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ENVIRONMENTAL ASSESSMENT

OAKWOOD SWITCHING STATION AND MONTGOMERY-OAKWOOD SWITCHING STATION TRANSMISSION LINE

Montgomery County, Tennessee

TENNESSEE VALLEY AUTHORITY
U.S. ARMY - FORT CAMPBELL

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CHAPTER 1

1. PURPOSE OF AND NEED FOR ACTION

1.1. Need

The western area of Montgomery County, Tennessee, the U. S. Army's Fort Campbell, and the Dover area of Stewart County, Tennessee, are supplied with electrical power from four substations: Dover, Woodlawn, Jersey Miniere and Screaming Eagles. All of these substations are served by connections to the Montgomery–Barkley 161-kilovolt (kV) transmission line. Because of growing electrical loads in the area and the long distance from the Barkley Hydro Plant (about 50 miles to the Dover substation), an outage of the line anywhere between the Montgomery and New Providence substations would result in low voltage and a blackout of these four stations. The Barkley-Dover transmission line section would also be overloaded in this situation. This problem could occur as early as the summer of 2006 and the amount of the load which would be out of service is expected to increase over time.

1.2. Proposed Action

The Tennessee Valley Authority (TVA) proposes to improve the reliability of service to western Montgomery County, Tennessee, the U. S. Army's Fort Campbell, and the Dover area of Stewart County, Tennessee by constructing and operating a new switching station along its Montgomery-Barkley 161-kV transmission line (also referred to as part of the Kentucky Dam-Nashville 161-kV line) and a transmission line connecting the new switching station to its existing Montgomery 500/161-kV Substation. The new Oakwood 161-kV Switching Station would be built at the intersection of Montgomery-Barkley 161-kV transmission line and its 161-kV tap line to TVA's Screaming Eagles 161-kV Substation near the Oakwood community in western Montgomery County, Tennessee (Figure 1-1). TVA proposes to construct and operate a new 13-mile 161-kV transmission line that would connect the Screaming Eagles Substation with the Montgomery Substation located northeast of Clarksville, Tennessee (Figures 1-2, 1-3). This would result in a new 20-mile transmission line connection between the new Oakwood Switching Station and the Montgomery Substation.

Also as part of the proposed action a new bay and circuit breaker would be installed at the Montgomery Substation and connected to the new transmission line. TVA would also make modifications to relay and communication equipment at its Barkley Hydro Plant Switchyard and at four of its 161-kV substations: Dover, Jersey Miniere, Van Leer and South Nashville. This work would consist primarily of the installation of new electronic control and protection equipment and wiring changes within the existing facilities.

The new switching station and the transmission line connection to the Montgomery Substation would provide a second direct connection to the strong power source at Montgomery and thus would provide voltage support for the area. With the proposed line in place, there would be a source of backup power to help avoid potential customer power outages.

1.3. Decisions to be Made

TVA must decide whether or not to build the new 161-kV transmission line and switching station. If TVA decides to build the transmission facilities, it must also decide when and where to build the facilities, and determine the need for any necessary mitigation measures necessary to minimize potential environmental impacts. A detailed description of the alternatives is provided in Section 2.2.

A portion of the proposed transmission line would be built on Fort Campbell. The U.S. Army must, therefore, decide whether or not to issue a right of entry and long-term lease to TVA for the construction and operation of transmission facilities on Fort Campbell. Because this action is subject to the requirements of the National Environmental Policy Act, the U.S. Army is cooperating with TVA in the preparation of this Environmental Assessment (EA).

1.4. Other Pertinent Environmental Reviews or Documentation

TVA has prepared two environmental reviews in recent years that are pertinent to this proposal.

Environmental Assessment - Kentucky Dam-Nashville 161-kV Transmission Line Tap and Screaming Eagles Substation, Fort Campbell, Montgomery County, Tennessee. TVA, 2003. -- This EA assessed the construction and operation of the Screaming Eagles Substation and 7-mile tap line connecting it with the Kentucky Dam-Nashville transmission line.

Final Environmental Impact Statement - 500-kV Transmission Line in Middle Tennessee. TVA, 2005. -- This final environmental impact statement (FEIS) assessed alternative routes for a 500-kV transmission line between Cumberland Fossil Plant and the Montgomery Substation. One of the alternative routes, the Cumberland-Montgomery Corridor D route, assessed about two-thirds of the route for the new 13-mile 161-kV transmission line that is part of the current proposal. This Corridor D route was ultimately not selected for the new 500-kV line.

1.5. The Scoping Process and Public Involvement

TVA conducted extensive public scoping and public involvement during the development of the EIS cited above in Section 1.3. The major issues raised during the development of the EIS included the need for the project, the range of alternatives, the right-of-way (ROW) acquisition process, ROW clearing and maintenance, effects on wetlands, wildlife and vegetation, effects on land use and farmland, and effects on property values. These issues have been considered in the development of this EA.

Based on the results of the scoping for the EIS, TVA's experience with conducting environmental assessments for other transmission projects, and the nature of the proposed action, the following issues are analyzed in detail in this EA:

- Air Quality
- Groundwater
- Surface Water

- Vegetation
- Wildlife
- Aquatic Ecology
- Endangered and Threatened Species
- Wetlands
- Floodplains
- Recreation, Parks, and Managed Areas
- Visual Resources
- Cultural Resources

Other potential issues not analyzed in detail include geology, soils, noise and environmental justice. Aspects of the area's geology are briefly described in the groundwater section of the EA and no impacts to area geology are anticipated. Similarly no long-term impacts to area soils are anticipated. Information on noise during construction and operation is provided in Appendix VIII. Potential environmental justice impacts were analyzed in the FEIS mentioned above (TVA 2005). The poverty rate of project area census tracts is lower than county, state, and national averages. The percent minority population in project census tracts along the proposed transmission line route ranges from about 10 percent less to 12 percent greater the county average of 29.1 percent, which is high relative to the state average of 20.9 percent and close to the national average. Because no residences would be displaced by the proposed transmission line and switching station and not other significant impacts are likely, significant impacts on disadvantaged populations are not anticipated and the project complies with Executive Order 12898 on environmental justice.

The following federal, state, and local agencies and other organizations have been contacted by TVA concerning the current proposal:

- U.S. Fish and Wildlife Service, Cookeville Field Office
- U.S. Congressmen from the project area
- U.S. Army Corps of Engineers, Nashville District
- United States Army Garrison, Fort Campbell, KY, Commander, Headquarters
- Tennessee Department of Transportation, Nashville; Mr. Edward H. Cole, Chief of Environment and Planning
- Tennessee Historical Commission, Nashville; Mr. Herbert L. Harper, Executive Director and subsequent Interim Director Mr. Richard G. Tune.

TVA has also contacted landowners affected by the portion of proposed new transmission line that was not reviewed in the previous EIS, as well as those at the proposed switching station site.

This proposal has been reviewed for consistency 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, EO 12372 (Intergovernmental Review), and EO 12898 (Environmental Justice). The proposal was also reviewed for consistency with EO 13045 (Protection of

Children from Environmental Health Risks and Safety Risks) and would not result in any disproportionate risks to children.

A draft of this EA was released for public review in January, 2007. It was posted on TVA's web site and notices of its availability were published in area newspapers. No comments were received on it during or after closure of the 30-day comment period.

1.6. Necessary Federal Permits or Licenses

Permits would be required from the state of Tennessee and Montgomery County for construction site storm water discharge for the switching station and transmission line construction. TVA would prepare the required erosion and sedimentation control plans and coordinate these plans with the appropriate state and local authorities in order to secure all necessary permits. A permit would also be required for burning trees and other combustible materials removed during construction activities. The U.S. Army would also grant TVA permission to build the short stretch of new transmission line located on Fort Campbell. TVA staff would coordinate with the Army to determine compliance with Army storm water regulations and provide copies of applicable permits to the Army.

CHAPTER 2

2. ALTERNATIVES INCLUDING THE PROPOSED ACTION

2.1. Alternatives

2.1.1. Alternative 1 – No Action

Under this alternative, TVA would not take any action, such as constructing the new switching station and transmission line, to improve the power supply in western Montgomery County and portions of Stewart County. As a result, the transmission system in this area would continue to operate with a high risk level of interruption in certain situations. This risk would likely increase over time as the electrical loads in the area grow.

2.1.2. Alternative 2 – Construct and Operate Oakwood 161-kV Switching Station and Montgomery-Oakwood 161-kV Transmission Line

Under this alternative, TVA would construct a new switching station with a 3-position ring bus near the Oakwood community in western Montgomery County at the intersection of its Montgomery-Barkley 161-kV transmission line and its 161-kV tap line to its Screaming Eagles 161-kV Substation (Figure 1-1). The switching station would occupy about 6 acres of land. TVA would also construct about 13 miles of new 161-kV transmission line from the Screaming Eagles Substation to the Montgomery Substation northeast of Clarksville (Figures 1-2, 1-3). This line, together with the Screaming Eagles tap line, would create a new 20-mile transmission line from the Montgomery Substation to the new Oakwood Switching Station.

A new bay and circuit breaker would be installed within the existing fenced area of the Montgomery Substation and connected to the new transmission line.

TVA would also make modifications to relay and communication equipment at its Barkley Hydro Plant Switchyard and at four of its 161-kV substations: Dover, Jersey Miniere, Van Leer and South Nashville. This work would consist primarily of the installation of new electronic control and protection equipment and changes to wiring within the existing facilities.

For TVA to implement this alternative, the U.S. Army would have to decide to provide TVA a right of entry and long-term lease for approximately 15 acres of Fort Campbell property to allow about 1.2 miles of the proposed transmission line to be built on Fort Campbell.

2.2. Alternatives Eliminated from Detailed Study

In addition to the proposed action as described above under Alternative 1, TVA considered four other solutions to the growing transmission problems in western Montgomery County and portions of Steward County. TVA studied the performance of these four alternatives, as well as the proposed action, under electrical load conditions forecast to occur in 2008 and 2018. The four alternatives are summarized below.

2.2.1. Construct Oakwood Switching Station and Clarksville - Oakwood Switching Station 161-kV TL

Under this alternative, TVA would construct the Oakwood Switching Station with a 3- or 4-position bus ring at the location described above for Alternative 2. TVA would also construct a new 161-kV transmission line about 15 miles long between the Oakwood Switching Station and the existing Clarksville 161-kV Substation. This alternative would likely not require that the U.S. Army provide TVA a right of entry and long-term lease for the use of Fort Campbell property.

