet long.

Segment 4 is approximately 800 feet long and connects Segments 2 and 3 to Segments 5 and 6. Segment 4 begins at the intersection of the ends of Segments 2 and 3, and heads north paralleling the Tennessee River before terminating into Segments 5 and 6. Segment 4 crosses fairly flat terrain with little elevation change, and is entirely in cropland.

Segment 5 is approximately 15,400 feet long and connects Tap Point 1 to Segments 4 and 6. This segment is located entirely on the western and northern sides of, and roughly parallel to, the Tennessee River. Segment 5 begins at the end of Segment 4, heads slightly northwest, then turns slightly northeast and back northeast again just as the segment crosses over SR 156. After crossing this road, the segment turns northeast, crossing over the mouth of Battle Creek. The segment then continues to parallel the Tennessee River, turning to the east to make a right angle into Tap Point 1. Although Segment 5 lies in mostly flat terrain as it parallels the banks of the Tennessee River, there is one major elevation change as this segment crosses SR 156 over the western end of the Rhinehart Bridge. Segment 5 crosses mostly undeveloped land, except near the mouth of Battle Creek, where the segment is near some park facilities.

Segment 6 begins at the intersection of Segments 4 and 5 and heads west to east across the Tennessee River, at approximately the 417.75 mile mark. This segment terminates into Segments 8 and 9, crosses undeveloped land or cropland and is approximately 1,900 feet long. However, based on comments received at the Open House and subsequent field investigations, Segment 6 could not be used due to the proximity of this proposed segment to the South Pittsburg Water Treatment facilities, located east of U.S. Highway 72. TVA field investigations confirmed that sufficient space was not available for the placement of a transmission line structure on the west bank of the Tennessee River along proposed Segment 6. Therefore, a small “connector” segment was added, linking the intersection of Segments 6, 8 and 9 to the middle of Segment 7. This change is reflected on the preferred route on Figure 1-1. Consequently, the southern crossing of the Tennessee River (Segment 7) would have to be utilized for any river crossing.

Segment 7 begins at the termination of segments 2 and 3 and heads east across the Tennessee River at approximately TRM 417.5. This segment terminates into the intersection of segments 8 and 13. The terrain along this segment is fairly flat as it crosses over the Tennessee River, but increases slightly in elevation as it progresses away from the eastern bank of the Tennessee River. Segment 7 consists of undeveloped land and cropland and is about 3,800 feet long.

Segment 8 connects segment 7 to segment 9 and is located in the southern portion of the study area. The segment is relatively flat, but increases in elevation as it heads west to east, slightly northwest to southeast. This segment is approximately 1,900 feet long. Segment 8 crosses mostly wooded land as it is along a tree line that is also a property line.

Segment 9 roughly parallels the eastern bank of the Tennessee River, running southwest to northeast. The elevation, much like segment 5, is relatively flat, but changes elevation where the segment crosses SR 156, just slightly east of the Rhinehart Bridge. This segment also crosses over some small creeks and is within approximately 650 feet of some homes along Rivers Landing Road. This segment is approximately 4,300 feet long and crosses cropland and developed residential property.

Segment 10 begins at the end of segment 9, just slightly north of SR 156 and east of the bank of the Tennessee River. This segment crosses undeveloped land and cropland, roughly paralleling the Tennessee River in a southwest to northeast direction, then turns east to terminate into segment 11. The terrain along this segment is relatively flat, with some small elevation changes near creeks and tree lines, and is approximately 8,200 feet long.

Segment 11 begins at the intersection of segments 10 and 12 and terminates into Tap Point 2, just northwest of Burns Island Road. The elevation on this segment varies due to some small hills. Mostly located along cropland and pasture, Segment 11 also crosses some tree lines. Segment 11 runs in a slightly northwest to southeast direction, turning to the northeast to make a right angle into the source line at the tap point. This segment is approximately 2,600 feet long.

Segment 12 connects segments 9 and 11 southwest to northeast, across cropland and forested areas with only minor elevation changes. Segment 12 is approximately 7,400 feet long.

Segment 13 connects segments 7 and 15. This segment begins in an easterly direction, before turning northeast and crossing over cropland and wooded areas before crossing over SR 156 and terminating into segment 15. This segment has some elevation change as it progresses toward SR 156, and it is approximately 6,400 feet long.

Segment 14 connects segments 9 and 15. This segment crosses cropland and is visible from some of the homes clustered around SR 156. Elevation increases as this segment heads away from the Tennessee River, and this segment is approximately 5,400 feet long.

Segment 15 begins at the end of segments 13 and 14, and extends to Tap Point 3, west of Port Road and northwest of Nickajack Dam. This segment crosses undeveloped wooded land and some developed residential property. Segment 15 starts at a higher elevation and then lowers as it approaches the tap point. This segment meanders slightly to take advantage of both natural features and property lines, but generally heads in a northwest to southeast direction. Segment 15 is about 12,600 feet long.

2.3.5.2 Potential Transmission Line Corridors

Twelve alternate transmission line routes consisting of combinations of these 15 constituent segments (see Figure 1-2 and Table 2-1) were developed. These routes were evaluated as described below.

Table 2-1. Alternative Route Corridors with Constituent Segments

Alternative Route	Constituent Segments	Tap Point
1	1, 2, 4, 5	1
2	1, 2, 4, 6, 9, 10, 11	2
3	1, 2, 4, 6, 9, 12, 11	2
4	1, 2, 4, 6, 9, 14, 15	3
5	1, 2, 4, 6, 8, 13, 15	3
6	1, 2, 7, 13, 15	3
7	1, 3, 4, 5	1
8	1, 3, 4, 6, 8, 13, 15	3
9	1, 3, 4, 6, 9, 10, 11	2
10	1, 3, 4, 6, 9, 12, 11	2
11	1, 3, 4, 6, 9, 14, 15	3
12	1, 3, 7, 13, 15	3

2.3.6 Route Identification and Evaluation

Each of the twelve alternative routes offered different opportunities and constraints. The assessment of the opportunities and constraints for these alternative routes are summarized below by engineering, social, and environmental criteria.

Engineering

Engineering constraints prevalent in the analysis included major road crossings (U.S. Highway 72), pipeline crossings, and length of the proposed routes. Each of the alternative routes crosses U.S. Highway 72, so while TVA minimized impacts to this major road crossing to the extent feasible, this was not a factor in the selection of the preferred route. The relatively flat terrain reduced the number of engineering inputs, and presented the greatest opportunity in this category. Less than 10 percent of the study area is between 20 and 30 percent slope, and less than 1 percent of the area consists of 30 percent or above slope. Routes 2 and 3 scored the best in this category, with Routes 8 and 12 having the poorest engineering scores.

Social

The primary social constraint was the presence of public housing apartments and commercial facilities. There were three feasible tap point opportunities due to the rural land along the Nickajack-Jasper-Raccoon Mountain (tap to Tennol section) 161-kV Transmission Line. The public was overwhelmingly opposed to six routes originating from Tap Point 3. The routes from tap points 1 and 2 cross over fewer and larger parcels, and undeveloped pasture and cropland. Poor social scores for the routes using Tap Point 3 was a major contributing factor to the routes (4, 5, 6, 8, 11, and 12) that scored the most unfavorably in the overall analysis.

Environmental

There were several environmental constraints which led to a distinct separation of the route rankings, mostly dependent upon the tap point chosen. The amount of forested acreage affected from routes using Tap Point 3 (4, 5, 6, 8, 11, and 12) was much greater (roughly four times) that of the routes originating from tap points 1 and 2. Floodplains and floodways were prevalent throughout the study area due to the proximity to the Tennessee River. Alternative Routes 1 and 7, which originate from Tap Point 1, cross the mouth of Battle Creek and have the greatest amount of floodplain and floodway acreage overall. Segment 3, which is used in six alternative routes (7-12), crosses wetland mitigation areas controlled by TDOT. These factors resulted in higher (poorer) environmental scores for the eight routes originating from Tap Points 1 and 3.

Upon completion of the analysis described above, there was a logical spread in the overall scores of the alternative routes (Table 2-2). Routes 2, 3, 9, and 10 had lower (better) overall scores than the other eight routes because they scored well with respect to social and environmental considerations. Route 3 received the best overall environmental score and was rated second best in engineering. These factors resulted in Route 3 receiving the second best overall score. Routes 5, 6 and 12 were the worst-scoring alternatives. Route 5 scored last in social and in the bottom three in engineering. Route 6 rated poorly in all three categories, with no ranking higher than ninth. Route 12 scored last with respect to environmental and eleventh with respect to engineering.

Table 2-2. Alternative Route Corridor Scores

Route Rankings	Total Score Based on Criteria Analysis	Alternative Route	Constituent Segments
1	29.52	10	1, 3, 4, 6, 9, 12, 11
2	29.56	3	1, 2, 4, 6, 9, 12, 11
3	32.94	2	1, 2, 4, 6, 9, 10, 11
4	33.90	9	1, 3, 4, 6, 9, 10, 11
5	35.65	7	1, 3, 4, 5
6	35.69	1	1, 2, 4, 5
7	46.67	11	1, 3, 4, 6, 9, 14, 15
8	46.71	4	1, 2, 4, 6, 9, 14, 15
9	52.76	8	1, 3, 4, 6, 8, 13, 15
10	52.80	5	1, 2, 4, 6, 8, 13, 15
11	53.77	12	1, 3, 7, 13, 15
12	53.82	6	1, 2, 7, 13, 15

As shown in Table 2-2, the scores ranking the alternative routes ranged from 29.52 for Alternative Route 10 (the route that ranked best) to 53.82 for Alternative Route 6 (the worst ranked route).

2.4 Comparison of Alternative Transmission Line Segments and Routes

From three possible tap points, and based on 15 possible alternative transmission line segments as shown in Figure 1-2, TVA established and considered 12 alternative routes that ranged between 4 and 6 miles in length. This section provides analysis of the route segments and their relation to alternative routes.

Segment 1 is used in all of the alternative routes due to SVEC's planned location for the new substation. The development of the immediate area surrounding the substation site limited possible avenues into the substation to a single path. The primary constraints along this segment were a road crossing and the presence of forest land.

Segment 2 is used in six of the alternative routes. The constraints on this segment were commercial areas and major road crossings. This segment passes a public housing complex, and both segments 2 and 3 cross U.S. Highway 72. One of these segments is included in each alternative route. Although TVA minimized impacts at U.S. Highway 72 to the extent feasible, this major road crossing was not a factor in the selection of the preferred route.

Segment 3 is used in six of the alternative routes. This segment crosses TDOT wetland mitigation areas and U.S. Highway 72. Segment 3 also runs parallel to a pipeline. Segment 4 is a small "connector" segment used in 10 of the alternative routes and is in a floodplain.

Segment 5, which is used in just two of the alternative routes, crosses the greatest amount of floodplain and floodways of all the alternative segments. This segment also crosses over the mouth of Battle Creek, as well as SR 156. Segment 5 also crosses some wetlands and forestland, and runs parallel to a pipeline.

Segment 6 crosses the Tennessee River, and therefore had impacts to the open water, floodplain, and floodway scores in the analysis. This segment, which was used in eight of the alternative routes, also crosses a pipeline. As mentioned previously, this segment was deemed unsuitable for use following the Open House. Similarly, Segment 7 also crosses the Tennessee River and as such, impacts would be similar to that of Segment 6, with the notable exception that this segment presented a feasible location for a transmission structure.

Segment 8, which was used in two of the alternative routes, crosses some forest land. Segment 9 was used in six of the alternative routes and crosses floodplain and floodways, along with one major road crossing (SR 156). Segment 10 was used in two alternative routes and also crosses floodplain and floodways along with some forested areas and wetlands. Segment 11 crosses floodplain and forestland, and was used in four of the alternative routes, connecting to Tap Point 2.

Segment 12, used in two of the alternative routes, crosses some forested area and some small stream crossings. Segment 13 crosses forested area and SR 156. In addition, the terrain is steeper along this segment than most of the other segments. Segment 14 crosses over mostly open pasture, but also crosses some forested areas, one minor road (Mail Loop Road) and some small streams.

Segment 15 was overwhelmingly opposed by the public. This segment, which is used in the six alternative routes utilizing Tap Point 3, crosses the most property parcels and would affect the most residential homes. Additionally, Segment 15 crosses more forested areas and steeper terrain than most of the alternative segments.

2.4.1 Alternative Transmission Line Routes

Due to the relatively flat conditions of the study area, combined with the undeveloped property being utilized for pasture and crop land, multiple potential tap points were available. This allowed multiple possible paths from TVA's Nickajack-Jasper-Raccoon Mountain (tap to Tennol section) 161-kV Transmission Line to the future SVEC substation site. These routes run roughly northeast to southwest across the study area.

Routes 1 and 7 originate from Tap Point 1. These routes follow the river, to the south and east side of U.S. Highway 72, crossing over the mouth of Battle Creek and over SR 156 before crossing U.S. Highway 72 and terminating into the substation. Both routes traverse floodplain and floodways across undeveloped pasture, cropland and forested areas. These routes ranked sixth and fifth, respectively.

Routes 2, 3, 9 and 10 all originate from Tap Point 2. Routes 2 and 9 follow the general path of the Tennessee River in the floodplain before crossing over the river and terminating into the substation. Route 2 follows a northern route into the substation, while Route 9 goes more southerly before terminating. Route 2 ranked third, while Route 9 ranked fourth overall.

Routes 3 and 10 go more inland than routes 2 and 9, utilizing segment 12. As such, these routes do not cross as much floodplain area as routes 2 and 9. North of SR 156, these routes follow the same paths as routes 2 and 9 to terminate into the substation. These were the top scoring routes. Route 10 ranked first, and Route 3 ranked second.

Finally, routes 4, 5, 6, 8, 11 and 12 all use Tap Point 3. These routes finished in the bottom half of the rankings.

Routes 4 and 11 used a northern route, crossing over SR 156 near the Rhinehart Bridge, before following other routes and terminating into the substation. These routes vary in the different paths taken into the substation on the west side of the Tennessee River, with Route 4 following the northern route and Route 11 taking the southern approach. Route 11 ranked seventh, and Route 4 placed eighth overall.

Routes 5 and 8 take a more southerly approach from the tap point to the substation. As such, they both cross SR 156 to the east of the Tennessee River and then utilize the northern crossing point over the Tennessee River. As with routes 4 and 11, the difference in routes 5 and 8 are in the approach to the substation. Route 5 takes a northern approach near the South Pittsburg Public Housing units, while Route 8 crosses TDOT wetland mitigation areas to the south. Route 8 ranked ninth, and Route 5 ranked tenth.

Finally, routes 6 and 12 take an even further route to the southeast of the Tennessee River, crossing SR 156 east of the Tennessee River, before using the southern proposed crossing point of the Tennessee River. Once again, the difference in the routes is the approach to the substation, with Route 6 using the northern path and Route 12 the southern path. Route 12 ranked eleventh, while Route 6 ranked twelfth.

2.4.2 Identification of the Preferred Transmission Line Route

Based on analysis of the potential routes and additional route adjustments, TVA's preferred transmission line route for the Action Alternative is Alternative Route 3 utilizing Tap Point 2 and consisting of Alternative Segments 1, 2, 7, 9, 12, and 11 (see Figure 1-1). As explained previously, this route is a slight modification to the route presented at the open house and shown in Tables 2-1 and 2-2. This is due to the difficulty utilizing the northern crossing of the Tennessee River.

While the scoring for the top two routes was extremely close, the preferred route was ranked second in the analysis. Route 10 had the best overall score, but this alternative was rejected because it includes Segment 3 crossing mitigated wetlands on the west side of U.S. Highway 72. Because these forested wetlands are part of a compensatory wetland mitigation project associated with the construction of U.S. Highway 72, they are to be avoided.

2.4.3 Explanation of Changes Along the Proposed Transmission Line Route

The preferred route was modified in a few locations from the original alignment as presented at the open house. These changes are reflected in Figure 1-1. A list of these modifications and explanations are provided below in Table 2-3.

