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FINAL ENVIRONMENTAL ASSESSMENT

KIRKMANSVILLE–CLIFTY CITY, KENTUCKY POWER SUPPLY IMPROVEMENT PROJECT

Christian, Muhlenburg, and Todd Counties, Kentucky

TENNESSEE VALLEY AUTHORITY

FEBRUARY 2005

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CHAPTER 1

1. PURPOSE OF AND NEED FOR ACTION

1.1. Proposed Action: Improve Power Supply

The Tennessee Valley Authority (TVA) is proposing to improve the power supply in Christian, Muhlenberg, and Todd Counties, Kentucky. The proposed action would include the following component actions:

- Retire the Kirkmansville 69-kilovolt (kV) Substation and replace it by constructing a new 161-26-kV substation to be known as the Fruit Hill Substation
- Construct a new 161-69-kV substation, i.e., the Jason Substation, to add another 69-kV power source in the area
- Rebuild a 23-mile portion of the Paradise-Hopkinsville 69-kV Transmission Line from the Clifty Substation tap (i.e., connection point) to the Paradise Fossil Plant (PAF)

1.2. Need

The Paradise-Hopkinsville 69-kV Transmission Line supplies electric power to TVA's Kirkmansville and Dunmor 69-kV Substations and to the Clifty and Ennis 69-kV Substations, which are owned by Pennyrile Rural Electric Cooperative Corporation (RECC). The entire line is 45.7 miles long and is constructed mainly with wood poles, wood crossarms, and pin-type insulators, which are all at the end of their useful lives. The line has had 80 interruptions over the last 5 years, and the cause of many of the interruptions cannot be explained. Because of the distance involved and the electrical load on the line, voltage fluctuations have been excessive for the Kirkmansville and Clifty Substations. The line performance is one of the worst on the TVA system and does not meet service quality standards. The Kirkmansville 69-kV Substation is also nearing the end of its useful life.

1.3. Objectives of the Proposed Power Supply Improvement Project

To improve the power supply for the Clifty, Dunmor, and Ennis delivery points, TVA would retire and rebuild that portion of the Paradise-Hopkinsville 69-kV Transmission Line from the Clifty Substation tap to the PAF using the existing right-of-way. The portion of the transmission line that would be rebuilt includes the Kirkmansville-Dunmor 69-kV Transmission Line running from the Clifty Substation to the Dunmor Substation and the Dunmor-Paradise 69-kV Transmission Line from the Dunmor Substation to PAF. Maps of the area are provided as Figures 1-1A through 1-1D. Plans for the rebuilt transmission line call for construction to start in October 2006 and the line to be in service by February 2008. The new line would be constructed using steel-pole structures on the centerline of the existing 75-foot-wide right-of-way. At places where the line changes direction, TVA may have to acquire additional rights for guys used to support the poles.

Figure 1-1A. Topographic Map Showing Locations of the Existing Clifty Substation, the Proposed Jason Substation Site and a Portion of the Kirkmansville-Dunmor 69-kV Transmission Line Proposed to be Rebuilt

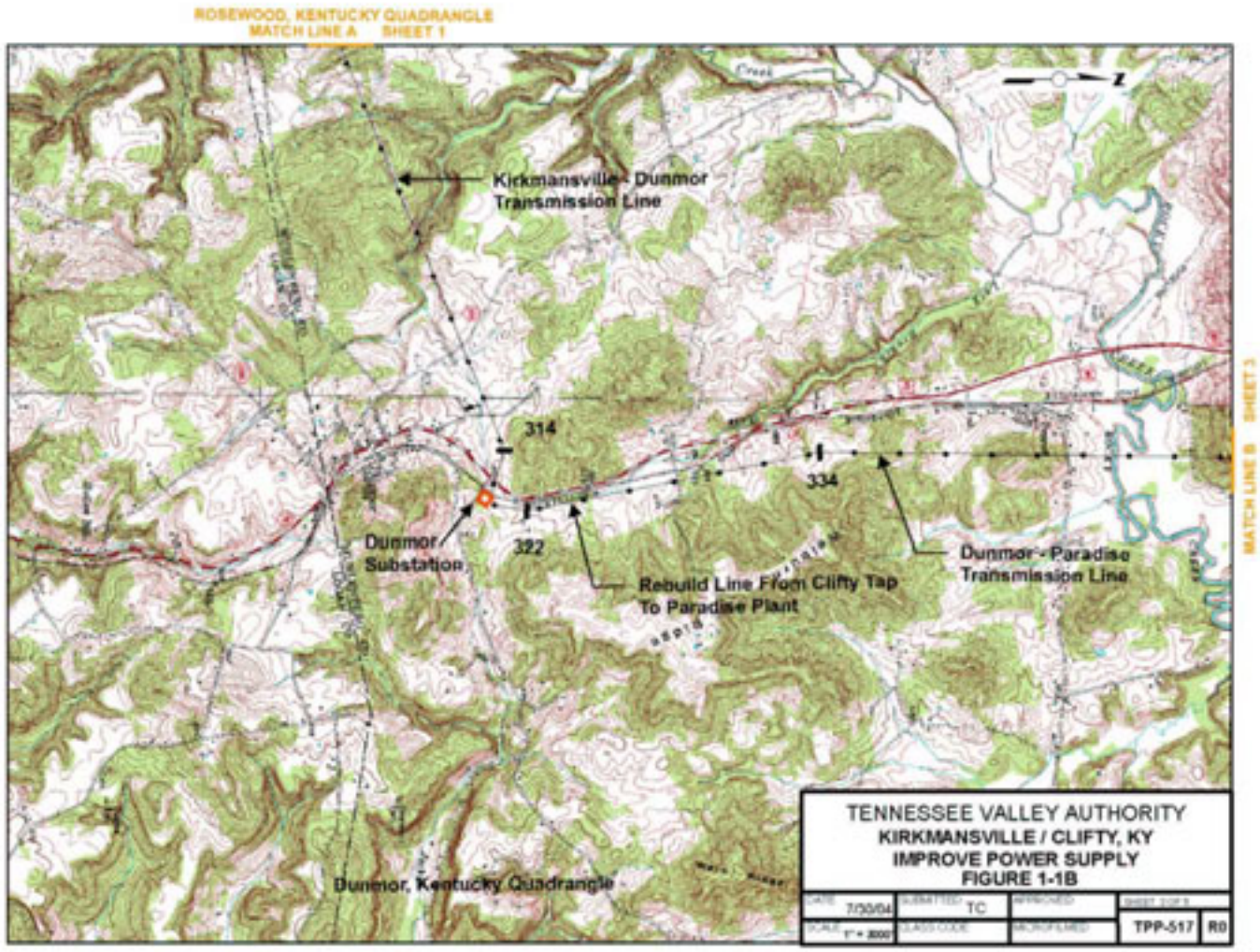

Figure 1-1B. Topographic Map Showing Locations of the Existing Dunmor Substation and a Portion of the 69-kV Dunmor-Paradise Transmission Line Proposed to be Rebuilt

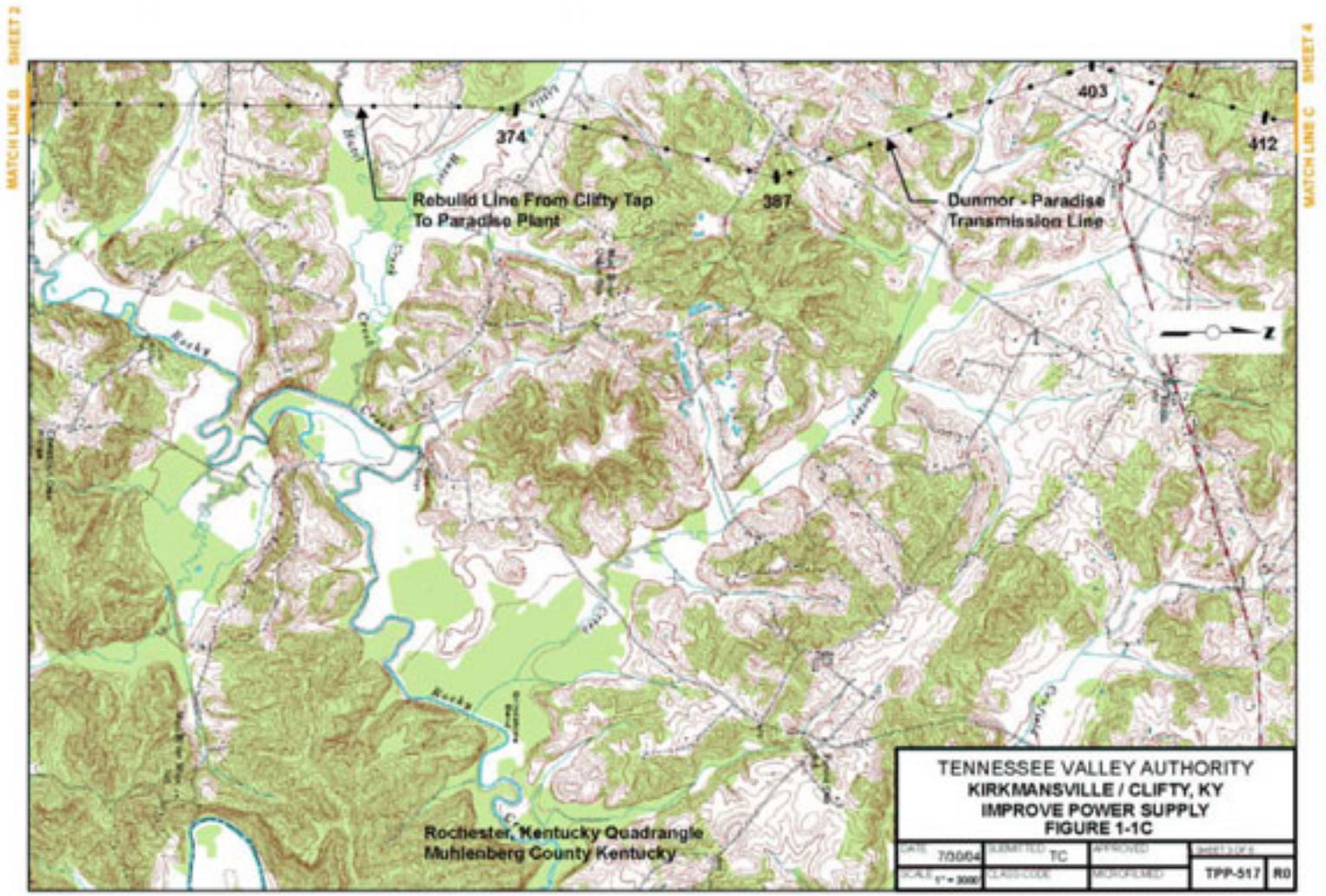

Figure 1-1C. Topographic Map Showing Location of a Portion of the 69-kV Kirkmansville-Dunmor Transmission Line Proposed to be Rebuilt