Under this alternative, the area electrical system would not experience problems until 2013, when the Montgomery Substation could become overloaded. This overload could then be solved by installing a Static Var Compensator (SVC) or a second 500/161-kV transformer bank at the Montgomery Substation. An SVC is a device that uses power electronics and fast switching to allow fixed capacitors to supply variable reactive power to control voltage. The initial costs of this alternative are roughly comparable to those of Alternative 1. The later work at the Montgomery Substation would, however, substantially increase costs over those of Alternative 1. The construction of the 161-kV line from the Clarksville Substation would also result in significant conflicts with existing development and land uses within the City of Clarksville and the purchase of the right-of-way would be very expensive. Therefore this alternative was eliminated from further consideration.

2.2.2. Construct Oakwood Switching Station and Install Static Var Compensators

This plan would involve the construction of the Oakwood Switching Station as described under Alternative 2. TVA would also install SVCs at the Screaming Eagles Substation to maintain adequate voltage levels on the Montgomery-Barkley line. This alternative would likely not require that the U.S. Army provide TVA a right of entry and long-term lease for the use of Fort Campbell property.

Although option appears acceptable in preventing low voltage problems, the SVCs, due to their inherent operating limits, cannot bring the voltage back up to within operational criteria when the voltage drops below 60% of the nominal voltage. SVC devices also have a history of requiring extensive and frequent maintenance to preserve operability. This alternative would also cost about 20 percent more than Alternative 1. For these reasons, this alternative was eliminated from further consideration.

2.2.3. Construct Oakwood Switching Station and Install Capacitors

Under this alternative, TVA would construct the new Oakwood Switching Station as described under Alternative 2. TVA would also install five 9 MVAR capacitor banks in the switching station to prevent voltages drops from occurring during the contingencies described in Section 1.1. This alternative would likely not require that the U.S. Army provide TVA a right of entry and long-term lease for the use of Fort Campbell property.

Studies show that there would be problems with these capacitor banks in the summer of 2013 . The capacitor banks would not be able to maintain proper voltages due to increased loads at Screaming Eagles and New Providence. Since this alternative would not solve the voltage problems, it was eliminated from further consideration.

2.2.4. Construct Oakwood 500-kV Substation and Cumberland – Oakwood and Oakwood-Montgomery 500-kV Transmission Lines

This plan would require the construction of a 500-kV substation near the Oakwood community. TVA would also construct a 500-kV transmission line loop connection to the new Cumberland-Montgomery 500-kV transmission line. This 500-kV substation would be located near the existing Screaming Eagles tap point. A three position 500-kv ring bus would be installed along with a minimum of a three position 161-kV ring bus. This alternative would likely not require that the U.S. Army provide TVA a right of entry and long-term lease for the use of Fort Campbell property.

Studies show that there would be problems with overloads in summer of 2008 and 2013. Additional 161-kV lines would need to be tied into the substation or the complete line from the substation to Montgomery would have to be rebuilt in order for this option to meet the system needs. The expense and impacts of the construction of a new 500-kV substation also contributed to the elimination of this alternative.

2.3. Description of Construction, Operation, and Maintenance of the Proposed 161-kV Transmission Line and Switching Station

2.3.1. Transmission Line Construction

2.3.1.1. Structures and Conductors

The proposed 161-kV transmission line connection from Montgomery to the interconnection point with the Screaming Eagles tap transmission line would be built primarily using single-steel poles similar to those shown in Figure 3a or H-frame steel pole structures similar to those shown in Figure 3b. Structure type is dependent on terrain and the distance between structures. Pole height would vary according to the terrain and would average between 80 and 110 feet.

a  b 

Figure 2-1. Single-pole (a) and H-frame (b) 161-kV transmission structures.

Three conductors (the cables that carry the electrical current) are required to make up a circuit in alternating current transmission lines. For 161-kV transmission lines, each conductor is made up of a single cable. The conductors are attached to fiberglass or ceramic insulators suspended from the structure cross arms. A smaller overhead ground wire or wires are attached to the top of the structures. This ground wire may contain fiber optic communication cables. In order to reduce the potential hazard to aircraft, orange warning spheres would be installed on conductors on the portion of the proposed transmission line on Fort Campbell and south of Clarksville Airport east of US 41A.

Poles at angles in the line may require supporting guys. Some structures for larger angles could require two or three poles. Most poles would be imbedded directly into 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-gravel mixture might be used. Some structures may be self-supporting (i.e., non-guyed) poles fastened to a concrete foundation that is formed and poured into an excavated hole.

Equipment used during the construction phase includes trucks, truck-mounted augers and drills, as well as tracked cranes and bulldozers.

2.3.1.2. Right-of-Way Acquisition and Clearing

New right-of-way (ROW) 100 feet wide would be needed for the transmission lines. TVA would purchase easements from landowners for the new ROW on private land and obtain a long-term lease from the U.S. Army for the segment on Fort Campbell. Fee title for the land within the ROW would normally remain with the landowner, and the easement or lease would prohibit certain activities such as the construction of buildings within the ROW that could interfere with the transmission line or create a hazardous situation.

Because of the need to maintain adequate clearance between tall vegetation and transmission line conductors, as well as to provide access for construction equipment, most trees and shrubs would be removed from the entire width of the ROW. Equipment used during this ROW clearing includes chain saws, skidders, bulldozers, and/or feller-bunchers. Marketable timber would be salvaged where feasible. Otherwise, woody debris and other vegetation would be piled and burned, chipped, or taken offsite. In some instances, vegetation may be windrowed along the edge of the right-of-way to serve as sediment barriers. Vegetation removal in streamside management zones (SMZs) and wetlands would be restricted to trees tall enough, or with the short-term potential to grow tall enough, to interfere with conductors. Clearing in SMZs would be accomplished using hand-held equipment or remote handling equipment such as a feller-buncher in order to limit ground disturbance. TVA *Right-of-Way Clearing Specifications*, *Environmental Quality Protection Specifications for Transmission Line Construction*, and *TVA Transmission Construction Guidelines Near Streams* are included in Appendixes II, III, and IV.

Any trees located off the ROW that are tall enough to pass within 5 feet of a 161-kV conductor or structure (if it were to fall toward the line) are designated "danger trees" and would be removed.

Subsequent to clearing and construction, vegetative cover on the ROW would be restored as much as is possible to its state prior to construction. Wooded areas would be restored using native grasses and other low-growing species. No invasive species would be used

during revegetation and local genotypes will be used if available. Erosion controls would remain in place until the plant communities become fully established. Streamside areas would be revegetated as described in Section 4.3, Summary of TVA Commitments and Proposed Mitigation Measures.

2.3.1.3. Access Roads

Permanent access roads would be needed to allow vehicle access to each structure and other points along the ROW. Existing roads are typically used for access along much of a ROW. Twelve access roads were identified along the proposed transmission line and were included in the environmental field review. TVA would obtain the necessary rights for these access roads from landowners. The identified roads are primarily existing roads that include privately-built farm and field roads. Some of these access roads may need upgrading. Upgrading would consist of minor grading and placement of gravel.

Typically access roads used for transmission lines are located on the ROW wherever possible and designed to avoid severe slope conditions and to minimize the need for stream crossings. Access roads are typically about 20 feet wide and are surfaced with dirt or gravel. The proposed construction access roads are shown in Figures 1-2 and 1-3. In addition to the farm and field roads shown in these figures, TVA would use existing streets and highways in the project area for construction and maintenance access. These include streets in the Gardner Hills housing area on Fort Campbell. TVA is presently coordinating with the Army and the Fort Campbell Family Housing, LLC over the use of these streets.

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

Access through high traffic or residential areas would be marked with appropriate signage and monitored by construction personnel for safety purposes.

2.3.1.4. Construction Assembly Areas

A construction assembly area would be required for worker assembly, vehicle parking, and material storage. The area would be graveled and fenced, and trailers used for material storage and office space would be parked on the areas. Following the completion of construction activities, all vehicles, trailers and unused materials will be removed for use on future projects. Any construction debris would be removed from the site to a certified landfill. The assembly area would not be located on Fort Campbell.

2.3.2. Conductor and Ground Wire Installation

Reels of conductor and ground wire would be delivered to various staging areas along the ROW. Temporary clearance poles would be installed at road and railroad crossings to reduce interference with traffic. A small rope would be pulled from structure to structure. It would be connected to the conductor and ground wire and used to pull them down the line through pulleys suspended from the insulators. A bulldozer and specialized tensioning

equipment would be used to pull conductors and ground wires to the proper tension. Crews would then clamp the wires to the insulators and remove the pulleys.

2.3.2.1. Switching Station Construction

The proposed switching station would be located on a 6.3 acre site at the intersection of the Montgomery-Barkley 161-kV transmission line and the tap line to Screaming Eagles. This site (Figure 1-1) is west of the Woodlawn substation.

Site drainage structures would be installed. The station yard would be covered with crushed stone and enclosed with chain link fencing seven feet in height. The unused portion of the site would be restored as much as possible to its preconstruction state.

The major equipment in the new substation would consist of multiple 161-kV disconnect switches, three SF6 circuit breakers, associated bus work, associated relays communication, control and protection equipment. The bus work, other conductors and some equipment would be supported on steel structures.

Environmental protection measures that would be applied during substation construction are listed in Appendix V.

2.3.3. Operation and Maintenance

2.3.3.1. Inspection

Periodic inspections of 161-kV transmission lines are performed from the ground and by aerial surveillance using a helicopter. These inspections are conducted to locate damaged conductors, insulators, or structures, and to report any abnormal conditions that might hamper the operation of the line or adversely impact the surrounding area. During these inspections, the condition of vegetation within and immediately adjoining the right-of-way is noted. These observations are then used to plan corrective maintenance or routine vegetation management.

2.3.3.2. Vegetation Management

Management of vegetation along the ROW would be necessary to ensure access to structures and to maintain an adequate distance between transmission line conductors and vegetation. Management of vegetation along the ROW would consist of two different activities: felling of “danger trees” adjacent to the cleared ROW, and control of vegetation within the cleared ROW.