Table 2-3. Modification to the Proposed Transmission Line Route

Location	Adjustment	Explanation of adjustment
Intersection of segments 6, 8 and 9 to middle of segment 7	Added a small “connector” segment.	As explained in section 2.4.1, this small segment was added to improve the river crossing.
Segment 11, tap point origination	Moved tap point to the northwest, between existing structures 20 and 21 of the Nickajack-Jasper-Raccoon Mountain (Tap to Tennol) 161-kV Transmission Line.	Discussed with property owner. This change would ensure no guyed structures would be placed in the creek bank.
Segment 11	Segment 11 was altered on one property. Alteration was to move segment further away the from river.	Property owner request. Change would allow future building site to remain outside of TVA’s easement. This parcel is quite large, and adjustment was feasible for TVA.
Segments 12 and 9, at crossing of SR 156	Segments were altered to the east.	Property owner request. Change would allow owner to place storage buildings in original route.
Segments 7, 8 and 9	Segments were shifted to the east.	Due to TVA design requirements and property owner requests.
Segment 2	Segment was moved south.	Due to TVA design requirements and property owner requests. Due to engineering considerations, the structure adjacent to the river crossing tower must be in a straight line. The configuration shown at the open house had a slightly curved path. Also, this was more desirable to the property owner.
Segments 1 and 2	Segments were moved to the northeast.	Property owner request. Change would accommodate future plant expansion and related creek relocation.

2.5 Comparison of Potential Environmental Impacts by Alternative

A synopsis of the potential effects anticipated under each of the alternatives is supplied in Table 2-4 below.

Table 2-4. Summary and Comparison of Alternatives by Resource Area

Resource Area	Impacts From Implementing the No Action Alternative	Impacts From Implementing the Action Alternative
Groundwater and Geology	No effects to local groundwater quality or quantity are expected.	Effects to groundwater quality would be minor. No effects to groundwater quantity are anticipated.
Surface Water	No changes in local surface water quality are anticipated.	Any effects to local surface waters would be minor.
Aquatic Ecology	Aquatic life in local streams would not be affected.	With the implementation of protective measures, effects to aquatic life in local surface waters are expected to be minor.
Vegetation	Local vegetation would not be affected.	Approximately 14 acres of forested area would be cleared for ROW construction. Revegetation of cleared areas with noninvasive species would minimize the potential introduction and spread of invasive species.
Wildlife	Local wildlife would not be affected.	Wildlife inhabiting onsite forest, early successional, and edge habitats would be displaced to adjacent local habitats.
Endangered and Threatened Species	No effects to endangered or threatened species or any designated critical habitats are anticipated.	No effects to any listed aquatic species or plants are anticipated. Implementing the Action Alternative would result in the removal of approximately 2.1 acres of suitable summer roosting habitat for the northern long-eared bat and the Indiana bat. TVA and the U.S. Fish and Wildlife Service would enter into a Memorandum of Agreement which would stipulate that TVA would limit clearing to winter periods and provide monetary compensation to offset the removal of suitable Indiana bat habitat.
Floodplains	Local floodplain functions would not be affected.	The proposed transmission line would not affect any floodplains or their functions.
Wetlands	No changes in local wetland extent or function are expected.	Transmission line construction would convert 0.91 acre of superior-quality forested wetland to emergent or scrub/shrub wetland. A structure would be located in Wetland W001.
Aesthetics	Aesthetic character of the area is expected to remain virtually unchanged.	Minor visual discord and noise above ambient levels would be produced during construction. The proposed transmission line would present a minor cumulative visual effect.

Resource Area	Impacts From Implementing the No Action Alternative	Impacts From Implementing the Action Alternative
Archaeological and Historic Resources	No effects to archaeological or historic resources are anticipated.	Implementing the proposed action would not affect archaeological or architectural resources listed in or eligible for listing in the National Register of Historic Places because TVA would avoid such resources.
Recreation, Parks, and Natural Areas	No changes in local recreation opportunities or natural areas are expected.	Because of the intervening distance, no local managed areas would be affected. Any loss of local formal or informal recreational opportunities would be temporary and minor.
Land use and Prime Farmlands	No land use changes would occur. No changes in local prime farmland are expected.	Approximately 14 acres of forested land would be cleared and maintained as ROW. No land considered prime farmland would be converted or committed to non-agricultural use by TVA.
Socioeconomics and Environmental Justice	Over time, the lack of reliable power service could have adverse economic effects that would affect all populations in the region.	Continued reliability of service would benefit the area and help maintain economic stability and growth in the area. Any adverse social, economic or environmental justice effects would be minor and would diminish over time.

2.6 Identification of Mitigation Measures

The following routine measures would be applied during the construction, operation, and maintenance of the planned substation, transmission lines, and access roads to reduce the potential for adverse environmental effects.

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

- Wet-weather conveyances that could be affected by the proposed construction would be protected by implementing standard best management practices (BMPs) as identified in Muncy (2012).

- The Tennessee River and an unnamed intermittent stream would be protected by the implementation of Standard Stream Protection (Category A) as defined in Muncy (2012) and Appendix D.

- TVA would utilize BMPs, as described by Muncy (2012), to minimize erosion during construction, operation, and maintenance activities.

- TVA would minimize wetland disturbance via adherence to wetland BMPs (Muncy 2012) for any and all other work necessary within the delineated wetland boundaries.

- In areas of the ROW requiring chemical treatment, only USEPA-registered herbicides would be used in accordance with BMPs and label directions designed in part to restrict applications near receiving waters and to prevent unacceptable aquatic and groundwater impacts.

- TVA's metering equipment at SVEC's Sixth Street and South Pittsburg 69-kV substations would be retained for reuse, recycled, sent for disposal, or handled through Investment Recovery.

TVA determined that the proposed action would result in the direct loss of 2.1 acres of potential bat roosting trees, which involves potential summer roosting habitat for the northern long-eared and Indiana bat. In accordance with the terms of the Memorandum of Agreement to be entered into between the USFWS and TVA.

- TVA would remove the suitable roost trees between the dates of November 15, 2014 and March 31, 2015 (i.e., when this habitat is unoccupied because the bats are hibernating elsewhere).

- TVA would contribute $7,980 to Tennessee's Indiana Bat Conservation Fund to promote the conservation and recovery of Indiana bat.

2.7 The Preferred Alternative

The Action Alternative, i.e., the construction of the proposed 4-mile, 161-kV transmission line to supply power to SVEC's planned South Pittsburg 161-kV Substation, is TVA's preferred alternative for this proposed project.

CHAPTER 3 – AFFECTED ENVIRONMENT

3.1 Groundwater and Geology

The proposed transmission line project is located in the Valley and Ridge Physiographic Province and is underlain by Mississippian aged rocks. 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, while 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 (Lloyd and Lyke 1995).

Groundwater in the Valley and Ridge aquifers[2] primarily is stored in and moves through fractures, bedding planes, and solution openings in the rocks. These aquifers are typically present in valleys and rarely present on the ridges. Most of the carbonate-rock aquifers are directly connected to sources of recharge, such as rivers or lakes, and solution activity has enlarged the original openings in the carbonate rocks. In the carbonate rocks, the fractures and bedding planes have been enlarged by dissolution of part of the rocks. Slightly acidic water dissolves some of the calcite and dolomite that compose the principal carbonate-rock aquifers. Most of this dissolution takes place along fractures and bedding planes where the largest volumes of groundwater flow causing karst features to occur. The water moves from the ridges where the water levels are high, toward lower water levels adjacent to major streams that flow parallel to the long axes of the valleys. Most of the groundwater is discharged directly to local springs or streams (Lloyd and Lyke 1995). In unconfined or poorly confined conditions, karst aquifers have very high flow and contaminant transport rates under rapid recharge conditions such as storm events.

The chemical quality of water in the freshwater parts of the Valley and Ridge aquifers is similar for shallow wells and springs. The water is hard, is a calcium magnesium bicarbonate type, and typically has a dissolved-solids concentration of 170 milligrams per liter or less. In places where the residuum that overlies the carbonate rocks is thin, the Valley and Ridge aquifers are susceptible to contamination by human activities (U.S. Geological Survey 1995).

Public drinking water for Marion County is supplied by both surface water and groundwater sources (USEPA 2013). A majority of the county population is supplied by the public water system. However, some private residences rely on private wells. The project is not within a State Designated Source water protection area for groundwater. Several caves have been reported within three miles of the proposed ROW. However, the proposed route would not cross any of these caves.

[2] An *aquifer* is an underground layer of material that contains groundwater and is capable of yielding water.

3.2 Surface Water

Precipitation in the vicinity of the proposed project averages about 63 inches per year. Typically, the wettest month is March, with an average accumulation of 6.8 inches of precipitation, while the driest month is August with an average of 3.8 inches. The median annual air temperature is 59 degrees Fahrenheit, and ranges from a monthly average of 38 degrees Fahrenheit in January to 78 degrees Fahrenheit in July. Stream flow varies with rainfall and averages about 27 inches of runoff per year or approximately 2.0 cubic feet per second per square mile of drainage area.

The area around the proposed project drains to the Tennessee River at Guntersville Reservoir. This Section of the Tennessee River is classified by the Tennessee Department of Environment and Conservation for domestic and industrial water supply, fish and aquatic life, recreation, livestock watering, irrigation, and navigation.

3.3 Aquatic Ecology

The proposed project occurs within the Jones Creek watershed which drains to the Tennessee River. Eleven access roads have been identified for access to the proposed transmission line. A total of nine watercourses, including one perennial, one intermittent, and 13 wet-weather conveyances occur along the proposed transmission line route and access roads. During the field survey the location of each watercourse was recorded using a global positioning system, and a habitat assessment form was completed.

TVA evaluated riparian conditions and in-stream habitat at each stream crossing along the proposed route. Riparian condition was assigned to one of the three standard classes listed below to indicate the current condition of streamside vegetation across the length of the proposed transmission line.

- Forested - Riparian area is fully vegetated with trees, shrubs, and herbaceous plants. Vegetative disruption from mowing or grazing is minimal or not evident. Riparian width extends more than 60 feet on either side of the stream.

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

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

Based on these evaluations and other considerations (such as State 303(d)[3] listing and presence of endangered or threatened aquatic species), TVA assigns appropriate SMZs and BMPs to reduce the potential for impacts to water quality and in-stream habitat for aquatic organisms. A summary of conditions of local water bodies, excluding wet-weather conveyances is provided in Table 3-1.

[3] States are required to submit reports to the U.S. Environmental Protection Agency. The term “303(d) list” refers to the list of impaired and threatened streams and water bodies identified by the state.

Table 3-1. Condition of Streams Located Within the Proposed Transmission Line ROW

Stream ID	Stream Type	SMZ Category	Stream Name	Riparian Condition	Notes
001	Perennial	Category A (50 foot)	Tennessee River	Partially forested	Guntersville Reservoir
002	Intermittent	Category A (50 foot)	Unnamed tributary to Tennessee River	Forested	7-foot wide by 10-foot deep channel with silt/substrate. Channel width/depth varies along reach.

Because of its riverine characteristics, the Tennessee River downstream of Nickajack Dam (located at TRM 424.7) provides suitable mussel habitat and supports a variety of mussel species. The Tennessee Wildlife Resources Agency (TWRA) has designated the approximately 8.2-mile section of the Tennessee River downstream from Nickajack Dam to the Tennessee-Alabama state line (TRM 416.5) as a state mussel sanctuary because of its high-quality mussel habitat. Within this river reach, known as the Guntersville Reservoir State Mussel Sanctuary, the taking of aquatic mollusks by any means or the willful destruction of their habitat is prohibited. The proposed transmission line would span the Sanctuary at TRM 417.5.

3.4 Vegetation

The proposed transmission line project would occur in the Sequatchie Valley Level IV ecoregion (Griffith et al. 1998). In Tennessee, this relatively narrow valley is about 1,000 feet lower in elevation than the surrounding Cumberland Plateau, which bounds the Sequatchie Valley on all sides. Today, the majority of arable land in the Sequatchie Valley is in agricultural production. Vegetation within the proposed transmission line ROW is characterized by two main types: herbaceous (70 percent) and forest (30 percent). No forested areas in the proposed ROW or access roads had structural characteristics indicative of old growth forest (Leverett 1996). All plant communities observed are common and well represented throughout the region. For the reader's convenience, scientific names of species mentioned below are provided in Appendix F.

Herbaceous vegetation is characterized by greater than 75 percent cover of forbs and grasses and less than 25 percent cover of other types of vegetation. Cultivated agricultural fields, heavily manipulated pastures, or disturbed sites in various stages of residential or industrial development account for the vast majority herbaceous vegetation in the proposed ROW and associated access roads. Most of these areas are dominated by plants indicative of early successional habitats including many non-native species. Early successional fields with naturalized vegetation contain herbaceous species like crabgrass, hairy white oldfield aster, ragweed, sericea lespedeza, and tall goldenrod. In addition, these sites are being actively colonized by woody species including Callery pear, Chinese privet, sugarberry, and trumpet vine. The most common herbaceous vegetation type in areas where the proposed construction would occur is agricultural fields, which are intensively managed for grazing or the production of a few crops like corn, soybeans, and wheat. Emergent wetlands (see Section 3.8) were characterized by species like bulrush, rush, sedges, smartweed, and spikerush.

All forest occurring within the proposed ROW and associated access roads is deciduous in composition and is characterized by trees with overlapping crowns where deciduous species account for more than 75 percent of the canopy cover. Forests associated with wetlands occurred in several portions of the proposed transmission line route. Additional descriptions of these areas are provided in Section 3.8. The overstory in these wet forests contained black willow, green ash, red maple, overcup oak, swamp chestnut oak, sweetgum, and willow oak. Average tree size varied by stand and ranged from 6 to 18 inches in diameter at breast height. The understory in these habitats was sparse and contained only a few species, including eastern swampprivet, lizard's tail, switchcane, Virginia sweetspire, and whitegrass. In general, upland forests in the project footprint (i.e., within the proposed ROW and associated access roads) are fragmented and heavily disturbed. No point within any forest stand intersected by the proposed ROW is more than 500 feet from the nearest edge. The smaller stands, which are often associated with streams, are dominated by early successional species including honeylocust, sugarberry, and sweetgum. The larger stands were found in drier habitats and were dominated by a different suite of species. American beech, black oak, hickory, loblolly pine, and white oak were most prevalent on these sites with overstory trees commonly attaining a diameter greater than 20 inches at breast height. Though the forest was relatively undisturbed, few herbaceous species were observed.

EO 13112 (Invasive Species) serves to prevent the introduction of invasive species and provides for their control to minimize the economic, ecological, and human health impacts that those species potentially cause. In this context, invasive species are nonnative species that invade natural areas, displace native species, and degrade ecological communities or ecosystem processes (Miller et al. 2010). No federal-noxious weeds were observed, but multiple species designated by the Tennessee Exotic Plant Pest Council as high priority invasive plants were observed in the proposed ROW (Table 3-2). During field surveys, invasive plants were more prevalent in areas of herbaceous vegetation. This likely reflects the frequency and magnitude of disturbance present in areas of herbaceous vegetation. Disturbances associated with agriculture, grazing, and mowing prevent tree species from becoming established, but can also encourage invasion and establishment of weedy plants.

Table 3-2. Invasive Plant Species Observed in the Proposed Transmission Line ROW

Common Name	Scientific Name
Tall fescue	*Festuca arundinacea*
Chinese lespedeza	*Lespedeza cuneata*
Japanese honeysuckle	*Lonicera japonica*
Japanese stiltgrass	*Microstegium vimineum*
Johnsongrass	*Sorghum halepense*

3.5 Wildlife

The proposed transmission line project lies in the lowland area along the Tennessee River downstream of Nickajack Dam. Much of this area was likely forested prior to the influx of agricultural practices and the establishment the town of South Pittsburg. Forest cover on the west side of the Tennessee River in South Pittsburg is now restricted to scattered trees among residential homes and businesses. Construction of the proposed ROW would

require the removal of a few of these scattered trees, younger trees surrounding a wetland, and a row of trees on the west bank of the Tennessee River. A large portion of this section of the line would span early herbaceous fields, both mowed and agricultural. The proposed ROW on the east side of the Tennessee River would span alternating agricultural fields, forested riparian stream corridors, and forest fragments. Several of these forest fragments are forested wetlands.