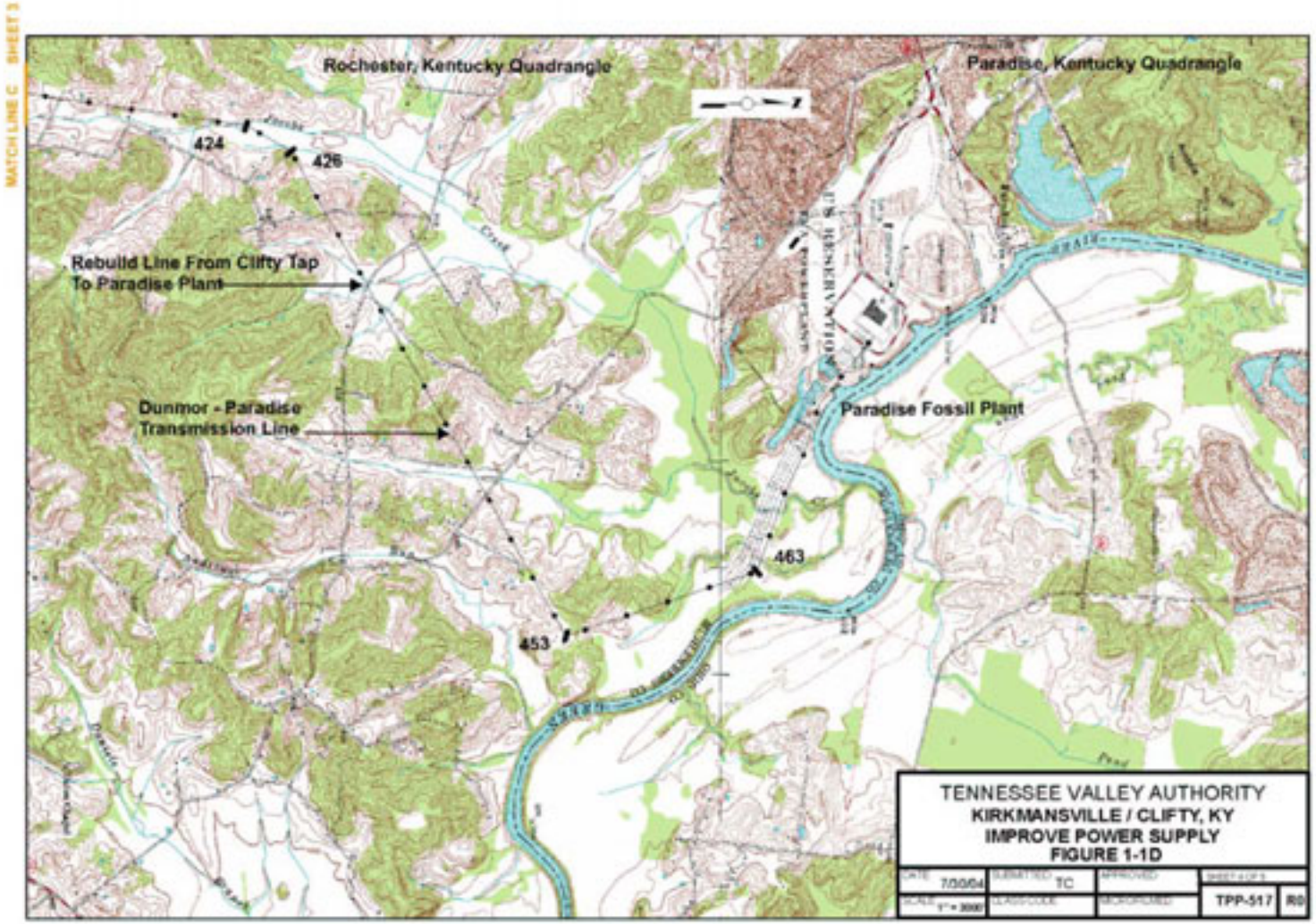

Figure 1-1D. Topographic Map Showing Location of Paradise Fossil Plant and a Portion of the 69-kV Kirkmansville-Dunmor Transmission Line Proposed to be Rebuilt

The new Jason 161-69-kV Substation would be located on an approximately 5-acre site at the intersection of the Paradise-Clarksville 161-kV Transmission Line and the Kirkmansville-Dunmor 69-kV Transmission Line. The Jason Substation would tap (i.e., connect to) both these transmission lines to provide an additional strong power source on the 69-kV line (see Figure 1-1A). To improve the power supply in the Kirkmansville area, the existing Kirkmansville 69-kV Substation would be retired, and the load would be shifted to the 161-kV system. A new delivery point for Pennyrile RECC would be established in Christian County, Kentucky, by tapping the Paradise-Hopkinsville No. 2 161-kV Transmission Line near Structure 35 and constructing a new substation. This new substation, known as the Fruit Hill 161-26-kV Substation, would be located adjacent to the line on an approximately 11-acre site (see Figure 1-1E).

1.4. Decisions to be Made

The primary decisions before TVA are whether to rebuild a portion of 69-kV transmission line, retire a substation, and construct two new substations to improve the electrical service in this portion of the Pennyrile RECC service area. A detailed description of the alternatives is provided in Section 2.2.

1.5. Public Involvement

The following federal and state agencies have been contacted to date concerning this project by TVA:

- The Kentucky Department of Environmental Protection
- The Kentucky State Historic Preservation Officer (SHPO)
- The Natural Resources Conservation Service

This proposal was reviewed for compliance with Executive Order (EO) 11988 (Floodplain Management), EO 11990 (Protection of Wetlands), Farmland Protection Policy Act, National Historic Preservation Act (NHPA), 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.

Because TVA holds an existing right-of-way for the 69-kV transmission line, public meetings were not held. The property owners would be sent a letter notifying them of TVA's plan to rebuild these facilities. The owners of the two proposed substation site properties were contacted individually about purchase of the sites. Both owners indicated willingness to consider selling the needed sites to TVA.

1.6. Necessary Permits or Licenses

A permit would be required from the state of Kentucky for construction site storm water discharge for substation construction and rebuilding the transmission line. TVA's Substation 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 1-1E. Topographic Map Showing Location of Proposed 161-26-kV Fruit Hill Substation

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CHAPTER 2

2. ALTERNATIVES INCLUDING THE PROPOSED ACTION

2.1. Introduction

This chapter includes a description of two alternatives, i.e., a No Action Alternative and an Action Alternative. Also, an alternative that was eliminated from further consideration is described in this chapter. Background information about the construction, operation, and management of the proposed transmission line and substations is also provided below. Project siting alternatives are described, and the preferred alternative is identified. In addition, mitigation measures that would be implemented to prevent or reduce potential adverse environmental effects are listed.

2.2. Alternatives

2.2.1. The No Action Alternative – Do Not Upgrade Transmission Line

Under the No Action Alternative, TVA would not upgrade the 69-kV transmission system or construct two new substations in the area. As a result, the large number of service interruptions to Pennyrile RECC would continue, and large voltage swings on the 69-kV system in the area would likely continue to occur.

2.2.2. Action Alternative – Build Two New Substations and Rebuild 23 Miles of 69-kV Transmission Line

Under the Action Alternative, TVA would retire the Kirkmansville 69-kV Substation and construct the new Fruit Hill 161-26-kV Substation to serve the same Pennyrile RECC electric power load. The new substation would be a slack-span tap with enhanced sectionalizing switches in the Paradise-Hopkinsville No. 2 161-kV Transmission Line. TVA would construct the Jason 161-69-kV Substation adjacent to the Paradise-Clarksville 161-kV Transmission Line. The Jason Substation would have a slack-span tap to the Paradise-Clarksville Line, and the substation would have enhanced sectionalizing switches. The Paradise-Hopkinsville 69-kV Transmission Line also borders this site and would be looped into the substation. TVA would rebuild the Paradise-Hopkinsville 69-kV Transmission Line from the Clifty tap to the PAF.

With the retirement of the Kirkmansville Substation, the electrical load from this substation would be shifted to the more reliable and efficient 161-kV substation at Fruit Hill. This leaves no load on the 24-mile section between Hopkinsville and the Clifty tap. The switch at Clifty toward Hopkinsville would normally be open, and the Hopkinsville feed would be used as backup. The Jason 161-69-kV Substation would be a strong, reliable source for the Clifty Substation about 2 miles away, as well as the Dunmor Substation, which is located about 5.5 miles away. The Dunmor tap sectionalizing switch toward Paradise would be vacuum enhanced and operated normally open toward Paradise. The Ennis Substation would normally be fed from Paradise, which is about 6 miles away. Implementation of this alternative would meet the growing power needs in the area, reduce service interruptions, eliminate voltage fluctuations, and provide capacity for growth of the electrical load.

2.2.3. Alternative Eliminated From Detailed Study – Rebuild the Entire Hopkinsville-Paradise 69-kV Transmission Line

One option considered was to rebuild the 45.7-mile-long Paradise-Hopkinsville 69-kV Transmission Line to 161-kV standards and operate the line at 69-kV. To address decreases in voltage, TVA would add two 2.1 megaVAR (MVAR) 13-kV capacitor banks at the Clifty 69-kV Substation. Installation of the new line could alleviate the outage problems occurring from unknown sources, and the installation of the capacitor bank in the middle of the line would likely reduce voltage fluctuations to an acceptable level. However, the long length of the transmission line would continue to make it susceptible to outages due to additional line exposure. The ability to serve load growth from additional power demands is also limited at 69-kV, as the line would be near its capacity at this voltage. Additionally, with no voltage increase in this transmission system, the anticipated load growth within the service area is expected to develop overload conditions within a few years even with the implementation of this alternative. This would result in the eventual need to upgrade the line and the tapped substations to 161-kV operation. The cost of the initial upgrade would be greater, and performance would be less than that expected under the Action Alternative. Consequently, TVA determined that this alternative would not address the reliability or capacity concerns in the Pennyrile RECC service area, and this alternative was eliminated as a viable option.

2.3. Description of Construction, Operation and Management of the Proposed 69-kV Transmission Line and Substations

2.3.1. Transmission Line Structures and Conductors

The existing pin-insulator, wood-pole transmission line would be demolished. Wood poles, which have been treated with creosote, would be removed and made available to the public for reuse. TVA requires persons obtaining used poles to sign an acknowledgement. TVA also supplies these secondary users with a consumer information sheet that provides guidelines for handling treated wood and advises against the use of treated wood for residential uses or other uses where treated wood could come into direct contact with the skin. Users are also warned that treated wood should not be burned or used in situations where animals could lick or bite it or where it could contaminate feedstocks. Any remaining, unclaimed poles would be sawed into manageable lengths and transported to appropriate landfills for disposal. Poles disposed of in this manner are not considered a hazardous waste and may be managed in a waste management facility authorized under state and local law to handle this material. Insulator pins on the existing transmission line may contain lead. Thus, all pins removed would be collected and stored in containers. Any lead-containing materials would be recycled. Usable ceramic insulators would be reused or disposed of as surplus material. Nonusable ceramic material would be discarded.

Conductors (the cables that carry the electrical current) are mostly aluminum, but have steel strands imbedded in the cable for strength. Because older conductors are typically not suitable for reuse, the metal would be scrapped and recycled. Likewise, the copper pole-mounted ground wires and the steel overhead ground wires (also known as “static wires”), which are used for lightning protection, would be recycled.

The transmission line would be rebuilt following demolition and removal of the old structures, conductors, and other hardware. Single steel-pole structures similar to those shown in Figure 2-1 would support the new transmission line. Structure heights would vary according to the terrain and would average between 65 and 75 feet. At creek or highway crossings, taller structures may be used in order to maintain adequate clearance for the conductors.