Management of vegetation within the cleared ROW would use an integrated vegetation management approach designed to encourage low-growing plant species and discourage tall-growing plant species (Appendix VI). A vegetation reclearing plan would be developed for each transmission line segment based on the results of the periodic inspections described above. Fort Campbell staff would be consulted during development of the reclearing plan for the transmission line segment on the base. Given the land use in the project area, ROW maintenance is only expected to be necessary on a few segments of the line. The two principal management techniques are mechanical mowing (using tractor-mounted rotary mowers) and herbicide application. Herbicides are normally applied in areas where heavy growth of woody vegetation is occurring on the ROW and mechanical

mowing is not practical. Herbicides would be applied selectively 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 and all herbicide applications would be by certified applicators.

Other than vegetation management, only minor 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, it would normally be lifted out of the ground by crane-like equipment, and the replacement structure would be inserted into the same hole or in an immediately adjacent hole.

2.4. Project Siting Alternatives

The major components of the proposed action are a new 161-kV switching station in western Montgomery County and a new 161-kV transmission line connecting that switching station to TVA's Montgomery 500-kV substation.

2.4.1. Switching Station Siting Alternatives

To best solve the transmission problems in western Montgomery County, the new switching station would need to be located close to the Montgomery-Barkley transmission line and have feasible route alternatives for the transmission line connection to the Montgomery substation. It is also preferable to locate the switching station west of the Woodlawn substation since there would be difficulties in supporting the Woodlawn load, under certain conditions, without a line connection to the Montgomery substation.

Two alternative sites were identified (see Figure 2-2):

- Site 1 is located at the intersection of the Montgomery-Barkley line and the Screaming Eagles tap line, west of the Woodlawn substation.

- Site 2 is located at the point that the Corridor D route alternative identified for the Cumberland-Montgomery 500-kV transmission line (TVA 2005) crosses the Montgomery-Dover section of the Montgomery-Barkley transmission line. This site is just east of the Woodlawn substation.

Both sites were reviewed and found to be feasible for construction of the switching station and connection with the Montgomery-Barkley transmission line.

Site 1 allows the use approximately 6.3 miles of the existing tap line to Screaming Eagles substation as part of the transmission line connection to the Montgomery substation. It requires approximately 1 mile of ROW to connect to the previously identified Cumberland-Montgomery Corridor D route. This site would also provide a more reliable power supply to the Screaming Eagles substation than does the present system by reducing the tap line length from 7 miles to 1 mile or less.

Site 2 requires slightly less length of new transmission line but is located east of the Woodlawn substation. It provides no improvement in reliability for the Screaming Eagles delivery point.

Based on these system considerations, Site 1 was preferred and Site 2 was eliminated from further consideration.

2.4.2. Transmission Line Siting Alternatives

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

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

As part of its project to upgrade the 500-kV bulk transmission system in Middle Tennessee, TVA identified an alternative transmission line route between Montgomery and Cumberland Fossil Plant which passed north of Clarksville, Tennessee and within less than two miles of the Screaming Eagles transmission connection (TVA 2005). During the planning of this 500-kV transmission line project, TVA held several public meetings during 2003 to review potential transmission line alternatives and routes and to receive public comments on them. TVA also accepted comments through surface and electronic mail, by phone, and by facsimile.

Because of the congestion, land uses conflicts and other constraints present around the built-up areas of the City of Clarksville, it became obvious that the route identified in the FEIS (TVA 2005) as the Cumberland-Montgomery Corridor D route was the most, if not only, viable line route passing north of the city. Therefore, this route, which was not selected for the construction of the 500-kV transmission line, was included as part of the routing process for the currently proposed 161-kV transmission system improvements in western Montgomery County. Some minor adjustments were made to the route described in the FEIS as result of residential development which has occurred in the time since the FEIS was published.

2.4.2.1. Definition of the Study Area

The preferred switching station site (see Section 2.4.1), the location of the Screaming Eagles tap line and the previously identified Cumberland-Montgomery Corridor D transmission line route were used to identify a study area for the segment between the Corridor D route and the Oakwood site that would minimize the length of transmission line and the length of the tap line to the Screaming Eagles substation. In addition, since sectionalizing switches would be added on each side of the new tap to Screaming Eagles, road access to that point was also a consideration. The identified study area was bounded by the Cumberland Montgomery Corridor D route on the north; by the residential development near Kay Road to the east; by the Screaming Eagles tap line to the west; and

the east-west portion of Fayette Road to the south. This study area offered the shorter transmission line lengths and decreased impact to existing and planned land use.

2.4.2.2. Establishment and Application of Siting Criteria

TVA has long employed a set of evaluation criteria that represent opportunities and constraints for development of transmission line routes. The criteria are oriented toward factors such as existing land use, ownership patterns, environmental features, cultural resources, and visual quality. Cost is also an important factor, with engineering considerations and ROW acquisition costs being the most important economic elements. Information gathered and comments made during the public review of the Cumberland-Montgomery Corridor D route were also considered.

Each of the transmission line route options was evaluated according to these criteria relating to engineering, environmental, land use, and cultural concerns. Specific criteria are described below.

- Engineering Criteria: Total length of the transmission route, length of new and rebuilt ROW, primary and secondary road crossings, pipeline and transmission line crossings, and total line cost.
- Environmental Criteria: Slopes greater than 30 percent (steeper slopes mean more potential for erosion and potential water quality impacts), slopes between 20 and 30 percent, visual aesthetics, forested areas, open water crossings, sensitive stream (such as those supporting endangered or threatened species) crossings, perennial and intermittent stream crossings, wetlands, rare species habitat, natural area crossings, and wildlife management areas.
- Land Use Criteria: The number of fragmented property parcels, schools, houses, commercial or industrial buildings, Fort Campbell base facilities, barns, and parkland crossings
- Cultural Criteria: Archaeological and historic sites, churches, and cemeteries

This evaluation process resulted in the identification of two alternative routes between the Cumberland-Montgomery Corridor D route near Kay Road and the Screaming Eagles tap line next to Woodlawn Road (Figure 2-3). Route Alternative 1 headed west from the Corridor D route approximately 1 mile to the Screaming Eagles substation dead end structure. Route Alternative 2 headed south and then west from the Corridor D route following floodplains approximately 1.3 miles to the tap line approximately 0.7 mile from the Screaming Eagles substation. Route Alternative 1 is all on Fort Campbell property. Route Alternative 2 is about half on Fort Campbell property and half on private property.

2.4.2.3. Identification of the Proposed Transmission Line Route

The proposed transmission line route, incorporating the Alternative 2 route mentioned above and a portion of the Cumberland-Montgomery 500-kV Corridor D route, begins on Fort Campbell at its intersection with the Screaming Eagles tap line about 0.8 miles south of the Screaming Eagles substation. The route then runs east and east-north east along the south side of Fletcher Fork. About half a mile west of US 41A, it crosses to the north side of Fletcher Fork, crosses a wooded upland area, and then crosses Little West Fork and US 41A a short distance north of the Little West Fork bridge. It then runs eastward to cross the Little West Fork four more times before crossing Peachers Mill Road. It continues running

due east across the West Fork Red River. It then runs east to east-northeast for about 5 miles to cross Spring Creek several times, as well as TN 48 and I-24 near the bridge over Spring Creek. About 1.6 miles east of I-24, the route turns south, crosses US 79, and then runs parallel to the west side of the existing Paradise-Montgomery 500-kV line for about 0.9 miles through the industrial park on existing ROW to the Montgomery 500-kV Substation.

2.5. Comparison of Alternatives and Selection of Preferred Alternative

The two transmission line route alternatives were evaluated as discussed above. Two significant conflicts were identified with Route Alternative 1. This route conflicts with areas on the Fort Campbell reservation identified for future base facility expansion, as well as planned base security improvements. Route Alternative 2 does not conflict with any identified future base facility expansion. Route Alternative 2 was therefore selected as the preferred route and is evaluated in detail in this EA.

Because of the small number of property owners (6) affected by the preferred route, a public open house to discuss the project was not held. Property owners were sent a letter explaining the project, identifying the preferred route and requesting permission to access their property to survey the route. Property owners were also contacted by phone. No comments were received from the property owners identifying any features which would alter the selection of the preferred route.

CHAPTER 3

3. AFFECTED ENVIRONMENT

This chapter describes the existing condition of the environmental resources in the project area that would be affected by implementing the proposed action. Much of the environmental setting for the proposed transmission line has previously been described in the FEIS for the 500-kV Transmission Line in Middle Tennessee (TVA 2005). The currently proposed 161-kV transmission line would utilize part of the Cumberland-Montgomery Corridor D route and its Ringgold Creek North, Little West Fork North, and Spring Creek South alignments. Because of recent land use changes in the project area, small portions of the proposed route have been slightly modified from those described in the FEIS, and the width of the proposed 161-kV transmission line ROW would be 100 feet rather than 175 feet as described for the 500-kV line ROW.

The affected environment descriptions below are based on field surveys conducted from 2004 through 2006, on published and unpublished reports, and on personal communications with resource experts at Fort Campbell. Additional information on Fort Campbell in the form of geographic information system files delineating various resources was also provided by Fort Campbell personnel.

3.1. Air Quality

The air quality in the vicinity of the Oakwood Switching Station and Transmission Line is generally good, with the area currently in compliance with all air quality standards. Regionally, air quality is also generally good. All areas in Tennessee had met attainment of the old 1-hour ozone standard. However, for some areas, attainment of the 8-hour ozone standard of 80 parts per billion (ppb) has been more difficult to achieve. Montgomery County in Tennessee and Christian County in Kentucky, which had been classified as nonattainment for the 8-hour ozone standard, were recently classified as an attainment maintenance area during the fourth quarter of 2005. In addition, some areas of the region—including Montgomery and Christian Counties—could experience difficulty maintaining attainment with the recently adopted annual $PM_{2.5}$ standard.

3.2. Groundwater

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

The carbonate rocks that form the Highland Rim aquifer are typical of karst systems. The term karst refers to carbonate rocks (limestone and dolostone) in which ground water flows through solution-enlarged channels and bedding planes within the rock. Karsts are characterized by sinkholes, springs, disappearing streams, and caves, as well as by rapid, highly directional groundwater flow in discrete channels or conduits. Because of the

connections between surface and underground features, water in karst areas is not distinctly surface water or ground water. The water in karst areas is also readily susceptible to contamination.

