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ENVIRONMENTAL ASSESSMENT

MONROE, TENNESSEE - PROVIDE 161-KV DELIVERY POINT

Overton County, Tennessee

PREPARED BY:
TENNESSEE VALLEY AUTHORITY

DECEMBER 2008

TABLE OF CONTENTS

LIST OF APPENDICES

LIST OF TABLES

LIST OF FIGURES

ACRONYMS, ABBREVIATIONS, AND GLOSSARY OF TERMS USED

§	Symbol for section
acre	A unit measure of land area equal to 43,560 square feet, i.e., a square area 208.7 feet on a side
APE	Acronym for area of potential effects
BMPs	Acronym for best management practices, i.e., accepted construction practices designed to reduce environmental effects
CFR	Acronym for Code of Federal Regulations
conductors	Cables that carry electrical current
cultural resources	Archaeological and historic resources
danger tree	A tree located outside the right-of-way that could pose a threat of grounding a line if allowed to fall near a transmission line or a structure
DBH	Abbreviation for diameter at breast height
distribution line	A series of electrical conductors ("wires") and their supporting structures used to transfer electric power locally between substations or from substations to power consumers
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
EMF(s)	Acronym for electric and magnetic field(s)
endangered species	A species in danger of extinction throughout all or a significant part of its range
EO	Acronym for Executive Order
feller-buncher	A piece of heavy equipment that grasps a tree while cutting it, which can then lift the tree and place it in a suitable location for disposal; this equipment prevents trees falling into a sensitive area, such as a wetland
forb	A herbaceous plant other than a grass or a fern
GIS	Acronym for 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
ibid	Abbreviation for the Latin term *ibidem*, meaning "in the same place"; refers to the immediately preceding work cited
kV	Symbol for kilovolt (1 kV equals 1,000 volts)
line loss	Electrical energy lost due to inherent inefficiencies in an electrical transmission and distribution system under specific conditions
load	That portion of the entire power in a network consumed within a given area; also synonymous with "demand" in a given area
n.d.	Indicates "no date," or date which Web site was accessed is unknown
NEPA	Acronym for *National Environmental Policy Act*

NIEHS	Acronym for National Institute of Environmental Health Sciences
NRHP	Acronym for the National Register of Historic Places
OSHA	Acronym for Occupational Safety and Health Administration
outage	An interruption of the electric power supply to a user
regolith	A layer of heterogeneous material, including soil, which lies over the bedrock of an area
revenue metering equipment	Meters that measure the amount of electric power for which a customer will be billed
right(s)-of-way (ROWs)	Corridor(s) containing a transmission line
riparian	Related to or located on the banks of a river or stream
runoff	That portion of total rainfall that eventually enters a stream or river
SHPO	Acronym for State Historic Preservation Officer
SMZs	Acronym for streamside management zones
SR	Acronym for State Route
structure	A pole or tower that supports a transmission line
substation	A facility connected to a transmission line used to reduce voltage so that electric power may be delivered to a local power distributor or user
surface water	Water collecting on the ground or in a stream, river, lake, or wetland; it is naturally lost through evaporation and seepage into the groundwater
switch	A device used to complete or break an electrical connection
tap line	An electric power line that connects an existing transmission line to a substation
tap point	A connection point between a tap line and an existing transmission line
TDEC	Acronym for the Tennessee Department of Environment and Conservation
threatened species	A species likely to become endangered within the foreseeable future
transmission line	A series of electrical conductors (“wires”) and their supporting structures used to transmit electric power from one location to another
TVA	Acronym for Tennessee Valley Authority
TVARAM	Acronym for the TVA Rapid Assessment Method for categorizing wetlands, a version of the Ohio Rapid Assessment Method designed specifically for the TVA region
UCEMC	Acronym for Upper Cumberland Electric Membership Corporation
USACE	Acronym for U.S. Army Corps of Engineers
USDA	Acronym U.S. Department of Agriculture
USEPA	Acronym for U.S. Environmental Protection Agency
USFWS	Acronym for U.S. 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	Acronym for World Health Organization

CHAPTER 1

1.0 PURPOSE OF AND NEED FOR ACTION

1.1. Proposed Action – Improve Power Supply

The Upper Cumberland Electric Membership Corporation (UCEMC) plans to construct a new substation in the Monroe Community northeast of Livingston, Overton County, Tennessee. The Tennessee Valley Authority (TVA) proposes to supply electric power to this new substation by constructing and operating approximately 5.5 miles of new 161-kilovolt (kV) transmission line (i.e., a "tap line") using single-pole steel structures that would connect the planned substation to TVA's existing Huntsville-Livingston 161-kV Transmission Line (see Figure 1-1). Approximately 3.3 miles of new transmission line would be built on new right-of-way (ROW) 100 feet in width, and 2.2 miles of the transmission line would be built parallel to TVA's existing Livingston-Byrdstown 69-kV Transmission Line on new ROW 87.5 feet in width. The new ROWs would occupy a total of about 51 acres.

The proposal includes the installation of three switch structures. Two of the switch structures would be installed within the Huntsville-Livingston 161-kV Transmission Line, and one would be installed within the new tap line ROW. TVA would provide UCEMC revenue metering equipment for installation at the Monroe Substation. TVA would add Monroe Substation information to the map board display at TVA's System Operations Center. The proposed line would be completed by late July 2009 or as soon as possible after that date 2009.

Communication and relay modifications would be made at the Huntsville, Tennessee, Substation.

1.2. Need for the Proposed Action

UCEMC provides electrical service to the area northeast of Livingston, Tennessee, including communities near Monroe and surrounding Dale Hollow Lake, by a series of long 13-kV distribution lines from the TVA Livingston 161-kV Substation. TVA's latest load projections indicate that TVA's 13-kV transformers at the Livingston Substation could be loaded about 10 percent above capacity by summer 2009. Additionally, a new industrial facility is under construction near the Monroe Community increasing the projected overloading to about 15 percent.

Summer loading is more critical because the capacity for equipment is usually lower (more limiting) in the summer due to the high ambient temperature. This situation is worsened by the fact that peak power demands typically occur during the hottest summer days because of the additional demand for cooling. If one of the transformers is lost, the others do not have the capability to supply the entire power demand (or "load"). Therefore, an overloaded situation would occur, potentially resulting in a power outage.

In addition to concerns regarding the transformer load capacity, commercial customers around Dale Hollow Lake have been experiencing low voltage problems caused by the distance of the Livingston Substation power supply to the area. To alleviate these problems and to address other anticipated electrical growth in the area, UCEMC plans to

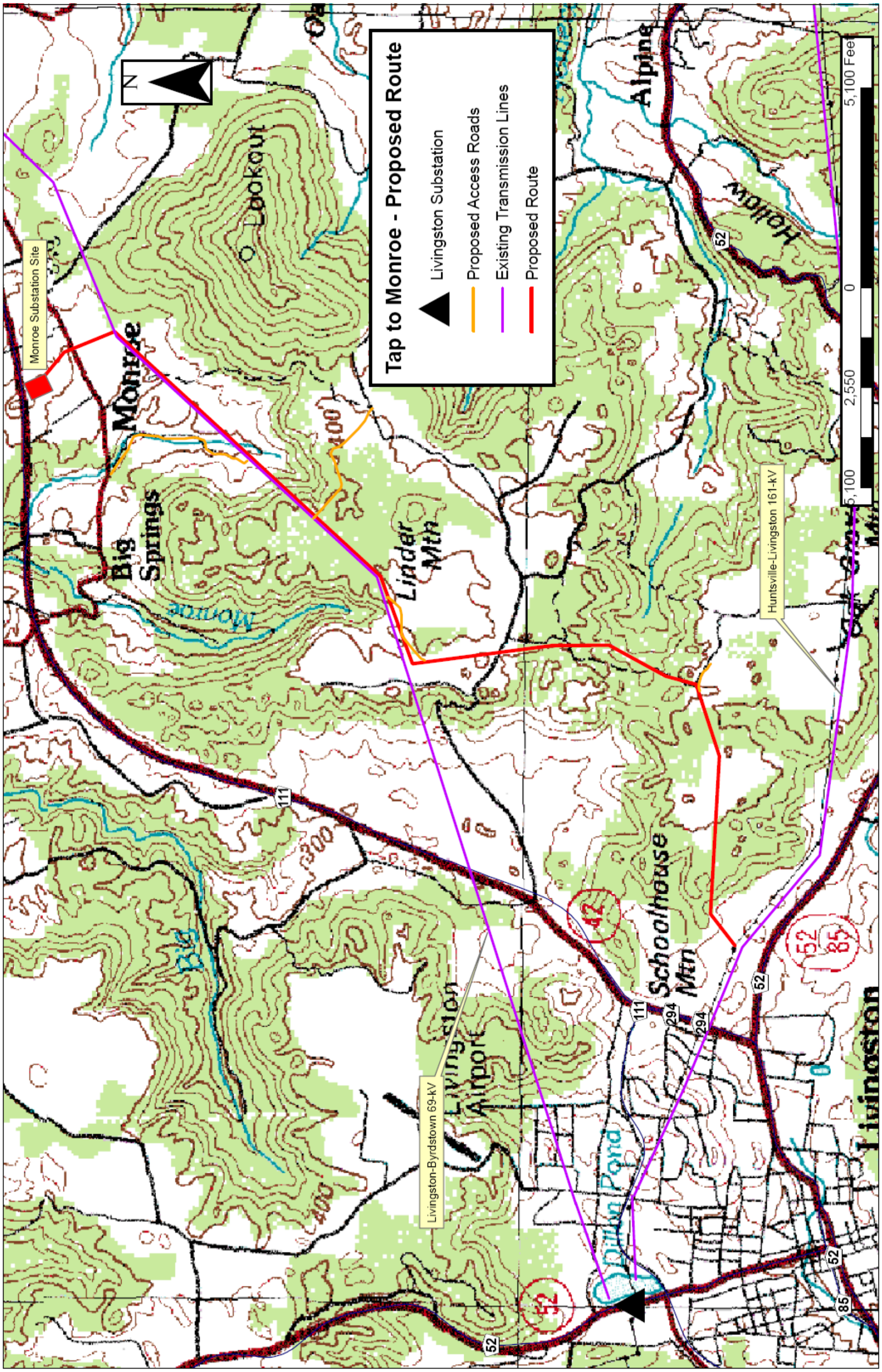


Figure 1-1. Proposed Huntsville-Livingston 161-kV Transmission Line Tap to Monroe Substation

construct a new 161-kV substation in the area of the Monroe Community. In order to connect this new substation to TVA's transmission network, a new 161-kV transmission line would have to be constructed.

1.3. Decisions

The primary decision before TVA is whether to provide additional electric power to the Monroe and Dale Hollow Lake area by constructing a new 161-kV transmission line to UCEMC's planned Monroe 161-kV Substation. A detailed description of the alternatives is provided in Section 2.1.

If the proposed transmission line is built, other secondary decisions are involved. These include the following considerations:

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

1.4. The Scoping Process and Public Involvement

The following federal and state officials or agencies and Native American tribes were contacted concerning the project.

- Eastern Band of the Cherokee Indians
- Muscogee (Creek) Nation of Oklahoma
- Tennessee Department of Environment and Conservation
- Tennessee Historical Commission
- Tennessee State Senators and Representatives from the study area
- U.S. Fish and Wildlife Service
- U.S. Senators and Representatives from the study area

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

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 and 209 property owners who could potentially be affected by any of the route alternatives were specifically invited to a project open house. Local news outlets and notices placed in the local newspapers were used to notify other interested members of the public of the open house. TVA held the open house on February 28, 2008, at the Livingston First United Methodist Church Family Life Center; 63 people attended.

A network of four alternative transmission line routes comprised of 11 different line segments (see Figure 1-2) was presented to the public for comment. These are described in Section 2.3.3. Open house attendees voiced concerns associated with alternative route locations relative to current or planned residential and commercial land development, health issues, and impacts of the proposed line on visual quality, along with natural, historical, and archaeological resources. Although there was some opposition to all the alternative routes, Routes 1 and 2 generated the most negative comments. Presumably, this was because more property parcels are associated with Routes 1 and 2.

During a 30-day public comment period following the open house, TVA accepted public comments on potential transmission line routes and other issues. A toll-free phone number and facsimile number were made available to facilitate comments. The same concerns voiced at the open house were also raised during the public comment period.