Figure 2-1. Single-Pole 69-kV Transmission Structure

Three conductors are required to make up a circuit in alternating current transmission lines. For 69-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 crossarms. A smaller, overhead ground wire is attached to the top of the structures. This ground wire may contain fiber optic communication cables.

Poles at angles in the transmission line may require supporting guy wires. Most poles would be imbedded directly in holes augured into the ground to a depth equal to 10 percent of the pole's length plus an additional 2 feet. The holes would normally be backfilled with the excavated material. In some cases, gravel or a cement and gravel mixture might be necessary. Some structures may be self-supporting (nonguyed) poles fastened to a concrete foundation that is formed and poured into an excavated hole.

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

2.3.2. Right-of-Way Clearing

The transmission line would be rebuilt on the existing 75-foot-wide right-of-way. TVA would purchase guy rights from landowners for the new structures as needed. The existing right-of-way easements give TVA the right to construct, operate, and maintain the transmission line, as well as remove "danger trees" off the right-of-way. Danger trees are those trees that are located away from the cleared right-of-way but that are tall enough to either pass within 5 feet of a conductor or strike a structure if they should fall toward the transmission line. Fee title, i.e., ownership, for the land within the right-of-way remains with the

landowner, and a number of activities may be continued on the property by the landowner. However, the easement agreement prohibits certain activities such as the construction of buildings and any other activities within the right-of-way that could interfere with the transmission line or create a hazardous situation.

Because of the need to maintain adequate clearance between tall vegetation and transmission line conductors, as well as to provide access for construction equipment, some reclearing of the right-of-way may be required. 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. In clearing rights-of-way, the guidelines stated in TVA's *Right-of-Way Clearing Specifications* (see Appendix B) would be followed. Similarly, TVA's *Environmental Quality Protection Specifications for Transmission Line Construction* (see Appendix C) and the *TVA Transmission Construction Guidelines Near Streams* (Appendix D) would guide transmission line construction activities. Also, any danger trees would be removed.

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

2.3.3. Transmission Line Access Roads

Permanent access roads already established for this existing right-of-way would be used for vehicle access to each structure and other points along the right-of-way. Some necessary improvements would be made to these access roads. However, a few temporary access roads would also be needed in some areas to allow equipment access. TVA would obtain the necessary rights for these access roads from landowners. Existing roads, including farm and field roads, some of which may need upgrading, would be used where possible. New access roads would be located on the right-of-way wherever possible, and these would be designed to avoid severe slope conditions and to minimize stream crossings. New access roads would be about 20 feet wide and surfaced with dirt or gravel. Fifty access roads have been identified along the proposed transmission line and were included in the environmental field review.

Culverts and other drainage devices, fences, and gates would be installed as necessary. Culverts installed in any permanent streams would be removed following construction. However, in wet-weather conveyances, they would be left or removed depending on the wishes of the landowner or any permit conditions that might apply. New temporary access roads would be restored to preconstruction conditions. If graveled, the gravel on the temporary access roads would be removed, and the area would be planted with native, noninvasive seed mixtures following construction.

2.3.4. Transmission Line Construction Assembly Areas

Two construction assembly areas would be required for worker assembly, vehicle parking, and material storage. One of the sites selected is in a graveled storage yard on the PAF reservation. This site, which has served previously as a construction laydown area, was chosen because of its convenient location and because it is a secure site for storage of

equipment and materials. It would be used primarily during the transmission line rebuild. Because the proposed action would not change this area from its current use, the proposed use of this area would result in no additional environmental effects. Thus, further environmental analysis of this site was not warranted. The other assembly area, which would be used during the Jason Substation construction, is located along the access road to the Jason Substation site. This construction assembly area, approximately 5 acres in size, would be leased for the duration of the construction period. It was chosen because of its proximity to the Jason site and because it was near a roadway that could accommodate heavy loads of equipment. This site consists of a gently sloping, previously cleared pastureland near the transmission line (see Figure 1-1A). Depending on site conditions, some minor grading and installation of drainage structures may be required. The area would be graveled and fenced to accommodate trailers used during the construction process for material storage and for temporary office space. Following the completion of construction activities, all trailers, unused materials, and construction debris would be removed from the site. Removal of the fence and restoration of the site would be at the discretion of the landowner.

2.3.5. Transmission Line Conductor and Ground Wire Installation

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

2.3.6. Transmission Line Inspection

Periodic inspections of 69-kV transmission lines are performed from the ground and by aerial surveillance from a helicopter. These inspections, which occur on approximately 5-year cycles after operation begins, are conducted to locate damaged conductors, insulators, or structures, and to detect any abnormal conditions that might hamper the normal operation of the line or adversely impact the surrounding area. During these inspections, the condition of vegetation within the right-of-way, as well as the area immediately adjoining the right-of-way, is noted. These observations are then used to plan corrective maintenance and routine vegetation management.

2.3.7. Vegetation Management

Management of vegetation along the right-of-way would be necessary to ensure access to structures and to maintain an adequate distance between transmission line conductors and vegetation. For a 69-kV transmission line, National Electric Safety Code standards require a minimum clearance of 19.1 feet.

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

An integrated vegetation management approach would be used to control vegetation within the cleared right-of-way. This approach would encourage low-growing plant species and discourage tall-growing plants. A plan for reclearing vegetation would be developed for

each transmission line segment based on the results of the periodic inspections described above. The two principal management techniques are mechanical mowing, using tractor-mounted rotary mowers, and herbicide application. Herbicides are normally applied in areas where heavy growth of woody vegetation is occurring on the right-of-way and where mechanical mowing is not practical. Herbicides would be applied selectively from the ground with backpack sprayers or vehicle-mounted sprayers.

Any herbicides used would be applied in accordance with applicable state and federal laws and regulations and the commitments listed in this document. Only herbicides registered with the United States Environmental Protection Agency (USEPA) would be used. A list of the herbicides and adjuvants (ingredients added to the herbicide solution to increase its effectiveness) currently used by TVA in right-of-way management 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.

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 releveling the area surrounding the replaced structures, but there would be little, if any, additional area disturbance.

2.3.8. Substation Site Preparation

Both of the new substation sites would be cleared and graded to promote proper site drainage. A storm water permit would be obtained prior to grading. Best Management Practices (BMPs) as described by Muncy (1992) would be used to minimize erosion and sedimentation. Adequate fill material exists at each site to have a balanced cut and fill on the site. The substation yard would be stabilized with gravel, and the balance of the site would be revegetated.

The Kirkmansville Substation would be demolished after the Fruit Hill Substation goes into service. The usable equipment would be returned to stock. Obsolete equipment and steel framework would be sent to TVA Investment Recovery and recycled or disposed of as appropriate. Spoil material would be taken to a sanitary landfill, and the site would be revegetated.

2.3.9. Substation Structures and Equipment

There are no county zoning restrictions at either the Fruit Hill or Jason Substation sites. On the Fruit Hill Substation site, TVA would install a slack-span tap structure in the transmission line. Enhanced sectionalizing switches would be installed in the transmission line about 100 feet from each side of the connection point. (Sectionalizing switches are used to disconnect a particular section of transmission line.) TVA would design and construct a standard substation capable of reducing the voltage from 161 kV to 26 kV. The substation would use a steel framework and buses (solid electrical connectors). A device known as a wave trap would be used to remove remote control signals from the circuit. Circuit switchers would provide protection for the high-voltage side. Other equipment would include isolating switches, grounding, lightning protection, two 161-26-kV transformer banks, protective relays, and metering equipment. The substation would be equipped with four circuit breakers on the low-voltage (i.e., 26-kV) side of the transformers. This 26-kV

power would then be delivered to the Pennyrile RECC system. The substation would contain System Control and Data Acquisition and communication equipment that would allow remote operation.

At the Jason site, TVA would install a tap structure and enhanced sectionalizing switches similar to those described above in the Paradise-Clarksville 161-kV Transmission Line and loop the Hopkinsville-Paradise 69-kV Transmission Line into the substation. TVA would design and construct a 161-69-kV substation.

The Dunmor 69-kV Substation tap point and sectionalizing switches would also be rebuilt with a vacuum enhancement on the normally open switch on the Paradise side.

2.4. Project Siting Alternatives

The proposed action involves the construction of two new substations. Because of the nature of the project, location alternatives for the new substations were very restricted. The substation to serve the Kirkmansville electric load would need to connect to the Paradise-Hopkinsville No. 2 161-kV Transmission Line. Also, a prospective site would ideally have adequate hard-surface road access to allow delivery of substation equipment. The Fruit Hill site was the only site identified with adequate space to allow connection to the source line, provide for installation of sectionalizing line switches, and provide enough area to allow construction of the substation. The identified site was 11 acres in size and sowed in grass. The topography of the site was suitable for construction, and the property owner was actively trying to sell the parcel.

The second proposed substation (i.e., the Jason Substation) would be used to provide another 161-69-kV power source on the 69-kV transmission line rebuilt from the Clifty tap to the PAF. It would normally supply the Clifty 69-kV and Dunmor 69-kV Substations. To accomplish this, the substation would need to be located adjacent to a source 161-kV transmission line and next to the 69-kV line it would feed. There is only one such line crossing available. This is at the intersection of the Paradise-Clarksville 161-kV Transmission Line and the Hopkinsville-Paradise 69-kV Transmission Line near Jason, Kentucky. The Paradise-Montgomery 500-kV Transmission Line runs parallel to the Paradise-Clarksville Line on the east side. In order to avoid induced voltages from crossing under the 500-kV line, the substation would have to be located on the west side of the Paradise-Clarksville 161-kV Line. The northwest quadrant of the intersection provided the most suitable substation site, as the southwest quadrant did not provide suitable topography. Access to the site is available via Canyon Rim Trail, which connects to County Road (CR) 1785.

A tap point with enhanced sectionalizing switches would be installed in the Paradise-Clarksville 161-kV Transmission Line, and a slack-span connection would be made into the Jason Substation site. The Hopkinsville-Paradise 69-kV Transmission Line would also be looped into the Jason Substation site. The site is partly pastureland and woodland. The owner indicated his willingness to sell the site to TVA.

2.5. The Preferred Alternative

Because the service in the Kirkmansville/Clifty area is worse than TVA's performance criteria, TVA would implement the Action Alternative in order to bring the level of service into the bounds of TVA's quality standards.

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CHAPTER 3

3. AFFECTED ENVIRONMENT

The various environmental resources and aspects of the environment that could potentially be affected by the proposed action are described below.

3.1. Terrestrial Ecology - Plants

The Kirkmansville-Clifty City power improvement project lands lie within the Highland Rim Section of the Interior Low Plateau Physiographic Province (Fenneman, 1938). This project occurs in the northern portion of the Highland Rim. The project is within the Western Mesophytic Forest Region as described by Braun (1950). Within the Western Mesophytic Forest Region, the proposed project area occurs in the Mississippian Plateau. The western area of the region is flat, and then becomes hilly to the east. Historically, the natural vegetation is a mosaic of bluestem prairie and oak-hickory forest. Today, extensive livestock grazing and tobacco, corn, soybean, and small grain farming occur.

The project lands lie entirely within an existing power line right-of-way with the exception of access roads and two proposed substation sites, i.e., the Fruit Hill site and the Jason site. The access roads are primarily on existing roads or through pastures and hayfields. Existing plant communities observed on the proposed project sites and access roads include grasses/forbs (managed pastures, old fields, and rights-of-way), cultivated fields, and very small areas (less than 1 percent for each) of roads, fragmented dry woods, and intermittent streams.