Eleven access roads were identified as necessary to complete the construction activities. All of these except one are either on an existing road or run through agricultural fields. Only one access road would require the removal of 0.19 acres of forested habitat. In total, approximately 14 acres of forested habitat would be removed.

Mowed herbaceous fields and agricultural fields offer scant suitable habitat for rare wildlife species, but can be used by many common species, especially when the landscape retains a few other features such as streams and trees. Birds that utilize fields include Canada goose, eastern phoebe, eastern kingbird, eastern meadowlark, killdeer, loggerhead shrike, red-tailed hawk, and red-winged blackbird. Mammals that can be found here are common mole, coyote, groundhog, least shrew, white-footed mouse, and white-tailed deer. Disturbed forest edges found between agricultural fields and urban areas provide habitat for birds such as American robin, American goldfinch, Carolina chickadee, Carolina wren, eastern towhee, eastern tufted titmouse, northern flicker, and northern mockingbird. Mammals found in these habitats include raccoon, eastern gray squirrel, hispid cotton rat, and Virginia opossum. Reptiles found in these areas are fence lizards, five-lined skinks, rat and ring-necked snakes. Larger forest fragments with less edge habitat support other species such as barred owl, bobcat, common night-hawk, eastern box turtle, great horned owl, hairy woodpecker, red fox, red-eyed vireo, ruby-crowned kinglet, striped skunk, white-breasted nuthatch, white-footed mouse, and yellow-bellied sapsucker.

Riparian areas along creeks and in wetlands provide suitable habitat for a number of species. American beavers near the project are known to create additional habitat by building dams on existing creeks and rivers, resulting in ponds and flooded lowland areas. Amphibians likely to use the area include the American bullfrog, eastern red-spotted newt, northern cricket frog, southern leopard frog, and the upland chorus frog. Forested wetlands are preferred by other amphibians including gray treefrogs and wood frogs, as well as marbled, slimy, and spotted salamanders. Reptiles utilizing these wet areas and the surrounding habitat include cottonmouths, garter snakes, and northern watersnakes. Birds that also utilize forested riparian zones include Acadian flycatcher, indigo bunting, Louisiana waterthrush, prothonotary warbler, pileated woodpecker, red-bellied woodpecker, ruby-throated hummingbird, and yellow-billed cuckoo. Common bat species known to forage over wetlands and ponds include big brown, hoary, little brown, tricolored, and silver-haired bats.

Review of the TVA Regional Natural Heritage database in November 2013 indicated that eleven caves are reported within three miles of the proposed project. No caves were found within the proposed ROW, and the nearest cave record is 0.7 miles from the project. No other unique or important terrestrial habitats exist along the proposed ROW corridor. In addition, no aggregations of migratory birds or colonial wading bird colonies are known from the proposed ROW corridor or observed during field reviews. However, two records of colonial wading bird colonies are reported 0.91 and 0.94 miles from the proposed ROW. One of these two heronry sites was abandoned two decades ago.

3.6 Endangered and Threatened Species

Endangered species are those determined to be in danger of extinction throughout all or a significant portion of their range. Threatened species are those determined to be likely to become endangered within the foreseeable future. Section 7 of the ESA requires federal agencies to consult with the USFWS when their proposed actions may affect endangered or threatened species or their critical habitats. A list of federally listed and state-listed endangered and threatened species that occur near the proposed transmission line is provided as Table 3-3.

Table 3-3. Federally and State-listed Species Known to Occur in the Vicinity of the Proposed Transmission Line Route and Access Roads

Common Name	Scientific Name	Federal Status[1]	State	State Status[1]	State Rank[2]
Amphibians					
Barking treefrog	*Hyla gratiosa*			NMGT	S3
Birds					
Bald eagle	*Haliaeetus leucocephalus*	DM	Tenn.	NMGT	S3
Common raven	*Corvus corax*		Tenn.	THR	S2
Fishes					
Flame chub[3]	*Hemitremia flammea*		Tenn.	NMGT	S3
Golden darter	*Eteostoma denoncourti*		Tenn.	NMGT	S2
Highfin carpsucker	*Carpoides velifer*		Tenn.	NMGT	S2S3
Snail darter	*Percina tanasi*	THR	Tenn.	THR	S2S3
Insects					
Owen Spring limnephilid (or Sequatchie) caddisfly	*Glyphopsyche sequatchie*	CAND	Tenn.	POTL	
Mammals					
Allegheny woodrat	*Neotoma magister*		Tenn.	NMGT	S3
Gray bat[4]	Myotis grisescens	END	Tenn.	END	S2
Indiana bat[4]	*Myotis sodalis*	END	Tenn.	END	S1
Northern long-eared bat[5]	*Myotis septentrionalis*	PE	Tenn.	NMGT	S4
Mussels					
Dromedary pearlymussel[6]	*Dromus dromas*	END	Tenn.	END	S1
Fanshell[3]	*Cyprogenia stegaria*	END	Tenn.	END	S1
Hickorynut[3]	*Obovaria olivaria*		Ala.	EXTI	SX
Kidneyshell[3]	*Ptychobranchus fasciolaris*		Ala.	TRKD	S1
Orange-footed pimpleback[3]	*Plethobasus cooperianus*	END	Ala.	PROT	S1
Pale lilliput[3]	*Toxolasma cylindrellus*	END	Tenn.	END	S1
Pink mucket	*Lampsilis abrupta*	END	Tenn.	END	S2
Ring pink[6]	*Obovaria refusa*	END	Ala.	PROT	S1
Rough pigtoe[6]	*Pleurobema plenum*	END	Ala.	PROT	S1
Slabside pearlymussel[3]	*Lexingtonia dolabelloides*	END	Ala.	PROT	S1
Smooth rabbitsfoot[3]	*Quadrula cylindrica cylindrica*	THR	Ala.	PROT	S1
Snuffbox[3]	*Epioblasma triquetra*	END	Ala.	TRKD	S1
Spectaclecase[3,7]	*Cumberlandia monodonta*	END	Tenn.	TRKD	S2S3
Tennessee heelsplitter[3]	*Lasmigona holstonia*		Ala.	TRKD	S1S2
Plants					
American hart's–tongue fern	*Asplenium scolopendrium* var. *americanum*	THR	Tenn.	END	S1
Featherfoil	*Hottonia inflata*		Tenn.	SPCO	S2

Common Name	Scientific Name	Federal Status[1]	State	State Status[1]	State Rank[2]
Great Plains ladies'-tresses	*Spiranthes magnicamporum*		Tenn.	END	S1
Hairy false gromwell	*Onosmodium hispidissimum*		Tenn.	END	S1
John Beck's leafcup	*Polymnia johnbeckii*		Tenn.	SPCO	S1
Lance-leaf trillium	*Trillium lancifolium*		Tenn.	END	S1
Large-flowered skullcap[8]	*Scutellaria montana*	THR	Tenn.	THR	S2
Michigan lily	*Lilium michiganse*		Tenn.	THR	S3
Monkey-face orchid[8]	*Platanthera integrilabia*	CAND	Tenn.	END	S2S3
Nevius' stonecrop	*Sedum nevii*		Tenn.	END	S1
Price's potato bean[8]	*Apios priceana*	THR	Tenn.	END	S2
Royal catchfly	*Silene regia*		Tenn.	E-P	SH
Slender blazing-star	*Liatris cylindracea*		Tenn.	THR	S2
Spreading rockcress	*Arabis patens*		Tenn.	END	S1
Three-parted violet	*Viola tripartita* var. *tripartita*		Tenn.	SPCO	S2S3
Reptiles					
Northern pinesnake	*Pituophis melanoleucus melanoleucus*		Tenn.	THR	S3
Snails					
Anthony's river snail	*Athearnia anthonyi*	END	Ala.	PROT	S1
Armored rocksnail	*Lithasia armigera*		Tenn.	TRKD	S1S2
Corpulent hornsnail	*Pleurocera corpulenta*		Ala.	TRKD	S1
Royal marstonia	*Pyrgulopsis ogmorhaphe*	END	Tenn.	END	S1
Smooth mudalia	*Leptoxis virgata*		Tenn.	TRKD	S1
Spiny riversnail	*Io fluvialis*		Tenn.	TRKD	S2
Varicose rocksnail	*Lithasia verrucosa*		Ala.	TRKD	S3
Warty rocksnail	*Lithasia lima*		Tenn.	TRKD	S2

Source: TVA Natural Heritage Database

[1]Status Codes: CAND=Candidate for federal listing; DM=Delisted but still monitored; E-P=Endangered, possibly extirpated; END=Endangered; EXTI=Extirpated or extinct; NMGT= in need of management; PE=Proposed endangered; POTL=Potential candidate for state listing; PROT=Protected; THR=Threatened; TRKD=Tracked as sensitive, but has no legal status.

[2]State Ranks: S1=Critically Imperiled; S2=Imperiled; S3=Vulnerable; S4=Apparently secure; SX=Presumed extirpated; S#S# denotes a range of ranks because the exact rarity of the species is uncertain.

[3]Historical = Record of occurrence is greater than 25 years old.

[4]Species occurs in Marion County but not within 3 miles of the project.

[5]Proposed endangered species whose range has been determined by USFWS to include all counties in Tennessee, although no records are known from Marion County.

[6]Extirpated. There is a lack of recent field information verifying the continued existence of the record, such as when the occurrence is based only on historical collections data, or when the occurrence, without field survey work, is considered to be possibly extirpated due to general habitat loss or degradation of the environment in the area.

[7]Species occurs within Marion County but not within 10 miles of the project.

[8]Species occurs within Marion County but not within 5 miles of the project.

3.6.1 Aquatic Animals

As mentioned in Section 3.3, the approximately 8.2-mile reach of the Tennessee River downstream from Nickajack Dam to the Tennessee-Alabama state line comprises the Guntersville Reservoir State Mussel Sanctuary. A variety of mussel and aquatic snail species, including some that are listed, inhabit this section of the river.

As shown in Table 3-3, there are twelve aquatic species (i.e., 10 mussel species and two species of aquatic snails) that are federally listed as endangered that are known to occur in Marion County. Also, the highfin carpsucker (a fish) and the smooth rabbitsfoot mussel, both federally listed as threatened, as well as the Owen Spring limnephlid caddisfly (a candidate for federal listing) have been documented in Marion County. All these federally listed aquatic species are also state-listed.

Because the federally listed dromedary pearlymussel, ring pink, and rough pigtoe are considered extirpated and no longer exist within the potentially affected area, they were not considered further in the environmental review. The records for the occurrence of the federally listed fanshell, orange-footed pimpleback, pale liliput, slabside pearlymussel, smooth rabbitsfoot, snuffbox, and spectaclecase are historical, and these mussel species likely no longer occur in the vicinity of the project.

Twelve additional state-listed aquatic species (three fish, three mussels, and six snail species) are also known to occur in Marion County or within a 10-mile radius of the proposed ROW. Only historical records exist for the occurrence of the state-listed hickorynut, kidneyshell, and Tennessee heelsplitter mussels; thus, these species likely no longer occur within the general area of the project. Habitat for the state-listed flame chub was not observed along the proposed transmission line route. Therefore, the flame chub is not considered to occur within the potentially affected area and was not considered further in the environmental review.

A brief description of those aquatic species that potentially occur within the vicinity of the proposed project appears below. Habitat requirements are as described in NatureServe (2013) for fish and snails, Etnier and Starnes (1993) for fish, and Parmalee and Bogan (1998) for mussels.

The golden darter was formerly considered as *Etheostoma tippecanoe* but was confirmed genetically to be a separate species. This fish prefers riffles and runs of medium rivers to creeks with moderate gradient and small gravel substrate.

The highfin carpsucker is the smallest of the carpsuckers, and the species that has been most adversely affected by environmental change. This fish prefers habitat consisting of areas of gravel substrate in clear medium to large rivers and is more susceptible to change by siltation and impoundment.

The snail darter is known to occur in larger creeks and rivers where it frequents sand and gravel shoal areas. This fish can also occur in deeper portions of rivers and reservoirs where current is present.

The fanshell mussel occurs in the Ohio, Cumberland, and Tennessee River systems. Adults reach a maximum length of 70 millimeters (2.75 inches). All viable populations are restricted to unimpounded stretches of the Clinch River on substrate of coarse sand gravel in strong flowing waters. Spawning takes place in the summer, with the glochidia[4] overwintering in females and expelled in the following spring. The glochidial host fish species is unknown.

The hickorynut mussel is typically found on sand or gravel substrates in deep water, depths usually exceeding six to eight feet, with good current.

The kidneyshell mussel occurs in small to medium-sized rivers of the Ohio, Tennessee, and Cumberland River systems. It can be found from the Lower Peninsula of Michigan into Kansas, Arkansas, Oklahoma, and Louisiana, from Pennsylvania west to Illinois, and south to Tennessee. It appears to be tolerant of a variety of habitat but prefers coarse gravel and sand substrate in water 1 to 24 feet deep.

The orange-footed pimpleback mussel is found primarily in big rivers. Individuals have been found at depths of 12 to 18 feet in sand and coarse gravel substrate. This mussel spawns in spring, and the glochidia are expelled during the summer. The host fish for glochidia is currently unknown.

The pale liliput mussel normally occurs in the tributaries of the Tennessee River. However, occurrences have been reported from the Mobile River system. Adults can reach lengths of 1.4 inches. It only occurs in small tributary rivers and streams. The pale lilliput prefers gravel and sand substrate in slow to moderate current at depths less than 3 feet. No other life history is known.

The pink mucket is typically a big river mussel species, but occasionally individuals become established in small to medium sized tributaries of large rivers. It inhabits rocky bottoms with swift current usually in less than 3 feet of water.

The slabside pearlymussel is most often found in sand, fine gravel, and cobbles in areas with a moderately strong current.

The smooth rabbitsfoot is a subspecies of the rabbitsfoot mussel that occurs within Tennessee. Individuals are encountered most frequently in current at depths of 9 to 12 feet.

The snuffbox mussel is typically found in shallow riffles with swift current over sand and gravel substrate.

The spectaclecase mussel has been documented in various types of substrate, including gravel, sand, and mud, in medium-sized to large rivers.

The Tennessee heelsplitter is a mussel species most often found inhabiting small shallow streams and headwater creeks with some current, and it may become locally abundant in stretches of substrate composed of sand and mud.

[4] Glochidia (singular is “glochidium”) are the microscopic larval stage of freshwater mussels that develop as an external parasite on the gills of fish.

Anthony's riversnail prefers habitat in large rivers in cobble/boulder substrates.

The armored rocksnail inhabits partially buried logs, gravel, and submerged rock outcroppings in medium to large rivers.

The corpulent hornsnail is known only from the Tennessee River in gravel and cobble substrate in moderate to swift current. It is currently only known to exist in the Nickajack Dam tailwaters at depths of two to four meters.

The royal marstonia snail is found only in spring runs flowing out of caves. It is found on soft mud, very rarely on sand, rock, detritus or hard clay.

The smooth mudalia is a snail that lives in shoal habitats, with moderate to heavy current and is generally found grazing on biofilm of rock surfaces.

The spiny riversnail can be found in shallow waters of shoals that have rapid to moderate current.

The varicose rocksnail inhabits rocky shoals and riffles in moderate current velocities in depths from near the water surface to several feet down.

The warty rocksnail appears to inhabit rocky substrates in riffle systems. It is found on gravel and cobble substrata in moderate to swift current.

3.6.2 Plants

Review of the TVA Natural Heritage Database (queried September 2013) indicated that one federally listed plant species (the American hart's-tongue fern) and eleven state-listed plant species have been previously reported within five miles of the proposed transmission line project. Two other federally listed plant species (i.e., Price's potato bean and the large-flowered skullcap) and one federal candidate plant species (the monkey-faced orchid) are known from Marion County, but not necessarily within 5 miles of the project. No designated critical habitat for plant species occurs in areas where work would occur. A listing of these plant species is provided in Table 3-3. No federally listed or state-listed plant species, or habitat capable of supporting such species, was observed during field surveys conducted in November 2013.