1.5. Necessary Federal Permits or Licenses

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

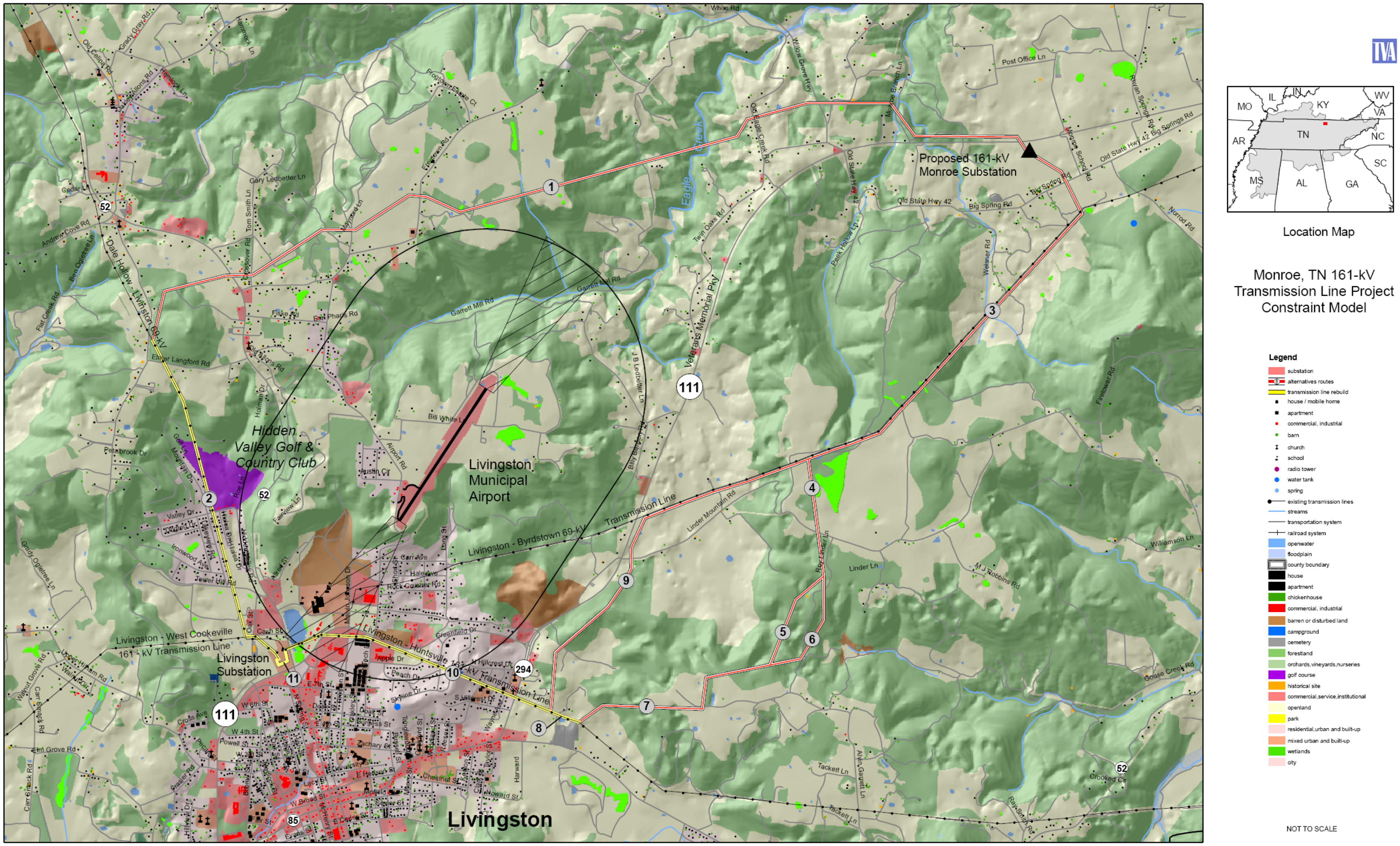


Figure 1-2. Proposed Alternative Routes for the Huntsville-Livingston 161-kV Transmission Line Tap to Monroe Substation

CHAPTER 2

2.0 ALTERNATIVES INCLUDING THE PROPOSED ACTION

As described in Chapter 1, TVA proposes to connect UCEMC's planned Monroe 161-kV Substation to TVA's existing Huntsville-Livingston 161-kV Transmission Line. The connection would be accomplished by constructing and operating a new 5.5-mile-long 161-kV transmission line.

This chapter contains the following five major sections:

- Description of Alternatives
- Description of Construction, Operation, and Maintenance of the Proposed 161-kV Transmission Line
- Project and Siting Process
- Comparison of the Alternative Routes
- Identification of the Preferred Alternative

This chapter describes all of the alternatives explored and provides additional background information about transmission line construction, operation, and maintenance.

2.1. Alternatives

Two alternatives—No Action and Action—are addressed in this environmental assessment. Under the No Action Alternative, the proposed action would not be undertaken by TVA, and the existing transmission system would continue to be used or UCEMC would modify its system. The Action Alternative involves the construction of the proposed transmission line.

During the development of this proposal, other alternatives were considered involving an increase in capacity of the Livingston Substation and the construction by UCEMC of additional distribution lines. These other alternatives have high costs and their own associated environmental impacts, and they do not meet project needs as well as the Action Alternative described below does. These other alternatives are described briefly below.

2.1.1. Alternative A – Do Not Construct a 161-kV Transmission Line (No Action Alternative)

Under the No Action Alternative, TVA would not construct the proposed transmission line to serve the new Monroe 161-kV Substation. However, UCEMC could decide to build a new transmission line to serve its new substation. UCEMC could possibly use the route identified by TVA or could select another route. If UCEMC were to construct the transmission line, the potential environmental effects resulting from the implementation of the No Action Alternative likely would be comparable to or greater than those resulting from the adoption of the Action Alternative, depending on the route chosen and the construction methods used by UCEMC.

If UCEMC chose not to construct a new substation and transmission line, the transmission system in the Monroe area would continue to operate with a high risk of interruption in certain situations, especially during periods of high electricity use. Because ongoing and future development will result in increased electrical demand, this risk is projected to increase over time.

Without a new 161-kV substation and a new 161-kV transmission line, as early as summer 2009, these increasing power loads could cause overloaded transformers and other electrical equipment to be damaged or 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. Alternative B – Construct and Operate a 161-kV Transmission Line to UCEMC's Planned Monroe 161-kV Substation (Action Alternative)

Under the Action Alternative, TVA would serve UCEMC's planned Monroe 161-kV Substation by building a 5.5-mile-long 161-kV transmission line connecting the planned substation to TVA's existing Livingston-Huntsville 161-kV Transmission Line (see Figure 1-1). TVA would install three switch structures near the Livingston-Huntsville Transmission Line tap point within the ROW. Two switch structures would be located on each side of the tap point, and one switch would be installed in the new transmission line.

The new transmission line would be located on new ROW from the tap point to the new Monroe 161-kV Substation. TVA would provide UCEMC revenue metering equipment for installation at the Monroe 161-kV Substation. Additionally, communication and relay modifications would be made at the Huntsville, Tennessee, Substation, and the Monroe Substation information would be added to the map board display at TVA's System Operations Center.

Implementation of this alternative would provide service to UCEMC's planned substation, would help meet the growing electric power needs in the Monroe area, would improve the reliability of the Monroe power supply by providing a delivery point, and would prevent overloading and possible damage of existing equipment.

2.1.3. Other Alternatives Considered

Two additional alternatives were considered; however, for the reasons given below, they were eliminated from further study.

2.1.3.1. Increase TVA Transformer Capacity at Livingston Substation

Under this alternative, TVA would install larger 161-26-13-kV transformers at the Livingston Substation. In addition, UCEMC would construct four new distribution lines to the Monroe area. UCEMC would also add voltage regulators on its system because of voltage drops associated with the long lower-voltage lines from the Livingston Substation to the Monroe area. This alternative would also require the addition of four new 13-kV circuit breakers in the Livingston Substation. Other UCEMC distribution lines in the area would have to be reconductored.

This alternative would have been 60 percent more expensive than the proposed Action Alternative, both because of additional equipment and construction costs and because of the line losses that result from the long, low-voltage lines between the Livingston Substation and the load demand in the Monroe area. In addition, present voltage problems in the Monroe area would continue and would intensify as a result of the addition of the new industrial load. This alternative would not meet the project need and was eliminated from further consideration.

2.1.3.2. Increase TVA and UCEMC Transformer Capacity at Livingston Substation

Under this alternative, TVA would install larger 161-26-13-kV transformers and UCEMC would install two new 13-26-kV transformers in the Livingston Substation. Additionally, UCEMC would construct 26-kV distribution lines from these transformers to the Monroe area.

This alternative would have been 34 percent more expensive than the Action Alternative. While the line losses would be somewhat less than those described in Section 2.1.3.1, this plan suffers from the same problems as described in that section. Therefore, this alternative would not meet the project need and was eliminated from further consideration.

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

2.2.1. Transmission Line Construction

2.2.1.1. Right-of-Way Acquisition and Clearing

The transmission line would be constructed within 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 off the ROW. Danger trees include any trees that are located off the cleared ROW, but that are tall enough to pass within 5 feet of a conductor or strike a structure should it fall toward the transmission line. The fee simple ownership of the land within the ROW would remain with the landowner, and many activities and land uses could occur on the property. 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, most trees and shrubs would initially be removed from the entire width of the ROW. Equipment used during this ROW clearing would include chain saws, skidders, bulldozers, tractors, and/or low ground-pressure feller-bunchers. Marketable timber would be salvaged where feasible; otherwise, woody debris and other vegetation would be piled and burned, chipped, or taken off site. In some instances, vegetation may be windrowed along the edge of the ROW to serve as sediment barriers. Vegetation removal in streamside management zones (SMZs) and wetlands would be restricted to trees tall enough, or with the potential soon to grow tall enough, to interfere with conductors. Clearing in SMZs would be accomplished using hand-held equipment or remote-handling equipment, such as a feller-buncher, in order to limit ground disturbance. TVA *Right-of-Way Clearing Specifications, Environmental Quality Protection Specifications for Transmission Line Construction,* and *Transmission Construction Guidelines Near Streams* (Appendices B, C, and D) would be followed in clearing and construction activities.

Subsequent to clearing and construction, the ROW would be restored as much as possible to its state prior to construction. Pasture areas would be reseeded with suitable grasses. Wooded areas would be restored using native grasses and other low-growing noninvasive species. Erosion controls would remain in place until the plant communities were established fully. Streamside areas would be revegetated as described in Appendices B, C, and D.

2.2.1.2. Access Roads

Permanent 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 designed to avoid severe slope conditions and to minimize stream crossings. Access roads are typically about 20 feet wide and are surfaced with dirt or gravel.

Four access roads were identified along the proposed transmission line and were included in the environmental field review. TVA would obtain the necessary rights for these access roads from landowners. The identified roads are primarily existing roads that include privately built, farm and field roads, some of which may need upgrading. Upgrading would consist of minor grading and placement of gravel.

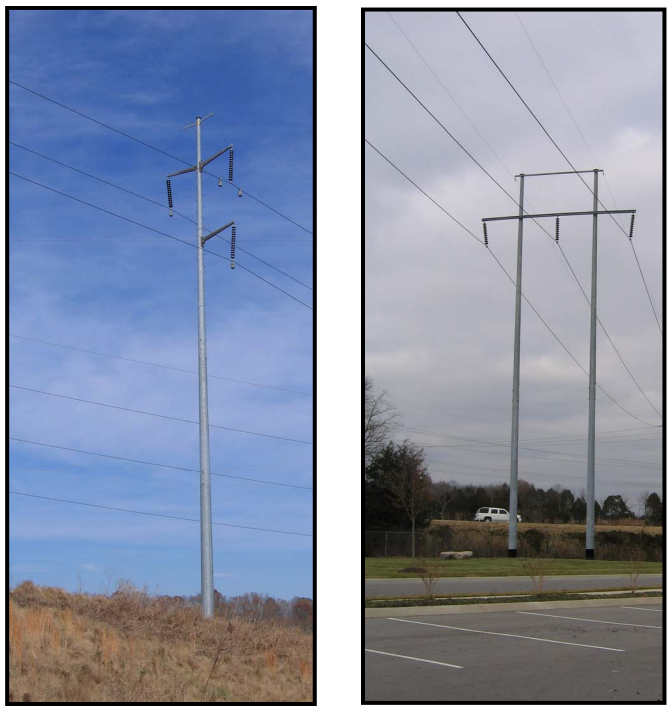
Culverts and other drainage devices, fences, and gates would be installed as necessary. Culverts installed in any permanent streams would be removed following construction. However, in wet-weather conveyances (i.e., streams that run only following a rainfall), they would be left or removed, depending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

2.2.1.3. Construction Assembly Areas

A construction assembly area (laydown area) would be required for worker assembly, vehicle parking, and material storage. This area may be on existing substation property or may be leased from a private landowner for the duration of the construction period. The property is typically leased by TVA about one 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. Several areas in the general vicinity of the project meet the criteria. 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 may be required. 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 fencing installed by TVA and site restoration would be at the discretion of the landowner.