The hydraulic characteristics of the Mississippian aquifers present in much of the project area can vary greatly over short distances. These large differences are reflected in the yield and specific capacity of wells completed in the limestone aquifers and the discharges of springs that issue from these aquifers. The yields of wells completed in the Mississippian aquifers commonly range from 5 to 50 gallons per minute, and maximum yields range from a few hundred to, rarely, several thousands of gallons per minute. However, such openings constitute only a small part of the rock and might be difficult to locate (Lloyd and Lyke 1995). Groundwater in the Mississippian aquifers generally contains concentrations of dissolved solids and iron less than secondary maximum contaminant levels for drinking water established by the U.S. Environmental Protection Agency. It is either a calcium magnesium bicarbonate type or a calcium bicarbonate type and generally of adequate quality, or can be treated and made adequate for most uses (Lloyd and Lyke 1995).

Total fresh groundwater withdrawals in Montgomery County were very low during 1995 which were reported to be 0.22 million gallons per day (USGS 1995). Out of four public water sources in Montgomery County, only one is a groundwater source and it was found by the Tennessee Division of Water Supply to be of high susceptibility to contamination (TDEC 2003). This public water source is operated by the Fort Campbell Water System and is located within the Red River Watershed. The water source is a spring that discharges from a Mississippian carbonate aquifer which is under the influence of surface water. Within the spring's protection area, the land use is predominantly urban. Solvents were detected in the source and reported to the Tennessee Division of Water Supply (TDEC 2003).

Along the proposed transmission line ROW, four sinkholes occur. There is one sinkhole located south of Little West Fork, near Peachers Mill Road. There are two sinkholes located north of Spring Creek between State Road 48 and Interstate 24 and a large sinkhole occurs along the ROW near U.S. Route 79.

3.3. Surface Water

The project area is located within the Cumberland River Basin and drains to tributaries of Barkley Reservoir. Barkley Reservoir, immediately downstream of Cheatham Dam, is a shallow lake extending 118.1 miles to Barkley Dam at Cumberland River mile 30.6. At the normal summer pool elevation of 359 feet (msl), Barkley has 1,004 miles of shoreline and an area of 74,500 acres. Rainfall in the area averages about 47 inches per year with March being the wettest month with 4.9 inches and October the driest with 2.6 inches. The average monthly air temperature ranges from 36°F in January to 79°F in July with a mean for the year of about 59°F. Stream flow varies with rainfall and reservoir operations. The mean annual flow at the U.S. Geological Survey gaging station just below Cheatham Dam is 23,800 cubic feet per second (cfs) or almost 1.7 cfs per square mile for the 14,163 square mile drainage area.

Table 3-1 lists the streams in the project area and their use classifications as designated by the Tennessee Department of Environment and Conservation. Cooper Creek, a tributary to Blooming Grove Creek and the Cumberland River, drains the proposed switching station site. The proposed transmission line route is drained by tributaries to the Red River. Four

streams in the project area are included on the state 303(d) list as not meeting their designated uses (Table 3-2). All of the listings include siltation as one of the causes for the listing. There are no waters within this study area that are classified as "high quality" by the state.

Table 3-1. State of Tennessee use classifications of streams in the project area (TDEC 2004a and 2004b).

Stream	Use Classification						
	Domestic Water Supply	Industrial Water Supply	Fish and Aquatic Life	Recreation	Livestock Watering & Wildlife	Irrigation	Navigation
Cumberland River (CRM 103)	X	X	X	X	X	X	X
Blooming Grove Creek			X	X	X	X	
Cooper Creek			X	X	X	X	
Red River (CRM 125.3)		X	X	X	X	X	X
West Fork Red River		X	X	X		X	X
Little West Fork		X	X	X	X	X	
Fletchers Fork			X	X	X	X	
Raccoon Branch			X	X	X	X	
Spring Creek			X	X	X	X	

Table 3-2. State of Tennessee 303(d) listed streams in the project area (TDEC 2004a and 2004b).

Stream	Cause	Source
Red River (CRM 125.3)	Siltation, pathogens, other habitat alterations, organic enrichment/low DO, nutrients	Nonirrigated crop production, collection system failure, land development, pasture grazing
West Fork Red River	Siltation, other habitat alteration	Land development
Little West Fork	Phosphorus, siltation, low dissolved oxygen	Major municipal point source, habitat modification
Fletchers Fork	Other habitat alterations	Habitat modification
Spring Creek	Siltation, organic enrichment/low dissolved oxygen, other habitat alteration	Nonirrigated crop production, removal of riparian vegetation, sources outside state

Fletchers Fork Creek is on the state 303(d) list due to other habitat alterations from habitat modification. It is listed as a Category 5 stream (i.e., a priority for corrective action and a Total Maximum Daily Load (TMDL) study). The Stream was assessed in March 2001 and

August 2003 by the Fort Campbell Environmental Division of the Public Works Business Center (Fort Campbell 2001, Fort Campbell 2003). Qualitative and quantitative data were collected using EPA's Rapid Bioassessment Protocols for Wadeable Streams and Rivers. Data were compared to Tennessee reference streams within the region. Physiochemical results complied with water quality criteria for each of the designated uses. Sediment deposition was visible at all sampling locations. Raccoon Branch and the upper reach of Fletchers Fork Creek had the largest deposition. The watershed receives heavy impacts from military and non-military activities.

3.4. Vegetation

The project area is located within the Pennyroyal Plain section of the Interior Low Plateaus Physiographic Province (Bailey 1995). This area is characterized by flat to gently rolling topography heavily used for agriculture, and contains numerous karst features such as sinkholes, caves, and sinking streams. Vegetation in the project area was surveyed by botanists who field inspected much of the potentially affected area.

Most (ca. 85%) of the proposed switching station site is herbaceous vegetation in the form of a weedy pasture dominated by tall fescue grass and sprangle top grass. Other plant species in the pasture are beefsteak plant, common ragweed, cocklebur, Canada goldenrod, false dandelion, sneezeweed and various other grass species. The remainder of the site is occupied by deciduous woods composed of white oak, southern red oak, mockernut hickory, pignut hickory, shagbark hickory, honey locust, wild black cherry, and winged elm. No plant communities of conservation concern occur on the site.

The proposed transmission line route crosses cultivated fields, abandoned fields in early to middle stages of plant succession, pastures, and forest. The landforms along the proposed route include creek bottoms, undissected uplands, bluffs and meanders of major creeks, and shallow sinkholes and moderate slopes. Access roads are mostly in cleared ground that is either in pasture or row crops, with short stretches through woodlands. Approximately 75% of the proposed 158-acre ROW is in cleared land (herbaceous vegetation), with the remaining 25% in deciduous forest. Herbaceous species in the cleared land include broomsedge, Canada goldenrod, carpet weed, crab grass, green pigweed, goosegrass, and various other grasses and asters. The forested areas are dominated by swamp chestnut oak, shingle oak, mockernut hickory, eastern cottonwood, tulip poplar and American sycamore, spicebush, hackberry, redbud, Ohio buckeye, wild black cherry, American elm, and hop horn-beam. The herbaceous layer consists of bearded beggar ticks, black snakeroot, blunt-lobed woodsia, bog hemp, Christmas fern, cut-leaf coneflower, and winged stem.

The only plant community of conservation concern (i.e., ranked G1, G2 or G3, see http://www.natureserve.org/explorer) previously reported from the vicinity is the Kentucky-Tennessee Big Barrens/Pennyroyal Karst Plain Prairie and Barrens (*Schizachyrium scoparium - (Helianthus mollis, Helianthus occidentalis, Silphium trifoliatum)* Herbaceous Vegetation association). Several examples of this plant community occur on Fort Campbell. Neither this community nor other plant communities of conservation concern occur along the proposed transmission line route or access roads.

Slightly over half (ca. 53%) of the 15 acres of proposed ROW on Fort Campbell is mesic deciduous forest. The other major plant communities present on Fort Campbell are

broomsedge/fescue fields (13%), floodplain forest (13%), early successional scrub-tree-grassland (12%), cultivated fields (5%), and mixed cedar-hardwood forest (4%).

The occurrence of invasive plants at the proposed switching station site and along the proposed transmission line is typical and representative of the region. The switching station site has been maintained as a tall fescue pasture, and invasive species present, in addition to the fescue, include Johnson grass, common cocklebur, Queen Anne's lace and a few plants of multiflora rose. The same species occur along the proposed transmission line along with Japanese stilt grass, Japanese honeysuckle, Chinese privet, and common periwinkle. Three of these species, Japanese honeysuckle, Japanese stilt grass, and multiflora rose, are ranked by the Tennessee Exotic Pest Plant Council as 'Severe Threat.' The infestations were judged to be minor.

3.5. Wildlife

Wildlife habitat in the project area is dominated by early successional farmland and grasslands; moderately to heavily fragmented upland and riparian deciduous forests are also present. The diversity of the wildlife community is somewhat limited by the lack of extensive unfragmented forests.

The proposed switching station site is primarily pasture dominated by fescue, other grasses, and forbs of moderate to low value as wildlife habitat. A few scattered trees and a stand of oak-hickory forest and a small pond are present. Animals found on site are typical of those species found in largely fragmented habitats. Birds expected in these areas include red-tailed hawk, Carolina wren, indigo bunting, field sparrow, and song sparrow. Small mammals and larger species such as white-tailed deer and coyote also use these habitats. The pond provides habitat for common species of amphibians such as the green frog.

The proposed transmission line would cross cultivated fields, abandoned fields in early to middle stages of plant succession, pastures, and several forested patches. Approximately 75% of the proposed right-of-way crosses early successional habitats. The remaining 25% crosses forested habitats.

There is a diverse bird community along the proposed route due to the mixture of largely fragmented habitats along the proposed route. Over 70 species of birds were observed along the proposed route during field surveys including the great blue heron, red-tailed hawk, northern bobwhite, Carolina wren, blue grosbeak, indigo bunting, and field and song sparrows. The wood thrush and pileated woodpecker, which have some sensitivity to forest fragmentation, also occur along the proposed route. Mammals observed along the proposed route include the eastern mole, coyote, raccoon, white-tailed deer, muskrat, woodchuck, eastern chipmunk, and gray, flying and fox squirrels. Eastern box turtles, fence lizards, skinks, and a variety of snakes are commonly found in habitats observed along the proposed route.