3.6.3 Terrestrial Animals

A review of the TVA Natural Heritage Project Database in November 2013 indicated that there are records of four Tennessee state-listed terrestrial animals (the barking treefrog, common raven, Allegheny woodrat, and the northern pinesnake) and one federally protected terrestrial animal species (the bald eagle) within three miles of the proposed project. Records of two additional federally listed as endangered terrestrial animal species (i.e., the gray bat and the Indiana bat) exist in Marion County. The northern long-eared bat is currently listed as proposed endangered by the USFWS and is thought to occur state-wide in Tennessee.

The barking treefrog is found in forested and scrub-shrub wetlands and in riparian zones with emergent vegetation and trees. During winter months, they burrow in soil and under vegetation, including tree roots. During the rest of the year they climb adjacent trees and produce breeding and territorial calls from these arboreal locations. The closest record of this species is approximately 1 mile from the proposed ROW. Suitable habitat exists for

barking treefrogs in and around four of the five identified wetlands with standing water and trees along the proposed ROW and within one forested wetland along access road 04.

Common ravens are most commonly found in hilly or mountainous areas near cliffs where they nest. One historical record of this species exists approximately 2.1 miles from the project site on the Cumberland Plateau. This record is from the 1920s, and no current records of this species are known from the area. No suitable nesting habitat exists for common ravens in the proposed ROW.

The Allegheny woodrat is associated with rocky outcrops, cliffs, talus slopes and karst environments. The closest record of this species is from a sinkhole approximately two miles from the project. No caves or karst areas are reported from the proposed ROW, and none were observed during field visits. No suitable habitat exits for Allegheny woodrat within the project footprint.

Northern pinesnakes use dry forests or woodlands with a significant pine component, an open understory, and sandy soils. The nearest record of this species is approximately 1.1 miles from the proposed ROW. Suitable habitat exists for this species within the proposed ROW corridor in one section of upland forest comprised of oaks, pines, hickories, as well as other hardwoods.

Bald eagles are protected under the Bald and Golden Eagle Protection Act. This species is associated with large, mature trees capable of supporting its massive nests. These are usually found near larger waterways where eagles forage. Records document the occurrence of five bald eagle nests within three miles of the proposed transmission line ROW along the Tennessee River and on adjacent lands. The closest of these records is 0.7 miles from the proposed ROW corridor. Three of the records reflect former nesting sites. These nests have since fallen out of the trees. Activity at two of the remaining two nesting sites has not been documented since 2004 and 2007. A new, active bald eagle nest was observed along the Tennessee River, 1.27 miles from the proposed ROW in April 2014. Suitable nesting habitat does exist for bald eagles in trees bordering the Tennessee River at the proposed river crossing or in mature trees throughout the proposed pathway of the new transmission line. No bald eagle nests or resident bald eagle pairs were observed within the project footprint.

Gray bats roost in caves year-round and migrate between summer and winter roosts during spring and fall (Tuttle 1976). They forage over bodies of water. Records document the occurrence of six gray bat hibernacula[5] in Marion County, Tennessee. One additional hibernaculum is within ten miles of the proposed ROW in Jackson County, Alabama. The closest hibernaculum, Nickajack Cave, which is 3.6 miles away, is identified as priority 1 hibernaculum for the gray bat in the Gray Bat Recovery Plan (Brady et.al 1982). Although no caves have been found within the proposed ROW corridor, and the nearest documented cave is 0.7 mile from the project footprint, gray bats may forage in the proposed ROW corridor and surrounding areas over inundated wetlands and over the Tennessee River. Mist net surveys performed at a TVA facility approximately 7 miles away in Alabama captured one post-lactating female gray bat over a pond in August 2013.

[5] Hibernacula (singular is hibernaculum) are places such as caves where bats regularly hibernate.

The Indiana bat hibernates in caves and forms summer roosts in mature forests with open understories, available roosts, and nearby sources of water. Roosts are formed under the exfoliating bark of live and dead trees (Pruitt and TeWinkel 2007, Kurta et al. 2002). Historical records document the occurrence of Indiana bats in Nickajack Cave (3.6 miles away). Nickajack Cave is listed as a historical hibernaculum for Indiana bat, but nonetheless a Priority 2 cave for Indiana bat (USFWS 2007). The closest caves currently occupied by Indiana bats are 18.5 miles away (Jackson County, Alabama), and 15.5 miles away (Dade County, Georgia). Additionally, records from a bat blitz performed by the Alabama Bat Working Group October 7 to 11, 2013 include one Indiana bat captured at a cave entrance, approximately 21.6 miles away from the proposed ROW corridor. Although no caves have been found in the proposed ROW corridor, and the nearest documented cave is 0.7 mile from the proposed ROW, potentially suitable habitats for Indiana bats exist in the general area. Trees and shrubs in the project footprint offer potentially suitable habitats for foraging, while inundated wetlands and the Tennessee River offer nearby sources of water. Additionally, field surveys conducted on October 30, 2013 and April 7, 2014 determined that suitable summer roosting habitat exists in a section of upland forest along the proposed ROW and in a forested wetland along a proposed access road. The suitable summer roosting habitat that would be removed is approximately 2.1 acres in size.

The USFWS proposed the northern long-eared bat for federal listing as endangered in October 2013. In winter, this species roosts in caves or cave-like structures, while summer roosts are typically in cave-like structures as well as live and dead trees with exfoliating bark and crevices. They tend to forage within the mid-story and canopy of upland forests on hillsides and ridges (USFWS 2014). There are no known records of northern long-eared hibernacula from Marion County, Tennessee. The closest known winter hibernaculum for this species is from Armstrong Cave, 102.5 miles away, in Lawrence, Alabama. Bat Blitzes held by the Alabama Bat Working Group also reported summer survey captures of northern long-eared bats here in August 2008. However the closest known northern long-eared record is from a bat blitz at Big Coon Cave approximately 19.1 miles away in Jackson County, Alabama. As with the Indiana bat, foraging habitat exists in the proposed ROW over trees and forested areas. Available water sources for this species in the area include inundated wetlands and the Tennessee River. Suitable summer roosting habitat exists in a section of upland forest along the proposed ROW and also in a forested wetland along a proposed access road that would be converted to shrub-scrub by the proposed action.

3.7 Floodplains

A floodplain is the relatively level land area along a stream or river that is subjected to periodic flooding. The area subject to a one-percent chance of flooding in any given year is normally called the 100-year floodplain. EO 11988 (Floodplain Management) requires federal agencies to avoid to the extent possible the adverse impacts associated with modifications of the 100-year floodplain. As can be seen in Figure 1-1, the proposed 4-mile transmission line route would cross several floodplain areas associated with the Tennessee River as well as those streams listed in Sections 3.2 and 3.3.

3.8 Wetlands

Wetlands are those areas inundated by surface water or groundwater such that vegetation adapted to saturated soil conditions is prevalent. Examples include swamps, marshes, bogs, and wet meadows. Wetland fringe areas also are found along the edges of most watercourses and impounded waters (both natural and man-made). Field surveys were conducted in October 2013 and April 2014 to delineate wetland areas within the proposed transmission line corridor and associated access roads.

Wetland determinations were performed according to the USACE standards, which require documentation of hydrophytic (wet-site) vegetation, hydric soil, and wetland hydrology (USACE 2010; Environmental Laboratory 1987; USACE 2014; U.S. Department of Defense and USEPA 2003). Broader definitions of wetlands, such as those used by the USFWS (Cowardin et al. 1979) 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 (i.e., the TVA Rapid Assessment Method or "TVARAM") was used to categorize wetlands by their functions, sensitivity to disturbance, rarity, and ability to be replaced.

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

The proposed transmission line corridor runs southwest-northeast from South Pittsburg, crossing the Tennessee River, traversing a landscape dominated by agriculture but interspersed with forested uplands and naturalized lowlands, to the tap point on the Nickajack-Jasper-Raccoon Mountain (Tap to Tennol Section) 161-kV Transmission Line. Five wetland areas, totaling 3.38 acres, were identified within the proposed ROW (Table 3-4). An additional five wetlands were identified adjacent to proposed access roads, and a sixth 0.14-acre wetland would be traversed gaining access to the ROW.

Table 3-4. Wetlands in the Proposed Transmission Line ROW

Wetland Identifier	Wetland Type[1]	Wetland Acreage in ROW	Wetland Acreage in Access Road	Impacted Forested Wetland Acreage	TVARAM Category (Score)
W001	PEM/PSS1E/PUB3E	1.20	0.0	0.0	2 (46)
W002	PEM1E/PUB3E	0.37	0.0	0.0	2 (33)
W003	PFO1F	0.77	0.0	0.77	3 (61)
Access road 04; W008-AR	PFO1E	0.0	0.14	0.14	3 (61)
Access road 04; W007-AR	PFO1E	0.0	Adjacent[2]	0.0	3(61)
Access road 04; W006-AR	PFO1E	0.0	Adjacent[2]	0.0	3 (61)
Access road 03; W005-AR	PFO1E	0.0	Adjacent[2]	0.0	1 (19.5)
Access road 06; W004-AR	PSS1E	0.0	Adjacent[2]	0.0	1 (20)
W004	PEM/PSS1E	0.49	0.0	0.0	2 (44)
W005	PSS1F	0.55	0.0	0.0	2 (44)

Wetland Identifier	Wetland Type[1]	Wetland Acreage in ROW	Wetland Acreage in Access Road	Impacted Forested Wetland Acreage	TVARAM Category (Score)
Access road 10; W001-AR	PFO1E	0.0	Adjacent	0.0	1 (27)
	Total Acres:	**3.38**	**0.14**	**0.91**	

[1]Classification codes as defined in Cowardin et al. (1979): PEM1 = palustrine emergent, persistent vegetation; PFO1 = palustrine forested, broadleaf deciduous vegetation; PSS1 = palustrine, scrub-shrub, broadleaf deciduous; PUB = palustrine, unconsolidated bottom; suffix "E" = seasonally flooded/saturated; suffix "F" = semi-permanently flooded; suffix "H' = permanently flooded; suffix "3" = mud.
[2]Access road is immediately adjacent to a wetland.

Wetland W001 consists of a manmade pond receiving runoff from U.S. Highway 72 and surrounding landscape, a failing pond berm, and a lowland area immediately adjacent to the pond basin. W001 contains 1.20 acres within the ROW, but it extends north and south outside the ROW for an approximate 3- to 4-acre expanse. W001 exhibited hydric soils with upland inclusions and an inferred ephemeral hydrologic connectivity to the Tennessee River. However, this connectivity is not evident in the vicinity of the proposed ROW. W001 is located within the floodplain of the Tennessee River and is bound by a waste water treatment facility to the north, U.S. Highway 72 to the east, an upland slope to the west, and agricultural fields along the remaining boundaries. W001 contained a drained pond bottom consisting of mud substrate and was devoid of vegetation at the time of the site visit. Outside the ROW, the pond basin exhibited standing water. Along the pond periphery and extending west, hydrophytic scrub-shrub and emergent wetland vegetation was dominant and consisted of black willow, green ash, box elder, red maple, annual ivy, and asters.

W002 is a backwater farmed wetland depression within the floodplain of the Tennessee River that is surrounded by active agricultural fields on all sides. W002 contains 0.37 acres within the ROW, but it extends north and south for approximately 4 acres total. This area is shown as completely inundated on aerial photographs. At the time of the site visit, W002 exhibited drained soils with surface cracking, mud substrate, shallow (less than 1 inch) standing water in pockets, and hydric soils. Although this wetland was predominantly devoid of vegetation, the periphery was dominated by hydrophytic emergent species consisting of smartweeds and barnyard grass.

W003 is a superior-quality forested wetland complex associated with several large backwater depressions within the eastern floodplain of the Tennessee River. This wetland area is part of an approximate 100-acre wetland system receiving drainage from the surrounding landscape and feeding directly to the Tennessee River. W003 includes 0.77-acre within the ROW. The backwater depression containing W003 is paralleled by a similar and connected slough, which is crossed by access road 04. This parallel backwater depression was designated W008-AR and contains 0.14 acre within the access road footprint. The wetland finger extends north, adjacent to access road 04 and was designated W007-AR. At its northern terminus, it is crossed by access road 03, leaving a small portion of this drainage designated W006-AR north of access road 03, but culverted for maintenance of hydrological connection with the wetland system. This entire wetland system contained hydric soils and standing water with emerging swamp forest habitat. W003 contained ponded water with standing trees during the October site visit, much of which had diminished to mud bottom during the April site visit. Dominant hydrophytic vegetation consisted of red maple, sweetgum, American elm, and green ash.

Access road 03 is an existing gravel farm road. An additional forested wetland depression, W005-AR, was identified and mapped adjacent to access road 03. This wetland contained hydric soil indicators, standing water at the time of the site visit, and culverted drainage below access road 03 to a channelized ditch connected to the wetland complex associated with W003. This wetland was dominated by hydrophytic oak species along with buttercups and pathrush known to inhabit wetlands.

Along access road 06, a small, isolated, scrub-shrub depression was identified and designated W004-AR. A gas pipeline is located in the vicinity of this depression; therefore, no digging was performed, and no soil samples were examined for hydric indicators. However, standing water within the depression was visible at the time of the site visit, and dominant vegetation consisted of hydrophytic species such as black willow saplings.

W004 and W005 consist of emergent/scrub-shrub wetland habitat that crosses the ROW twice and connected via a wide drainage system to the southwest. W004 totals 0.49 acre, and W005 totals 0.55 acre within the ROW. However, the larger wetland area is approximately 5 acres in size. This wetland area is impacted by beaver, and retains water throughout the year. It receives inflow from the surrounding landscape and drains directly into the Tennessee River. Both wetland areas exhibit hydric soils. W004 consists of emergent wetland vegetation along the periphery of a farm field. This vegetation is dominated by bulrush, flatsedge, pathrush, and redtop panic grass. The scrub-shrub portion of W004 and all of W005 are dominated by young saplings consisting of American elm, black willow, green ash, red maple, and silver maple.

Access road 10 traverses a cattle pasture, crossing two drainages, one of which forms the outlet for a headwater wetland depression adjacent to access road 10 and mapped as W001-AR. This wetland depression is forested and has been heavily impacted by grazing cattle. The wetland soils contained hydric indications and standing water was present during the site visit draining across access road 10 via a wet-weather conveyance tributary to the Tennessee River. Wetland vegetation was dominated by cherrybark oak and sugarberry.

3.9 Aesthetics

3.9.1 Visual Resources

The physical, biological, and cultural features of an area combine to make the visual landscape character both identifiable and unique. Scenic integrity indicates the degree of unity or wholeness of the visual character. Scenic attractiveness is the evaluation of outstanding or unique natural features, scenic variety, seasonal change, and strategic location. Where and how the landscape is viewed affects the more subjective perceptions of its aesthetic quality and sense of place. Views of a landscape are described in terms of what is seen in foreground, 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 a mile and four 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.

At its western end, the proposed transmission line would traverse a commercial/industrial area containing a few residences. The proposed route would also cross near a retirement facility (the Bridge at South Pittsburg) and public housing on Hemlock Drive and Hemlock Lane before crossing over U.S. Highway 72. Structures in this portion of the proposed line route would be about 95 feet tall. However, a single lattice-steel tower structures located on each side of the Tennessee River crossing would be about 193 feet above the ground. That is, the 183-foot tall structure would be placed on a foundation 10 feet above grade. Because they are less than 200 feet tall, these structures would not be equipped with aviation warning strobe lights. However, the conductors across the river span would be fitted with red aviation warning spheres. A portion of the transmission line in this area, including the taller towers would be visible to travelers on U.S. Highway 72.

Much of the proposed transmission route east of the Tennessee River would cross agricultural lands, and few residences would be near the ROW. Thus, the line would not be generally visible except to residents on Rivers Landing Road and to traffic at the eastern end of the SR 156 Bridge over the Tennessee River.