2.2.1.4. Structures and Conductors

The proposed 161-kV transmission line would utilize both single- and double-pole steel structures (Figure 2-1). Structure type would depend on terrain and the resulting distance between structures. Structure heights would vary according to the terrain and would range between 80 and 110 feet.



(a) Single Steel-Pole Structure (b) Double Steel-Pole Structure

Figure 2-1. Examples of Single and Double Steel-Pole 161-kV Transmission Structures

Additionally, the tap point would be a three-pole dead-end structure located within the existing Huntsville-Livingston 161-kV Transmission Line ROW near Structure 410. Two switch structures 25 feet tall would be located within the existing Huntsville-Livingston 161-kV Transmission Line ROW on each side of the tap structure. Another switch structure 35 feet tall would be located near the tap structure on the new ROW.

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

Poles at angles (i.e., angle points) in the transmission line may require supporting guys. Some structures for larger angles could require two or three poles. Most poles would be imbedded directly in holes augured into the ground to a depth equal to 10 percent of the pole's length plus an additional 2 feet. Normally, the holes would be backfilled with the excavated material, but in some cases, gravel or a cement-and-gravel mixture would be used. Screw-and-rock-anchored guys would be installed for angle structures and tap structures. One of the three switch structures located in the new ROW would require concrete foundations. Six-foot-diameter holes would be excavated for each leg of the structure. The spoil from the foundation holes would be spread within the ROW.

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

2.2.1.5. Conductor and Ground Wire Installation

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

2.2.2. Operation and Maintenance

2.2.2.1. Inspection

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

2.2.2.2. Vegetation Management

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

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

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

2.2.2.3. Structure Replacement

Other than vegetation management, little other maintenance work would normally be required. The transmission line structures and other components typically last several decades. In the event that a structure must be replaced, the structure would normally be lifted out of the ground by crane-like equipment, and the replacement structure would be inserted into the same hole or an immediately adjacent hole. Access to the structures would be on existing roads where possible. Replacement of structures may require leveling the area surrounding the replaced structures, but there would be little, if any, additional area disturbance when compared to the initial installation of the structure.

2.3. Project and 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:

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

2.3.1. Definition of Study Area

The first task in defining the study area was to identify the power sources that could supply the planned substation. TVA provides power to the Overton County area from the Livingston 161-69-13-kV Substation, which is supplied by transmission lines from the West Cookeville and Huntsville substations. Thus, TVA's existing Livingston Substation was the most practical source because it supplies the closest 161-kV transmission lines to the planned substation and would serve as the most reliable power source to the new substation.

The study area boundaries were chosen to allow for the establishment of two or more corridors between the Livingston Substation power source and the planned Monroe 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 2-2. The study area extends from west of the Livingston Substation, northward to a line north of Monroe and eastward to a line well east of Monroe and includes most of the existing transmission infrastructure in the area.

The study area for the proposed transmission line includes both urban and rural areas in Overton County. The study area includes parts of the Livingston urban area and the Allons Community around State Route (SR) 52 to the north.

2.3.2. Data Collection

Information sources used in the transmission line study included design drawings for area transmission lines, data collected into a geographic information system (GIS), including U.S. Geological Survey digital line graphs, and Overton County tax maps. Additionally, TVA used various proprietary data maintained by TVA in a corporate geo-referenced database, including Heritage file data on sensitive plants and animals and archaeological and historical resources.

Additionally, new color aerial photography of the project area was flown for TVA in March 2007. These images were first rectified 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. The orthophotography was photo-interpreted to delineate all buildings and various land uses and wetlands.

Data were 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 factors of the study area to be examined simultaneously to develop and evaluate numerous options and scenarios to determine the route or routes that would best meet project needs, including avoiding or reducing potential environmental impacts.

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

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

Possible transmission line route segments were developed utilizing data, which included current aerial photography of the study area, 7.5-minute U.S. Geological Survey topographic maps, as well as a constraint model of the study area. The constraint maps were produced by interpretation of aerial photographs as well as a search of existing records of important natural, historical, and archaeological resources (Figure 1-2).

The straight-line distance from the Livingston Substation to the planned Monroe Substation site is approximately 4.5 miles. However, the Livingston Municipal Airport and its airspace restrictions formed a large constraint area within the study area, forcing route options to one side or the other of the airport zone. The Federal Aviation Administration height-restricted zone for a 4000-foot runway is defined as 200 feet above the airport elevation and 10,000 feet from the end of the runway. The airport, however, is situated on a plateau at an elevation well above most of the surrounding urban area of Livingston, providing clearance under the restricted airspace for the proposed transmission line routes to the planned Monroe Substation.

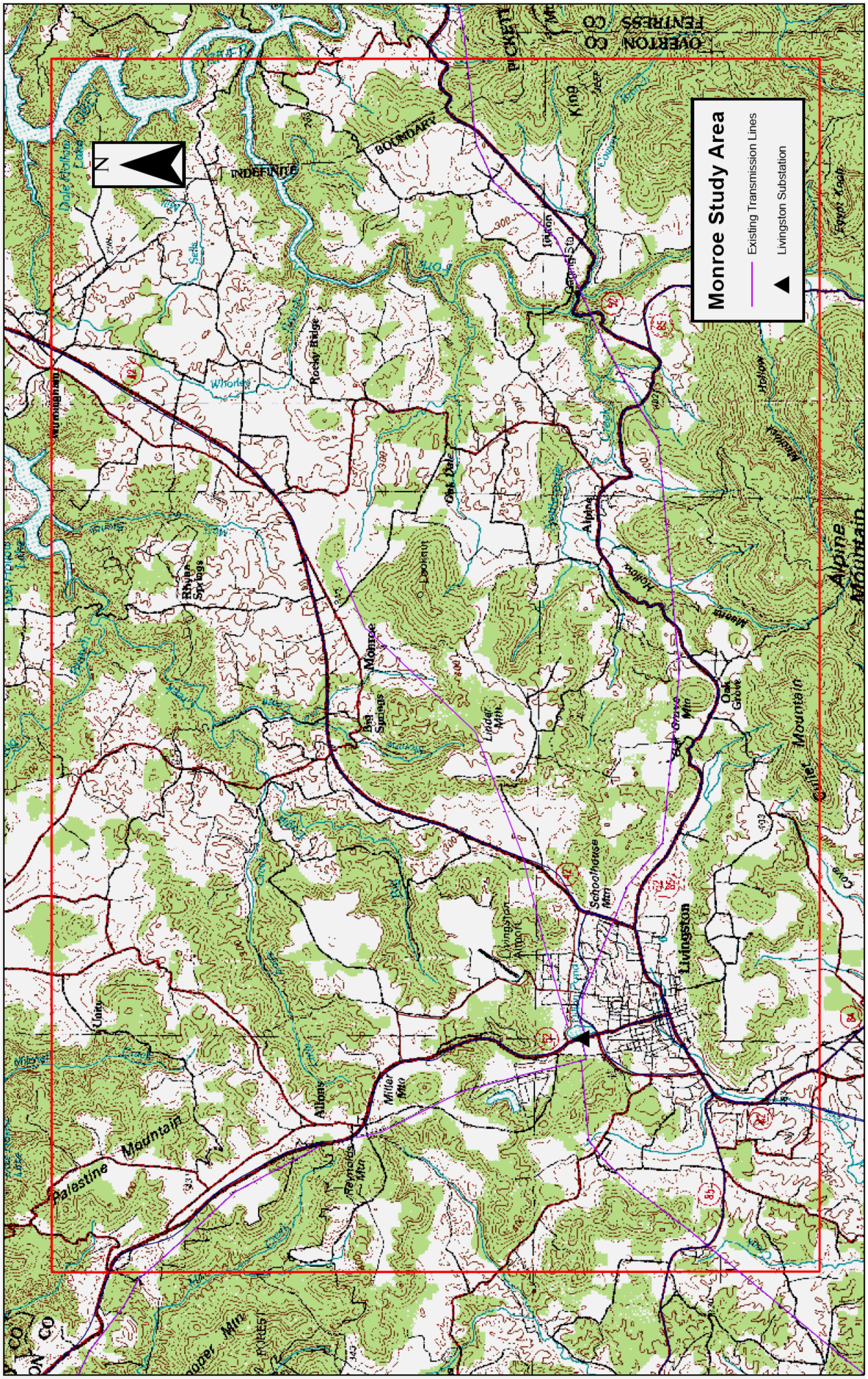


Figure 2-2. Study Area for the Huntsville-Livingston 161-kV Transmission Line Tap to Monroe Substation

The study area outside the Livingston urban area is constrained by steep wooded slopes, numerous sinkholes, large property parcels, a few wetland areas, and a state-listed threatened fish (ashy darter) known to occur in the Nettlecarrier Creek tributaries in the southeast part of the study area. Existing homes and other buildings, stream buffers, caves, and the curving SR 111 alignment also presented constraints that influenced the location of alternative transmission line routes.

The original proposal to provide improved service to the Monroe area involved the addition of a new transmission line bay to the west side of Livingston Substation within the existing TVA property. The identification of possible line routes to the planned Monroe Substation proceeded on this basis.

Because of dense building development within the first 2 miles from the Livingston Substation, the only route opportunities for a new transmission line out of the substation include the rebuilding of one or the other of two existing transmission lines on the existing ROW.

A third existing line from the Livingston Substation is the radial 69-kV line to Byrdstown. Because this line is the only source of electrical service to Byrdstown, rebuilding this line was not considered an option.

One of the available exiting lines is a 69-kV single-pole line on an existing 100-foot-wide ROW. This line from Dale Hollow Hydro Plant approaches Livingston Substation from the north. This line is no longer needed and could be removed and replaced. Along this ROW, homes have been built close to both sides of the ROW as it passes through a golf course neighborhood.

To provide an efficient connection to an expanded substation, a new line from the Livingston Substation that also could occupy one side of the double-circuit towers on the substation property (Segment 11) could occupy the Dale Hollow-Livingston 69-kV Transmission Line ROW for 1.8 miles (Segment 2). The new line would then leave the old corridor at Miller Mountain and go east across SR 52 toward Monroe (Segment 1). The total length of this route would be approximately 8.0 miles. Use of the old corridor even farther to the north would not result in a usable route alternative because a school and development congestion in the Allons Community on SR 52 would block an eastward route toward Monroe.

The other existing line that could provide an exit route from the Livingston Substation is the Livingston-Huntsville 161-kV Transmission Line, that heads east across Dillon Pond Park and partially along Bradford-Hicks Drive. This line, a single-circuit single-steel pole line on 100-foot ROW, parallels the Livingston-Byrdstown 69-kV Transmission Line for a short distance.

As the existing transmission line heads east, the ROW passes close to homes, businesses and a water tank on top of a steep ridge (Schoolhouse Mountain) (Segment 10). The urban character of the landscape changes to a much more rural character just east of the ridge. This line could be taken out of service and rebuilt for at least 1.6 miles as a double-circuit steel-pole line. Using this ROW would allow the construction of a new circuit through the constrained urban area.

A new line would then leave the old corridor and head north toward Monroe on new ROW (Segment 9). The route would meet and parallel the existing Livingston-Byrdstown 69-kV

Transmission Line (Segment 3) to a point approximately 2,000 feet from the Monroe Substation site.

A second reasonable location to branch from a rebuild of the Livingston-Huntsville 161-kV Transmission Line corridor is about 900 feet farther east (Segment 8). From this point behind a large cemetery on SR 52, the line route (Segment 7) primarily would follow property ownership boundaries up and across a higher plateau (Linder Mountain). Two route options were identified on the plateau: one (2.6 miles) (Segment 5) would follow a property line overlooking a steep wooded slope for about 0.6 mile; the other (2.7 miles) (Segment 6) would set back from the rim in a 0.7-mile segment. The route would then continue north (Segment 4) to meet and parallel the existing Livingston-Byrdstown 69-kV Transmission Line for 2.1 miles (Segment 3) to a point approximately 2,000 feet from the Monroe Substation site.