Approximately 80 percent of the existing right-of-way is grasses and forbs. The remainder is almost entirely cultivated fields. The proposed Fruit Hill Substation covers 11 acres of pastureland dominated by fescue grass. The proposed 5-acre Jason Substation site consists of grazed woods and pasture. The nearby 5-acre construction assembly area is a pasture.

Grasses and forbs occupy approximately 70 percent of the right-of-way. Managed pastures, hayfields, and open rights-of-way are most prevalent. Most of these areas are dominated by tall fescue but include Bermuda grass and broom sedge as well. The several species of forbs that occur within this vegetation type include butterfly weed, ironweed, goldenrod, Chinese lespedeza, Queen Anne's lace, passionflower, daisy fleabane, and thistle. Cultivated fields occupy approximately 30 percent of the existing right-of-way. This community is dominated by tobacco, corn, soybean, and small grain farming.

Dry woods occur at the proposed 5-acre Jason Substation site. This site is within a forest fragment that is open on all sides to pastureland. The forest includes white oak, southern red oak and post oak, Virginia pine, and tulip poplar as canopy trees. The understory, which is open due to browsing cattle, includes red maple, flowering dogwood, and black gum.

The plant communities observed along the proposed line rebuild route, substation sites, and access roads are common and representative of the region. No uncommon plant communities were observed.

A review of the TVA Natural Heritage database indicated that no plant species that are federally listed as threatened or endangered are known within a 5-mile radius of the proposed project areas. However, there are three plant species listed by Kentucky within a 5-mile radius (see Table 3-1).

Table 3-1. Endangered, Threatened, and Rare Plant Species Reported Within 5 Miles of the Project Area

Common Name	Scientific Name	Federal Status	State Status
Water-purslane	*Didiplis diandra*	None	Special Concern
French's shooting star	*Dodecatheon frenchii*	None	Special Concern
Ozark bunchflower	*Melanthium woodii*	None	Threatened

Known protected plant species as well as federally and other state-listed species not presently known within the 5-mile radius were sought within areas that could be impacted by the proposed project. No federally listed or state-listed plant species were observed. Botanical field reviews indicated the proposed project areas would not provide suitable habitat for these or other rare plant species.

3.2. Terrestrial Ecology - Animals

The animal habitats observed in the project area have been largely altered by agricultural and forestry practices. The two primary habitat types observed along the transmission corridor included early successional habitats and several tracts of hardwood forests.

The corridor route consists predominantly of early successional habitats with a combination of agricultural fields, pastures, old fields, clear-cuts, and residential areas. Wildlife species observed during field surveys included white-tailed deer and black rat snake. Common bird species included red-tailed hawk, turkey vulture, killdeer, barn swallow, northern mockingbird, indigo bunting, eastern meadowlark, mourning dove, eastern bluebird, and American goldfinch. Other species commonly found in these habitats include eastern cottontail rabbit, house mouse, Virginia opossum, and big brown bat.

Several tracts of hardwood forest occur along the project right-of-way corridor. White-tailed deer were observed within this habitat. Common bird species encountered included eastern tufted titmouse, northern cardinal, yellow-billed cuckoo, American crow, blue jay, and Carolina chickadee. Other terrestrial animals common in such forested areas include eastern cottontail, gray squirrel, eastern chipmunk, white-footed mouse, red bat, eastern mole, wild turkey, slimy salamander, ground skink, five-lined skink, black rat snake, and eastern box turtle.

A review of the TVA Natural Heritage database indicated that 14 protected animal species have been reported from Muhlenberg, Christian, Todd, and Logan Counties in Kentucky (see Table 3-2). All 14 species are protected by the commonwealth of Kentucky.

Table 3-2. Protected Terrestrial Animal Species Reported From Muhlenberg, Christian, Todd, and Logan Counties, Kentucky

Common Name	Scientific Name	Federal Status	State Status
Amphibians			
Barking tree frog	*Hyla gratiosa*	None	Special Concern
Birds			
Blue-winged teal	*Anas discors*	None	Endangered
Northern harrier	*Circus cyaneus*	None	Endangered
Lark sparrow	*Chondestes grammacus*	None	Threatened
Vesper sparrow	*Pooecetes gramineus*	None	Endangered
Yellow-bellied sapsucker	*Sphyrapicus varius*	None	Special Concern
Bachman's warbler	*Vermivora bachmanii*	Endangered	Extinct
Mammals			
Southeastern bat	*Myotis austroriparius*	None	Endangered
Gray bat	*Myotis grisescens*	Endangered	Endangered
Indiana bat	*Myotis sodalis*	Endangered	Endangered
Common shrew	*Sorex cinereus*	None	Special Concern
Southeastern shrew	*Sorex longirostris*	None	Special Concern
Reptiles			
Eastern ribbon snake	*Thamnophis sauritus*	None	Special Concern
Copper-belly water snake	*Nerodia erythrogaster neglecta*	Partial Status	Special Concern

Barking tree frogs are associated with wetland habitats. Individuals aggregate in permanent water during the breeding season, but spend warm months in treetops. During dry periods or winter months, they burrow under vegetation. Although several streams cross the project area, a minimal amount of wetland habitat exists on the project corridor. Due to the lack of suitable habitat, this species is unlikely to inhabit the project area.

The blue-winged teal nests within the cover of grasses and other herbaceous plants within the immediate vicinity of water bodies. This habitat does not occur within the right-of-way.

In Kentucky, northern harriers have been found to inhabit reclaimed coal mines within the first few years after reclamation. The harriers use these areas for only a limited time of the year. This habitat type does not exist along the right-of-way.

Lark sparrows prefer areas with extensive open ground such as would be found in dry, rocky areas and cedar glades. They can be found in areas with scattered red cedars with a sparsely vegetated ground cover. This habitat was not found within the transmission line corridor.

Vesper sparrows nest in areas of well-grazed pastures containing scattered rock outcrops and patches of bare ground having a few scattered trees for singing perches. They have also been found to nest where row-crop fields predominate. This species rarely breeds south of Indiana and Illinois. The particular habitat type for this species is uncommon to nonexistent along the transmission line.

Yellow-bellied sapsuckers and Bachman's warblers are not expected to exist in the project area. Yellow-bellied sapsuckers very rarely breed in the South, and they are not expected to breed in west Kentucky. Bachman's warblers are considered extinct in Kentucky. They nest in bottomland forests along major river systems. This particular habitat type was not found along the right-of-way.

Southeastern bats typically roost in caves and occasionally in trees. They forage over open water and typically roost near lakes or ponds. Gray bats roost in caves during all seasons and also tend to forage over open-water habitats.

Indiana bats roost in caves during the winter and form summer roosts under the bark of living and dead trees. Their summer roosts are found in forests with an open understory usually near water. Although summer roosts have not been reported from the region, approximately 3,000 Indiana bats have been observed during winter in Bob Overton Cave in Christian County.

Common shrews are found in a variety of habitats. They can mostly be found among rocks and logs in moist woods, marshy meadows, and sphagnum bogs. Southeastern shrews dwell in a variety of habitats but are mostly found in moist areas within forested or early successional habitats.

Two protected snakes are listed in the study area. Eastern ribbon snakes are found within vegetation along waterways. Copper-belly water snakes prefer slow-moving waterways.

3.3. Aquatic Ecology

The proposed transmission line rebuild and the two substations are located within the Green River drainage, a tributary of the Ohio River. Land use is predominantly agricultural, with some residential and forested areas. Located in the Western Coal Field Physiographic Province (also known as Shawnee Hills), this region is underlain by extensive Pennsylvanian sandstone and shale formations, and the resulting landscape is characterized by rolling hills. The Western Coal Field Province is most well known for its large coal deposits. Groundwater in this region typically flows through fractures, where flow is more abundant in valley wells than wells along ridges (Commonwealth of Kentucky, 2001).

A search of the TVA Natural Heritage database indicated that several federally and state-listed aquatic animal species are known to occur in the streams or in cave systems in Christian and Muhlenberg Counties, Kentucky. These species are listed in Table 3-3 below.

Field investigation of the subject right-of-way was conducted between August 23 and September 2, 2004. Overall, 102 aquatic resources were encountered; 58 were wet-weather conveyances; 9 were intermittent streams, and 35 were perennial (14 ponds and 21 perennial streams). A listing of these stream crossings is provided in Appendix G. Some of the crossings involve streams having more than one channel. In other locations, streams lie parallel to or meander within the right-of-way. Larger named streams that could be affected by the proposed transmission line rebuild are Sulfur Spring Creek, Clifty Creek, Rocky Creek, Hazel Creek, Little Hazel Creek, and Jacobs Creek. None of the sites where the transmission line crosses these streams were identified as suitable habitat for listed aquatic species.

Table 3-3. Federally and State-Listed Aquatic Animal Species Reported From Streams in Christian and Muhlenberg Counties, Kentucky

Common Name	Scientific Name	Federal Status	State Status
Fish			
Chestnut lamprey	*Ichthyomyzon castaneus*	None	Special Concern
Redspotted sunfish	*Lepomis miniatus*	None	Threatened
Southern cavefish	*Typhlichthys subterraneus*	None	Special Concern
Crayfish			
Eyeless crayfish	*Orconectes pellucidus*	None	Special Concern
Mussels			
Fanshell	*Cyprogenia stegaria*	Endangered	Endangered
Pocketbook	*Lampsilis ovata*	None	Endangered
Pyramid pigtoe	*Pleurobema rubrum*	None	Endangered
Purple lilliput	*Toxolasma lividus*	None	Endangered
Little spectaclecase	*Villosa lienosa*	None	Special Concern

3.4. Recreation and Managed Areas

A review of the TVA Natural Heritage database indicated that the transmission line for the proposed Kirksmanville-Clifty City power improvement project crosses two managed areas. One additional managed area is within 3 miles of the proposed project. No Ecologically Significant Sites or streams on the Nationwide Rivers Inventory (NRI) are located within 3 miles of the proposed project.

The proposed transmission line rebuild begins at PAF, which is located between the Sinclair and Ken Hopewell tracts of the Peabody State Wildlife Management Area (WMA). The Peabody WMA in Ohio and Muhlenberg Counties, composed of six disjunct units or tracts, is a rough terrain of reclaimed coal-mined lands with numerous excavated ridges and water-filled strip-mine pits. Waterfowl and small and big game frequent swamplands, high ridges, and deep pits. Fishing and hunting opportunities are excellent. The entire 60,000-acre Peabody State WMA (including three additional tracts to the west) is managed by the Kentucky Department of Fish and Wildlife Resources. Primitive camping is allowed on all tracts.

The Sinclair tract in Muhlenberg County is adjacent to PAF along the plant's southern boundary. Approximately 2.8 miles of the transmission line passes through the Sinclair tract. This tract is a well-known bird-watching locale. Bald eagles, golden eagles, ospreys, and snow geese have been noted at Goose Lake, which is approximately 2.0 miles northwest of the transmission line. In summer, Bell's vireo, willow flycatcher, and Henslow's sparrow come to the WMA. Winter brings shorebirds and a large raptor population, including northern harriers and short-eared owls.