3.9.2 Noise

There are no single, major sources of noise along the proposed transmission line route. Traffic on U.S. Highway 72 generates some ambient noise. Similarly, the Sequatchie Valley Railroad, which runs along the east side of South Pittsburg, produces occasional localized noise. This line connects to the CSX rail system and serves local manufacturing facilities. Local residents are acclimated to these recurring noises.

3.9.3 Odors

There are no known major sources of objectionable odors along the route or in the vicinity of the proposed transmission line. Local industries and manufacturing facilities may occasionally emit unusual odors. Generally, local residents have become acclimated to these odors.

3.10 Archaeological and Historic Resources

Federal agencies are required by Section 106 of the National Historic Preservation Act and by National Environmental Policy Act (NEPA) to consider the possible effects of their undertakings on historic properties. The term “historic property” includes any historic or prehistoric site, district, building, structure or object included in, or eligible for inclusion in, the National Register of Historic Places (NRHP). “Undertaking” means any project, activity, or program that has the potential to have an effect on a historic property and that is under the direct or indirect jurisdiction of a federal agency, or is licensed or assisted by a federal agency.

During the Section 106 process, the agency must consult with the appropriate SHPO, federally-recognized Native American tribes that have an interest in the undertaking, and any other party with a vested interest in the undertaking.

Based on a desktop review of the affected area, TVA recognized that the proposed actions have potential to affect any historic properties, such as archaeological sites or historic structures, that might be present and are listed in or eligible for listing in the NRHP. TVA defined the area of potential effects (APE) for archaeological resources as the proposed new transmission line ROW and all associated access roads. TVA defined the APE for architectural resources as a one-half mile radius surrounding the proposed new ROW, which represents the area within which the new structures would be clearly visible.

TVA contracted with Tennessee Valley Archaeological Research (TVAR) of Huntsville, Alabama to perform a Phase I cultural resources survey of the proposed new transmission line ROW to identify any NRHP-listed or –eligible cultural resources that may be present. Prior to initiating the survey, TVAR conducted background research at the Tennessee Historical Commission and Tennessee Division of Archaeology and found there are two previously recorded archaeological sites within the affected area: 40Mi116 and 40Mi161. During the field survey, both sites were investigated, although the survey was limited to the proposed 100-foot wide ROW. No evidence of 40Mi116 was identified, suggesting that the site does not extend into the affected area. Site 40Mi161 is extant and was recommended potentially eligible for listing in the NRHP under criterion D of 36 CFR Part 60 (research potential). In addition, seven previously unrecorded sites (40Mi306, 40Mi307, 40Mi308, 40Mi309, 40Mi310, 40Mi311, and 40Mi312) were identified within the ROW. Five of these sites are recommended ineligible for listing in the NRHP due to a lack of significant research potential. TVAR recommended sites 40Mi310 and 40Mi312 as potentially eligible for the NRHP under criterion D.

The historic architectural resources survey included the ROW and a half-mile radius surrounding the ROW. One previously recorded architectural resource, the South Pittsburg Historic District, was noted during the background study. This historic district had been determined eligible for the NRHP previously. The field study investigated the South Pittsburg Historic District, and also identified seven previously unrecorded architectural resources (identified by TVAR as HS-1 through HS-7). TVAR recommended all seven previously recorded architectural resources as ineligible for listing in the NRHP. TVAR recommends that the South Pittsburg Historic District remains eligible for listing in the NRHP.

Subsequently, TVA contracted with TVAR to perform a Phase I archaeological survey of the access roads portion of the APE. TVAR's background research at the Tennessee Historical Commission and Tennessee Division of Archaeology found there are two previously recorded archaeological sites within the proposed access roads: 40Mi157 and 40Mi94. Three previously unrecorded sites (40Mi313, 40Mi314, and 40Mi315) were identified within the proposed access roads, and three previously recorded sites (40Mi94, 40Mi117, and 40Mi157) were revisited. TVAR recommended that the portions of 40Mi313, 40Mi314, and 40Mi317 within the APE are ineligible for inclusion in the NRHP. Site 40Mi314 is located within the originally proposed access road 07 on the left descending bank of the Tennessee River. Sites 40Mi313 is located within the originally proposed access road 02 on the east side of the Tennessee River, and 40Mi117 is within the relocated access road 02. TVAR recommended that site 40Mi315 (also located within the originally proposed access road 07) is potentially eligible for the NRHP based on research potential. Site 40Mi94 was recommended eligible for the NRHP by Alexander (1991), who originally identified the site. TVAR's study did not contradict that evaluation but did identify an absence of archaeological deposits within the portion of the site that intersects the APE. TVAR recommended that site 40Mi157, located along originally proposed access road 02 on the right descending bank (south of 40Mi313), is potentially eligible for the NRHP. In sum, five archaeological sites that are potentially eligible for listing in the NRHP were identified by these surveys within the APE (40Mi157, 40Mi161, 40Mi310, 40Mi312, and 40Mi315). One NRHP-eligible historic district (South Pittsburg Historic District) was identified within the architectural APE. Table 3.10.1 summarizes these findings.

Table 3.10.1 Survey findings – Phase I Surveys

Site/property	Location	NRHP recommendation
40Mi94	AR06	Eligible
40Mi116		Ineligible
40Mi117	AR02-relocated	Portion within AR02 is ineligible
40Mi157	AR02-original	Potentially eligible
40Mi161		Potentially eligible
40Mi306		Ineligible
40Mi307		Ineligible
40Mi308		Ineligible
40Mi309		Ineligible
40Mi310		Potentially eligible
40Mi311		Ineligible
40Mi312		Potentially eligible
40Mi313	AR02-original	Ineligible
40Mi314	AR07	Ineligible
40Mi315	AR07	Potentially eligible
South Pittsburg HD	South Pittsburg	Eligible

TVA has consulted with the Tennessee SHPO pursuant to 36 CFR Part 800.4(d)(1), and federally-recognized Indian tribes to 36 CFR Part 800.3(f)(2), regarding the NRHP eligibility of the archaeological sites within the affected area and the South Pittsburg Historic District. The SHPO has agreed (by letters dated January 30, 2014 and June 10, 2014; Appendix A) that sites 40Mi161, 40Mi157, 40Mi310, 40Mi312, and 40Mi315 are potentially eligible for the NRHP and should be either avoided by ground disturbing activities or subject to Phase II testing (Appendix A). The SHPO also concurred with TVA's determinations that the following resources are all ineligible for listing in the NRHP: 40Mi116, 40Mi306, 40Mi307, 40Mi308, 40Mi309, 40Mi311, 40Mi313, 40Mi314, the portion of 40Mi317 within access road 02, and architectural resources HS-1 to HS-7. SHPO agreed further with TVA's finding that sites 40Mi94 and 40Mi116 do not extend into the affected area, and that the South Pittsburg Historic District remains eligible for listing. TVA received two responses from the United Keetoowah Band of Cherokee Indians in Oklahoma (emails dated January 24, 2014 and June 5, 2014), stating they have no comments or objections, but requesting to be notified if any human remains are discovered inadvertently during construction of the proposed transmission line (Appendix A).

Subsequent to the completion of these surveys, TVA elected to remove access roads 07 and 08 from the project and to move the location of access road 02. Due to this design change, sites 40Mi313 and 40Mi315 are no longer located within the affected area. A portion of 40Mi317 lies within access road 02.

3.11 Recreation, Parks, and Natural Areas

This section describes recreational and natural areas that are within the vicinity of the proposed project. Natural areas include ecologically significant sites; federal, state, or local park lands; national or state forests; wilderness areas; scenic areas; wildlife management areas; recreational areas; greenways; trails; Nationwide Rivers Inventory streams; and Wild and Scenic Rivers.

There are several developed outdoor recreation areas within 2 miles of the proposed new 161-kV Delivery Point and associated installations. These include boat launching ramps and shoreline fishing facilities located immediately below Nickajack Dam, Hidden Valley Golf course (located approximately 2 miles south of the proposed project), South Pittsburg

Municipal Park which includes picnic facilities and a boat launching ramp, and Loyd Park which includes ball fields, play courts and a swimming pool. A small boat ramp is located at the end of Ferry Road, east of U.S. Highway 72 in South Pittsburg. The South Pittsburg Municipal Park, located on the west bank of Guntersville Reservoir immediately upstream from the SR 156 bridge, is closest to the proposed transmission line which would pass along the opposite (east) bank of the reservoir and come within about 0.5 mile of the park.

The proposed transmission line would span the Tennessee River (i.e., the upper portion of Guntersville Reservoir) at TRM 417.5. As mentioned in Section 3.3, the Tennessee River downstream from Nickajack Dam (TRM 424.7) to the Tennessee-Alabama state line at TRM 416.5 is designated by the TWRA as a state mussel sanctuary.

As mentioned in Section 3.6.3, Nickajack Cave, a TVA Natural Area administered by the TWRA as a refuge for endangered gray bats, is located and immediately upstream of Nickajack Dam, approximately 3.6 miles from the proposed transmission line project.

The Nationwide Rivers Inventory (NRI), which is administered by the U.S. National Park Service, is a listing of more than 3,400 free-flowing river segments in the United States that are believed to possess one or more "outstandingly remarkable" natural or cultural values judged to be of more than local or regional significance. Federal agencies must seek to avoid or mitigate actions that would adversely affect one or more NRI segments. The Sequatchie River, which is listed on the NRI, joins the Tennessee River approximately 1.4 miles east of the proposed tap point. Other NRI streams in the vicinity include Big Fiery Gizzard Creek (over 7 miles from the project), Little Sequatchie River (approximately 6.5 miles away), and Sweden Creek (approximately 4 miles away). There are no designated Wild and Scenic Rivers within 50 miles of the proposed project.

3.12 Land Use and Prime Farmland

The proposed transmission line would connect to the proposed South Pittsburg 161-kV Substation, which would be constructed by SVEC. The land use in the vicinity of the planned substation and the proposed ROW route west of the Tennessee River is a mixture of commercial/industrial and residential areas. The ROW for the proposed route would be located within approximately 150 feet from a nursing home (i.e., the Bridge at South Pittsburg) and within 100 feet of a public housing project located on Hemlock Drive and Hemlock Lane.

The proposed 4-mile transmission line would be constructed on a 100-foot wide ROW occupying approximately 50 acres. From the point where the proposed transmission line crosses U.S. Highway 72 and before crossing the Tennessee River, the ROW would be located on a mixture of open and agricultural land containing narrow tree lines.

On the eastern side of the Tennessee River, the proposed ROW would cross land that is currently used primarily for agriculture. Some small woodlots are also found along the proposed route. The proposed route would pass approximately 650 feet to the east of five homes located on the waterfront on Rivers Landing Road.

Prime farmland is defined by the U.S. Department of Agriculture as land that has the best combination of chemical and physical characteristics for producing food, feed, forage, fiber, and oilseed crops. To be considered prime farmland it cannot be urban, built-up or covered by water. Concern regarding the conversion of prime farmland to urban or industrial use prompted the creation of the federal Farmland Protection Policy Act in 1981. This act

requires federal agencies to evaluate impacts to farmland prior to permanently converting the land to non-agricultural use.

Those areas in the vicinity of the project near the Tennessee River tend to have silty loam soils that have been deposited within the river's floodplains. Generally those areas having these alluvial soils with flat to generally rolling topography contain fertile soils, many of which are considered prime farmland soils. An analysis of Natural Resources Conservation Service (2014) soil maps indicated that the proposed transmission line would cross several areas containing prime farmlands.

3.13 Socioeconomics and Environmental Justice

The proposed transmission line project is located entirely in Marion County, Tennessee. As shown in Figure 1-1, the westernmost portion of the proposed line would be located in South Pittsburg. On the eastern side of the Tennessee River, the route of the proposed line would be located west and north of the dispersed community of New Hope.

As shown in Table 3-5, minorities tend to comprise a small component of the population, especially in the community of New Hope and in Marion County. The minority share within South Pittsburg is comparable to that of the state. Although the median earning for workers is higher in South Pittsburg than that of the state, per capita and household incomes in South Pittsburg tend to be slightly lower than those at the state level. Within Marion County, including South Pittsburg and New Hope, the percent of those considered to be below the poverty level is higher than the state level.

Table 3-5. Demographic and Socioeconomic Conditions in Marion County, Tennessee

Characteristic	South Pittsburg	New Hope	Marion County	Tennessee
Population Characteristics:				
Estimated 2010 population	2,992	1,082	28,237	6,346,105
Median age	42.6	42.8	42.3	38.0
White[1]	80.3%	97.1%	93.9%	77.6%
Black or African American[1]	16.6%	0.8%	3.6%	16.7%
Hispanic or Latino[2]	1.6%	0.4%	1.3%	4.6
Economic Characteristics[3]:				
Unemployed[4]	10.7%	4.9%	9.1%	9.8%
Median earnings for workers	$30,541	$27,177	$26,101	$27,054
Per capita income	$21,099	$21,503	$21,008	$24,294
Median household income	33,955	$45,625	$39,817	$44,140
Below poverty level (all families)	19.1%	14.5%	14.2%	13.0%
Below poverty level (all people)	23.7%	18.1%	19.2%	17.3%

Source: U.S. Census Bureau (2014)
[1]Estimates are based on those individuals considered to be of one race.
[2]Estimates are based on Hispanic or Latino heritage, regardless of race.
[3]Estimates are for 2008-2012
[4]Estimates are percent unemployed within the civilian labor force.

Industries located in South Pittsburg include the Shaw Industries Group and Lodge Manufacturing. Shaw Industries manufactures flooring products, and the South Pittsburg facility produces hardwood flooring material. In 2013 Shaw announced a planned $40 million expansion of its South Pittsburg flooring facility. The facility currently employs about 200 people. Lodge manufactures cookware, including a line of cast iron products. Lodge currently employs about 220 people at its foundry, four distribution centers, and sales outlets. Lodge is currently expanding its facilities in South Pittsburg. Beaulieu of America, which manufactures synthetic fibers for the carpet industry, has a large facility in nearby Bridgeport, Alabama.

3.14 Navigation

The proposed transmission line would cross Guntersville Reservoir at TRM 417.5. This site is at the upper reach of Guntersville Reservoir, approximately 7 miles downstream of Nickajack Dam.

Guntersville Reservoir was impounded in 1939 upon the completion of Guntersville Dam at TRM 349. Nickajack Dam was built at TRM 424.7 in 1967. Both reservoirs are links in the commercially navigable, 800-mile Tennessee River Waterway. The Tennessee River Waterway is an important part of the 12,000 mile National Inland Waterway, and supports national and international commerce.

According to the USACE's Lock Performance Monitoring System, commercial barge traffic through Nickajack Lock ranged from 2.4 million tons in 2010 to 3.0 million tons in 2012 (498 to 593 tows, respectively). Recreational boat traffic through Nickajack lock during the same time period ranged from approximately 1,500 boats in 2010 to 1,200 in 2012. Lock utilization studies show that in 2007 Nickajack lock was in use an average of 6.5 hours per day, seven days a week, with Fridays and Saturdays being the heaviest days for recreational boating traffic through the lock.

The U.S, Coast Guard, the federal entity that is responsible for marking the commercial navigation channel, maintains the red and green permanent buoys at TRM 417. These are the only navigation aids in the vicinity of the proposed transmission line crossing.

Two recreational boat launch ramps are located at the site of the old ferry on both sides of the reservoir at approximately TRM 418.2. Another public launch ramp is located immediately north of the SR 156 bridge at TRM 418.5. An abandoned commercial landing with two mooring cells is located immediately upstream of this boat ramp. A First Class Landing is located on the eastern shoreline immediately downstream of the SR 156 bridge from TRM 418.25 to 418.4. A First Class Landing is an area which provides a depth of at least 9 feet, even during low water periods. Other than these facilities, there are no commercial navigation facilities, such as barge terminals, located within 2 miles of the proposed crossing.

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CHAPTER 4 – ENVIRONMENTAL CONSEQUENCES

The potential effects of adopting and implementing the No Action Alternative and the Action Alternative on the various resources described in Chapter 3 were analyzed, and findings are documented in this chapter. The potential effects are presented by resource in the same order as in Chapter 3.