Four alternate transmission line routes consisting of combinations of these 11 constituent segments were then developed (Figure 1-2 and Table 2-1). These routes were evaluated as described below.

Table 2-1. Alternative Route Corridors

Alternative Route Option	Constituent Segments
1	11, 2, 1
2	10, 9, 3
3	10, 8, 7, 5, 4, 3
4	10, 8, 7, 6, 4, 3

2.3.4. Establish and Apply Siting Criteria

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

Each of the transmission line alternative routes was evaluated according to the following criteria.

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

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

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

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

2.3.5. Route Evaluation and Identification

For each criterion described as occurring along a proposed route option, a higher score means a bigger constraint. For example, a greater number of streams crossed, a longer transmission line route length, or a greater number of historic resources affected would give a transmission line route option a worse score.

Scores for each of the route options were calculated by adding individual criterion values for each transmission line route. The resulting sum values were evaluated using standard statistical techniques and were assigned a ranking for each route in each subcategory (engineering, environmental, land use, and cultural). A weighted score was then produced for each transmission line route in each subcategory (Appendix F, Tables F-1 to F-4).

This made it possible to understand which routes would have the lowest and highest impacts on engineering, environmental, land use, and cultural resources based on the data available at this stage in the siting process. Finally, to determine total impacts, the scores from each category were combined for an overall score. These scores provided a ranking for each of the alternative route options (Table 2-2).

Table 2-2. Alternative Route Option Ranks

Alternative Route	Ranking
1	4
2	1
3	2
4	3

The numerical scores of Routes 2, 3, and 4 were very close, being 200, 201, and 202, respectively, with a lower number indicating a better score (Appendix F, Table F-5). Route 1 had a score of 234.

2.4. Comparison of Alternative Routes

Route 1 appeared to have more specific issues than the other routes (caves, bats, low-flying aircraft, springs, rock house environment, unstable slopes, hayfield angles, and highway frontage location). At Miller Mountain near the junction of Segments 1 and 2, there would be a possible air traffic obstruction unless it were possible for the line to use a structure no taller than 70 feet. Additionally, construction and maintenance access for Route 1 would be especially difficult for the slope area near Big Eagle Creek. Further, on the rebuild portion, Route 1 would require construction not only through backyards but also through a golf course, resulting in greater than average sensitivity and demands for ROW restoration.

After analysis, Route 1 had a long list of characteristics that make it least desirable and ranked fourth among alternatives in the preliminary ranking. In addition to the previously mentioned items, this route is the longest proposed route. It would require the acquisition of the most new ROW acres and would require the most forest clearing. It has the most property parcels affected, the most houses within 300 feet of the line, and the most road crossings and stream crossings—including a crossing of Big Eagle Creek in a "visual concern" area.

Route 2 is the shortest of the proposed routes and numerical analysis ranked it first. This route would have the greatest percentage of rebuild or parallel use of existing transmission lines. This route, however, was not preferred because it conflicts with planned future development of a limestone quarry, would cross a large sinkhole area that is also an oil production area, and for part of its length, would be at the crest of a ridge and very visible to a wide urban area. A new cell tower on the same ridge has already been a source of local controversy.

Route 3 ranked second among the four but actually scored almost identical to Routes 2 and 4. Participants at the open house identified that this route would conflict with owner-identified plans for a residential development of lots designed to offer panoramic views.

Fewer conflicts were identified with the proposed Route 4. This route would avoid the identified "view-lots" on the otherwise identical Route 3. It would have the lowest number of both property parcels and occupied buildings within 300 feet (three on new ROW). A greater percentage of the route would occur as either rebuild or parallel an existing transmission line, or would be in a zone along property lines. This lends to a relatively low land use impact and potentially better acceptance by landowners.

<u>Project Modification</u>

In late April 2008, after completing further engineering studies, TVA determined that additional equipment at the Livingston Substation would not be necessary to support the increasing load in the Monroe area at this time. Instead, a new connection or tap placed in the Livingston-Huntsville 161-kV Transmission Line and construction of a new transmission line from that point to the planned Monroe Substation would meet the identified project needs.

Using information gathered during the system studies and data development phases, potential tap point locations were identified on the Livingston-Huntsville 161-kV Transmission Line. Electric system reliability concerns required a 161-kV disconnect switch on each side of the future tap structure in the existing source line and a disconnect switch in the tap line itself near the tap point. These switch locations must meet line engineering requirements and must be accessible by road in all weather conditions, including high water.

Because of the need for road access and proper line configuration, these requirements resulted in two possible tap point locations. A suitable tap point was identified behind the Memorial Cemetery where Routes 3 and 4 diverge from the existing ROW. A second potentially suitable tap point location was identified 1.3 line miles east of the Route 4 tap point.

In considering the use of the two potential tap points, TVA must weigh the expense of extra double-circuit construction in a future project against the potential 0.6-mile reduced length of the route for this project. An additional consideration is that the transmission line route from the identified second location would run through the middle of a property tract and close to the landowner’s home.

2.5. The Preferred Alternative

The Action Alternative, i.e., Construct and Operate the Huntsville-Livingston 161-kV Transmission Line Tap to Monroe Substation, is TVA’s preferred alternative for this proposed project. TVA would build a 161-kV transmission line tap to the planned Monroe Substation utilizing the tap point on the Livingston-Huntsville 161-kV Transmission Line originating at the divergence of Route 4. The transmission line route beginning at the tap point behind the cemetery to the proposed Monroe Substation would be 5.5 miles in length and would follow along the remainder of Route 4 as previously described in Section 2.4.

CHAPTER 3

3.0 AFFECTED ENVIRONMENT

Various environmental resources could be affected by the implementation of the alternatives described in Chapter 2. This chapter describes the status of these potentially affected environmental resources. The resources include the following: groundwater and geology, surface water, aquatic life, wildlife, vegetation, endangered and threatened species, wetlands, floodplains, visual and aesthetic quality, recreation, parks, and natural areas, and historical and archaeological resources. The affected environment descriptions below are based on field surveys conducted in 2008, on published and unpublished reports, and on personal communications with resource experts. This information establishes the baseline conditions against which the decision-maker and the public can compare the potential effects of the alternatives under consideration.

3.1. Groundwater and Geology

The general project area is underlain by the Highland Rim aquifer system, which is part of the Interior Low Plateaus Physiographic Province. The Highland Rim aquifer consists of flat-lying carbonate rocks of Mississippian age. Locally, the formations that make up the Highland Rim aquifer are the Monteagle Limestone, the St. Genevieve Limestone, the St. Louis Limestone, the Warsaw Limestone, and the Fort Payne Formation (Lloyd and Lyke 1995). The bedrock formations weather to form a thick chert regolith, which stores and releases groundwater into fractures and solution openings in the bedrock (Tennessee Department of Environment and Conservation [TDEC] 2002).

The carbonate rocks that form the Highland Rim aquifer are typical of karst systems. The term “karst” refers to carbonate rocks (limestone and dolostone) in which groundwater flows through solution-enlarged channels and bedding planes within the rock. Karst topography is characterized by sinkholes, springs, disappearing streams, and caves, as well as by rapid, highly directional groundwater flow in discrete channels or conduits. Because of the connections between surface and underground features, water in karst areas is not distinctly surface water or groundwater.

Karst systems are readily susceptible to contamination as the waters can travel long distances through conduits with no chance for natural filtering processes of soil or bacterial action to diminish the contamination. “Mature” or well-developed karst is particularly susceptible to contamination, and some karst in the project area is considered mature. In unconfined or poorly confined conditions, karst aquifers have very high flow and contaminant transport rates under rapid recharge conditions such as storm events (ibid). Consequently, the groundwater sources in karst aquifers considered most vulnerable to contamination are those that are under the direct influence of surface water.

A 2.75-mile section of the ROW, from Linder Mountain Road south to where the ROW taps the Livingston-Jamestown 161-kV Transmission Line, is located within mature karst terrain. In this section, the ROW crosses several sinkholes. North of Linder Mountain Road, the sinkholes are fewer; only one sinkhole is found within the ROW. None of the proposed access roads are located in sinkholes.

The hydraulic characteristics of the Mississippian aquifers present in much of the project area can vary greatly over short distances. These large differences are reflected in the yield and specific capacity of wells completed in the limestone aquifers and the discharges of springs that issue from these aquifers. The yields of wells completed in the Mississippian aquifers commonly range from 5 to 50 gallons per minute, and maximum yields range from a few hundred to, rarely, several thousands of gallons per minute. However, such openings constitute only a small part of the rock and might be difficult to locate (Lloyd and Lyke 1995).

The groundwater in the Mississippian aquifers in Tennessee generally contains concentrations of dissolved solids and iron less than secondary maximum contaminant levels for drinking water established by the USEPA. The water is either a calcium-magnesium-bicarbonate type or a calcium-bicarbonate type and is generally of adequate quality or can be treated and made adequate for most uses (ibid).

Public drinking water for Overton County is supplied by surface water sources; however, private wells may occur in the area (USEPA 2008).

3.2. Surface Water

Precipitation in the project area averages about 58 inches per year. The wettest month is March, with 5.9 inches of precipitation, and the driest month is October, with 3.5 inches. The average annual air temperature is 57 degrees Fahrenheit (ºF). Temperatures range from a monthly average of 36ºF in January to 77ºF in July. Stream flow varies with rainfall and averages about 21 inches of runoff per year. This equates to approximately 1.5 cubic feet per second per square mile of drainage area.

The project area drains to several Cumberland River tributaries including Monroe Creek of Big Eagle Creek of the Obey River, Nettlecarrier Creek of the West Fork of the Obey River, and Town Creek of Carr Creek of the Roaring River. The Obey River is classified by TDEC for domestic and industrial water supply, fish and aquatic life, recreation, irrigation, and livestock watering and wildlife. Carr Creek is classified for domestic water supply, fish and aquatic life, recreation, irrigation, and livestock watering and wildlife. The remaining streams in the project area are classified for fish and aquatic life, recreation, irrigation, and livestock watering and wildlife. West of the project area, the Roaring River from SR 136 to Cordell Hull Reservoir is a State Scenic River and designated as a Tier 2 (high-quality) stream. The West Fork Obey River is on the state 303(d) list (TDEC 2008) as impaired (i.e., not fully supporting its designated uses) due to metals, pH, and loss of biological integrity due to siltation from abandoned mining. Town Creek is listed due to nutrients, low dissolved oxygen, and bacterial (*Escherichia coli*) contamination from collection system failure and urbanized high-density area. Carr Creek is listed due to bacterial (*Escherichia coli*) contamination from an undetermined source.

3.3. Aquatic Ecology

The proposed Huntsville-Livingston 161-kV Transmission Line Tap to Monroe Substation crosses the Eastern Highland Rim ecoregion within drainages of the Roaring River and Obey River, tributaries to the Cumberland River. The proposed transmission line route crosses two intermittent streams, five ponds (Appendix G), and seven wet-weather conveyances. The two intermittent stream crossings are within the Eagle Creek (051301060201) watershed.

Streams of the Highland Rim region are characterized by coarse chert gravel and sand substrates interspersed with bedrock areas, moderate gradients, clear waters, and moderate to low productivity, and thus little aquatic vegetation except near spring sources (Etnier and Starnes 1993). Additionally, the Highland Rim is host to the most diverse fish fauna of any region of comparable size in North America (ibid).

Because transmission line construction and maintenance activities mainly affect riparian conditions, in turn affecting in-stream aquatic habitat, TVA evaluated the conditions of both of these at each stream crossing along the proposed route. From these habitat assessments, riparian condition was assigned to one of three classes to indicate the current condition of streamside vegetation across the length of the proposed transmission line (Table 3-1). The assigned classes are as follows:

- **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.

Table 3-1. Riparian Condition of Streams Located Within the Right-of-Way of the Huntsville-Livingston 161-kV Transmission Line Tap to Monroe Substation

Riparian Condition	Number of Perennial Streams	Number of Intermittent Streams	Total
Forested	0	1	1
Partially forested	0	1	1
Nonforested	0	0	0
Total	**0**	**2**	**2**

TVA then assigns appropriate SMZs and best management practices (BMPs) based upon these evaluations and other considerations [such as 303(d) and presence of endangered or threatened aquatic species]. These BMPs minimize impacts to water quality and in-stream habitat for aquatic organisms.