The Ken Hopewell tract in Ohio County is across the Green River from PAF, approximately 0.5 mile northeast of the plant and the transmission line right-of-way. Horseback riding is a popular activity on trails within this tract.

Lake Malone in Muhlenberg County is managed by the Kentucky Department of Fish and Wildlife Resources. The 826-acre lake is noted for game fish and for recreational use. The

transmission line crosses over four branches of Lake Malone. Portions of the shoreline are densely developed for residential access facilities. One new residential development, Canyon Run Resort, has an existing par 3 golf course in the vicinity of the project. Future plans could include expansion of the golf course into the area of the project.

Lake Malone State Park is a recreational area on the northern bank of Lake Malone and is managed by the Kentucky Department of Parks. The 325-acre park is across the lake and approximately 0.4 mile from the proposed work. The park provides facilities for hiking, fishing, recreational boating and camping, as well as a swimming beach and ball fields.

Other recreational activities in the area are generally unorganized and dispersed and occur on private land. Activities consist of deer and small game hunting, recreational target shooting, off-road vehicle activity, and wildlife viewing.

3.5. Wetlands

A ground survey of the project area was conducted from September 8 to 10, 2004, and from September 22 to 24, 2004. The survey encompassed rights-of-way and access roads. A previous inspection of the proposed substation sites indicated that no wetlands are located at either site. A total of 24 wetlands meeting United States Army Corps of Engineers (USACE) parameters for federal jurisdictional wetlands were identified in the right-of-way, and another 4 wetlands were identified on designated access roads. Wetland characteristics are summarized in Table 3-4. The wetland locations were marked on detail maps of the transmission line, and wetland boundaries were marked with flagging for ease of relocation in the field. Total acreage of wetlands within the right-of-way was 22.32 acres. Five of the wetland areas (W-1, W-6, W-11, W-12, and W-19) contained a transmission line structure.

Wetland determinations were performed according to USACE standards (Environmental Laboratory, 1987), which require documentation of hydrophytic vegetation (United States Fish and Wildlife Service [USFWS], 1996), hydric soil, and wetland hydrology. Broader definitions of wetlands, such as the definition provided in EO 11990 (Protection of Wetlands), the Tennessee state regulatory definitions (Tennessee Rule: 1200-04-07 and TCA Section 69-3-103(33), the USFWS definition (Cowardin et al., 1979), and the TVA Environmental Review Procedures definition (TVA, 1983), were also considered.

Wetlands are protected under Sections 404 and 401 of the Clean Water Act and are also addressed by EO 11990. In order to conduct specific activities in jurisdictional wetlands, authorization under a Section 404 Nationwide General Permit or Individual Permit from the USACE is required. Nationwide General Permit No. 12 authorizes activities related to utility line construction and contains conditions to ensure that impacts to wetlands are minimal. Section 401 gives states the authority to certify whether activities permitted under Section 404 are in accordance with state water quality standards (Strand, 1997). EO 11990 requires all federal agencies to minimize the destruction, loss, or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands in carrying out the agency's responsibilities.

Table 3-4. Summary of Wetland Characteristics – Kirkmansville-Clifty City Transmission Line Right-of-Way – October 2004

Wetland Identification No.	Cowardin Code	Estimated Acreage in Right-of-Way or Access Road	Comments
W-1	PEM1E	0.36	Fringe wetland associated with wet-weather conveyance.
W-2	PEM1	0.26	Fringe wetland associated with wet-weather conveyance.
W-3	PEM1A	0.08	Fringe wetland associated with wet-weather conveyance.
W-4	PEM1	0.80	Shallow depression associated with Hazel Creek. Drained by shallow ditch.
W-5	PEM1	0.08	Drainage of lowland pasture associated with Hazel Creek. Pasture drain tiled.
W-6	PEM1	0.88	Structure is located within drained pasture wetland. Mound and furrow swales.
W-7	PEM1	0.20	Wetland prairie pasture occasionally mowed.
W-8	PEM1	0.20	Small side configuration wet pasture.
W-9	PEM1	0.40	Wet meadow, no trees, seasonally flooded
W-10	PEM1	1.10	Upland inclusion and pond.
W-11	PEM1	2.20	Interspersed wetland/upland complex. Drains northeast to Palustrine Forested off right-of-way.
W-12	PEM1F or H	1.00	Palustrine Emergent in swales and depressions in mine reclamation area.
W-13	PEM1	2.63	Palustrine Emergent in swales and depressions in mine reclamation area.
W-14	PEM1	0.50	Narrow valley containing wet-weather conveyance, PEM1 in broad right-of-way.
W-15	PEM1	0.60	Joins PFO1 off right-of-way corridor.
W-16	PEM1	1.40	Narrow upland inclusion. Part of large system.
W-17	PEM1	0.08	Connects to large PFO1 off right-of-way to east. Culverted drainage crossing.
W-18	PEM1E	0.20	Narrow drainage crossing to PFO1 off right-of-way to east.
W-19	PEM1E	7.24	Large wetland with upland inclusions.
W-20	PEM1	0.16	Wetland confined to broad swale. Defoliated vegetation within wetland from spraying.
W-21	PEM1	0.20	Recently dewatered farm pond.
W-22	PEM1	0.10	Man-made pond seepage draining to upland forest off right-of-way.
W-23	PEM1	0.31	Laterally attenuated PEM1 traversing right-of-way.
W-24	PEM1	0.31	Wetland extends off east side of right-of-way corridor.
AP-24 W1	PEM1	0.24	Elongated depression in pasture adjacent to access road. Culverted at both ends.
APO-45 W1	PEM1	0.06	Connects to W-13. Reclamation mine area, current WMA.
APO-46 W1	PFO1B	0.50	Connects to W-19. Moderate quality forested wetland.
APO-48 W1	PFO1/EM	0.23	No structures within access road route. Within floodplain to Green River.
Total Acres:		22.32	

3.6. Floodplains

The existing transmission line right-of-way crosses the identified 100-year floodplains of Rocky Creek, Hazel Creek, Little Hazel Creek, Jacobs Creek, the Green River, and several minor floodplain areas in Muhlenberg County, Kentucky. The existing Clifty City Substation is located in Todd County about 200 feet east of Highway 181. The proposed Jason Substation site is located in Muhlenberg County just north of the county line and about 3,000 feet east of Stevens Road. The proposed Fruit Hill Substation site is located in Christian County about 1,000 feet north of the intersection of State Routes (SRs) 189 and 800. The proposed substation sites and construction assembly areas are not located within the 100-year floodplain.

3.7. Surface Water

The project area is located in the Green River drainage of the Ohio River Basin. Rainfall in the area averages about 49 inches per year with March being the wettest month with 4.6 inches and October the driest with 2.8 inches. The average monthly air temperature ranges from 33 degrees Fahrenheit (°F) in January to 77°F in July with a mean for the year of about 57°F. Stream flow varies with rainfall. The mean annual flow at the United States Geological Survey gauging station on the Green River at Paradise, Kentucky, is 8,979 cubic feet per second or almost 1.5 cubic feet per second per square mile for the 6,183 square mile drainage area. This represents approximately 20 inches of annual runoff from the watershed.

The project area drains to the Green River and its tributaries in Muhlenberg, Todd, and Christian Counties, Kentucky. A list of receiving streams and their state classifications or designated uses are identified in Table 3-5. All of the streams, except Mud River, are classified for warm water aquatic habitat, primary contact recreation, secondary contact recreation, and domestic water supply. Mud River is classified for warm water aquatic habitat, primary contact recreation, and secondary contact recreation. The streams on the draft 2004 Kentucky 303 (d) list considered impaired are provided in Table 3-6. The impaired use, pollutant of concern, and suspected source are also shown.

Table 3-5. State of Kentucky Stream Use Classifications

Stream	Use Classification[1]			
	WAH	PCR	SCR	DWS
Green River	X	X	X	X
Pond Creek	X	X	X	X
Plum Creek	X	X	X	X
Jacobs Creek	X	X	X	X
Andrews Run	X	X	X	X
Mud River	X	X	X	
Rocky Creek	X	X	X	X
Hooper Creek	X	X	X	X
Hazel Creek	X	X	X	X
Little Hazel Creek	X	X	X	X
Lazy Branch	X	X	X	X

Stream	Use Classification[1]			
	WAH	PCR	SCR	DWS
Sulphur Spring Creek	X	X	X	X
Rocky Clifty Creek	X	X	X	X
Pond River	X	X	X	X
East Fork Pond River	X	X	X	X
Long Creek	X	X	X	X
Buck Fork	X	X	X	X
Dulin Creek	X	X	X	X

[1]*Classification codes:*
WAH–warm water aquatic habitat *SCR–secondary contact recreation*
PCR–primary contact recreation *DWS–domestic water supply*

Source: Kentucky Administrative Regulations (2004)

Table 3-6. State of Kentucky 303(d) Impaired Stream Uses in the Project Area

Stream	Impaired Uses	Pollutants	Suspected Sources
Green River	Swimming	Pathogens	Agriculture
Pond Creek	Aquatic Life	Chlorides, Total Dissolved Solids, Siltation	Land Disposal, Resource Extraction, Hydro-modification, Habitat Modification, Bank Modification/Destabilization, Urban Runoff/Storm Sewers
Plum Creek	Swimming, Aquatic Life	Pathogens, Siltation, Habitat Alteration, Salinity/Total Dissolved Solids/Chlorides	Unknown, Habitat Modification, Land Disposal
Jacobs Creek	None		
Andrews Run	None		
Mud River	Fish Consumption	Polychlorinated Biphenyls, Mercury	Industrial Point Sources, Unknown
Rocky Creek	None		
Hooper Creek	None		
Hazel Creek	None		
Little Hazel Creek	None		
Lazy Branch	None		
Sulphur Spring Creek	None		
Rocky Clifty Creek	None		
Pond River	Aquatic Life	Siltation, Habitat Alteration	Habitat Modification
East Fork Pond River	None		
Long Creek	None		
Buck Fork	Swimming, Aquatic Life	Pathogens, Siltation, Habitat Alteration	Unknown, Habitat Modifications
Dulin Creek	None		

Source: Kentucky Department of Environmental Protection (2004)

3.8. Groundwater

The project area is underlain by Pennsylvanian-aged aquifers in the Interior Low Plateaus Physiographic Province. The Pennsylvanian sandstones that are present in the northwestern part of Kentucky are known as the Western Coal Field. The 25-mile-long transmission line would be rebuilt along an existing right-of-way that occurs in several different formations within the Pennsylvanian aquifers.

The section of the right-of-way that begins at PAF and ends approximately 1 mile north of SR 70 is underlain by the McLeansboro Group. This group contains several formations consisting of shale, sandy shale, and limestone. The McLeansboro Group yields practically no water except to wells that penetrate the sandstone layer. Water from shallow wells near outcrop areas is hard, but water from deep wells further from the outcrop areas is generally soft and contains sodium bicarbonate (in some places in objectionable amounts). Iron may be present in objectionable amounts (Carey and Stickney, 2001a).

As the transmission line runs south, sections of the right-of-way are underlain by the Carbondale and the Tradewater Formations, except for sections that pass over the Little Hazel Creek, Hazel Creek, and Rocky Creek. The areas that surround these creeks are underlain by alluvium. Waters from the alluvium located along smaller creeks in Muhlenberg County yield very little water, and water that comes from these sources is usually very hard and contains objectionable amounts of iron (Carey and Stickney, 2001a).