As stated in Section 2.1.1, under the No Action Alternative, TVA would not construct the proposed transmission line. Because the construction, operation, and maintenance of the proposed facilities would not occur under the No Action Alternative, no direct effects to those environmental resources listed in Chapter 3 are anticipated.

4.1 Groundwater and Geology

Potential impacts to groundwater could occur during construction if sediments from excavated materials enter or clog sinkholes or springs. During ROW maintenance, the transport of contaminants, such as herbicides and fertilizers, into sinkholes and other karst features can potentially cause adverse effects to groundwater quality.

4.1.1 No Action Alternative

Under the No Action Alternative, the transmission line would not be built. Thus, construction, operation, and maintenance activities that could have possible impacts on groundwater resources or local geological characteristics would not occur. Thus, no effects to groundwater resources or the local geological character are expected from adopting the No Action Alternative.

4.1.2 Action Alternative

Under the Action Alternative, BMPs as described in Muncy (2012) would be used during construction of the proposed transmission line, including clearing of the ROW, to avoid contamination of groundwater in the vicinity of the project. Thus, the transfer of sediments to groundwater would be avoided by the implementation of appropriate BMPs during construction activities.

During revegetation and maintenance activities, herbicides with groundwater contamination warnings would not be used, and the use of fertilizers and herbicides would be considered with caution before application, and they would be applied according to the manufacturer's label. TVA BMPs as described in by Muncy (2012) would be used to avoid contamination of groundwater. BMPs for herbicide and fertilizer application would be used and would prevent adverse effects to groundwater. BMPs would be used to control sediment infiltration from stormwater runoff. With the use of BMPs, any effects to groundwater quality from the proposed action would be minor. No cumulative impacts to groundwater resources are anticipated.

4.2 Surface Water

Soil disturbances associated with access roads or other construction activities can potentially result in adverse surface water quality impacts. Soil erosion and sedimentation can clog small streams and threaten aquatic life. 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, the construction activities and operation of the proposed transmission line that could affect local surface water quality would not occur. Thus, adoption of the No Action Alternative would not cause any direct effects to local surface water quality.

4.2.2 Action Alternative

TVA routinely includes precautions in the design, construction, and maintenance of its transmission line projects to minimize potential impacts to surface water. Permanent stream crossings that could not be avoided would be designed not to impede runoff patterns and the natural movement of aquatic fauna. Temporary stream crossings and other construction and maintenance activities would comply with appropriate state permit requirements and TVA requirements as described in Muncy (2012).

ROW maintenance would employ manual and low impact methods wherever possible. In areas requiring chemical treatment, only USEPA-registered herbicides would be used in accordance with label directions designed in part to restrict applications in the vicinity of 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 to surface water quality are anticipated.

4.3 Aquatic Ecology

Aquatic life can be affected 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 and associated access roads.

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 effects resulting from construction and maintenance include alteration of stream banks and stream bottoms by heavy equipment and by herbicide runoff into streams. Siltation has a detrimental effect on many aquatic animals adapted to riverine environments. Turbidity caused by suspended sediment can negatively impact spawning and feeding success of many fish and mussel species (Sutherland et al. 2002).

4.3.1 No Action Alternative

Under the No Action Alternative, the proposed transmission line would not be built. Thus, no changes to aquatic resources within the area of the proposed project would result from TVA's actions.

4.3.2 Action Alternative

TVA assigns appropriate SMZs and BMPs based on field evaluations and other considerations (such as State 303(d) impaired waters listing and presence of endangered or threatened aquatic species). Appropriate application of the BMPs can reduce the potential for impacts to water quality and in-stream habitat for aquatic organisms.

Watercourses that convey surface water only during storm events (such as wet-weather conveyances) and that could be affected by construction and maintenance of the proposed transmission line and access roads would be protected by the implementation of standard BMPs as identified in Muncy (2012). These BMPs are designed in part to minimize disturbance of riparian areas, and subsequent erosion and sedimentation that can be

carried to streams. TVA also provides additional categories of protection to watercourses based on the variety of species and habitats that exist in the streams, as well as the state and federal requirements to avoid harming certain species (Appendix D). The width of the SMZs is determined by the type of watercourse, primary use of the water resource, topography, or other physical barriers (Muncy 2012).

The watercourses identified in Table 3-1 that could be affected by construction and maintenance of the proposed transmission line would be protected by implementing Standard Stream Protection (Category A) SMZs as defined in Muncy (2012). This standard (basic) level of protection for streams and the habitats around them is intended to minimize the amount and length of disturbance to riparian areas, thereby avoiding or minimizing subsequent erosion and sedimentation to be carried to streams and water bodies.

Because appropriate BMPs and SMZs would be implemented during construction, operation, and maintenance of the proposed transmission line, any direct, indirect, or cumulative impacts to aquatic animals resulting from the proposed action would be minor.

4.4 Vegetation

Necessary clearing associated with transmission line construction, along with periodic vegetation management within the ROW to prevent the growth of tall woody vegetation could change the character of vegetation along the proposed ROW corridor. These changes would be most apparent in sections of the ROW that are currently forested.

4.4.1 No Action Alternative

Adoption of the No Action Alternative would not affect plant life in the area of the proposed ROW because no project-related work would occur. Changes to local plant communities resulting from natural ecological processes and human-related disturbance would continue to occur, but those changes would not result from the proposed project. All invasive species found in the project vicinity are common throughout the region, and implementation of the No Action Alternative would not change this situation.

4.4.2 Action Alternative

Adoption of the Action Alternative would affect the terrestrial ecology of the region to a minor extent. The conversion of forest land to managed ROW for construction of the proposed transmission line would be long term in duration, but would constitute a minor change in the amount of local forest cover. Adoption of this alternative would require clearing of approximately 14 acres of forest. However, these forested communities are common and well represented throughout the region. As of 2011, there were over 1.3 million acres of forest land in Marion County, Tennessee and the surrounding Alabama, Georgia, and Tennessee counties (U.S. Forest Service 2013). Cumulatively, project-related effects to forest resources would be negligible (0.0011 percent) when compared to the total amount of forest land occurring in the region.

Much of the area in the vicinity of the project currently has a large component of invasive terrestrial plants, and adoption of the Action Alternative would not noticeably affect the extent or abundance of these species at the county, regional, or state level. A few areas of relatively mature deciduous forest have a smaller component of invasive terrestrial plants. In these areas the use of TVA standard operating procedure of revegetating with noninvasive species (Muncy 2012) would serve to reduce the potential introduction and spread of invasive species in the project vicinity.

4.5 Wildlife

Various wildlife species can be affected directly by disturbance or displacement associated with transmission line construction and operation. Clearing of the proposed ROW would result in the loss of very small forest habitat, but could increase the amount of low-growing brushy habitat and edge habitat, thereby improving habitat for some species.

4.5.1 No Action Alternative

Under the No Action Alternative TVA would not construct the proposed transmission line. No land would be cleared for a ROW or access roads, soil would not be disturbed for the installation of transmission towers, and the transmission line would not be installed along the proposed ROW. Soil and vegetation would remain in place in their current state. Therefore, terrestrial animals and their habitats would not be affected under the No Action Alternative.

4.5.2 Action Alternative

Under the Action Alternative, TVA would clear vegetation within the proposed width of the ROW), soil would be disturbed and holes dug for the installation of transmission structures, and the transmission line would be installed along the proposed ROW. The ROW would be re-cleared and woody vegetation removed as needed to maintain proper clearance under the power lines. Due to urban expansion and agricultural practices, much of the area in the vicinity of the proposed ROW has been developed or turned into crop fields, while forested areas have been fragmented. Implementing the proposed action would displace wildlife using this habitat for the duration of project construction. However, many species would likely repopulate the area once project construction activities are complete. Beavers active in the project vicinity whose dams cause flooding within the proposed ROW would be removed by permitted authorities. Beavers are known to have high site fidelity, thus the physical removal of the beaver would be required to prevent repeated dam building and flooding.

Unanticipated direct effects to some individuals of other species that are unable to mobilize quickly may occur as a result of project activities. The disturbance in the area and removal of habitat would force wildlife to move to surrounding environments and attempt to reestablish territories, shelter, and find new food sources. If surrounding areas are already crowded, populations could be stressed by the influx of more individuals. However, similarly disturbed environments are common in areas surrounding the project site, and it is unlikely that these would be negatively impacted by the influx. In many areas along the proposed route, similar habitat exists immediately adjacent to the proposed ROW path; thus, dispersal distances would be minimal. Upon completion of the project, species that utilize early successional, herbaceous fields and edge habitat would repopulate the area. These species would incur occasional disturbance during routine clearing and maintenance actions, but disturbance would be temporary. The ROW itself would remain permeable to travel by most species. Implementing this alternative is expected to result in minor effects to terrestrial wildlife or their habitats.

4.6 Endangered and Threatened Species

As described in Section 3.6, endangered and threatened species often have fairly specific habitat requirements. Thus, many such species are susceptible to even minor changes in their habitats, including vegetative and physical changes, and disturbances from construction or maintenance activities.

4.6.1 No Action Alternative

Under the No Action Alternative, areas within the proposed transmission line ROW and access road corridors would remain in their current condition. Thus, no federally or state-listed aquatic or terrestrial animals or any plant species or their habitats in the vicinity of the proposed project would be affected directly by any TVA project-related actions. The status and conservation of any potentially affected listed species would continue to be determined by the actions of others. Changes to the local area would nonetheless occur over time, as factors such as population trends, land use and development, quality of air/water/soil, recreational patterns, and cultural, ecological, and educational interests change within the area.

4.6.2 Action Alternative

4.6.2.1 Aquatic Animals

The proposed transmission line would cross the Tennessee River at South Pittsburg at TRM 417.5. Because no work would occur within the river channel, there would be no direct impacts to any federal or state-listed aquatic species known from the Tennessee River (Guntersville Reservoir) in the vicinity of the proposed project.

Indirect effects to listed aquatic species could occur from increased siltation entering habitats from adjacent watercourses resulting from the clearing of riparian areas or soil disturbances associated with transmission line construction or maintenance activities at stream crossings. However, watercourses that convey surface water during only storm events (i.e., wet-weather conveyances) and that could be affected by the proposed transmission line route would be protected by implementing standard BMPs as identified in Muncy (2012). These BMPs are designed in part to minimize disturbance of riparian areas and subsequent erosion and sedimentation that can be carried to streams.

The one perennial stream (the Tennessee River) and an intermittent stream would be protected by implementing Standard Stream Protection (Category A) SMZ as defined in Muncy (2012). The width of the SMZs is determined by the type of watercourse, primary use of the water resource, topography or other physical barriers (Muncy 2012).

Because appropriate BMPs and SMZs would be implemented during construction, operation, and maintenance of the proposed transmission line, no impacts to federally or state-listed aquatic species are anticipated to occur.

4.6.2.2 Plants

Adoption of the Action Alternative would not affect federally or state-listed plant species because no individual plants or habitat capable of supporting listed species occur in the proposed ROW or along any proposed access roads. Project-related work would disturb plants currently growing on the site, but because no listed plant species occur there, no direct, indirect, or cumulative impacts to endangered and threatened plant species or designated critical habitat would result from implementing the Action Alternative.

4.6.2.3 Terrestrial Animals

Potential effects to eight terrestrial animal species (see Section 3.6.3) were assessed based on their documented presence within three miles of the proposed ROW corridor. Two of these species, the common raven and the Allegheny woodrat are highly unlikely to occur in the vicinity of the proposed project due to the lack of suitable habitat. Thus, potential effects to two species (barking treefrog and northern pinesnake) considered rare by the state of Tennessee, a federally protected species (bald eagle), two federally listed

species (gray bat and Indiana bat) known from the county, and one federally proposed endangered species thought to occur state-wide (i.e., the northern long-eared bat) were assessed.

Field reviews of the proposed ROW determined that suitable habitat exists for barking treefrog in and around wetlands with surrounding trees and tall emergent vegetation. Although wetland characteristics would be retained during and after construction of the transmission line by implementing BMPs (see Section 4.8.2), surrounding trees and tall vegetation totaling 0.91 acres would be permanently removed, thus rendering these areas relatively undesirable for this particular species. This loss of habitat would displace individuals currently using these wetlands to areas outside of the ROW or access roads, where they would need to reestablish territories and find shelter among already established individuals. Several of the wetlands that fall within the proposed ROW and along proposed access road 04 extend beyond the ROW totaling 5 acres. Therefore, most displaced individuals would need to travel only to immediately adjacent areas to find suitable habitat. Furthermore, implementation of BMPs would ensure these areas would remain permeable to individuals traveling across the affected areas. Implementation of the proposed action would result in minor effects to this species.

Habitat for the northern pinesnake exists in one forest fragment along the proposed transmission line route. The proposed actions would involve removing vegetation within the ROW, dividing this forest fragment into two smaller fragments. Forested habitat would be retained on either side of the ROW. Loss of habitat would displace any individuals currently using these 3.2 acres of forest. Individuals would need to reestablish territories and find shelter among already established northern pinesnakes occupying the forested areas that are located just outside of the ROW. Low-growing vegetation would be established in the ROW, making this area permeable to any individuals of this species traveling between remaining forested sections. Implementing the proposed action would cause minor effects to this species.

Suitable nesting habitat for bald eagles exists in trees bordering the Tennessee River and in mature trees throughout the proposed pathway of the new transmission line. Similarly suitable nesting habitat is abundant in the surrounding area. Several pairs of bald eagles have nested throughout the tail waters of Nickajack Dam within three miles of the proposed ROW, but none are known to have nested in the project footprint. A new, active bald eagle nest was observed 1.27 miles from the project in April 2014. This nest would not be impacted by project activities. In addition, no bald eagle nests or resident bald eagle pairs were observed within the proposed ROW corridor during field reviews in October 2013 and April, 2014. Thus, bald eagles would not likely be affected by implementing the proposed action.

Gray bats utilize caves year-round but leave the caves to forage at night. No caves are reported from the proposed transmission line corridor, and none were observed during field review of the project footprint. Hibernacula habitat for this species would not be affected by the proposed actions. The project activities would remove tall vegetation over several wetlands totaling 0.91 acres within the 50 acre project footprint; however, wetland function would be retained. Thus, these areas would remain functional as foraging habitat for gray bat. In fact, vegetation removal may increase the accessibility of these foraging areas to gray bats. In addition, the Tennessee River would also remain suitable foraging habitat despite construction activities over the river.

Research suggests that northern long-eared bats occupy similar habitat to Indiana bats, although northern long-eared bats appear to be more varied in their roost selections. No caves are reported from the immediate project area, and none were observed during field review of the 49 acre project footprint on October 30, 2013. Thus, hibernacula habitat for Indiana bat and northern long-eared bat would not be affected by the proposed actions. However, suitable summer roosting habitat for Indiana bat and northern long-eared bat was identified within the proposed ROW. One section of upland forest the proposed ROW has a strong white oak component within the array of hardwood canopy species and many snags with suitable exfoliating bark. The understory is open due to the presence of grazing cattle. Another section of forested wetland with a high concentration of snags was identified within access road 04. Approximately 2.1 acres of suitable summer roosting habitat for Indiana bat and northern long-eared bat would be removed by the proposed ROW clearing. In addition, forested areas, wetlands, and the Tennessee River offer suitable foraging habitat and sources of water for these two bat species within the project footprint. Vegetation clearing would remove some foraging habitat for these species. However, this habitat is plentiful in the area.