3.4. Vegetation

Moderately steep slopes and irregular plains characterize the Eastern Highland Rim Level IV ecoregion (Griffith et al. 1997). The region is underlain by Mississippian-age bedrock. The natural vegetation of the ecoregion is a transitional type between the oak-hickory forests found to the west and the mesophytic forest found farther east on the rich slopes and deep ravines of the Cumberland Plateau.

Vegetation in the proposed new transmission line ROW is characterized by two main types—herbaceous vegetation (63 percent) and forest (37 percent).

Herbaceous vegetation in the proposed transmission line ROW occurs in pastures, hayfields, agricultural fields, and fencerows. 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. The herbaceous vegetation located in the area is chiefly comprised of grass and forb species typical of heavily disturbed sites. Disturbances observed in the area of the proposed action include cattle grazing, mowing, and construction. Common species in the herbaceous vegetation type are dallis grass, goldenrod, horseweed, Queen Anne's lace, purpletop, ragweed, sneezeweed, and tall fescue. Some areas of herbaceous vegetation occurring in emergent wetlands had a higher proportion of native species that were indicative of moist soils. Species on these sites included beak sedge, buttonweed, joe pye weed, mistflower, rush, smartweed, white doll's daisy, and wool grass.

Forest along the proposed transmission line ROW is deciduous in composition. This forest is characterized by trees with overlapping crowns where deciduous species account for more than 75 percent of the canopy cover. Forest composition varied slightly with aspect and landscape position, but common overstory species were relatively consistent throughout all of the surveyed forested area. Common tree species included chestnut oak, chinquapin oak, pignut hickory, red maple, shagbark hickory, sugar maple, white ash, and white oak. Herbaceous plants observed in forested areas included American burnweed, goldenrods, late eupatorium, small woodland sunflower, St. John's wort, white snakeroot, and other common species. Five American ginseng plants were observed in the proposed ROW near its southern end.

Forest structure varied throughout the transmission line corridor, but forest stands were generally less disturbed south of Linder Mountain Road. Along the southern section of proposed transmission line, average diameter at breast height (DBH) of overstory trees was between 18 to 24 inches. These stands had not been recently logged and were not being actively grazed by cattle at the time of survey. About 22 percent of forested area located in the proposed ROW had been recently logged (within five years) or was actively being logged. No forested areas along the ROW had structural characteristics considered indicative of old-growth forest stands (Leverett 1996).

Nonnative, invasive species are a threat to biodiversity and natural plant communities. Unchecked invasives lead to the degradation of natural areas and displace native species. Nonnative, invasive species occur in and around the planned substation and transmission line ROW. However, within the project area, nonnative species were an appreciable component of the total vegetative cover only in open areas (pastures, ROWs, roadsides, etc.) and forest/field edges. TVA has compiled a list of invasive species considered high priority because of their potential to spread rapidly and displace native vegetation.

To evaluate the invasive species within the transmission line ROW, TVA used ranking designations determined by the Tennessee Exotic Plant Pest Council (2001). During field surveys conducted in summer 2008, six species considered a severe threat to native plant communities were observed at least once (Table 3-2).

Table 3-2. Invasive Plant Species Observed in the Rights-of-way for the Huntsville-Livingston 161-kV Transmission Line Tap to Monroe Substation

Common Name	Scientific Name
Chinese privet	*Ligustrum sinense*
Japanese honeysuckle	*Lonicera japonica*
Japanese stilt grass	*Microstegium vimineum*
Johnson grass	*Sorghum halepense*
Sericea lespedeza	*Lespedeza cuneata*
Tree-of-heaven	*Ailanthus altissima*

3.5. Wildlife

Habitats within the ROW for the proposed transmission line and along access roads include 63 percent early successional habitat and 37 percent mixed hardwood forest. A more detailed description of vegetation is provided in Section 3.4. Several rock outcrops and other karst features were observed within the forested habitats. Six wetlands, five ponds, and two intermittent streams occur along the proposed route.

Early successional habitats observed along the route include pastures, grass/forb fields, and developed areas. Birds frequently found in these early successional habitats include Carolina wren, American robin, northern cardinal, downy woodpecker, eastern towhee, eastern meadowlark, and mourning dove. Indigo bunting, white-eyed vireo, and gray catbird are also found here. Common mammals in this habitat type include striped skunk, eastern cottontail rabbit, white-tailed deer, Virginia opossum, and rodents such as white-footed mouse. Reptiles often found in early successional habitats include black racer, rat snake, milksnake, and eastern garter snake. Wetlands within early successional habitats provide habitats for amphibians such as American toad, Fowler’s toad, green frog, northern cricket frog, southeastern chorus frog, and red-spotted newt.

Deciduous forests provide habitat for wild turkey, downy woodpecker, pileated woodpecker, white-breasted nuthatch, and American crow, as well as neotropical migrants such as wood thrush, blue-gray gnatcatcher, red-eyed vireo, and ovenbird. White-tailed deer and eastern gray squirrel are mammals frequently found in deciduous forests, and scattered rock outcrops within these forests provide suitable habitat for the white-footed mouse and other small mammals. Northern zigzag salamander and slimy salamander are likely inhabitants on the forest floor of deciduous habitats. Common reptiles include eastern box turtle, northern ringneck snake, rat snake, and northern copperhead.

Unique and important terrestrial habitats, such as caves, were also searched for during field investigations. Approximately 35 caves have been reported from the vicinity of the proposed new transmission line route. The closest cave records are 0.17, 0.34, 0.81, 1.16, and 1.49 miles from the proposed ROW and access roads. All other known cave locations are greater than 3 miles from the proposed ROW and access roads. No heron colonies, other aggregations of migratory birds, or designated critical habitats for terrestrial animals occur in the project area.

3.6. Endangered and Threatened Species

3.6.1. Aquatic Animals

Seven state-listed aquatic species are known to occur in Overton County (Table 3-3) and within a 10-mile radius of the proposed Huntsville-Livingston 161-kV Transmission Line Tap to Monroe Substation. These species are identified in Table 3-3 followed by a brief description of the range and habitat of the six state-listed species known from within the affected watersheds. No federally listed species are known from the project area.

Table 3-3. State-Listed Aquatic Animals Reported From Overton County or Known From Within 10 Miles of the Proposed Actions

Common Name	Scientific Name	Tennessee Status[1] (Rank[2])
Fish		
Ashy darter[3]	*Etheostoma cinereum*	THR (S2S3)
Blotchside logperch[4]	*Percina burtoni*	NMGT (S2)
Highfin carpsucker[4]	*Carpiodes velifer*	NMGT (S2S3)
Longhead darter[4]	*Percina macrocephala*	THR (S2)
Southern cavefish[4]	*Typhlichthys subterraneus*	NMGT (S3)
Snails		
Armored rocksnail[4]	*Lithasia armigera*	TRKD (S1S2)
Ornate rocksnail[4]	*Lithasia geniculata*	TRKD (S3)

[1]Status codes: NMGT = In need of management; THR = Threatened; TRKD = Tracked as sensitive but has no legal status

[2]Rank abbreviations: S1 = Extremely rare and critically imperiled in the state with 5 or fewer occurrences, or very few remaining individuals, or because of some special condition where the species is particularly vulnerable to extirpation; S2 = Very rare and imperiled, often with less than 20 occurrences; S3 = Rare or uncommon with less than 100 occurrences

[3] Record of occurrence does not occur within the potentially affected watershed

[4]Historic record of occurrence

The blotchside logperch prefers large to medium-sized rivers and creeks with areas of large gravel and small cobble, low turbidity, and moderate current. It can usually be found in depths of 1.5 feet or more. Spawning occurs from April to May. It is endemic to the Tennessee and Cumberland River drainages (Etnier and Starnes 1993).

The highfin carpsucker still occurs in parts of the Mississippi River basin, in various rivers along the Gulf Coast to the Choctawhatchee River, and in the Santee and Cape Fear rivers in the Atlantic drainage of North Carolina (ibid). This fish prefers a habitat of gravel substrate in relatively clear, medium to large rivers.

The longhead darter typically occurs in small to medium-sized rivers with bedrock and boulder substrates (ibid).

The southern cavefish occurs in the Ozark Plateau of Missouri, Arkansas, and Oklahoma and in the Cumberland and interior low plateaus of north Alabama, northwest Georgia, and central Tennessee and Kentucky. It inhabits mostly limestone subterranean waters of the Tennessee and Coosa River systems in clear, mud bottom pools (Mettee et al. 1996).

The armored rocksnail is endemic to the Ohio River system and prefers creeks with fallen logs and debris. It has been reported from the Cumberland River on partially buried wood, gravel, and submerged rock outcrops (NatureServe 2008).

The ornate rocksnail is only known to occur in Kentucky, Tennessee, and Alabama; however, very little is known about its life history or ecology. It is believed to prefer big river habitats (ibid).

3.6.2. Plants

No federally listed plants or designated critical habitats are known from Overton County, and no federally listed plants were observed during field surveys conducted in September 2008. Three state-listed species are known from within 5 miles of the proposed line (Table 3-4). Although forests in the proposed ROW contain habitat suitable for these species, none of the listed plants were observed during field surveys.

Table 3-4. State-Listed Plant Species Known From Within 5 Miles of the Proposed Actions

Common Name	Scientific Name	Tennessee Status[1] (Rank[2])
Butternut	*Juglans cinerea*	THR (S3)
Manna-grass	*Glyceria acutiflora*	THR (S3)
Michigan lily	*Lilium michiganense*	SPCO (S2)

[1] State status abbreviations: THR = Threatened, SPCO = Special concern
[2] State rank abbreviations: S2 = Very rare and imperiled, often with less than 20 occurrences; S3 = Rare or uncommon with less than 100 occurrences

3.6.3. Terrestrial Animals

No federally or state-listed terrestrial animal species were observed during the field investigation (September 2008). One federally listed and one state-listed terrestrial animal species are reported from Overton County, Tennessee (Table 3-5).

Table 3-5. Federally Listed Terrestrial Animals Reported From Overton County and State-Listed Terrestrial Animals Reported From or Having Suitable Habitat Within 3 Miles of the Proposed Actions

Common Name	Scientific Name	Tennessee Status[1](Rank[2])	Federal Status[1]
Bird			
Bald eagle	*Haliaeetus leucocephalus*	NMGT (S3)	*
Mammal			
Gray bat	*Myotis grisescens*	END (S2)	END

*This species is protected by the *Bald and Golden Eagle Protection Act.*
[1]Status abbreviations: END = Endangered, NMGT = Deemed in need of management
[2]Rank abbreviations: S2 = Very rare and imperiled, often with less than 20 occurrences, S3 = Rare or uncommon with less than 100 occurrences

Bald eagles nest in forested areas near large bodies of water, such as rivers and reservoirs, where they forage. One pair has been reported from Overton County. Several nests have been reported from nearby Dale Hollow Lake. The closest nest is 6.5 miles northwest of the proposed line. No suitable habitat for bald eagles exists along the line route or near access roads.

Although not reported from within a 3-mile radius of the project site, cerulean warblers are reported from various locations in Overton County, Tennessee. This state-listed species (threatened) prefers to nest and forage in large blocks of mostly mature forest. Limited suitable habitat for the species occurs in portions of the forested habitat along the proposed corridor extending south from the existing transmission line corridor.

Gray bats roost in caves year-round and typically forage over streams, rivers, and reservoirs. One cave in Overton County has historic records of occurrence of gray bats. This cave is located 6.4 miles from the proposed new transmission line route. However, gray bats have not been reported from this site since the 1960s. No other foraging habitat was observed during field surveys in the area.

Numerous other caves in the vicinity of the proposed new transmission line route and access roads offer potential gray bat roosting habitat. However, gray bats have not been reported from these caves. Because none of the closest caves (0.17, 0.34, 0.81, 1.16, and 1.49 miles away) would be affected by the proposed actions; there would be no impacts to this species or these habitats.