The proposed transmission line crosses Fletcher Fork and an associated riparian forest and forested wetlands on and near Fort Campbell property. This area contains habitat for the barking treefrog, green frog, toads, red salamander, and other amphibians, as well as the wood duck, barred owl, wild turkey, woodpeckers, blue jay, Carolina chickadee, brown creeper, blue-gray gnatcatcher, red-eyed vireo, northern parula, prothonotary warbler, and several other animals. Birds of conservation concern (Fort Campbell 2005) known or likely

to occur in the project area on Fort Campbell, as well as at other locations in the project area, include the whip-poor-will, red-headed woodpecker, wood thrush, worm-eating warbler, and Louisiana waterthrush.

A small nesting colony of great blue herons, containing about 20 nests, occurs about 240 feet from the proposed transmission line at its crossing of West Fork Red River. Several caves, some of which are known to support bats, salamanders, and other animals, are known from the project area. The closest cave, an unnamed cave with a large stream flowing from its entrance, is about 200 feet from the proposed ROW and on the opposite side of Spring Creek. This cave does not provide suitable habitat for endangered bats.

3.6. Aquatic Ecology

The project area is in the Western Highland Rim section of the Interior Low Plateau. Streams of the Highland Rim are characterized by coarse chert gravel and sand substrates interspersed with bedrock areas, moderate gradients, clear waters, and moderate to low productivity, and thus little aquatic vegetation except near springs. Because of the abundance of dissolution channels in the softer limestones, the region is very rich in cave and spring habitat. Due to its geologic complexity, and numerous semi-independent drainage systems, the Highland Rim harbors the most diverse aquatic fauna of any region of comparable size in North America (Etnier and Starnes 1993).

As described in Section 3.3, the project area is located in watershed of the West Fork Red River, a tributary to the larger Red River. Tennessee Wildlife Resources Agency (TWRA) sampling of the Red River in 1999 collected 43 fish species, indicative of moderate to high quality. The Red River supports a very good black bass fishery, and an excellent channel and flathead catfish fishery (TWRA 2000). The West Fork Red River and its larger tributaries are expected to have similar aquatic communities. The West Fork Red River is also managed as a winter put-and-take trout fishery by the TWRA with the most recent stockings of trout occurring on 7 December 2005 and 7 February 2006 (TWRA 2006).

The larger named streams crossed by the proposed transmission line are Fletchers Fork, Little West Fork, West Fork Red River, and Spring Creek. The biological integrity of these four streams has been impacted by siltation and other factors (see Section 3.3).

The portion of the proposed transmission line on Fort Campbell would cross Fletchers Fork, Little West Fork, and the intermittent Raccoon Branch. As part of a base monitoring program, the Fort Campbell Fisheries and Wildlife Program has sampled the benthic (bottom-dwelling) macroinvertebrate community in Fletchers Fork Creek and Raccoon Branch (Fort Campbell 2001, 2003). These sampling results show the presence of species moderately tolerant of pollution. The creeks meet state physiochemical standards for their designated uses but are impaired by habitat modification and excessive siltation.

A farm pond heavily degraded by cattle occurs on the switching station site. The proposed transmission line and associated access roads would cross a total of 68 watercourses and 2 ponds. The 68 watercourses consisted of 13 perennial streams, 8 intermittent streams, and 47 wet-weather conveyances. A summary of streams crossed by the proposed transmission line, streamside management zone protection categories and widths, and a brief description of each stream is presented in Appendix VII.

3.7. Endangered and Threatened Species

A few species listed as endangered or threatened under the Endangered Species Act (ESA), as well as several state-listed species, are known from Montgomery County (Table 3-3). No designated critical habitat occurs in the area. Field surveys to determine the presence of listed species in the portion of the proposed transmission line that was previously part of the proposed 500-kV transmission line (TVA 2005) were conducted in the spring and summer of 2004 and field surveys of the remainder of the project area were conducted during the summer of 2005 and winter of 2006. These surveys focused on species previously reported from Montgomery and surrounding counties (Tables 3-13, 3-14, and 3-15 in TVA 2005), including previous studies carried out on Fort Campbell (e.g., Chester et al. 1995).

The federally listed Price's potato-bean is known from about 1.1 miles southwest of the proposed switching station. Neither this species, nor any other federally listed or state-listed plant species, were observed in potentially affected areas.

The only listed aquatic animals known or likely to occur in the project area are the slenderhead darter and the eastern hellbender. The darter is known from the Red River and prefers gravel shoals with moderate to fast currents as a habitat and spawns in swift gravel riffles during May (Etnier and Starnes 1993). No habitat for the slenderhead darter was identified in streams crossed by the proposed transmission line. The hellbender has been reported from Little West Fork at its junction with Fletchers Fork, close to a proposed transmission line stream crossing.

Two terrestrial animals listed as endangered under the ESA, the gray bat and the Indiana bat, have been reported from the general vicinity of the project area (Table 3-3). Gray bats were captured on Fort Campbell during the summer and the fall of 2004 with the greatest numbers over Jordan, Piney Fork, and Fletcher Fork Creeks (BHE 2004). Indiana and gray bats have been reported from two caves, Coleman Cave and Bellamy Cave, about 1.1 miles southwest of the proposed Oakwood switching station. The gray bat is also known from a third cave in Montgomery County farther from the project area. No caves suitable for gray bats were observed in the immediate vicinity of the proposed transmission line or switching station. Gray bats roost in caves during all seasons and typically forage over open water habitats; little suitable foraging habitat occurs in the project area.

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. Indiana bats forage primarily in forested areas along streams or other corridors. Forests on Fort Campbell appear to provide suitable spring, summer, and fall roosting and foraging habitat for Indiana bats (BHE 2004). There are numerous records for this species in Montgomery County and the closest cave known to be visited by Indiana bats, Cooper Creek Cave, is about 1.3 miles from the proposed switching station. The more frequently used Bellamy Cave is about 2.8 miles from the proposed switching station. Surveys for Indiana bats have been conducted for several years at Fort Campbell, and three individuals have been captured there - two during fall migration in 1998 and one during the summer breeding season (BHE 2004). The results of these surveys (BHE 2004, Hill and Kiser 2006) indicate that Indiana bats are rare in the project area during the summer.

A Habitat Suitability Index Model adopted from the Indiana Bat Revised Recovery Plan (Romme et al. 1995, USFWS 1999) was used to assess the quality of forested areas along

the proposed transmission line as potential Indiana Bat summer habitat during 2004 and 2005. Eight plots were sampled, and three of these plots were on Fort Campbell. Two of the eight plots, including one on Fort Campbell, were ranked as having moderate potential for Indiana bat roosting sites. The other six plots ranked as having low potential. The main factors contributing to the moderate and low suitability rankings were the presence of a dense subcanopy and the lack of potential roost trees. No caves suitable for Indiana bats were observed in the project area.

Although none of the state-listed animals were observed during the field surveys of the project area, suitable habitat for some of them occurs along the proposed transmission line route. Suitable habitat for the barking tree frog and western pigmy rattlesnake occurs in riparian woodland along Fletchers Fork and at some ponds along the proposed route. Suitable habitat for the eastern slender glass lizard and northern pine snake, in the form of well-drained old fields and wooded areas is scattered along the proposed transmission line route. A small area of low quality habitat for the Swainson's warbler occurs along Fletchers Fork and brushy early successional habitat for Bewick's wren exists in several locations along the proposed transmission line route. Moist woods and old fields suitable for the common shrew, southeastern shrew, southern bog lemming, and meadow jumping mouse are also present.

Table 3-3. Endangered and threatened species reported from Montgomery County.

Common Name	Scientific Name	Federal Status*	State Status and Rank*
Plants			
American ginseng	*Panax quinquefolius*	--	S-CE (S3S4)
Appalachian bugbane	*Cimicifuga rubifolia*	--	THR (S3)
Barbed rattlesnake-root	*Prenanthes barbata*	--	SPCO (S2)
Blue scorpion-weed	*Phacelia ranunculacea*	--	SPCO (S2S3)
Compass-plant	*Silphium laciniatum*	--	THR (S2)
Earleaf foxglove	*Agalinis auriculata*	--	END (S2)
Goldenseal	*Hydrastis canadensis*	--	S-CE (S3)
Hairy hawkweed	*Hieracium longipilum*	--	SPCO (S1)
Heavy-fruited sedge	*Carex gravida*	--	SPCO (S1)
Lance-like spikerush	*Eleocharis lanceolata*	--	SPCO (S1)
Large-tooth aspen	*Populus grandidentata*	--	SPCO (S2)
Limestone blue-star	*Amsonia tabernaemontana var gattingeri*	--	SPCO (S3)
McDowell's sunflower	*Helianthus occidentalis*	--	SPCO (S2)
Michigan lily	*Lilium michiganense*	--	THR (S3)
Muhly	*Muhlenbergia glabrifloris*	--	SPCO (S1)
Prairie-dock	*Silphium pinnatifidum*	--	THR (S2)
Price's potato-bean	*Apios priceana*	THR	END (S2)
Purple milkweed	*Asclepias purpurascens*	--	THR (S1)
Rock goldenrod	*Solidago rupestris*	--	END (S1)
Running strawberry-bush	*Euonymus obovatus*	--	SPCO (S2)
Sedge	*Carex muskingumensis*	--	END-P (SH)
Short's bladderpod	*Lesquerella globosa*	CAND	END (S2)
Short's rock-cress	*Arabis shortii*	--	SPCO (S1S2)