The number of suitable summer roost trees within the proposed project area and surrounding areas has led TVA to determine that this area could present suitable summer roosting habitat for Indiana and northern long-eared bats. TVA would removal of these trees between November 15 and March 31 to remove any potential for direct effects to Indiana and northern long-eared bats. Due to the relatively small areas of impact, the isolation of the patches across the landscape, and the abundance of similar habitat in the surrounding area, TVA determined that any indirect or cumulative effects to Indiana bat resulting from this action would be discountable. TVA has determined that the construction of this transmission line and associated access roads may effect, but would not likely adversely affect Indiana bats nor would the actions jeopardize the existence of the northern long-eared bat. Informal consultation with USFWS was initiated on July 2, 2014 (see Appendix A). This led to a Memorandum of Agreement between TVA and USFWS wherein TVA contributed $7,980 to Tennessee's Indiana Bat Conservation Fund for the removal of 2.1 acres of suitable Indiana bat summer roosting habitat. This fulfills TVA's obligations under the Endangered Species Act as documented in the August 8, 2014 e-mail from USFWS (Appendix A).

4.7 Floodplains

As a federal agency, TVA is subject to the requirements of EO 11988 (Floodplain Management). The objective of EO 11988 is "…to avoid to the extent possible the long- and short-term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative" (U.S. Water Resources Council 1978). The EO is not intended to prohibit floodplain development in all cases, but rather to create a consistent government policy against such development under most circumstances. The EO requires that agencies avoid the 100-year floodplain unless there is no practicable alternative.

4.7.1 No Action Alternative

Under the No Action Alternative, the proposed transmission line would not be constructed. Therefore, there would be no direct, indirect, or cumulative impacts to local floodplains or their functions because there would be no physical changes to the current conditions found within the local floodplains.

4.7.2 Action Alternative

Under the Action Alternative, the proposed transmission line and associated access roads would cross the 100-year floodplains of the Tennessee River and several streams in Marion County, Tennessee. Consistent with EO 11988, an overhead transmission line and related support structures are considered to be repetitive actions in the 100-year floodplain. The elevation of the transmission line would be located well above the elevation of the 100-year floodplain.

The construction of the support structures for the transmission line would not 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. Because the ROW would be revegetated with natural vegetation and appropriate BMPs would be used during construction, adverse impacts on natural and beneficial floodplain values would be minor.

Based on a review of the Marion County, Tennessee, Flood Insurance Rate Maps, all of access road 08 and portions of access roads 01, 02, 03, 04, 05, and 06 are located within 100-year floodplains. Consistent with EO 11988, roads are considered repetitive actions in the 100-year floodplain. To minimize the potential for adverse effects to floodplains, any road improvements would be conducted in such a manner that upstream flood elevations would not be increased.

Based upon implementation of the above mitigation measures, the proposed South Pittsburg delivery point would have only minor, if any, impacts to floodplains.

4.8 Wetlands

Activities in wetlands are regulated under Sections 401 and 404 of the Clean Water Act and are addressed by EO 11990 (Protection of Wetlands). Section 401 requires water quality certification by the state for projects permitted by the federal government (Strand 1997). Activities resulting in the discharge of dredge or fill into waters of the United States require authorization through a Nationwide General Permit or Individual Permit issued by the USACE under Section 404 of the Clean Water Act. EO 11990 requires federal agencies to minimize wetland destruction, loss, or degradation, and preserve and enhance natural and beneficial wetland values, while carrying out agency responsibilities.

4.8.1 No Action Alternative

Under the No Action Alternative no project-related disturbance to wetlands within the project footprint would occur. Therefore, no wetlands would be affected. Changes to wetlands could nonetheless occur over time as other factors such as population trends, land use and development, quality of air/water/soil, recreational patterns, and cultural, ecological, and educational interests change within the area.

4.8.2 Action Alternative

Under the Action Alternative, the proposed transmission line would be constructed. Some wetlands located within the proposed ROW would be spanned by the transmission line, thus allowing emergent and scrub-shrub wetlands to continue functioning in the same capacity as current conditions. However, as described in Section 2.2.1.1, adequate clearance between tall vegetation and transmission line conductors would require trees within the proposed ROW to be cleared. As a result, implementing the Action Alternative would involve tree clearing and conversion of 0.91 acre of superior-quality forested wetland to emergent to scrub-shrub wetland habitat (Table 3-4) within W003 and W008-AR.

Additionally, placement of guy anchors would be necessary in W008-AR for structure support, and one structure would be placed within W001.

Within W001, a minor loss of wetland function is anticipated due to the combination of a nominal amount of fill required for structure placement and the existing moderately low quality/condition of this wetland area and moderately low provision of wetland functions. A total of 0.91 acre of forested wetland within W003 and W008-AR would be converted to scrub-shrub/emergent wetland, with nominal fill in W008-AR to accommodate guy anchor placement. These actions within wetlands would fall within the parameters of USACE Nationwide Permit 12 for Utility Line Activities with no pre-construction notification unless triggered by other actions included in this single and complete project or as deemed necessary by the USACE in its discretion.

In compliance with the Clean Water Act, NEPA, and EO 11990, TVA has considered all alternatives to avoid and minimize wetland impacts, resulting in the least wetland disturbance practicable. Wetland 003 and W008-AR are part of a larger wetland which totals nearly 100 acres. Therefore, the functional capacity of the wetland area at-large would not be detrimentally affected by the conversion of less than 1 percent to non-forested wetland habitat. TVA would minimize wetland disturbance via no-mechanized clearing in wetlands, use of mats during clearing and construction activities, minimization of rutting to reduce soil compaction, and adherence to wetland BMPs (Muncy 2012) for any and all other work necessary within the delineated wetland boundaries. With these efforts in place, no major direct or indirect wetland impacts are anticipated as a result of constructing the proposed transmission line corridor and associated ROW.

Cumulative impact analysis of wetland effects takes into account wetland loss and conversion at a watershed-level scale. Proposed wetland impacts are considered minor on a cumulative scale due to the avoidance and minimization measures in place. Therefore, no cumulative wetland impacts are anticipated as a result of the proposed new transmission line construction project.

4.9 Aesthetics

Visual consequences were examined in terms of visual changes between the existing landscape and proposed actions, sensitivity of viewing points available to the general public, their viewing distances, and the 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.

4.9.1 No Action Alternative

Under this alternative, the visual character of the proposed transmission line route and the immediate area would likely remain virtually unchanged, at least for the foreseeable future. However, some visual changes could occur over the long term due to residential or commercial development. Likewise, no changes in local ambient noise levels or new sources of odors are likely to occur within the foreseeable future under the No Action Alternative. Nevertheless, any changes in aesthetic character of the area would not result from TVA's proposed action.

4.9.2 Action Alternative

4.9.2.1 Visual Resources

Under the Action Alternative, a new transmission line would be constructed beginning at SVEC's planned substation in South Pittsburg, Tennessee and ending with a tap point in TVA's Nickajack-Jasper-Raccoon Mountain 161-kV Transmission Line.

On the western side of the Tennessee River, the new transmission line would be visible to some local residents, particularly those in the Bridge at South Pittsburg nursing home and residents on Hemlock Drive and Hemlock Lane. The proposed line would span U.S. Highway 72, and would be visible to local motorists on this highway. Similarly, the segment of the proposed line that spans the Tennessee River would be visible to motorists on U.S. Highway 72, as well as some local residents and motorists, due to the height of the support structures (193 feet above grade, including the foundations) at each end of the span. However, because the local surroundings in this area are a mixture of residential, commercial, and industrial, the presence of the new line would tend to blend into the local visual character.

On the eastern side of the river, the proposed transmission line would be visible to motorists on SR 156, mainly where it would cross SR 156. Immediately south of SR 156, the proposed route would parallel a property line approximately 500 feet from a row of five homes located on Rivers Landing Road. Residents in this area would have foreground views of the proposed transmission line across their back lawns.

For the remainder of the proposed transmission line route, the line would cross several agricultural areas and scattered woodlots. Views of the line in these areas would tend to be intermittent and generally in the middleground.

In general, motorists along local roads, area residents, and patrons to commercial districts would notice a minor cumulative change in the landscape from the presence of new structures and lines. For some residents, these views would be in the foreground. However, as these distances increase, details become weak and visually indistinct.

Operation, construction, and maintenance of the proposed transmission line would be visually insignificant. There may be some minor cumulative 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 existing and proposed ROW and laydown areas have been restored through the use of TVA standard BMPs (Muncy 2012). Therefore, any visual impacts anticipated as a result of this project would be minor.

4.9.2.2 Noise and Odors

During construction of the proposed transmission line, equipment could generate noise above ambient levels. Because of the short construction period, noise-related effects are expected to be temporary and minor. For similar reasons, noise related to periodic line maintenance is also expected to be minor. As described in Section 4.15.1, transmission lines may also produce noise during operation under certain atmospheric conditions. Off the ROW, this noise is below the level that would interfere with speech. Construction and operation of the transmission line are not expected to produce any noticeable odors.

4.10 Archaeological and Historic Resources

A project may have effects on a historic property that are not adverse if those effects do not diminish the qualities of the property that identify it as eligible for listing on the NRHP. However, if the agency determines (in consultation with the SHPO) that the undertaking's effect on an historic property within the APE would diminish any of the qualities that make the property eligible for the NRHP, the effect would be considered adverse. Examples of adverse effects include ground disturbing activity in an archaeological site or erecting structures within the viewshed of a historic building in such a way as to diminish the building's historic setting.

4.10.1 No Action Alternative

Under the No Action Alternative, there would be no foreseeable direct, indirect, or cumulative impacts to historic or archaeological resources because there would be no changes within the APE of the proposed project. However, changes to cultural resources may possibly occur over time, independently of TVA's actions, due to factors such as population increases, changes in land use, and the potential for development to occur in the area.

4.10.2 Action Alternative

Under TVA's original design, the five archaeological sites that are potentially eligible for the NRHP (40Mi157, 40Mi161, 40Mi310, 40Mi312, and 40Mi315) would be directly impacted by construction and maintenance of the South Pittsburg 161-kV Transmission Line. However, TVA has avoided effects to all five sites through design changes, detailed below. TVA and SHPO agreed that NRHP-eligible site 40Mi94 and potentially eligible site 40Mi117 would not be affected by the project. TVA and SHPO also agreed that the NRHP-listed South Pittsburg Historic District would be affected by the undertaking, but that the effect would not be adverse.

TVA avoided 40Mi157 by moving access road 02 to a location further east, outside the site boundaries. Potentially eligible site 40Mi157 and ineligible site 40Mi313 are no longer located within the affected area. Similarly, upon field identification of 40Mi315, TVA removed access road 07 from the project such that potentially eligible site 40Mi315 is no longer located within the affected area. The change in location of access road 02 resulted in 40MI117 being within access road 02. However, TVA finds that the portion of 40Mi117 within access road 02 lacks integrity and that the planned use of access road 02 would not have an adverse effect on the site. The SHPO agreed with this finding in their letter dated June 10, 2014 (see Appendix A).

TVA avoided effects to 40Mi161 by redesigning the placement of proposed tower structure 622, which had originally been located within the site boundary. As a result of this redesign, proposed structure 622 would be installed outside the boundaries of that site. No access road would cross the site boundary, no vegetation would be cut within the access road, and wetland mats would be deployed within the access road during construction. Should it become necessary to cut vegetation on the river bank in the future in order to meet clearance requirements, TVA would cut the vegetation using methods that avoid ground disturbance and would stabilize the river bank to prevent erosion. TVA finds that the proposed actions would have no effects on 40Mi161 provided that TVA follows these conditions. The SHPO agreed with this finding in their letter dated April 24, 2014 (see Appendix A).

TVA avoided effects to site 40Mi310 by redesigning the project such that proposed structures and the associated access road are located outside the site boundary, in areas in which the archaeological survey identified no archaeological deposits. No physical work would be performed within the boundaries of this site. Thus, TVA finds that the proposed actions would have no effects on 40Mi310, given these conditions. The SHPO agreed with this finding by letter dated April 24, 2014 (see Appendix A).

Although 40MI312 is within the proposed TL ROW, no transmission line structures would be erected within the site boundary. TVA would minimize impacts to the site from construction and future maintenance activities by utilizing an existing dirt road that bisects this site, and by placing restrictions on vegetation maintenance. Vegetation clearing would be performed using the existing access road, during times of dry and firm ground, and would use either low ground pressure equipment or wetland mats within the site boundary. TVA finds that these restrictions would sufficiently minimize any effect that the undertaking would have on 40Mi312. SHPO agreed by letter dated January 30, 2014 (Appendix A).

TVA has avoided project effects to 40Mi315 by deleting access road 07 from the undertaking. The proposed access road would not be used and no work would take place within the site boundaries. SHPO agreed (by letter dated June 10, 2014) with this avoidance plan.

Although site 40Mi94, which was determined eligible for the NRHP by TDOT (Alexander 2001), is located within access road 06, TVA finds that the portion of the site intersected by access road 06 does not possess the qualities that make the site eligible. Therefore, TVA finds that the proposed undertaking would have no adverse effects on site 40Mi94.

Although TVAR recommended site 40Mi117 potentially eligible for listing in the NRHP, and the relocated access road 02 intersects the site, TVA and SHPO have agreed that the use of this access road would not affect the site (see Appendix A). Therefore, no avoidance or minimization measures are needed at this site.

In sum, SHPO agreed (see letters dated April 24, 2014 and June 10, 2014 in Appendix A) that TVA's proposed avoidance and minimization measures adequately address potential project effects to the potentially eligible archaeological sites and that the undertaking would not affect NRHP-listed or –eligible archaeological resources within the APE.

TVA finds that the proposed undertaking would not have an adverse effect on the South Pittsburg Historic District. The project is situated 0.37 mile from the historic district in an area that has been compromised by modern commercial and residential development and a substation. In addition, direct lines of sight from the historic district to the project are largely obstructed by a combination of rolling terrain and mature tree growth. SHPO did not disagree with TVA's finding in its letter dated January 30, 2014 (see Appendix A).

Determinations of potential effects to historic resources are summarized below in Table 4-1.

Table 4-1. Summary of Consequences to Cultural Resources

Resource	NRHP Eligibility Determination	Project Effects (Initial finding)	Resolution	SHPO Response
40Mi94	Eligible (Alexander 2001)	Portion within access road 06 not affected	N/A	Concurrence 6/10/2014
40Mi116	Ineligible	N/A	N/A	Concurrence 1/30/2014
40Mi117	Portion of site within APE is ineligible	No effects	N/A	Concurrence 6/10/2014
40Mi157	Potentially eligible	Affected by access road 02	Access road 02 moved; site no longer in affected area	Concurrence 6/10/2014
40Mi161	Potentially eligible	Affected by Structure 622 (tower)	Structure moved; site no longer in affected area	Concurrence 4/24/2014
40Mi306	Ineligible	N/A	N/A	Concurrence 1/30/2014
40Mi307	Ineligible	N/A	N/A	Concurrence 1/30/2014
40Mi308	Ineligible	N/A	N/A	Concurrence 1/30/2014
40Mi309	Ineligible	N/A	N/A	Concurrence 1/30/2014
40Mi310	Potentially eligible	Affected by structures 620, 621 (poles)	Structures and Access road 04 moved; site no longer in affected area	Concurrence 4/24/2014
40Mi311	Ineligible	N/A	N/A	Concurrence 1/30/2014
40Mi312	Potentially eligible	Affected by access	Utilize existing access and restrictions on vegetation maintenance	Concurrence 1/30/2014
40Mi313	Ineligible	N/A	N/A	Concurrence 6/10/2014
40Mi314	Ineligible	N/A	N/A	Concurrence 6/10/2014
40Mi315	Potentially eligible	Affected by access road 07	Access road 07 removed; site no longer in affected area	Concurrence 6/10/2014
South Pittsburg Historic District	Listed	Non-adverse visual effect	N/A	Concurrence 1/30/2014

4.11 Recreation, Parks, and Natural Areas

Potential effects to recreational resources, including natural areas, tend to be indirect in nature and are frequently related to a reduction in the aesthetic qualities of the particular site due to nuisances, such as noise or dust during construction. Additionally, long-term effects can occur if the natural character of the facility or site is adversely affected by the presence of non-natural views or activities.

4.11.1 No Action Alternative

Under the No Action Alternative, the proposed transmission line project would not be undertaken. Therefore, no impacts to natural areas are anticipated should the No Action Alternative be selected.