Indiana bats roost in caves during the winter and typically roost under the bark of dead or dying trees during the summer (Menzel et al. 2001). Optimal summer roosts occur in forests with an open understory and available roost trees, and usually near water (Romme et al. 1995). Indiana bats forage primarily in forested areas along streams or other corridors. The closest record of Indiana bats occurs in a cave approximately 14.8 miles from the proposed new transmission line. Although there are no other records of Indiana bats occurring in Overton County, other caves may provide suitable roosting sites, and mature forested habitat in the area proved suitable summer habitat for this species.

Numerous caves in the vicinity of the proposed new transmission line route offer potential Indiana bat habitat. However, Indiana bats have not been recorded from these caves. Because none of the closest caves (0.17, 0.34, 0.81, 1.16, and 1.49 miles away) would be affected by the proposed actions; there would be no impacts to this species or these habitats.

In order to assess their suitability as summer roost habitat for Indiana bats, forests along the proposed route were sampled using a protocol based on information in Romme et al. (1995). Five forest variables were estimated at forested sites containing at least some mature trees and consisting of primarily deciduous trees. Average canopy cover, average height to bottom of canopy, and average DBH of overstory trees were measured. Subcanopy density was categorized as open (less than 5 percent), moderately dense (5 to 20 percent), dense (20 to 60 percent), and very dense (greater than 60 percent). Potential roost trees included snags greater than approximately 10 feet in height, hollow trees or trees with large cavities, and trees with exfoliating bark. Percent exfoliating bark was used to categorize quality of potential roost trees. High-quality trees exhibited greater than 25 percent of the remaining bark exfoliating, moderate trees 11 to 25 percent, and low-quality trees less than 10 percent. High-quality habitat plots contained a mature forest with a relatively open subcanopy and at least one moderate or high-quality potential roost tree. Low-quality habitat plots consisted of either young stands lacking mature trees or strands with a dense subcanopy, or they lacked potential roost trees.

Three sample points were taken in forests along the proposed transmission line route. Overall, most forested habitat was found to be unsuitable for Indiana bats, and most points were rated as low-quality habitat. However, one point near the western end of the proposed route contained moderate quality habitat for Indiana bats.

3.7. Wetlands

Wetlands are areas inundated by surface water or groundwater such that vegetation adapted to saturated soil conditions are prevalent. Examples include swamps, marshes, bogs, wet meadows, and lacustrine or palustrine shoreline fringes. On September 2, 2008, a ground survey was conducted to delineate wetland areas within the proposed transmission line ROW and all access roads.

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

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

The project area includes a landscape that is predominantly upland forest and agricultural fields. Six wetlands, totaling 3.46 acres, were identified within the subject ROWs (Table 3-6). All access roads leading to the transmission line ROW are existing; therefore, no wetlands were identified on any of the proposed access roads outside the transmission line corridor.

Table 3-6. Wetlands in the Proposed Transmission Line Rights-of-Way

Wetland Identifier	Type[1]	Wetland Area Within Right-of-Way (acres)	Estimated Forested Wetland Acreage in Proposed Right-of-Way	TVARAM Category (score)
W001	PEM1E	0.08	0.00	1 (28)
W002	PEM/PSS1E	0.16	0.00	1 (26)
W003	PEM/PSS1E	0.15	0.00	1 (26)
W004	PEM/PSS1E	2.07	0.00	2 (46)
W005	PEM/PSS1E	0.83	0.00	2 (46)
W006	PFO1E	0.17	0.17	2 (46)
	TOTAL	**3.46**	0.17	

[1]Classification codes as defined in Cowardin et al. (1979): PEM1 = Palustrine emergent, persistent vegetation; PSS1 = Palustrine scrub-shrub, broadleaf deciduous; PFO1 = Palustrine forested, broadleaf deciduous; E = Seasonally flooded/saturated

Wetland 001 (W001) is an 0.08-acre, emergent wetland located in a depressional feature in a cattle pasture. This wetland extends outside the proposed ROW for approximately 0.25 acre. W001 exhibits hydric soils, but does not maintain hydrologic connectivity to any nearby surface water. W001 is dominated by hydrophytic vegetation, including panic grasses and Virginia marsh flower. W001 was rated as a Category 1 wetland using TVARAM because it exhibits impaired wetland condition and poor provision of wetland functions.

Wetland 002 (W002) is a 0.16-acre, emergent, scrub-shrub wetland located in a drainage feature in a crop field. This wetland extends west of the proposed ROW approximately 0.6 acre. W002 exhibits hydric soils, but no longer maintains hydrologic connectivity to any nearby surface potentially due to adjacent wetland fill and impoundment of the historical drain. W002 is dominated by hydrophytic vegetation that includes knotweeds, black willow, and red maple. W002 scored in Category 1 using TVARAM because it exhibits impaired wetland condition and poor provision of wetland functions.

Wetland 003 (W003) is a 0.15-acre, emergent, scrub-shrub wetland located in a drainage at the base of an excavated pond. This wetland extends north of the proposed ROW approximately 1 acre into a drainage feature. W003 exhibits hydric soils and appears to maintain hydrologic connectivity to Monroe Creek. W003 is dominated by hydrophytic vegetation that includes panic grass, knotweed, goldenrod, and buttonbush. W003 scored in Category 1 using TVARAM because it exhibits impaired wetland condition and poor provision of wetland functions.

Wetlands 004, 005, and 006 (W004, W005, W006) are part of a large emergent, scrub-shrub-forested wetland complex associated with the headwaters of Monroe Creek. This wetland totals approximately 15 acres, crossing the ROW in three separate locations. Within the ROW, W004 (2.07 acres) and W005 (0.83 acre) encompass the emergent, scrub-shrub components of this wetland complex. W006 encompasses the forested portion of this wetland complex and totals 0.17 acre on the ROW. Each of these wetland areas exhibit hydric soil and are dominated by hydrophytic vegetation. W004 and W005 appear to be maintained by infrequent bush-hogging and are dominated by knotweed, tag alder, reed canary grass, narrow leaf sunflower, and broomsedge. W006 is dominated by pin oak, sweetgum, river oats, and moss.

3.8. Floodplains

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

The proposed transmission line route crosses small areas in Overton County of the 100-year floodplains associated with streams listed in Section 3.2.

3.9. Visual and Aesthetic Quality

The physical, biological, and cultural features of an area combine to make the visual landscape character both identifiable and unique. Scenic integrity indicates the degree of unity or wholeness of the visual character. Scenic attractiveness is the evaluation of outstanding or unique natural features, scenic variety, seasonal change, and strategic location. Where and how the landscape is viewed would affect the more subjective perceptions of its aesthetic quality and sense of place. Views of a landscape are described in terms of what is seen in foreground, middleground, and background distances. In the foreground, an area within 0.5 mile of the observer, details of objects are easily distinguished in the landscape. In the middleground, normally between 0.5 and 4 miles from the observer, objects may be distinguishable, but their details are weak and they tend to merge into larger patterns. Details and colors of objects in the background, the distant part of the landscape, are not normally discernible unless they are especially large and standing alone. The impressions of an area’s visual character can influence how it is appreciated, protected, and used. The general landscape character of the study area is described in this section with additional details in Section 4.9.

The new 161-kV transmission line would begin at the tap point along the existing Livingston-Jamestown 161-kV Transmission Line located just northeast of Good Hope Cemetery in Livingston. The landscape character in this area ranges from urban development closest to the existing line to undeveloped ridgelines farther to the north. Traffic along SR 52/85 is moderate. Scenic attractiveness is common. Scenic integrity is low.

The line would be routed to the northeast and then turn east, traversing steep ridgelines before turning north at Alvin Road. There are a few houses scattered along Alvin Road, a minor access road with light traffic. The new transmission line would continue north along steep topography and dense, mature trees. From viewing positions in the middleground and background along SR 52/85 to the south and Linder Mountain Road to the north, details of the vegetation merge into broader patterns and are definable mainly as mature hardwood and evergreen trees. Scenic attractiveness is common. Scenic integrity is moderate.

The transmission line would cross Linder Mountain Road to the north. This area is mainly open agriculture to the east and heavily wooded to the west. There is one home to the east in the foreground of the proposed line. The line would disappear quickly to the north within mature deciduous and evergreen forest. Approximately 0.5 mile to the north, the proposed transmission line would turn northeast and parallel the Livingston-Byrdstown Transmission Line for approximately 1.5 miles.

The line would then turn northwest and cross Big Springs Road. There are several homes located sporadically along Big Ridge Road to the east and west of the proposed line. There are numerous existing utility poles and lines located along the roadway. To the east, the area is mainly open pasture. Views of this area for residents along Big Springs Road and motorists are in the middleground distances. Scenic attractiveness is common. Scenic integrity is low.

The line would turn to the northwest and enter the UCEMC substation just south of SR 111. This area is mainly open agricultural land with a few residents to the northeast. SR 111 is a main thoroughfare, and traffic is moderate to heavy.

3.10. Recreation, Parks, and Natural Areas

There are no public or commercial recreation areas in the vicinity of the proposed transmission line ROW. Additionally, the proposed transmission line ROW is not within or adjacent to any natural areas; however, two natural areas are located within 3 miles.

While the varied terrain and mix of open field and tree cover make the area suitable for some dispersed recreation use such as hunting, walking, hiking, and nature observation, there appears to be limited opportunities for public recreation in the area, and private land owners would likely account for most of the use that does occur.

Dillion Pond Park is a public park created by TDEC, Overton County, and the City of Livingston. The park, consisting of a shallow pond surrounded by walking trails, is located approximately 1.7 miles west of the proposed ROW.

Dale Hollow Reservoir Reservation is a 52,453-acre area surrounding the 27,700-acre reservoir on the Obey River. The reservation, built and managed by the USACE, is located approximately 2.5 miles northeast of the proposed site.

3.11. Historical and Archaeological Resources

Middle Tennessee has been an area of human occupation for the last 12,000 years. Human occupation of the area is generally described in five broad cultural periods: Paleo-Indian (11,000 to 8000 B.C.), Archaic (8000 to 1600 B.C.), Woodland (1600 B.C. to A.D. 1000), Mississippian (A.D. 1000 to 1700), and Historic (A.D. 1700 to present). Prehistoric land use and settlement patterns vary during each period, but short- and long-term habitation sites are generally located on floodplains and alluvial terraces along rivers and tributaries. Specialized campsites tend to be located on older alluvial terraces and in the uplands.

Overton County was created on September 12, 1806, from Jackson County. Dr. Moses Fisk established a settlement at Hilham, one of the oldest communities in the county. The county seat moved from Monroe to Livingston in 1835. Overton County was located mostly outside the fighting of the Civil War; however, a band of Confederate guerrillas burned down the courthouse in 1865. The coal mining industry and the logging industry moved into the county after the Civil War. This industrial boom brought the railroads into the region. That economic boom reached its peak in the 1940s and has been on the decline ever since (Birdwell 1998).

The area of potential effects (APE) for archaeological resources was determined as all areas in which land-disturbing activities would take place. The APE for architectural studies includes a 0.5-mile area surrounding the proposed transmission line ROW route, as well as any areas where the project would alter existing topography or vegetation in view of a historic resource. Background research identified no previously recorded archaeological resources within the archaeological APE. However, 10 previously recorded architectural resources (OV-732, 733, 738, 966-970, 1024, and 1091) were identified within the architectural APE. OV-732, 970, 1024, and 1091 are located outside the visual line of sight to the proposed transmission line and ROW. OV-966, 967, and 968 are considered ineligible for listing in the National Register of Historic Places (NRHP) due to modern alterations and lack of architectural distinction. OV-733, 738, and 969 have been destroyed since their initial recordation.

The archaeological field survey identified 13 previously unrecorded archaeological resources. These sites are considered ineligible for listing in the NRHP because they did not contain intact deposits. The architectural survey identified one previously unrecorded architectural resource (HS-1). HS-1 is considered ineligible for listing in the NRHP due to its lack of architectural distinction and modern alterations.

CHAPTER 4

4.0 ENVIRONMENTAL CONSEQUENCES

This chapter contains a discussion of the potential effects of implementing the alternatives. The discussion of the potential effects to the various resources is presented in the same order as the previous chapter. Potential effects anticipated under the No Action and the Action Alternatives are provided under each resource area.

In the discussion of the No Action Alternative that follows, the assumption was made that UCEMC would not connect its planned substation to the TVA transmission system. However, as mentioned in Section 2.1.1, UCEMC could decide to build a new transmission line to serve its new substation. If it chose to do that, the potential impacts identified for the No Action Alternative likely would be similar to or greater than the impacts if TVA decides to construct the line connecting the substation to the transmission system, depending on the route chosen by UCEMC and its construction techniques.