Common Name	Scientific Name	Federal Status*	State Status and Rank*
Smaller mud-plantain	*Heteranthera limosa*	--	THR (S1S2)
Sweet coneflower	*Rudbeckia subtomentosa*	--	THR (S2)
White water-buttercup	*Ranunculus aquatilis var. diffusus*	--	END (S1)
Fish			
Slenderhead darter	*Percina phoxocephala*	--	NMGT
Amphibians			
Eastern hellbender	*Cryptobranchus alleghaniensis alleghaniensis*	--	NMGT (S3)
Barking treefrog	*Hyla gratiosa*	--	NMGT (S3)
Reptiles			
Eastern slender glass lizard	*Ophisaurus attenuatus longicaudus*	--	NMGT (S3)
Northern pine snake	*Pituophis melanoleucus melanoleucus*	--	THR (S3)
Western pigmy rattlesnake	*Sistrurus miliarius streckeri*	--	THR (S2S3)
Birds			
Henslow's sparrow	*Ammodramus henslowii*	--	NMGT (S1B)
American bittern	*Botaurus lentiginosus*	--	NOST (S1)
Lark sparrow	*Chondestes grammacus*	--	THR (S1B)
Swainson's warbler	*Limnothlypis swainsonii*	--	NMGT (S3)
Bewick's wren	*Thryomanes bewickii bewickii*	--	END (S1)
Mammals			
Gray bat	*Myotis grisescens*	END	END (S2)
Eastern small-footed bat	*Myotis leibii*	--	NMGT (S2S3)
Indiana bat	*Myotis sodalis*	END	END (S1)
Common shrew	*Sorex cinereus*	--	NMGT (S4)
Pygmy shrew	*Sorex hoyi*	--	NOST (S2)
Southeastern shrew	*Sorex longirostris*	--	NMGT (S4)
Southern bog lemming	*Synaptomys cooperi*	--	NMGT (S4)
Meadow jumping mouse	*Zapus hudsonius*	--	NMGT (S4)

***END**-Endangered, **THR**-Threatened, **SPCO**-Special Concern, **END-P**-Endangered-Possibly Extirpated, **NMGT** - In Need of Management, **NOST** - No officially state-listed but considered of conservation concern by TN Department of Environment and Conservation; **S-CE**-Special Concern-Commercially Exploited, **P-THR**-Proposed Threatened, **CAND**-Candidate Species, **S1-**critically imperiled with 5 or fewer occurrences; **S2-** imperiled with 6 to 20 occurrences; **S3**- rare or uncommon with 21 to 100 occurrences; **S4**-widespread, abundant and apparently secure with more than 101 occurrences, **SH**-historical occurrence, not seen in TN in last 25 years, **SxSx**-denotes a range of ranks because the exact rarity of the element is uncertain.

3.8. Wetlands

Wetlands are areas inundated by surface or groundwater often enough to support vegetation or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction. Wetlands generally include swamps, marshes, bogs, and similar areas such as sloughs, potholes, wet meadows, mud flats, and natural ponds. Activities in wetlands are regulated under Section 404 of the Clean Water Act, and, for activities of Federal agencies, by Executive Order 11990.

Field surveys to determine the presence of wetlands in the project area were conducted during February 2004 and in autumn and winter 2005-2006. Wetland determinations were performed according to U.S. Army Corps of Engineers standards (Environmental Laboratory 1987) for wetlands which are regulated under the Clean Water Act; the determinations also considered broader definitions of wetlands such as the one used by the U.S. Fish and Wildlife Service (Cowardin et al. 1979).

National Wetland Inventory data indicate that wetlands in the project area primarily occur in the riparian zones of Fletcher Fork, Little West Fork, West Fork, and Spring Creek. None of these wetlands are on Fort Campbell property. The largest concentration of forested wetlands occurs in the floodplains of Fletcher Fork and Spring Creek. These wetlands do not meet all of the three mandatory criteria (wetland plants, hydrology, and soils) for wetlands regulated under the Clean Water Act (e.g., jurisdictional wetlands). Fourteen of these nonjurisdictional wetlands covering a total of 11.2 acres occur within the proposed transmission line ROW. These nonjurisdictional wetlands range in size from 0.11 acre to 4.07 acres and are of fair to moderate quality.

No jurisdictional wetlands were found in or adjacent to the proposed transmission line ROW, at the site of the proposed switching station, or at any of the proposed access roads and construction laydown areas.

3.9. Floodplains

The site of the proposed Oakwood switching station is in an upland area, outside of any floodplain. The proposed transmission line crosses several floodplain areas along Fletchers Fork, Little West Fork, West Fork Red River, and Spring Creek.

3.10. Recreation, Parks, and Managed Areas

Most recreation activities in the immediate vicinity of the proposed switching station and transmission line are informal and dispersed and include hunting, walking, horseback riding, off-road vehicle, and nature viewing. There are no developed public recreational facilities at the switching station site or along the proposed transmission line.

The managed areas closest to the proposed switching station are the Bellamy Cave Protection Planning Site, about 2.8 miles to the southwest, and Barnett Woods, about 1.1 miles to the southwest. Bellamy Cave has been a winter roosting site for the Indiana bat and a maternity site for the gray bat. The eastern small-footed bat and the southern cavefish, both state-listed, also have been recorded in Bellamy Cave. The Tennessee Chapter for The Nature Conservancy manages this site in cooperation with the Tennessee Wildlife Resources Agency.

Barnett Woods is a Nature Conservancy Preserve and Designated State Natural Area. This 40 acre area includes stream bank forests, caves, springs, and bluffs. Several state-listed endangered and threatened plants occur there, as does the federally listed Price's potato-bean. The endangered Indiana bat has occasionally been found in Cooper Creek Cave on the Barnett Woods site. The Tennessee Chapter of The Nature Conservancy owns this site and manages it in cooperation with the Tennessee Department of Environment and Conservation.

The western end of the proposed transmission line crosses the eastern portion of Fort Campbell Military Reservation. The reservation contains many important natural resources including a high diversity of plants and animals and the most extensive tall grass prairies or barrens system known within the states of Tennessee and Kentucky. The reservation has an active wildlife management program and hunting and fishing are popular recreational activities. The proposed transmission line and its 100-foot wide ROW would occupy about 15 acres of Fort Campbell property. About 60% of this area is forested and the remainder is open fields. An area of Fort Campbell along Fletcher Fork along the proposed ROW is used as a camping area by Boy Scouts. This camping area includes a pavilion in a wooded area.

The proposed transmission line would cross a portion of the West Fork Red River listed on the Nationwide Rivers Inventory. The National Park Service recognizes the lower 14 miles of this stream for its high recreation, fisheries and wildlife values. The proposed line would affect about two acres of a forested stream buffer west of Needmore Road and north of Highway 374 near River Mile 8.

The Austin Peay Environmental Education Center and University Farm are located about 1.4 miles south of the proposed transmission line near the West Fork Red River. This 476 acre area has a variety of habitat types and a few state-listed plants and animals are present.

3.11. Visual Resources

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

The proposed transmission line route begins at a tap point along TVA's recently constructed Screaming Eagles transmission line approximately 2.25 miles west of US 41A inside the eastern boundary of Fort Campbell. The route in this area runs parallel to Fletchers Fork in partially cleared stream bottoms and mostly forested upland areas. The route traverses rolling terrain north of the Ringgold community and crosses over US 41A just east of the Little West Fork. Traffic is heavy and the area is characterized by numerous commercial establishments, utility lines, and billboards. Vegetation is dense near the Little West Fork, obscuring views of the stream for motorists.

The route continues to the east, crossing the Little West Fork six times and Peachers Mill Road. Peachers Mill Road is heavily traveled and views are limited to narrow, maintained

right-of-way. Scenic attractiveness is common. Scenic integrity is moderate. The route crosses Needmore Road, a major thoroughfare. Motorists have foreground views of existing utility lines along each side of the roadway. The proposed route crosses Spring Creek and traverses a variety of open and wooded settings before crossing TN 48. Two existing transmission line with laced-steel structures can be seen in the middleground approximately one mile south, crossing TN 48.

The route continues east, crossing Interstate 24 and then Spring Creek. Near the last Spring Creek crossing, the route turns south and crosses TN 79 before entering the Montgomery substation at Mimms Industrial Park. There are numerous transmission lines and other discordantly-contrasting elements in the industrial park landscape. Traffic is light within the park except during shift changes. Scenic attractiveness is common. Scenic integrity is low.

The proposed switching station site, located near TN 233 southwest of Woodlawn, is at the junction of two existing transmission lines and in the foreground of a residential area. Transmission and distribution lines with wood and steel pole structures are visible in the foreground and middleground to area residents and motorists. The terrain is relatively flat with a variety of open fields and pasture land. Scenic attractiveness is minimal and scenic integrity is low.

3.12. Cultural Resources

Middle Tennessee has been an area of human occupation for the last 12,000 years. Human occupation of the area is generally described in five broad cultural periods: Paleo-Indian (11,000-8,000 BC), Archaic (8000-1600 BC), Woodland (1600 BC-AD 1000), Mississippian (AD 1000-1700), and Historic (AD 1700- to present). Prehistoric land use and settlement patterns vary during each period, but short- and long-term habitation sites are generally located on flood plains and alluvial terraces along rivers and tributaries. Specialized campsites tend to be located on older alluvial terraces and in the uplands, and prehistoric chert quarries are also typically in uplands.

Montgomery County was created in 1796 and named after John Montgomery, the founder of Clarksville. Tobacco was an important cash crop for the county during the nineteenth century and was exported along with other goods up and down the Cumberland and Red Rivers. Prior to the Civil War, the county's primary industry was iron production. During the war, Montgomery County was home to numerous training grounds and staging areas for Confederate regiments. Following the Civil War, Clarksville became well known for its production of dark fired tobacco. Fort Campbell, originally known as Camp Campbell, was established during World War II as a training camp. It later grew into a major Army facility and is the home of the 101st Airborne Division. Today, Clarksville is the fifth largest municipality in Tennessee and one of the fastest growing cities in the South (Williams 1998).

The archaeological Area of Potential Effect (APE) for the project was determined in consultation with the Tennessee State Historic Preservation Officer (SHPO) to be the 15 mile long transmission line corridor, the proposed switching station site, and construction access roads. Approximately 12.5 miles of the transmission line APE were previously surveyed as part of the Cumberland-Montgomery Alternative Corridor D route for the Middle Tennessee 500-kV Transmission Line project (TVA 2005). A Phase I survey was

conducted of that route and its associated access roads in 2004 (Deter-Wolf and Karpynec 2004, Deter-Wolf and Wampler 2004) and the SHPO concurred with TVA's final reports and recommendations.