The Carbondale Formation consists of shale, coal, sandstone, and limestone and yields enough water for a modern domestic supply to wells that penetrate the sandstone layer. It yields practically no water to wells penetrating only shale. Wells are known to produce as much as 30 gallons per minute (gpm). Water is hard or very hard but otherwise of good quality. The Carbondale Formation yields either no water or water containing iron sulfate in areas where the Kentucky No. 9 coal has been mined (Carey and Stickney, 2001a).

The Tradewater Formation contains shale, coal, sandstone, and limestone, and generally yields only small quantities of water to wells. It may yield enough water for a modern domestic supply to wells penetrating a sufficient thickness of sandstone. Many wells yield more than 10 gpm from the Curlew Sandstone. Water is fresh near outcrop areas but becomes increasingly mineralized with depth (Carey and Stickney, 2001a).

The remainder of the transmission line from just south of Penrod to the Clifty City Substation and the proposed Jason Substation are underlain by the Caseyville Formation. The Caseyville Formation is made up of sandstone and sandy shale and will yield enough water for a modern domestic supply to most wells penetrating sandstone. Yields of 100 gpm have been obtained from wells penetrating thick sections of sandstone. At depth, the water becomes salty or may have a high sodium bicarbonate content. Water is hard to very hard and is low in dissolved solids. Generally, wells in small upland areas are inadequate for domestic use (Carey and Stickney, 2001a).

The Fruit Hill Substation site is located in Christian County and is underlain by Upper Mississippian-aged rocks of the Upper Chesterian Formations. The formations that make up the Upper Chesterian are interlayered limestone, sandstone, and shale. The Upper Mississippian rocks usually form confining units, but may contain some local sandstone and limestone aquifers (Carey and Stickney, 2001b).

Sources for public water supply in the region are mainly from surface water. However, there are at least 2,100 people in Muhlenberg County using private wells for domestic use. Many of them are concentrated near Paradise, Kentucky. In Christian County, there are approximately 7,000 people using wells for domestic use, but most of those wells are located in the southern half of the county.

3.9. Archaeology

Occupation of the region is likely to have occurred continuously for at least the past 12,000 years. Throughout this vast period, various changes in technology, settlement patterns, subsistence practices, population density, social organization, ideology, and other aspects of human behavior have occurred. These 12,000 years are divided into four prehistoric periods: Paleo-Indian, Archaic, Woodland, and Mississippian. Prehistoric land use and settlement patterns vary during each period, but short- and long-term habitation sites are generally located on floodplains and alluvial terraces along rivers and tributaries. Specialized campsites tend to be located on older alluvial terraces and in the uplands. During the early period of European exploration in the Ohio River valley, Kentucky was primarily a hunting ground for Native American tribes including the Shawnee, the Delaware, the Cherokee, and the Mingo. In the mid-eighteenth century, European travel began reaching north-central Kentucky. By 1798, Muhlenberg County was formed from portions of Christian and Logan Counties. In 1812, Christian and Logan were once again partitioned to form Todd County. The area was opened to widespread settlement during the 1780s and 1790s due to the Cumberland and Tennessee Rivers, which were highly important in the transportation network. The discovery of coal and iron deposits in Muhlenberg County led to a vibrant coal and iron industry that continues to the present day. Muhlenberg County served as the heart of Kentucky's iron industry during the antebellum period (Bryant, 1992). Todd County has historically maintained an agricultural-based economy focused on the production of tobacco and corn and the raising of livestock (Kleber, 1992). As a result, farmers in Todd County relied heavily on slave labor and, thus, when the Civil War arose, sided heavily with the Confederacy. Following the Civil War, the introduction of railroads helped revive local economies and led to increases in both agricultural production and coal mining. During the twentieth century, both counties relied heavily on an industrial and agricultural economy.

Section 106 of the NHPA requires federal agencies, including TVA to: (1) consider the effect of its actions on historic properties and (2) allow the Advisory Council on Historic Preservation an opportunity to comment on the action. TVA, in consultation with the Kentucky SHPO, determined the Area of Potential Effect (APE) to be the right-of-way for the rebuilt transmission line along with the two proposed substation sites and the construction assembly area at the Jason Substation site. For the architectural inventory, the APE was determined to be those areas from which the transmission line would be visible in a 0.5-mile radius. A records search indicated that no architectural or historical structures are located within the APE. Five previously recorded prehistoric archaeological sites (15MU19, 15MU38, 15MU55, 15MU83, and 15MU135) are located within or immediately adjacent to the APE. Site 15MU135, a low-density lithic scatter, has been previously recommended ineligible for inclusion on the National Register of Historic Places (NRHP) (Wampler and Karpynec, 2004). Sites 15MU19 and 15MU55, possible burial mounds; site 15MU83, a low-density scatter; and site 15MU38, a rock shelter, have not been fully assessed according to their NRHP eligibility status (Wampler and Karpynec, 2004).

An archaeological survey conducted between July and August 2004, recorded six previously unrecorded archaeological sites (15MU243 through 15MU248) within the APE (Wampler and Karpynec, 2004). All six archaeological sites are considered ineligible for listing on the NRHP. Sites 15MU244 through 15MU247 are characterized as low-density lithic scatters of unknown prehistoric cultural affiliations, with deposits confined within the plow zone. Site 15MU243 represents a low-density artifact surface scatter that is located within a disturbed tobacco field. Site 15MU248 consists of a surface and subsurface artifact scatter. The subsurface deposits at this site are disturbed. Cultural deposits of previously recorded sites 15MU19, 15MU38, 15MU55, 15MU83, and 15MU135 were not relocated during the Phase 1 survey. These sites may have been mismarked on the maps or may be currently under water. Therefore, the portions of these previously recorded sites depicted in the state site files within the APE are not considered eligible for listing on the NRHP.

An architectural survey (Karpynec, 2004) was conducted between July and August 2004. The survey identified 29 previously unrecorded historic structures. Of these, 13 were located in Todd County (TO26 through TO38), and 16 were in Muhlenberg County (MU41 through MU56), within the proposed APE. None of these resources are recommended eligible for listing on the NRHP due to the lack of unique features of architectural style or workmanship and the inability to associate the properties with their original owners or with an important historical event. Also, alterations have been made to several of the structures, thereby compromising their integrity.

3.10. Visual

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 1-4 miles from the observer, objects may be distinguishable but their details are weak, and they tend to merge into larger patterns. Details and colors of objects in the background, the distant part of the landscape, are not normally discernible unless they are especially large and standing alone. The impressions of an area's visual character can have a significant influence on how it is appreciated, protected, and used. The general landscape character of the study area is described below, and additional details are provided in Section 4.9.

The transmission line would be rebuilt utilizing existing 69-kV right-of-way from PAF to the Clifty City Substation tap approximately 25 miles to the southwest. The visual character of the area surrounding PAF ranges from highly industrial within the plant fence to scenic along the Green River to the east. Higher structures within the plant site, such as the smoke stacks, can be seen from middleground distances up to 3 miles away.

The existing transmission line right-of-way follows a path to the south across the Green River, traversing mostly pastoral landscapes with sparse residential developments scattered throughout the countryside. The route crosses SR 70 to the south near Tom Hall

Road. This area is characterized by numerous lines and structures within a major transmission line corridor. Scenic attractiveness is minimal, and scenic integrity is low.

The transmission line right-of-way continues south, crossing numerous local roads, and traversing a variety of middle Kentucky countrysides. Elevations range from approximately 400 feet mean sea level (msl) near Jacobs Creek to approximately 540 feet msl along higher ridges to the south. Views of existing structures and lines are mostly from local roads and scattered residents with foreground and middleground views.

The existing right-of-way crosses United States Highway (US) 431 to the south and turns west across open pastoral landscapes. The right-of-way traverses Lake Malone and McPherson Road to the west near a major transmission line corridor. Northwest of this corridor, the proposed Jason Substation would occupy approximately 5 acres of open agricultural land. The right-of-way continues east of CR 1785 before crossing SR 181 and entering the Clifty City Substation. Traffic is moderate to low. Scenic attractiveness is minimal; scenic integrity is low.

The proposed Fruit Hill Substation would be located to the west of the proposed Jason Substation just north of the Fruit Hill community on CR 189. The substation would occupy approximately 11 acres of relatively flat open land.

3.11. Prime Farmland

Prime farmland soils, as defined by the U. S. Department of Agriculture, are those soils that have the best combination of physical and chemical properties for production of agricultural crops. The concern that continued conversion of prime farmland to nonagricultural use would deplete the nation's resource of productive farmland prompted creation of the 1981 Farmland Protection Policy Act. The act set guidelines that require all federal agencies to evaluate land prior to permanently converting it to nonagricultural land use. Before an action is taken, completion of Form AD 1006, "Farmland Conversion Impact Rating," is required with assistance from the Natural Resources Conservation Service (NRCS). The rating has two parts: (1) the relative value of farmland score and (2) the site assessment score. NRCS staff assigns a relative value of farmland based on county land evaluation criteria. The federal agency completes the site assessment portion and may use a local site assessment or determine the score based on criteria as explained in 7 CFR 658.5 b. This rating is based on the rural versus urban nature of the site, distance from urban support services, creation of nonfarmable farmland, etc. A combined rating greater than 160 suggests that the farmland should be protected and another site considered.

Besides the transmission line upgrades, the proposed action involves two sites for new sub-stations. One proposed substation site is located in Muhlenberg County, Kentucky, on about 5 acres near the Jason Community. This site is comprised of about 4 acres of Sadler silt loam soil and about 1 acre of Zanesville silt loam soil (see Table 3-7). The Sadler silt loam occurs on slopes of 2 to 6 percent and has properties to be classified as prime farmland soil. The Zanesville silt loam is located on slopes of 6 to 12 percent and is severely eroded. Currently, the proposed Jason Substation site is mostly timberland.

Table 3-7. Soils Located in the Proposed Jason Substation Site

SMU[1]	Name	Slopes	Description	Acres
SaB	Sadler silt loam	2 to 6 percent	Prime Farmland	3.96
ZaC3	Zanesville silt loam	6 to 12 percent	Severely Eroded	0.97
			Total	4.93

[1]*SMU = soil mapping unit*

The second proposed substation site is located in Christian County, Kentucky, and occupies about 11 acres near the Fruit Hill Community. Soils with characteristics to be classified as prime farmland are Crider and Zanesville silt loams (see Table 3-8). They are located on slopes of 2 to 6 percent and occupy about 4.5 acres. Nicholson silt loam soil, having slopes of 6 to 12 percent, occurs on about 4.7 acres and is classified as state-important farmland. The remaining acreage is Zanesville silt loam, on 6 to 12 percent slopes, and is severely eroded. This site has been planted in hay, but has not been harvested.

Table 3-8. Soils Located in the Proposed Fruit Hill Substation Site

SMU	Name	Slopes	Description	Acres
CrB	Crider silt loam	2 to 6 percent	Prime Farmland	0.17
NhC	Nicholson silt loam	6 to 12 percent	State Important	4.74
ZnB	Zanesville silt loam	2 to 6 percent	Prime Farmland	4.29
ZnC3	Zanesville silt loam	6 to 12 percent	Severely Eroded	1.47
			Total	10.67

Form AD 1006 was completed with assistance from NRCS staff from each county. NRCS assigned a score for the Land Evaluation (Relative Value of Farmland) portion of the rating. For the Jason site, the relative value of farmland is 89, and the site assessment score is 55, for a total rating of 144. The relative value of farmland score for the Fruit Hill site is 77, and the site assessment score is 54. A total rating of 131 was assigned to this site. Scores for both sites are below the 160-threshold level. Thus, consideration for protection is not required.