4.1. Groundwater and Geology

4.1.1. No Action Alternative

Under the No Action Alternative, there would be no direct effects to groundwater or geological resources because the proposed transmission line would not be built. The existing transmission line would remain in operation, and periodic and routine maintenance of the ROW would continue. Thus, there would be no additional effects to groundwater or geological resources along this existing line under the No Action Alternative.

4.1.2. Action Alternative

Potential impacts to groundwater could result if sediments from excavated materials enter or clog karst features and from the transport of contaminants such as herbicides and fertilizers into sinkholes. BMPs (Muncy 1999) would be used during ROW and access road construction to control sediment infiltration from storm water runoff to avoid contamination of groundwater in the project area.

During revegetation and maintenance activities, application of herbicides and fertilizers would be avoided in the areas along the ROW where sinkholes and caves occur to prevent groundwater contamination. Any herbicides applied to the ROW during periodic maintenance would be applied according to the manufacturer's label. Due to the mature karst terrain, herbicides with groundwater contamination warnings would not be used within the ROW south of Linder Mountain Road. During ROW maintenance, the vegetation management guidelines and procedures as described in Appendix E would be followed. With the implementation of BMPs and routine precautionary measures, impacts to groundwater from the proposed action would be insignificant.

4.2. Surface Water

4.2.1. No Action Alternative

Under the No Action Alternative, the proposed 161-kV transmission line would not be constructed. Thus, there would be no project-related effects to surface water or to surface water quality along the proposed ROW. Therefore, there would be no additional effects to surface water along this segment under the No Action Alternative.

4.2.2. Action Alternative

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

TVA routinely includes precautions in the design, construction, and maintenance of its transmission line projects to minimize these potential impacts (see Appendices B, C, D, and E). Permanent stream crossings would be designed to prevent impedance of runoff patterns and the blockage of the natural movement of aquatic fauna. Temporary stream crossings and other construction and maintenance activities would comply with appropriate state permit requirements and TVA requirements as described in Muncy (1999). Canopies in all SMZs would be left undisturbed unless there were no practicable alternative. ROW maintenance would employ manual and low-impact methods wherever possible. In areas requiring chemical treatment, only USEPA-registered herbicides would be used in accordance with label directions designed in part to restrict applications near receiving waters and to prevent unacceptable aquatic impacts. Proper implementation of these controls is expected to result in only minor temporary impacts to surface waters. The Roaring River, listed as a State Scenic River, is more than 10 miles from the proposed project and is also not within the project drainage area. No impacts to this river are expected as a result of the proposed project. No cumulative impacts are anticipated.

4.3. Aquatic Ecology

4.3.1. No Action Alternative

Under the No Action Alternative, the transmission line, ROW, and access roads would not be built. Thus, no changes to aquatic resources within these areas would occur. Adoption of the No Action Alternative is not expected to result in any additional effects to local aquatic life.

4.3.2. Action Alternative

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

Siltation has a detrimental effect on many aquatic animals adapted to riverine environments. Turbidity caused by suspended sediment can negatively impact spawning and feeding success of many fish species (Sutherland et al. 2002). Several mussel species found in the potentially affected watersheds are adapted to a sand and gravel bottom environment. These mussels cannot long survive for extended periods in a bottom environment composed of fine sediment because they are quickly destroyed by silt that clogs the gills which smothers the animals (Parmalee and Bogan 1998).

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

Standard Stream Protection (Category A) as defined in Muncy (1999) would protect the five ponds and two intermittent streams along the proposed transmission line. This category of protection is based on the variety of species and habitats that exist in the pond or streams as well as the state and federal requirements to avoid harming certain species. The width of the SMZs is determined by the type of watercourse, primary use of the water resource, topography, or other physical barriers (ibid).

Because appropriate BMPs and SMZs would be implemented during construction, operation, and maintenance of the proposed transmission line, any impacts to aquatic life resulting from the proposed action would be insignificant.

4.4. Vegetation

4.4.1. No Action Alternative

Under the No Action Alternative, the proposed new transmission line would not be built, and the area within the proposed ROW would remain in its current condition. Thus, 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 the changes would not result from the proposed project.

Adoption of the No Action Alternative would not significantly impact the extent or severity of invasive terrestrial plants within the ROW of the proposed transmission line. Because no project-related work would take place, adoption of the No Action Alternative would allow nonnative invasive plant species present in the project area to remain. All invasive species found in the project area are common throughout the region.

4.4.2. Action Alternative

Adoption of the Action Alternative would not significantly affect the terrestrial ecology of the region. Adoption of this alternative would require clearing of approximately 23 acres of forest. About 22 percent of this is heavily disturbed by recent (in the previous five years) or current logging. About 7 acres of mature, minimally disturbed deciduous forest would be cleared. In these areas, overstory trees have an average DBH of 2 feet, have not had major recent disturbance (i.e., grazing, logging), and have relatively low concentrations of non-native plant species. However, these communities are common and well represented throughout the region. No rare plant communities occur in the project area. Thus, any impacts to terrestrial ecology along the proposed ROW are expected to be minor and insignificant.

Adoption of the Action Alternative would not significantly affect the extent or severity of invasive terrestrial plants at the county, regional, or state level, but invasive species could become more prevalent in certain areas of newly constructed ROW. Much of the project area currently has a large component of exotic species, and adoption of the Action Alternative would not change the current situation. Some areas of mature deciduous forest currently have low concentrations of invasive plants. TVA standard operating procedure of revegetating with noninvasive species (Muncy 1999) would help prevent introduction and spread of invasive species at the project site.

Converting forestland to managed ROW for construction of the proposed transmission line would be long term in duration, but insignificant when compared to regional land use changes expected to occur in the foreseeable future. Completion of the project, as currently proposed, would result in clearing of 23 acres of forest including about 7 acres of mature, minimally disturbed deciduous forest. As of 2004, Overton and the five adjacent counties (Clay, Fentress, Jackson, Pickett, and Putnam) are estimated to have over 800,000 acres of forested land (Miles 2008).

4.5. Wildlife

4.5.1. No Action Alternative

Under the No Action Alternative, the proposed new transmission line and access roads would not be constructed, and the project area would remain in its current condition. Wildlife and wildlife habitats would not be affected by any project-related actions.

4.5.2. Action Alternative

Under the Action Alternative, construction of the proposed new transmission line and access roads would result in a change in the composition of wildlife habitats in the project area. Most trees and other vegetation would be removed from the proposed ROW, which would be maintained as early successional habitats. Overhanging trees and other vegetation would be removed alongside roads to widen them for use as access roads. The initial clearing would likely temporarily displace larger animals, such as deer and turkey, from the project area into surrounding areas. Smaller animals occupying the areas to be cleared, such as mice, shrews, frogs, and salamanders, could be destroyed by construction activities. Following the line construction and revegetation of the site, wildlife favoring edge and early successional habitats would occupy the proposed ROW, changing the overall species composition of the area to those favoring early successional or scrub-shrub habitats.

Environmental effects resulting from the proposed actions are expected to include the loss of approximately 23 acres of forested habitat, increased fragmentation of remaining adjacent forests, and an increase in both early successional and edge habitats within the proposed project area. The increase in early successional and edge habitats would benefit early successional species and species that tolerate disturbance well. The loss of forest habitats in the proposed project area, and further fragmentation of adjacent forested areas, would impact species favoring forested habitats. Clearing of forested habitat along the route would result in minimal habitat fragmentation and would slightly increase the percentage of forest edge. Overall, forest conversion would be locally insignificant due to the high amount of habitat fragmentation that already exists along the proposed route. Most species that would be affected by these changes are locally and regionally common.

Thirty-five caves are known to occur within 3 miles of the proposed new transmission line route and access roads, with the closest being 0.17, 0.34, 0.81, 1.16, and 1.49 miles away. The closest cave (Linder Mountain Cave) has no records of animals, and because it is greater than 200 feet from the proposed new transmission line route and access roads, the proposed actions would not further disturb this cave or other cave habitats in the area. The proposed new transmission line and access roads are not expected to result in significant direct or indirect impacts to terrestrial wildlife or their habitats.

Central Tennessee is one of the faster growing areas in the United States. This level of population growth is associated with large-scale development that converts natural areas to other land uses, including the transmission of electricity to areas with new growth. However, this area is already highly disturbed and modified from previous human alterations of the landscape, and the changes from the proposed project would not be regionally significant. The proposed transmission line project would convert approximately 23 acres of forested habitat to early successional habitat. Due to existing levels of fragmentation of forested habitats in the vicinity, the proposed action would not result in adverse impacts to local wildlife populations or their habitats.

4.6. Endangered and Threatened Species

4.6.1. No Action Alternative

Under the No Action Alternative, TVA would not construct the proposed transmission line. Thus, any federally or state-listed species and their habitats in the project area would not 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 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

Adoption of the Action Alternative would have no effect on federally listed aquatic species because no federally listed aquatic species or their habitat occurs in areas of the proposed transmission line ROW. Additionally, the state-listed ashy darter does not occur within the potentially affected watersheds. Therefore, no impacts to the ashy darter or its habitat would occur. The other six state-listed aquatic species in Table 3-3 are historical records occurring prior to the impoundment of the Obey River by the construction of Dale Hollow Dam in 1943. These species are considered extirpated from the area due to a loss of suitable habitat. Therefore, no impacts to any state-listed aquatic species would occur as a result of the construction of the 161-kV transmission tap line and ROW.

4.6.2.2. Plants

Adoption of the Action Alternative would not affect federally listed plant species because no such plant species or their habitats occur in areas proposed for ROW construction. Suitable habitat for three state-listed plant species known from within 5 miles of the proposed transmission line occurs within the ROW; however, none of these plants were found during field surveys, and no impacts to state-listed plant species are anticipated with the implementation of the proposed project.

4.6.2.3. Terrestrial Animals

No suitable bald eagle habitat occurs along the proposed transmission line route or access roads. Forested habitats along the route vary in age, have a low percentage of mature timber, and are largely fragmented offering little suitable habitat for cerulean warblers. The proposed project would not result in adverse impacts to these species.

The nearest known gray bat cave occurs 6.4 miles from the proposed transmission line route and access roads. Because of this distance and the historical nature of this record, the proposed actions would not affect this cave. Other caves in the area provide potentially suitable habitat for both Indiana and gray bats. None of these caves, however, occur close enough to the proposed route to experience potential effects. Therefore, cave habitat for either bat species would not be affected by the proposed actions.

The ponds and intermittent streams that cross the proposed transmission line ROW provide marginal foraging habitat for gray bats; however, the proposed action is not expected to change or affect this foraging habitat. Therefore, no direct or indirect effects would occur to gray bats and their habitats by the proposed actions.

The potential Indiana bat summer roosting habitat within the proposed transmission line ROW was found to be mostly low quality, with two of three sample points scoring low quality and one point scoring moderate quality. According to the Indiana Bat Survey Guidance for the Commonwealth of Kentucky (USFWS 2008), cutting trees in areas of potential Indiana bat summer roosting habitat should only take place between October 15 and March 31 when the bats are not present in this habitat.

The conversion of mature forested habitat potentially used by Indiana bats affects only 1.4 miles of forested habitat on the southern end of the proposed transmission line corridor. Overall, the loss of mature forest habitat and forest fragmentation is not regionally or locally significant. The proposed actions would create additional areas of early successional habitats in the project area. However, this decrease in forested habitats would not result in adverse cumulative effects to protected species using these habitats.

With the implementation of the Action Alternative, TVA would remove any potential moderate-quality Indiana bat habitat occurring within the southwest end of the proposed transmission line corridor before March 31, 2009. Remaining forested portions with low-quality habitat would also be cleared during this time but may be extended beyond March 31, if necessary. Because the area of moderate-quality Indiana bat habitat that would be cleared would occur during the October 15 and March 31 time period, TVA determined that the proposed project is not likely to adversely affect populations of Indiana bats. In accordance with Section 7 of the *Endangered Species Act*, TVA consulted with the USFWS, which concurred with this determination in a letter dated October 15, 2008 (see Appendix A).

4.7. Wetlands

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

4.7.1. No Action Alternative

Under the No Action Alternative, no disturbance to wetlands within the proposed transmission line ROW would occur. Therefore, no wetlands would be affected.