The approximately 2.5 miles of proposed transmission line that was not part of the earlier 500-kV transmission line project remained to be surveyed. The archaeological APE for the survey of this area consisted of the 2.5 miles of proposed transmission line ROW, the 6 acre site for the proposed switching station, and associated access roads. The APE for architectural studies included those areas within 0.5 mile of the proposed transmission line and switching station from which they would be visible. Along with the SHPO, the Fort Campbell Cultural Resources staff was contacted before these surveys were conducted in 2005. The Fort Campbell Cultural Resources staff also assisted TVA in designing an additional survey of the portion of the proposed transmission line on base property conducted in October and November of 2006.

A records search conducted prior to the survey identified 14 archaeological and 25 architectural properties previously recorded within or in the vicinity of the APE. Ten of the archaeological sites (40MT9, 40MT945-951, and 40MT953-954) were documented during the archaeological survey for the previous 500-kV transmission line project (Deter-Wolf et al. 2005). Four sites (40MT757-760) were recorded during a Section 110 survey of Fort Campbell (Buchner and Albertson 2003). The 2005 archaeological survey of the remaining components of the proposed 161-kV transmission line and switching station project identified one previously documented site, 40MT760, within the APE (Deter-Wolf and Karpynec 2006). Site 40MT757, as originally recorded by Buchner and Albertson (2003) who identified as potentially eligible for listing in the NRHP, appeared to have been located in the APE. However no archaeological deposits associated with this site were found within the APE during the 2005 survey. The 2006 Phase I survey (Deter-Wolf and Karpynec 2006) identified two new archaeological sites (40MT1012 and 40MT1013). 40MT1012 is an undetermined prehistoric quarry/lithic extraction located in an unnamed upland drainage. 40MT1013 is an undetermined prehistoric open habitation located in the northeastern portion of the surveyed area.

Phase II archaeological assessments were conducted on sites 40MT1012 and 40MT1013 (Deter-Wolf and Karpynec 2006). No intact archaeological deposits were identified within either site; consequently site 40MT1012 and the portion of site 40MT1013 that is located within the proposed transmission line ROW are considered ineligible for lisiting in the NHRP. Field survey data indicate that all of the other archaeological sites or the portions of archaeological sites within the APE are heavily disturbed and are therefore unlikely to yield additional significant archaeological data.

The 25 architectural properties identified during the records search are designated HS-64 – 73, MT-1406, MT-1408, MT-1409, MT-1427 – 1430, MT-1435, Clarksville Base Historic District, Allen House, Ringgold Mill Complex, Whitehall, and I-5 – 7). Some of these properties (MT-1406 (Idlewild), MT-1408 (Rose-Morris Cemetery), MT-1409 (Eupedon Farm), MT-1435 (Meriwether Farm), Allen House, Ringgold Mill Complex, and Whitehall), are described in more detail in the Middle Tennessee 500-kV Transmission Line EIS (TVA 2005). One additional architectural property, the Capehart/Wherry era housing area, was identified as a result of comments by the Fort Campbell Cultural Resources staff. Both the Clarksville Base Historic District and the Capehart/Wherry era housing area are on Fort Campbell. No additional undocumented architectural properties were identified within the APE during the survey conducted for this project.

Allen House, Ringgold Mill complex, and Whitehall are listed on the National Register. HS-65, MT-1406 (Idlewild), MT-1408, MT-1409, Clarksville Base Historic District have been determined eligible for the listing on the National Register of Historic Places (NRHP). The Capehart/Wherry era housing area, consisting of housing constructed during the 1950s and early 1960s, has been considered eligible by the Army in previous Fort Campbell undertakings. The NRHP eligibility of architectural properties I-5 – 7 has not been determined because of lack of access to these sites. The remaining 14 architectural sites have been determined not eligible for the NRHP. One of these 14 sites, MT-1435 (Meriwether Farm), was previously identified as eligible; its status has recently changed to ineligible because its viewshed has been compromised by recent extensive development.

CHAPTER 4

4. ENVIRONMENTAL CONSEQUENCES

4.1. Alternative 1 - No Action

Under this alternative, TVA would not construct and operate the proposed switching station and transmission line, or take other actions to improve the power supply situation in western Montgomery County. None of the impacts resulting from the construction and operation of the proposed facilities described below would occur. In general, factors outside of TVA's control would continue to influence natural and cultural resources in the project area.

4.2. Alternative 2 - Construct and Operate Switching Station and Transmission Line

4.2.1. Air Quality

The project area is in an attainment maintenance area for ozone. To assist Fort Campbell in complying with the General Conformity Rule, TVA will provide the information necessary to calculate estimated emissions from construction activities to the Fort Campbell Air Quality Program. In addition, air pollution restrictions applicable to this project do not allow materials to be burned on Fort Campbell. TVA will also take appropriate dust control measures during construction (Appendices III, V).

4.2.2. Groundwater

Extensive limestone aquifers are present in the project area and the proposed transmission line route has four sinkholes located within the ROW. Potential impacts to groundwater could result from sediments from excavated materials entering or clogging sinkholes, and from the transport of contaminants such as herbicides and fertilizers into sinkholes. The use of Best Management Practices (BMPs) as described in Muncy (1999) will minimize the potential for impacts to groundwater in the project area. For any structure located within a sinkhole, a Class V Underground Injection Control Permit may be required by the State of Tennessee. Application of herbicides and fertilizers should be avoided in the areas along the ROW where sinkholes occur to further minimize the potential for groundwater contamination. No sinkholes are located along ROW near the Fort Campbell Military Reservation. With the use of BMPs, impacts to groundwater from the proposed action would be insignificant.

4.2.3. Surface Water

Soil disturbances associated switching station construction, ROW clearing, access road construction, and other construction activities can potentially result in adverse water quality impacts. Erosion and sedimentation can clog small streams, increase nutrient loads, and threaten aquatic life. Removal of the tree canopy at stream crossings can result in increased water temperatures and adverse impacts to aquatic biota. Improper use of herbicides to control vegetation could result in runoff to streams and subsequent aquatic impacts.

TVA routinely includes precautions in the design, construction, and maintenance of its transmission line projects to minimize these potential impacts. Permanent stream crossings would be designed not to impede runoff patterns and the natural movement of aquatic fauna. All construction and maintenance activities would comply with appropriate state permit requirements and TVA requirements as described in Muncy (1999) and Appendices II, III, IV and VI. Canopies in all streamside management zones (SMZs; see Appendix VII) would be left undisturbed unless there were no practicable alternative. ROW maintenance would employ manual and low impact methods wherever possible. In areas requiring chemical treatment, only USEPA-registered herbicides would be used in accordance with label directions designed in part to restrict applications in the vicinity of receiving waters and to prevent unacceptable aquatic impacts.

With the implementation of these measures, the effects on surface waters are expected to be short-term and insignificant. Potential construction impacts will be controlled using best management practices (BMPs) that are designed to limit erosion and keep sediment or other pollutants from entering receiving streams. Protective measures will also be followed during normal operations and maintenance activities to avoid pollutant runoff. No adverse cumulative surface water impacts are anticipated.

4.2.4. Vegetation

The proposed Oakwood switching site is mostly weedy pasture, a common vegetation type in the area, and the construction and operation of the switching station would not adversely affect vegetation.

Construction and operation of the proposed transmission line would result in the long term conversion of several acres of forest to early successional habitats. Forests along the proposed transmission line are relatively fragmented, and the effects of the additional fragmentation resulting from transmission line construction would be minor. No examples of plant communities of conservation concern would be adversely impacted. The proposed construction and maintenance activities have the potential to contribute to the spread and abundance of invasive species in the project area. This potential would be minimized by replanting disturbed areas with native species or non-invasive non-native species. Overall impacts to vegetation are expected to be insignificant.

4.2.5. Wildlife

The construction and operation of the proposed Oakwood Switching Station would result in the loss of early successional wildlife habitat. This old-field habitat type is fairly common in the area and the effects on wildlife populations would be minor. Construction and operation of the proposed transmission line would result in the long-term conversion of forested habitats within the proposed ROW to early successional habitats. This would negatively affect wildlife dependent on forested habitats. About a quarter of the ROW is forested, and these forests are already fragmented. The impacts to wildlife using forested habitats, including many species of migratory birds, are expected to be minor.

Migratory birds of conservation concern (USFWS 2002) known or likely to occur on Fort Campbell or elsewhere in Montgomery County are the whip-poor-will, red-headed woodpecker, Bewick's wren, wood thrush, blue-winged warbler, prairie warbler, worm-eating warbler, Swainson's warbler, Louisiana waterthrush, Bachman's sparrow, and Henslow's sparrow (Fort Campbell 2005). Due to their habitat preferences, neither the Bachman's sparrow nor the Henslow's sparrow are likely to be affected. The construction

and operation of the proposed transmission line would result in a long-term increase in early successional habitats and thus benefit birds using this habitat type such as the blue-winged and prairie warblers. Forested habitat near Fletcher Fork on Fort Campbell and at other locations along the proposed transmission line east of Fort Campbell would be converted to early successional habitat. This would impact forest-dwelling species such as the wood thrush, worm-eating warbler, and Louisiana waterthrush. Due to both the current fragmented condition of forests along the proposed ROW and the relatively small area of forest to be cleared (about 39 acres total; 8 acres on Fort Campbell)), the impacts on forest-dwelling species would be small in terms of the number of individuals affected. Impacts to forest inhabiting birds would be somewhat greater on Fort Campbell forested tracts are larger in size than elsewhere along the proposed transmission line. In accordance with the Migratory Bird Executive Order and Fort Campbell's Migratory Bird Management Strategy (Fort Campbell 2005), TVA has attempted to minimize impacts on migratory birds by, to the extent possible, avoiding forested areas during the transmission line routing process. TVA also modified its original route for the western end of the transmission line on Fort Campbell to route more of it through open fields and reduce clearing of riparian forests and wetlands along Fletcher Fork. Given the fragmented nature of the forested habitats in the project area, the proposed project would not result in significant direct, indirect or cumulative impacts to migratory birds and birds of conservation concern.

A great blue heron colony exists along West Fork Creek about 240 feet from the proposed transmission line route. Construction activities associated with the new transmission line would result in disturbance to the nearby heron colony. This disturbance could be avoided by restricting construction activities to the period between mid-July and December when herons are not nesting at this site.