CHAPTER 4

4. ENVIRONMENTAL CONSEQUENCES

This chapter contains a discussion of potential effects that are anticipated under the two alternatives. The potentially affected resources are discussed in the same order that they were presented in Chapter 3.

4.1. Terrestrial Ecology - Plants

4.1.1. No Action Alternative

Adoption of the No Action Alternative would not result in any project-related impacts to the terrestrial biological resources of the region beyond those currently associated with the maintenance of the existing transmission line. No project-related impacts to rare plant species would result from the adoption of the No Action Alternative.

4.1.2. Action Alternative

No uncommon plant communities were encountered along the transmission line route, at the new substation sites, or at the construction assembly areas. Any project-related impacts to the terrestrial biological resources of the region are expected to be insignificant as a result of the proposed Action Alternative. No occurrences of federally listed or state listed plant species were encountered in or adjacent to the proposed project route, proposed substations, or access roads. Therefore, there would be no effects to any federally listed or state-listed plant species as a result of the proposed action.

4.2. Terrestrial Ecology - Animals

4.2.1. No Action Alternative

Under the No Action Alternative, the transmission line would not be rebuilt, and the two proposed substations would not be constructed. Thus, the project area would likely remain in its current state and would remain relatively unchanged. Therefore, common terrestrial animals and their habitats would not be affected. Also for this reason, implementation of the No Action Alternative would not affect protected terrestrial animal species or their habitats.

4.2.2. Action Alternative

The majority of the project area consists of fragmented and previously disturbed habitats. Therefore, the construction of the proposed substations and the associated transmission line would displace wildlife only to a minor degree. Also, because the proposed work would be mostly restricted to the existing right-of-way, the project would not add to the loss of forested habitats or cause additional forest fragmentation. Potential effects to common terrestrial wildlife species are expected to be minor and insignificant.

According to the TVA Natural Heritage database, no state-listed or federally listed species were recorded from within a 3-mile radius of the Kirkmansville-Clifty City Transmission Line. No unique habitats, such as caves, were found during field inspections.

Suitable habitat for barking tree frog, blue-winged teal, lark sparrow, yellow-bellied sapsucker, Bachman's warbler (which is considered extinct), gray bat, and both the eastern ribbon and copper-belly water snake does not occur along the transmission line. Thus, there would be no effects to these species.

Habitat for vesper sparrows is uncommon to nonexistent along and within the right-of-way. This bird typically nests within fields of short grass that have rock outcrops and small scattered trees. If vesper sparrows are in fact present in the area, they would likely nest within the fields rather than in the narrow strip found in the right-of-way. Therefore, there would be no effects to vesper sparrows under the Action Alternative.

Gray bats have been reported in caves from Christian, Todd, and Logan Counties. Because there are no known caves within a 3-mile radius of the project area, there would be no effects to this species.

Moist forested habitat occurs adjacent to the right-of-way. These forests may be suitable habitat for common shrews and southeastern shrews. No marshy meadows or sphagnum bogs were located along the right-of-way. Because the proposed project would not result in the conversion of forested habitats, it would not result in adverse impacts to these species.

Suitable habitat for southeastern and Indiana bats exists within the project area, mostly where the transmission line crosses Lake Malone in Muhlenberg County. This species could potentially roost in the vicinity in hollow trees or under loose tree bark. Forested areas adjacent to the right-of-way were assessed for their suitability as roosting sites for the Indiana bat using a modified version of the Indiana Bat Habitat Suitability Index Model (Romme and Brack, 1995). None of the areas assessed were considered to have high roosting potential. The Jason Substation site is forested. However, because of the size of the trees and the lack of undergrowth, this site also has low potential as roosting habitat. With the exception of the Jason site, the project would not result in the removal of forested habitats, and no caves are known within a 3-mile radius of the right-of-way. Therefore, the proposed project would have no effect to southeastern or Indiana bats or their habitats.

4.3. Aquatic Ecology

4.3.1. No Action Alternative

Under the No Action Alternative, the proposed rebuild of the Kirkmansville-Clifty City Transmission Line and two substations would not be undertaken. Because there would be no change from the current condition under the No Action Alternative, there would be no effects to aquatic ecological resources beyond the minimal effects associated with maintenance of the existing line.

4.3.2. Action Alternative

Watercourses that convey surface water only during storm events (i.e., wet-weather conveyances or ephemeral streams) that may be affected by the project would be protected by the use of standard BMPs as identified in Muncy (1992). These BMPs are designed to minimize erosion and subsequent sedimentation in streams. The approximate locations of wet-weather conveyances are listed in Appendix G.

The intermittent and perennial streams and their riparian habitats that occur within the project area would receive “Standard Stream Protection (Category A)” as designated by TVA (see Appendix D). The Standard Stream Protection designation is based on the variety of species and habitats that exist in intermittent and perennial streams and the various state and federal requirements designed to protect these resources. Criteria for the Standard Stream Protection designation included evidence of aquatic life and/or the presence of a well-defined channel with rock or soil substrate. SMZ width is determined by category and slope of land adjacent to the stream (Muncy, 1992). The streams identified for Category A protection and the SMZ sizes are noted in Appendix G. SMZs would extend at least 50 feet from the stream bank on either side of a proposed crossing depending on the slope of the surrounding land.

By following the Standard Stream Protection requirements on identified streams, the rebuilding of the transmission line would not result in significant impacts to aquatic life. All construction and maintenance work, especially near streams, would be conducted following the requirements and recommendations presented in TVA’s *Guidelines for Environmental Protection During Transmission Line Construction* (Muncy, 1992). Access to construction sites would be via existing maintenance access points. This would reduce potential erosion and sedimentation effects compared to the construction of new access routes. If no practicable alternative exists, trees along streams within the line corridor and danger trees adjacent to the corridor would be cut. However, their stumps would not be removed, and short understory vegetation would be disturbed as little as possible. Maintenance activities along streams would be by mechanical cutting or by selective use of herbicides registered with the USEPA. Design of permanent and temporary stream crossings would comply with appropriate federal and state permitting requirements as well as any applicable designations and BMPs. Where herbicides are used, these chemicals would be applied following USEPA label restrictions and TVA BMPs.

No streams are located on the proposed substations’ sites. Therefore, no effects to aquatic resources, including protected aquatic species, are anticipated. No state-listed or federally listed aquatic species would be affected directly by the construction and operation of the proposed transmission line. Because of the limited amount of site disturbance, indirect effects, such as increased sediment load or other changes in physical habitat of affected streams to local populations of aquatic animals in streams along this transmission line right-of-way, are unlikely. Because this transmission line would be placed on an existing right-of-way, and all construction work, especially near streams, would be conducted following the requirements and guidelines in TVA’s BMP guidelines (Muncy, 1992), no direct or indirect impacts to protected aquatic animals would occur as a result of this activity.

Maintenance techniques as described by Muncy (1992) would be employed during transmission line maintenance. These measures are designed to avoid or minimize potential adverse effects to streams. Any herbicides used as part of the maintenance program would be registered for that use by USEPA and would be applied according to label directions. Particular care would be given to the selection of herbicides to be used near streams as a further safeguard for the protection of aquatic species, including those protected under federal and state law. With these measures in effect and because none of the larger stream crossings were identified as suitable habitat for listed aquatic species, maintenance of this transmission line right-of-way is not expected to affect listed aquatic species.

Due to the nature of this action, there would likely be no potential impacts from invasive aquatic animal species.

4.4. Recreation and Managed Areas

4.4.1. No Action Alternative

Under the No Action Alternative, the proposed transmission line would not be rebuilt and associated activities would not be performed. Therefore, managed areas in the vicinity would not be impacted if the No Action Alternative were adopted. For similar reasons, recreational resources would not be affected.

4.4.2. Action Alternative

Implementation of the proposed project would have insignificant effects on public recreation resources, facilities, and activities. Transmission lines are compatible activities within the Peabody WMA as long as BMPs are maintained. There are four existing power line crossings of portions of Lake Malone along the existing right-of-way, so potential effects are expected to be temporary and insignificant. The proposed structures are compatible with potential golf course developments. There would be no impacts to the Lake Malone State Park, as the project is approximately 0.4 mile south of the park. Cumulative effects of the project on recreation facilities and activities would be insignificant.

The proposed rebuilt transmission line would cross two managed areas, i.e., the Sinclair Tract of the Peabody WMA and Lake Malone. Because existing right-of-way would be used, potential impacts to the Peabody WMA are expected to be minor and temporary. BMPs for stream crossings would be implemented to avoid impacts to Lake Malone. The proposed work is about 0.4 mile from Lake Malone State Park. Because the park lies across the lake from the transmission line right-of-way, no impacts are anticipated.

4.5. Wetlands

4.5.1. No Action Alternative

If the proposed activities were not undertaken, there would be no change in wetlands from their current condition. Thus, implementation of the No Action Alternative would not affect wetlands.

4.5.2. Action Alternative

No wetlands were identified on or near the proposed substation sites. Thus, construction and operation of the Jason and Fruit Hill Substations are not expected to affect wetlands. The wetlands identified in the right-of-way are not expected to be impacted significantly by the proposed scope of work because of the following:

- The majority of the wetlands would be avoided and would be spanned by the new conductors.
- Existing access roads would be used.
- Appropriate federal and state permits would be obtained for any structure placement and fill in wetlands, and all permit conditions would be strictly implemented.

- Potential impacts would be avoided or minimized through implementation of appropriate BMPs (Muncy, 1992).
- There would be no clearing of forested wetlands.

Transmission line improvement projects are not anticipated to require excavation or fill in jurisdictional wetlands. However, if excavation or fill in a jurisdictional wetland cannot be avoided, a request for a jurisdictional determination and an application for Nationwide General Permit No. 12 would be submitted to the USACE.

Two wetlands, APO 46 W1 and APO 48 W1, are associated with access roads that would likely require improvements to accommodate necessary equipment. Required permits would be sought should any fill be placed outside of the footprint of the existing roads, and erosion control devices, such as silt fencing, would be used to minimize any potential impacts to these forested wetlands. With these measures in place, any potential effects to wetlands from access road upgrades would be insignificant.

4.6. Floodplains

4.6.1. No Action Alternative

If the proposed activities are not undertaken, there would be no change from current conditions, and there would be no potential effects to floodplains.

4.6.2. Action Alternative

The existing transmission line right-of-way crosses several floodplain areas in Muhlenberg County, Kentucky. Rebuilding the existing line could involve locating support structures in the 100-year floodplain. Under 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 is not expected to result in any increase in flood hazard either due to increased flood elevations or to changes in flow-carrying capacity of the streams being crossed. To minimize potential adverse impacts on natural and beneficial floodplain values, the right-of-way would be revegetated where natural vegetation is removed, and the removal of unique vegetation would be avoided. BMPs would be used during construction activities. The TVA subclass review criteria for transmission line location in floodplains would be followed to ensure floodplain impacts would be minimized. The existing Clifty City Substation and the proposed Jason and Fruit Hill Substations are not located in the 100-year floodplain. Thus, siting of these substations is consistent with the requirements of EO 11988.