4.7.2. Action Alternative

The proposed transmission line project would result in the clearing of 0.17 acre of forested wetland in W006 and the potential placement of transmission line structures within wetlands. As a result of the long-term maintenance of the ROW, this forested wetland acreage would become an emergent wetland and would remain so as long as the line stays in operation. Because the forested wetland acreage proposed for clearing is part of a much larger wetland complex, the functions this larger wetland area provides would be maintained sufficiently post-construction. If any structures or fill material to facilitate equipment access are to be placed within the delineated wetland boundaries, TVA would comply with USACE regulations regarding any required permits. All other potential wetland impacts resulting from vehicular access across these wetlands for transmission line construction and/or long-term maintenance activities would be minimized sufficiently with BMPs (Muncy 1999). Therefore, the conversion of 0.17 acre of forested wetland to emergent/scrub-shrub and the use of BMPs to minimize impacts associated with vehicular access and long-term maintenance, collectively, would result in insignificant impacts to wetland areas within the project site.

Cumulative impact analysis of wetland impacts took into account wetland loss and conversion at a watershed-level scale, in this case within the Eagle Creek/Obey River watershed. According to National Wetland Inventory data, 529 mapped wetland acres are located within the localized watershed. Conversion of 0.17 acre of forested wetlands to emergent/scrub-shrub wetland habitat would affect less than 0.01 percent of overall forested wetland acreage in the watershed. Thus, cumulative project-related effects on wetlands would be insignificant.

4.8. Floodplains

4.8.1. No Action Alternative

Under the No Action Alternative, the proposed transmission line and access roads would not be constructed. Therefore, no floodplains would be affected under this alternative because there would be no physical changes to the current condition of local floodplains.

4.8.2. Action Alternative

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

Some of the proposed access roads cross 100-year floodplain areas. Consistent with EO 11988, a road is considered a repetitive action in the 100-year floodplain. To minimize adverse impacts, any new road construction would be done in such a manner that upstream flood elevations would not be increased. Neither the proposed Monroe Substation nor the three transmission line switch structures would be located within the 100-year floodplain, which would be consistent with EO 11988.

4.9. Visual and Aesthetic Quality

Visual consequences are examined in terms of visual changes between the existing landscape and proposed actions, sensitivity of viewing points available to the public, their viewing distances, and 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 new transmission line would not be constructed, and there would be no project-related effects to the visual resources of the area.

4.9.2. Action Alternative

The tap point for the new 161-kV transmission line would be just northeast of Good Hope Cemetery in Livingston, along the existing Livingston-Jamestown 161-kV Transmission Line. Residents and motorists along SR 52/85 would have foreground views of the new transmission line. Although the new transmission line would contribute to a decline in scenic integrity, the new line and structures would be visually similar to the numerous transmission structures seen in the landscape now.

The new line would be routed to the northeast and then turn east, traversing steep ridgelines before turning north at Alvin Road. There are a few houses scattered along Alvin Road that would have minor views of the new line, particularly to the west. However, the line would cross Alvin Road farther east and would quickly disappear into existing vegetation.

The new line would cross Linder Mountain Road to the north. Presently, one resident to the east would have foreground views of the new line. These views would likely be of several new structures before views would be obscured by existing vegetation to the north. The new structures would contribute to a decline in scenic attractiveness and scenic integrity. This decline would likely not lower scenic value class by two levels or more, the threshold of significance.

The new line would turn northwest and cross Big Springs Road. There are several homes located sporadically along Big Ridge Road to the east and west of the proposed line. There are numerous existing service poles and lines located along the roadway.

New lines and structures would increase adverse vertical contrast for area residents. There would be a decline in scenic integrity that would result in adverse contrast visual discord. However, the existing landscape offers panoramic views to the south and west and has the potential to absorb visual change due to topography and interspersed groves of mature deciduous and evergreen trees.

The line would turn to the northwest and enter UCEMC's new Monroe Substation just south of SR 111. Area residents to the northeast and motorists along SR 111 would have foreground views of the new line. For motorists, these views would be brief mainly due to the existing road alignment. Residents to the northeast would likely have views of several structures as the lines enter the substation. These structures would contribute to a decline in scenic integrity.

Operation, construction, and maintenance of the proposed transmission line would be visually insignificant. There may be some minor visual discord during the construction period due to an increase in personnel and equipment and the use of laydown and material storage areas. These minor visual obtrusions would be temporary until the proposed 100-foot ROW and laydown areas have been restored through the use of TVA's standard BMPs (Muncy 1999). Therefore, no significant adverse visual impacts are anticipated as a result of this project.

4.10. Recreation, Parks, and Natural Areas

4.10.1. No Action Alternative

Under the No Action Alternative, the proposed transmission line would not be constructed. Thus, adoption of the No Action Alternative would have no effect on recreation or managed areas in the proposed project area. However, over the long term, these features as well as their management objectives could be subject to change from various factors. These factors include local population trends, surrounding land use, area development, regional recreational patterns, and changes in cultural, ecological, and educational interests.

4.10.2. Action Alternative

Because the ROW for the proposed transmission line is sufficient distance from the two natural areas, no direct, indirect, or cumulative effects to natural areas are anticipated as a result of the proposed action.

The proposed project could cause some minor shifts in recreational use patterns in the immediate area of the substation and transmission line. These minor shifts, however, would not result in a significant impact on outdoor recreation activities in the area.

4.11. Historical and Archaeological Resources

4.11.1. No Action Alternative

Under the No Action Alternative, the proposed actions would not be undertaken, and there would be no project-related effects to historic or archaeological resources if this alternative were adopted. Likewise, no additional new effects or cumulative effects to these resources along the proposed line route are expected under this alternative.

4.11.2. Action Alternative

Thirteen previously unrecorded archaeological resources were identified within the APE. These sites are considered ineligible for listing in the NRHP because they did not contain intact deposits. Ten previously recorded architectural resources and one previously unrecorded architectural structure are located within the APE (Jones 2008). Four of these were located outside the visual line of sight of the proposed transmission line ROW, and the remaining seven sites are considered ineligible for listing in the NRHP because the resources lack integrity or have had modern alterations.

In compliance with Section 106 of the *National Historic Preservation Act* pursuant to 36CFR§§800, TVA consulted with the Tennessee State Historic Preservation Officer (SHPO), and other consulting parties. In a letter dated November 20, 2008, the Tennessee SHPO concurred with TVA's determination that the proposed undertaking would not adversely affect any historic properties that are potentially eligible or currently listed in the NRHP (Appendix A).

4.12. Post-Construction Effects

4.12.1. Electric and Magnetic Fields

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

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

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

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

Under certain weather conditions, high-voltage transmission lines, such as the proposed 161-kV line, may produce an audible low-volume hissing or crackling noise. This noise is generated by the corona resulting from the dissipation of energy and heat as high voltage is applied to a small area. Under normal conditions, corona-generated noise is not audible. The noise may be audible under some wet conditions, 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 correctable and would be repaired if reported to TVA.

Implanted medical devices historically had a potential for power equipment strong-field interference when they came within the influence of low-frequency, high-energy workplace exposure. However, the older devices and designs (i.e., those beyond five to 10 years old) have been replaced with different designs and different shielding that prevent potential for interference from external field sources up to and including the most powerful magnetic resonance imaging medical scanners. Unlike high-energy radio frequency devices that can still interfere with implanted medical devices, low-frequency and low-energy powered electric or magnetic devices no longer potentially interfere (*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 object’s static charge accumulation and discharge in dairy facilities have been found when the connections from a distribution line meter have not been properly installed on the consumer’s side of a distribution circuit.

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, substations, or equipment.

There is some public concern as to the potential for adverse health effects that may be related to long-term exposure to 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 [NIEHS] 2002). Some research continues on the statistical association between magnetic field exposure and a rare form of childhood leukemia known as acute lymphocytic leukemia. A recent review of this topic by the WHO (International Association for Research on Cancer 2002) concluded that this association is very weak, and there is inadequate evidence to support any other type of excess cancer risk associated with exposure to EMFs.

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

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

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

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

4.12.2. 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.

4.12.3. Transmission Structure Stability

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

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

4.12.4. Noise and Odor

During construction of the proposed transmission line, equipment would generate noise above ambient levels. Because of the short construction period, noise-related effects are expected to be temporary and insignificant. In the more densely populated areas along the ROW, construction techniques would be used to limit noise as much as possible. For similar reasons, noise related to periodic line maintenance is also expected to be insignificant. In residential areas, the need for periodic ROW vegetation maintenance, i.e., mowing, would be limited or nonexistent. As described in Section 4.12.1, transmission lines may also produce noise during operation under certain atmospheric conditions.
Away from the ROW, this noise is below the level that would interfere with speech. Construction and operation of the line are not expected to produce any noticeable odors.

4.12.5. Other Impacts

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

4.12.6. No Action Alternative

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

4.12.7. Action Alternative

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

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

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

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

4.13. Unavoidable Adverse Impacts

Construction and operation of the proposed transmission line has the potential to cause unavoidable adverse effects to several environmental resources. These adverse effects could include the loss of forest area and changes in associated wildlife populations; increased forest fragmentation; removal of the tree canopy at stream crossings; restrictions on future land use within the ROW; and changes to the visual character within the local area. TVA has reduced the potential for such adverse effects during the planning process. In addition, TVA would implement mitigation measures (see Section 4.16) to reduce potential adverse effects to certain environmental resources.

4.14. Relationship of Short-Term Uses and Long-Term Productivity

The construction and operation of the proposed transmission line would increase the capacity and reliability of the power supply in the TVA service area and, specifically, in the Monroe and Livingston areas. Not doing this could undermine the economic and population growth that is occurring in the Overton County area.

Construction and operation activities associated with the proposed transmission line would result in short-term and long-term effects on timber and wildlife production within the ROW. A minor amount of agricultural productivity would be lost for the life of the transmission line due to the placement of poles, but most agricultural activities could continue within the transmission line ROW. There would be long-term visual effects along some portions of the proposed transmission line route due to the visual intrusions of the transmission line and its structures. These potential effects have been reduced to the extent possible during the planning process.

4.15. Irreversible and Irretrievable Commitments of Resources

Irreversible commitments of resources cannot be reversed, except perhaps in the extreme long term. For example, mining of ore is an irreversible commitment of a resource; once the ore is removed and used, it cannot be replaced. Irretrievable commitments are those in which a resource is lost for a finite period—even a long period of time. For example, the construction of a road through a forest would be an irretrievable commitment of the productivity of timber within the road ROW as long as the road remains.

The materials used for construction of the proposed transmission line would be committed for the life of the line, a period of 50 years or more. Some materials, such as ceramic insulators may be irrevocably committed. However, metals in conductors, structures, and other equipment could be recycled.

Constructing the proposed transmission line would result in the irretrievable loss of 23 acres of forest. Similarly, the ROW used for the proposed transmission line would be committed irretrievably, but the approximately 51 acres of ROW could be returned to other uses upon retirement of the line. In the meantime, compatible uses of the ROW such as farming and the provision of open-land wildlife habitat could continue. However, the provision of forest products, forest wildlife habitat, and other forest-dependent amenities on those forested sections of the proposed ROW would be lost for the life of the transmission line.

4.16. Summary of TVA Commitments and Proposed Mitigation Measures

TVA would undertake the following routine measures to reduce the potential for adverse environmental effects.

- Appropriate BMPs would be implemented during construction activities.
- During construction and operation of the proposed transmission line, the environmental quality protection specifications as described in Appendices B, C, D, and E of this document would be implemented.
- Any improvements to the access road for the proposed switches would be done in a manner such that upstream flood elevations would not be increased.

The following nonroutine measure would be applied during construction and operation of the proposed transmission line to reduce the potential for adverse environmental effects.

- Due to the mature karst terrain, herbicides with groundwater contamination warnings would not be used within the 2.75-mile transmission line ROW beginning south of Linder Mountain Road to the Livingston-Jamestown 161-kV Transmission Line tap point. Vegetation management guidelines and procedures as described in Appendix E would be followed during ROW maintenance.

CHAPTER 5

5.0 LIST OF PREPARERS

5.1. NEPA Project Management

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Position:	Senior NEPA Specialist
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5.2. Other Contributors

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CHAPTER 6

6.0 LIST OF AGENCIES TO WHOM COPIES ARE SENT

Federal Agencies

U.S. Fish and Wildlife Service

State Agencies

Tennessee Department of Environment and Conservation
Tennessee Historical Commission

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CHAPTER 7

7.0 LITERATURE CITED

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