4.11.2 Action Alternative

The proposed project would not intersect any recreation assets within the affected area. Other than the proposed project being visible from the river and from recreation amenities within an approximately 2-mile radius, the project does not have known or anticipated adverse effects to recreation or educational uses along its length or to the users of the recreation areas.

One designated natural area, the Guntersville Reservoir State Mussel Sanctuary, would be spanned by a section of the proposed transmission line. However, no support structures would be constructed within the channel of the Tennessee River. Appropriate BMPs would be implemented during construction of the proposed transmission line. Spanning of the Tennessee River and the Guntersville Reservoir State Mussel Sanctuary would not alter mussel habitat. No other managed areas or sites occur in the vicinity of the proposed construction activities. Thus, no noticeable effects to natural areas are anticipated under the Action Alternative.

South Pittsburg Municipal Park is located approximately 1 mile north of the proposed river crossing. The boat ramp located at Ferry Road is approximately 3,300 feet from the river crossing. Construction associated with the river crossing would be of short duration. Thus, because of the intervening distance between the proposed crossing location and local recreational boat ramps and other recreational facilities, any effects to local recreational opportunities, either formal or informal, are expected to be temporary and minor.

The Sequatchie River mouth, which is listed on the NRI, is located approximately 1.4 miles east of the proposed tap point. The proposed transmission line would have no direct, indirect or cumulative effects to this NRI stream due to the distance and intervening topography. No Wild and Scenic Rivers would be affected because none are located within 50 miles of the proposed project.

4.12 Land Use and Prime Farmland

The proposed transmission line would require a ROW that is approximately 4 miles long and 100 feet wide. Thus, the proposed ROW would occupy approximately 50 acres. As discussed in Section 2.2.1.1, TVA establishes a long-term easement with the appropriate property owners. The, establishment of a transmission line ROW does not necessarily change existing land use of a property or preclude its current use, although certain restrictions apply.

4.12.1 No Action Alternative

Under the No Action Alternative, the proposed transmission line would not be constructed. Thus, no new ROW would be cleared to accommodate the proposed line. No changes in current land uses along the existing ROW are anticipated within the foreseeable future under the No Action Alternative. Thus, implementation of this alternative is not expected to directly cause any effects to current land uses or to any prime farmlands.

4.12.2 Action Alternative

On the west side of the Tennessee River, the proposed ROW was routed in a manner to avoid conflicts with existing residential properties. Most of the proposed route crosses land currently used for commercial or industrial purposes, and future land uses are likely to be commercial or industrial.

On the eastern side of the Tennessee River, the transmission line would cross land that is mostly open. Approximately 14 acres of forested area would be cleared for the ROW segment on the east side of the Tennessee River.

As a term of the ROW agreement between TVA and the landowner, structures are prohibited within the ROW. Construction and operation of the proposed transmission line would not preclude the continued use of land within the ROW for agricultural uses or the conversion of the land use within the ROW to agriculture. Because existing agricultural activities could continue within the proposed ROW corridor, any effects to prime farmlands under the Action Alternative would be incidental and minor.

4.13 Socioeconomics and Environmental Justice

4.13.1 No Action Alternative

Under the No Action Alternative, no land or property easements for locating the proposed transmission line would be purchased by TVA, and TVA would not build the proposed transmission line. Over time, increasing power loads caused by commercial and industrial growth in the area could eventually result in overloads on TVA's existing Jasper-South Pittsburg 69-kV Transmission Line, as well as associated electrical transmission equipment. This could cause a loss of reliability of the local electrical power transmission system and possible power outages. In that case, local industries, businesses, and residences would be negatively affected by the lack of an adequate and reliable power supply. Particularly, local industries that consume large amounts of electric power would be affected directly and would be unable to plan for future expansion. Poor power reliability would make the area unattractive to new industry and existing industry may look for other locations.

4.13.2 Action Alternative

Construction of the proposed transmission line would require the purchase of approximately 50 acres of easements on privately-owned property. Those easements would give TVA the right to locate and operate the proposed transmission line on the subject properties. Current landowners would be compensated for these rights. The direct local economic effect from these transactions would be minor. Implementing the proposed action would accommodate anticipated increases in power loads in the area and would ensure an adequate supply of power for local industries and commerce. Therefore, there would be some long-term economic benefits to the area from implementing the Action Alternative.

In the vicinity of the proposed South Pittsburg Substation, the proposed transmission line would be located near a retirement facility and a public housing facility. Because the

proposed transmission line is not expected to have a direct or indirect effect on the economic wellbeing of the residents of these two facilities, the construction, operation, and maintenance of the proposed transmission line would not disproportionally affect any economically disadvantaged or minority populations.

4.14 Navigation

The proposed transmission line would cross the Tennessee River at TRM 417.5. Thus, potential effects to navigation on the Tennessee River, primarily in the form of delays of commercial barge traffic, could occur from the construction of the line. The potential to affect recreational boating is much less, due to the ability of small boats to maneuver around obstacles and their ability to utilize other locations for access to the river.

4.14.1 No Action Alternative

Under the No-Action Alternative, the proposed transmission line would not be constructed. Thus, no effects to navigation from the transmission line crossing or the access roads are anticipated.

4.14.2 Action Alternative

Under the Action Alternative, a crossing of the Tennessee River would occur at TRM 417.5. Foreseeable potential environmental consequences under the Action Alternative are limited to the minimum clearances of transmission lines required for navigation safety. Because none of the access roads involve crossing the river channel, there would be no effects to navigation from the construction of the access roads.

The river crossing would be designed according to design standards and not interfere with commercial navigation. Construction activities at the river crossing are expected to last two or three days, depending on weather conditions. Because the conductors would have sufficient clearance to avoid interference with commercial river traffic and because precautionary measures would be taken to warn local boaters, any effects to commercial navigation or recreational boating are expected to be minor.

4.15 Post-Construction Effects

4.15.1 Electric and Magnetic Fields

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

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

Magnetic fields can induce currents in conducting objects. Electric fields can create static charges in ungrounded, conducting materials. The strength of the induced current or charge under a transmission line varies with: (1) the strength of the electric or magnetic

field, (2) the size and shape of the conducting object, and (3) whether the conducting object is grounded. Induced currents and charges can cause shocks under certain conditions by making contact with objects in an electric or magnetic field.

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

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

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

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

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

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

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

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

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

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

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

4.15.1.1 No Action Alternative

Under the No Action Alternative, no new EMFs would be created from the construction of the proposed transmission line. However, over time, the electrical loading on existing portions of TVA's local transmission system would likely increase. This could result in increases in somewhat stronger EMFs being produced along these lines. However, because these increases would be minor, any EMF-related effects are also expected to be minor.

4.15.1.2 Action Alternative

EMFs would be produced along the length of the proposed transmission line. The strength of the fields within and near the ROW varies with the electric load on the line and with the terrain. Nevertheless, EMF strength attenuates rapidly with distance from the line and is usually equal to local ambient levels at the edge of the ROW. Thus, public exposure to EMFs would be minimal, and any resultant effects from EMFs would be minor.

4.15.2 Lightning Strike Hazard

TVA transmission lines are built with overhead ground wires that lead a lightning strike into the ground for dissipation. Thus, a safety zone is created under the ground wires at the top of structures and along the line, for at least the width of the ROW. The 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.

4.15.3 Transmission Structure Stability

The steel pole structures, similar to those shown in Figure 2-1 that would be used on the proposed 161-kV transmission line are the result of detailed engineering design and have been used by TVA for over 70 years with an exceptional safety record. Many structures of this type have been in service for more than 60 years with little maintenance necessary other than painting or minor repair of some of the steel members. These structures have demonstrated a good safety record. They are not prone to rot or crack, like wooden poles, nor are they subject to substantial storm damage due to their low cross-section in the wind. 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.

The lattice-steel tower structures that would be used to cross the Tennessee River have been used for river crossings and heavy-duty applications for over 50 years (originally designed in 1961). These new towers would be installed on concrete footings that would place the bottom of the tower steel above the 100-year floodplain elevation. Because the tower steel would not be subject to groundwater or flood damage, maintenance would be minimal and only subject to routine inspections.

4.15.4 Other Impacts

No significant impacts to air quality and solid waste are expected to result from the relatively short-term activities of construction. Appendix C contains procedures for dealing with these issues.

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

4.16 Long-Term and Cumulative Impacts

Installation of the proposed transmission line, especially the placement of the tall structures on each side of the Tennessee River, would cause the visual character of the immediate area to be more industrial in nature and contribute to a minor cumulative loss of the local rural and historic character of the South Pittsburg area.

Implementation of the proposed action would create an additional source of electric power to the South Pittsburg area. This additional power would accommodate projected power demands for the foreseeable future and could, perhaps, facilitate future commercial and industrial growth in the local area.

4.17 Unavoidable Adverse Environmental Impacts

As previously stated, the construction, operation, and long-term maintenance of the proposed transmission line would cause some unavoidable adverse environmental effects. These are summarized below.

- Construction of the proposed transmission line could temporarily result in a small amount of localized siltation.
- Clearing and construction would result in the disruption and/or loss of some wildlife, and the long-term loss of about 14 acres of forested wildlife habitats.
- The proposed project would result in the direct loss of 2.1 acres of potential bat roosting trees, which involves potential summer roosting habitat for the northern long-eared bat and the Indiana bat.
- Any burning of cleared material would result in some short-term air pollution.
- Construction of the proposed transmission line would result in a minor amount of fill in wetland W001 for the placement of a transmission structure and the conversion of 0.91 acre of forested wetland to a scrub-shrub/emergent wetland.
- The proposed transmission line would result in minor, long-term visual effects on the landscape in the immediate local area.

4.18 Relationship of Short-Term Uses and Long-Term Productivity

The approximately 50 acres of land within the ROW of the proposed transmission line would be committed to use for electrical system needs for the foreseeable future. The property within the proposed ROW is primarily used for agriculture and forested land. Although agricultural land uses are acceptable within the proposed ROW this land could not be used for forestry. These losses of long-term productivity with respect to timber production and as wildlife habitat are minor both locally and regionally.

4.19 Irreversible and Irretrievable Commitments of Resources

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

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

The ROW for the proposed transmission line would occupy approximately 50 acres, and approximately 14 acres of forest land would be cleared for the ROW. Thus, changes in the characteristics of wildlife habitat and wetlands and in forest resources would be most pronounced in those areas where clearing is required. The use of this acreage for the transmission line ROW would constitute an irretrievable commitment of some onsite resources, such as wildlife habitat, forest resources, and wetlands in that the approximate previous land use and land cover could be returned upon retirement of these facilities. In the interim, compatible land uses within the transmission line ROW could, and likely, would continue for the foreseeable future.

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4.20 NEPA Project Management

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4.21 Other Contributors

Nicole Cate Berger, P.E.

Position	Supervisor, Navigation Program
Education	B.S., Civil and Environmental Engineering; M.S., Engineering Management
Experience	15 years in Water Resources Engineering; 1 year in Civil Design Engineering
Involvement	Navigation

W. Nannette Brodie, CPG

Position	Senior Environmental Scientist
Education	B.S., Environmental Science; B.S., Geology
Experience	16 years in Environmental Analyses, Surface Water Quality, and Groundwater/Surface Water
Involvement:	Groundwater

Kimberly D. Choate

Position	Manager, Transmission Siting
Education	B.S. and M.S. Civil Engineering
Experience	26 years in Civil Engineering, Environmental Engineering, NEPA Preparation, Project Management, and Manager of Siting Engineers
Involvement:	Document Review

Stephen C. Cole

Position:	Contract Archaeologist
Education:	Ph.D., Archaeology; M.A. and B.A., Anthropology
Experience:	10 years in Cultural Resources; 4 years teaching at university level
Involvement:	Cultural Resources Compliance

Patricia B. Cox

Position:	Botanist, Specialist
Education:	Ph.D., Botany (Plant Taxonomy and Anatomy); M.S. and B.S., Biology
Experience:	31 years in Plant Taxonomy; 9 years in Rare Species Monitoring, Environmental Assessment, and NEPA Compliance
Involvement:	Threatened and Endangered Species Compliance, Invasive Plant Species, and Terrestrial Ecology

Patricia Bernard Ezzell

Position:	Specialist, Native American Liaison
Education:	M.A., History with an emphasis in Historic Preservation; B.A., Honors History
Experience:	26 years in History, Historic Preservation, and Cultural Resource Management; 11 years in Tribal Relations
Involvement:	Tribal Liaison

Andrew R. Henderson

Position:	Aquatic Endangered Species Biologist
Education:	M.S. Fisheries; B.S. Fisheries
Experience:	10 years in Imperiled Aquatic Species; 5 years in Aquatic Threatened and Endangered Species
Involvement:	Aquatic Threatened and Endangered Species

John M. Higgins, P.E.

Position:	Water Quality Specialist
Education:	Ph.D., Environmental Engineering; M.S., B.S., Civil Engineering
Experience:	41 years in Environmental Engineering and Water Resources Management
Involvement:	Surface Water

Charles S. Howard

Position:	Aquatic Endangered Species Biologist
Education:	M.S., Zoology; B.S., Biology
Experience:	20 years in Aquatic Ecology Research, Impact Assessment, and Endangered Species Conservation
Involvement:	Threatened and Endangered Aquatic Species

Justin H. Kleinfeld, P.E.

Position:	Senior Engineer, Transmission Engineering
Education:	B.S., Electrical Engineering
Experience:	5 years with TVA, 5 years in Transmission Engineering
Involvement:	Project Need, Project Justification, Electrical Alternatives and Document Review

Todd C. Liskey

Position:	Environmental Program Manager
Education:	M.B.A.; B.S., Civil Engineering
Experience:	20 years in Engineering associated with Environmental Compliance and Transmission Siting; Preparation of Environmental Review Documents
Involvement:	Project Coordination, Purpose of and Need for Action, Alternatives including the Proposed Action

Britta P. Lees

Position:	Wetlands Biologist
Education:	M.S., Botany-Wetlands Ecology Emphasis; B.A., Biology
Experience:	13 years in Wetlands Assessments, Botanical Surveys, Wetlands Regulations, and/or NEPA Compliance
Involvement:	Wetlands

Carrie C. Mays, P.E.

Position:	Civil Engineer, Flood Risk
Education:	M.S., Civil Engineering; B.S., Civil Engineering
Experience:	10 years in Compliance Monitoring and Reservoir Water Quality; 4 years in River Hydraulics
Involvement:	Floodplains

Robert A. Marker

Position:	Recreation Specialist
Education:	B.S. Outdoor Recreation Resources management
Experience:	40 years in Outdoor Recreation resources Planning and Management
Involvement:	Recreation

W. Chett Peebles, ASLA

Position:	Landscape Architect
Education:	Bachelor of Landscape Architecture
Experience:	24 years in Site Planning, Design, and Scenic resource Management, 6 years in Architectural History and Historic Preservation
Involvement:	Visual Resources and Historic Architectural Resources

Craig L. Phillips

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

Kim Pilarski-Hall

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

Aurora Moldovanyi Pulliam

Position:	Recreation Planner
Education:	M.S., Recreation, Tourism, Park Planning and Management; B.S., Wildlife and Fisheries Biology and Management
Experience:	9 years in NEPA and Recreational Project Planning
Involvement:	Recreational Resources

CHAPTER 6 – ENVIRONMENTAL ASSESSMENT RECIPIENTS

5.1 Federal Agencies

United States Fish and Wildlife Service, Cookeville, Tennessee

5.2 Federally Recognized Tribes

Absentee Shawnee Tribe of Oklahoma
Alabama-Coushatta Tribe of Texas
Alabama-Quassarte Tribal Town
Cherokee Nation
Chickasaw Nation
Eastern Band of Cherokee Indians
Eastern Shawnee Tribe of Oklahoma
Kialegee Tribal Town
Muscogee (Creek) Nation
Shawnee Tribe
Thlopthlocco Tribal Town
United Keetoowah Band of Cherokee Indians in Oklahoma

5.3 State Agencies

Tennessee Division of Archaeology, Nashville, Tennessee
Tennessee Historical Commission, Nashville, Tennessee

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CHAPTER 7 – LITERATURE CITED

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