4.7. Surface Water

4.7.1. No Action Alternative

No effects to surface water quality beyond those now occurring in connection with the maintenance of the existing transmission line are expected under the No Action Alternative because the proposed activities would not occur.

4.7.2. Action Alternative

Soil disturbances associated with access roads or other construction activities can

potentially result in adverse water quality impacts. Erosion and sedimentation can clog small streams and affect aquatic life. Removal of the tree canopy at stream crossings along transmission lines can result in increased water temperatures and adverse effects to aquatic biota. Improper use of herbicides to control vegetation could potentially result in runoff to streams and subsequent aquatic impacts.

Precautions would be included in the design, construction, and maintenance of the project to minimize potential impacts and to avoid the addition of sediment or siltation to streams. Construction BMPs would be used at the proposed substation sites to prevent off-site migration of sediments (see Section 4.3.2). Because of these measures and because there are no streams on the substation sites, potential effects to surface waters from substation construction are unlikely.

Along the transmission line route, permanent stream crossings would be constructed so as not to impede runoff patterns and the natural movement of aquatic fauna. Temporary stream crossings and other construction and maintenance activities would comply with appropriate state permit requirements and TVA requirements as described in Muncy (1992). These measures include installation of silt screens and sediment traps, restrictions on use of heavy equipment near streams, and prompt revegetation. Canopies in all SMZs would be left undisturbed unless there were no practicable alternative. The situation where streamside canopies are left undisturbed, however, is rare and restricted to streams in deep ravines. right-of-way maintenance that requires chemical treatment would employ only USEPA-registered herbicides used in accordance with label directions. With these safeguards in place, potential effects to surface water quality are expected to be insignificant.

4.8. Groundwater

4.8.1. No Action Alternative

Because the proposed activities would not be undertaken under the No Action Alternative, adoption of this alternative is not expected to affect groundwater resources.

4.8.2. Action Alternative

There are several sinkholes and two domestic wells located within a mile of the proposed Fruit Hill Substation. There are no sinkholes located near the Jason Substation site or the laydown area. However, there is one domestic well within a mile of the Jason site. There are ponds that could possibly be fed by groundwater near both sites. BMPs as described by Muncy (1992) would be used to control sediment infiltration into groundwater in the project area. Construction activities would avoid springs and sinkholes as practicable. During revegetation and maintenance activities, fertilizers and herbicides would be used sparingly to avoid contamination of groundwater. As stated in the BMPs (Muncy, 1992), fertilizers and herbicides would not be applied in areas that flow to groundwater infiltration zones (i.e., springs, wells, and sinkholes). With the use of these BMPs, potential impacts on groundwater from this action would be insignificant.

4.9. Archaeology

4.9.1. No Action Alternative

If the No Action Alternative were adopted, there would be no potential to disturb archaeological resources or historic properties.

4.9.2. Action Alternative

The archaeological and architectural surveys identified 6 prehistoric archaeological sites and 29 historic structures within the APE of the proposed project. All of these historic properties were recommended ineligible for listing on the NRHP. In a letter of December 15, 2004 (see Appendix A), the Kentucky SHPO concurred with these findings. Thus, TVA has determined that the proposed undertaking would not have the potential to affect any historic properties that are potentially eligible, eligible, or currently listed on the NRHP.

4.10. Visual

4.10.1. No Action Alternative

Under the No Action Alternative, TVA would not rebuild the transmission line from the Clifty City tap to PAF and would not construct the Jason or Fruit Hill Substations. If this alternative were adopted, there would be no change in visual character.

4.10.2. Action Alternative

Visual consequences are examined in terms of visual changes between the existing landscape and proposed actions, sensitivity of viewing points available to the general public, their viewing distances, and 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. The foreground, middleground, and background viewing distances were described previously in Chapter 3.

The rebuilt transmission line would be visually similar to other lines and structures seen at and near PAF. Because the number of structures is not expected to change significantly, and new structures would normally be placed near the original pole locations, reductions of visual coherence and harmony in the vicinity of PAF would not be significant.

Recreation users along the Green River to the south would likely see the rebuilt transmission line from oblique angles and between structures. These views would be in the foreground and comparable in height to existing structures seen in the area now. As new steel poles weather, they would provide less contrast in the landscape. At SR 70 to the south near Tom Hall Road, new poles and structures would provide minor visual contrast when compared to the major transmission line route in the immediate foreground to the west.

Continuing south, the new transmission line would cross numerous local roads and would be seen from various locations along pastoral landscapes. Most views would be by motorists in the foreground between structures and by residents in the middleground and background distances. Visual impacts decrease as distance increases. The influence of the natural landscape on the transmission line and structures in this area greatly decreases negative impacts on scenic character. The reduction of perceived details is mainly a factor

of the natural landscape when viewed from this distance. Evergreen and deciduous vegetation, as well as gradient changes, obscures details and the transmission line would be seen as a broader, natural pattern as opposed to a focal point in the landscape.

The new route crosses US 431 to the south and turns west across open pastoral landscapes. The right-of-way traverses Lake Malone and McPherson Road to the west near a major transmission line corridor. The Jason Substation would occupy about 5 acres of open agricultural land northwest of this main corridor. New fencing, structures, and lines needed for the new substation would be visually similar to transmission structures seen in the landscape by motorists along CR 1785 and nearby residents. The proposed laydown area next to the substation would be temporary. There may be some minor visual discord during the construction period due to an increase in personnel and equipment. However, this would be temporary until all activities are completed and the area has been restored through the use of TVA standard BMPs.

The rebuilt transmission line would continue east of CR 1785 before crossing KY 181 and entering the Clifty City Substation. There are few residents in the area. Traffic along local roads is light to moderate. Views of the new transmission line for motorists and area residents would be visually similar to the 69-kV line seen in the area now.

The new Fruit Hill Substation would be located to the west of the proposed Jason Substation immediately north of Fruit Hill on CR 189 and would occupy an 11-acre site. The construction laydown area would be on site. Visual impacts to the area as a result of the new substation would be similar to those described for the proposed Jason Substation.

Operation, construction, and maintenance of the proposed transmission line, right-of-way, and associated substations 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 right-of-way and laydown areas have been restored through the use of TVA standard BMPs (Muncy, 1992). Therefore, no significant visual impacts are anticipated as a result of this project.

4.11. Prime Farmland

4.11.1. No Action Alternative

Under the No Action Alternative, the proposed activities would not take place. Thus, under this alternative, there would be no effect to prime farmland.

4.11.2. Action Alternative

Because the proposed transmission line upgrades would take place on existing right-of-way, no changes in land use would result from these upgrades. However, construction of the proposed substations would involve a change in land use to nonagricultural uses. Thus, potential effects to prime farmland were considered. The aggregate score from Form 1006 for the Jason Substation site was 144. Similarly, the score for the Fruit Hill site was 131. Both of these scores were below the threshold value of 160. Sites with scores greater than 160 merit protection. Because both substation sites scored much less than the 160-threshold value, they are not considered prime farmland, and protection of agricultural land on these sites is not considered necessary. Because of the minor amount of acreage

involved (about 16 acres) and because the sites are not considered prime farmland, any potential effects to prime farmland would be insignificant.

4.12. Summary of TVA Commitments and Proposed Mitigation Measures

The following measures would be applied as a matter of routine during construction and operation of the proposed transmission line:

- Appropriate Best Management Practices as described in *A Guide for Environmental Protection and Best Management Practices for Tennessee Valley Authority Transmission Construction and Maintenance Activities* (Muncy, 1992) would be implemented during construction activities.

- During construction, the environmental quality protection specifications as described in Appendices B, C, D, E, and F would be implemented to reduce the potential for adverse environmental effects.

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CHAPTER 5

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CHAPTER 6

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CHAPTER 7

7. SUPPORTING INFORMATION

7.1. Literature Cited

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7.2. Glossary of Terms

°F	Symbol for degree Fahrenheit
alluvium	A general term for clay, silt, sand, gravel, or similar unconsolidated material deposited by a stream or other body of running water
APE	Acronym for Area of Potential Effect
BMP	Acronym for Best Management Practice, i.e., accepted construction practice designed to reduce environmental effects
bus	A rigid (rather than a flexible cable) electrical connector
capacitor	An electrical device that can store and quickly release an electrical charge
conductor	The “wire” or cable that carries electric current
CR	Acronym for County Road
culvert	A large pipe placed under a roadway to allow drainage water to pass under the road
danger tree	A tree that could pose a threat of grounding a line if allowed to fall near a transmission line or onto a structure
easement	An agreement that gives a party rights on a particular property and allows other uses not inconsistent with the easement rights. An easement for a transmission line right-of-way entitles TVA to cross the landowner’s property with a transmission line and to operate that line, among other things.

EO	Acronym for Executive Order
e.g.	Latin term exempli gratia meaning “for example”
et al.	Latin term et alii (masculine), et aliae (feminine), or et alia (neuter) meaning “and others”
etc.	Latin term et cetera meaning “and other things” “and so forth”
forb	A nonwoody, low-growing plant that is not a grass
gpm	Abbreviation for gallons per minute
i.e.	Latin term, id est, meaning “that is”
insulator	A fixture made of nonconducting material used to hold a conductor while isolating the conductor from ground
isolating switch	A switch that allows a portion of a circuit to be isolated electrically from the rest of the circuit
kV	Symbol for kilovolt (one kV equals 1,000 volts)
lithic scatter	A type of archaeological site consisting of a scattering of broken rock pieces
msl	Abbreviation for mean sea level
MVAR	Megavars; one million VARs
NEPA	Acronym for National Environmental Policy Act
NHPA	Acronym for the National Historic Preservation Act
No.	Abbreviation for number
NRCS	Acronym for Natural Resources Conservation Service
NRHP	Acronym for the National Register of Historic Places
PAF	Acronym for Paradise Fossil Plant
RECC	Acronym for Rural Electric Cooperative Corporation
SHPO	Acronym for State Historic Preservation Officer
SMU	Acronym for soil mapping unit
SMZ	Acronym for Streamside Management Zone
spoil	Excess earthen material
SR	Acronym for State Route
structure	A pole or tower that supports a transmission line
substation	A facility connected to a transmission line used to reduce voltage so that electric power may be delivered to a local power distributor or user
tap	The point at which a substation connects electrically to a transmission line
TDS	Acronym for total dissolved solids, a measurement used in determining water quality
transformer	An electrical device used to decrease or increase voltage in a circuit; a step-down transformer reduces voltage, while a step-up transformer increases voltage

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 the Tennessee Valley Authority
US	Abbreviation for United States Highway
USACE	Acronym for the United States Army Corps of Engineers
USEPA	Acronym for United States Environmental Protection Agency
USFWS	Acronym for United States Fish and Wildlife Service
VAR	Volt-Ampere-Reactive, a unit of measure of the power that maintains the constantly varying electric and magnetic fields associated with alternating current circuits
voltage	A measure of electrical potential
wave trap	An electrical device used to remove signals imbedded in the electrical current of a circuit
wet-weather conveyance	A stream that is normally dry during dry weather but that has a steady flow after a rainfall
WMA	Acronym for Wildlife Management Area