None of the numerous caves previously reported from Montgomery County would be affected. An unnamed cave, found during field investigations in 2006, occurs within 200 feet of the transmission line route near Spring Creek. The cave provides potential habitat for cave, northern zigzag, and long-tailed salamanders, but does not provide roosting/maternity habitat for bats including gray and Indiana bats. The cave, which has a large stream flowing from its entrance, and its recharge area, are located on the opposite side of Spring Creek from the proposed transmission line corridor. Therefore the cave would be buffered from any potential impacts from construction activities. No other unique or important terrestrial animal habitats are known along the transmission line route. The Action alternative would not result in direct, indirect or cumulative adverse impacts on unique or important wildlife habitat.

4.2.6. Aquatic Ecology

The proposed action can impact aquatic life either directly by alteration of conditions in the streambed, or indirectly due to modification of the riparian zone and by stormwater runoff from construction and maintenance activities. Potential impacts due to removal of streamside vegetation include increased siltation and erosion, altered thermal regime, and loss of habitat (Sutherland et al. 2002). Other potential construction and maintenance impacts include alteration of streambanks and stream bottoms by heavy equipment, and runoff of herbicides into streams. Siltation has a detrimental effect on many aquatic animals adapted to riverine environments. Turbidity caused by suspended sediment can negatively impact spawning and feeding success of many fish species.

In order to minimize potential impacts to aquatic life, Best Management Practices (BMPs) as outlined in Muncy (1999) would be applied to all construction and maintenance activities. Additional protective measures as outlined under Category B - Protection of Important Permanent Streams (Appendix IV) would be applied to construction and maintenance activities on Little West Fork, West Fork Red River, and Spring Creek because of their status as stocked winter trout fisheries (TWRA 2006) and 303(d) listing status (Section 3.3; TDEC 2004a, 2004b). Category A - Standard Stream Protection measures (Appendix IV) would be applied to all other perennial and intermittent streams. Appendix VII lists the various streams that would be crossed by the proposed transmission line and protective measures that would be used at each crossing.

Watercourses in the project area and along access roads identified as wet weather conveyances or ponds would be protected by standard BMPs as identified in Muncy (1999). These BMPs are designed to minimize erosion and subsequent sedimentation in streams.

With the use of TVA Best Management Practices as outlined in Muncy (1999) and additional protective measures described above and in the Appendices, all impacts to aquatic resources from the construction and maintenance of the proposed transmission line and switching station would be insignificant. The cumulative impacts to previously impaired streams, including those on Fort Campbell already impacted by siltation would be small and negligible over the life of the project.

4.2.7. Endangered and Threatened Species

Because no state or federally listed plants are known from the proposed switching station site or transmission line route, no adverse environmental impacts on listed plants are anticipated from the proposed action.

No threatened or endangered terrestrial animals were encountered during field surveys in 2004 and 2005. They have, however, been reported from the region.

Gray bats are known to forage over streams within the project area including Fletcher Fork on Fort Campbell, where Fort Campbell staff monitors gray bats (BHE 2004). Eastern small-footed bats often forage in similar habitats. With the use of BMPs, little impact to stream water quality and aquatic invertebrates eaten by foraging bats is expected (see Sections 4.2.3 and 4.2.6). The clearing of the ROW at stream crossings would create breaks in the riparian forest canopy. Transmission line corridors over streams are not known to impede bat movements as bats are readily observed moving through these areas. The proposed action would not affect roosting and maternity caves used by these bats and consequently no direct, indirect or cumulative adverse impacts on gray or eastern small-footed bats are anticipated.

Six of the eight plots forest plots sampled to assess the quality of potential Indiana Bat summer habitat along the proposed transmission line were of low quality and two plots, including one on Fort Campbell, were of moderate quality. Forests elsewhere on Fort Campbell, and presumably elsewhere in the project area, have been determined to provide suitable spring, summer, and fall roosting and foraging habitat for the Indiana bat (BHE 2004). No suitable habitat for Indiana bats occurs on the proposed switching station site and no caves occupied by the species would be affected. The majority of the proposed transmission line ROW contains low quality habitat for the Indiana bat. In accordance with the Fort Campbell Endangered Species Management Plan (USFWS 2001), seasonal restrictions on clearing of the ROW would not be required in this area because of the low probability of Indiana bats being present. No effect on Indiana bats is expected.

Suitable habitat for American bitterns and lark sparrows does not occur along the transmission line route or at the switching station site. Eastern hellbenders occur in the vicinity but would not likely be impacted due to the use of BMPs (Muncy, 1999). Habitat for northern pine snakes, Bewick's wren, pigmy shrew, southeastern shrew, and meadow jumping mouse is abundant in the project area. Although there would be temporary disturbances to the species during construction activities, most of these species would readily move into habitats within the right-of-way. Therefore, the proposed action would not result in adverse impacts to these species.

The forested wetland on Fort Campbell adjacent to Fletcher Fork provides habitat for barking treefrogs, western pigmy rattlesnakes, common shrews, and southern bog lemmings, although according to Fort Campbell personnel, these species have not been recorded from this area. The transmission line route avoids the wetland and BMPs would be used at all stream crossings to minimize impacts to water quality. Some loss of forested habitat is expected adjacent to Fletcher Fork, however this riparian habitat common in the area. The proposed action would not result in significant direct, indirect, or cumulative impacts to these species.

4.2.8. Wetlands

As described in Section 3.7, no jurisdictional wetlands occur at the proposed switching station site, within the proposed transmission line ROW, or along any of the proposed access roads and construction laydown areas. Therefore, the proposed action would have no effect on jurisdictional wetlands.

The majority of the nonjurisdictional wetlands within the proposed transmission line ROW are concentrated in the floodplains and riparian areas of Fletcher Fork and Spring Creek. Impacts to these fair to moderate quality wetlands would be confined to removing trees for the proposed transmission line corridor. Use of Best Management Practices (BMPs; Muncy 1999) would mitigate any potentially adverse impacts to nonjurisdictional wetlands. Therefore, clearing of the proposed ROW would have insignificant impacts on nonjurisdictional wetlands in the project area.

4.2.9. Floodplains

The proposed transmission line crosses several floodplain areas in Montgomery County, Tennessee, including floodplains of Little West Fork and Fletchers Fork on Fort Campbell. Consistent with Executive Order 11988, an overhead transmission line and related support structures are considered to be a repetitive action in the 100-year floodplain. The construction of the support structures for the transmission line is not expected to result in any increase in flood hazard either as a result of increased flood elevations or changes in flow carrying capacity of the streams being crossed. To minimize adverse impacts on natural and beneficial floodplain values, the right-of-way would be revegetated where natural vegetation is removed and the removal of unique vegetation would be avoided. Best management practices would be used during construction activities.

Some of the access roads would cross streams or involve construction in the 100-year floodplain. Consistent with Executive Order 11988, an access road is considered to be a repetitive action in the 100-year floodplain. To minimize adverse impacts, any new stream crossings would be designed to pass the 100-year flood with no more than a one foot increase in upstream flood elevations. Any necessary improvements to existing roads would be done in such a manner that upstream flood elevations would not be increased. The existing Montgomery 500-kV Substation and the proposed Oakwood Switching Station site are located outside of the 100-year floodplain.

4.2.10. Recreation, Parks and Managed Areas

No developed public recreation facilities would be affected by the construction and operation of the proposed switching station and transmission line. The proposed action could have some affect on dispersed recreation activities such as hunting, camping, and horseback riding that are not dependent on developed facilities. These impacts would mostly occur during construction and are expected to be minor.

The proposed action would have no effects on the Barnett Woods preserve, the Bellamy Cave site, or the Austin Peay Environmental Education Center and University farm which are located 1.1 miles, 2.8 miles, and 1.4 miles, respectively, from the closest portion of the proposed switching station or transmission line. The proposed transmission line would cross a portion of the West Fork Red River listed on the Nationwide Rivers Inventory. Both the presence of the new transmission line crossing the stream, as well as the long-term removal of about 2 acres of forest adjacent to the stream, would diminish the aesthetic character of a short stretch of the stream. The use of BMPs would minimize sediment runoff into the stream and its tributaries, and little adverse affect on the other values identified by the National Park Service, recreation, fisheries, and wildlife, is expected. Overall impacts to the Nationwide Rivers Inventory status of the West Fork Red River would be minor and insignificant.

About 1.2 miles of the proposed transmission line, with a ROW area of about 15 acres, would be located on Fort Campbell property. Part of the Boy Scout camping area near Fletcher Fork, including a pavilion, occurs within the proposed transmission line ROW. The pavilion would have to be removed and TVA will work with FTC staff to reconstruct it in a suitable location. About 8 acres of this proposed ROW is forested and would be cleared during construction and then maintained in an early successional state. No uncommon plant or animal communities are known from this area. With the proposed mitigation measure concerning the scout camping pavilion, impacts to Fort Campbell operations, including its natural resource management and recreation programs, would be minor.

4.2.11. Visual Resources

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 previously described in the affected environment section.

The construction and operation of the proposed switching station and transmission line would change the visual character of the project area by introducing elements which may contrast with the existing local landscape. These changes include the removal of trees and most other vegetation from the ROW, erection of tall, silvery-gray steel transmission line structures, and installation of silvery-gray metal conductors between structures. The operation of construction equipment during this phase of the project results in an additional, short-term visual impact. The transmission line structures and conductors become essentially permanent features in the landscape. Their visibility, as well as the visibility of the cleared ROW, depends on the surrounding landscape and can be more prominent in a forested landscape than in a cleared agricultural landscape. Periodic vegetation

management activities also alter the appearance of the ROW; this change generally lessens during the first growing season following maintenance.

The western end of the proposed transmission line, at its junction with the Screaming Eagles tap line, would be visible to motorists on 101st Airborne Road on Fort Campbell. Most of the western 2.25 miles of proposed transmission line, between the tap point and US 41A, would cross undeveloped areas and would not be visible from public roads or from housing developments. Portions of the line in this area would also have aircraft warning spheres placed on conductors to increase its visibility to base air traffic. Although the construction and operation of the transmission line would change the visual character of this area, the visual impacts in his area would be minor because of the few viewing points.

The proposed transmission line in the vicinity of US 41A would be visually similar to existing utility lines and numerous other vertical objects in the landscape. The new structures would be seen most frequently in the foreground and middleground. On the east side of US 41A, the line would pass a short distance north of the Ringgold Mill Complex historic district. The transmission line would have minor but cumulative long term impacts, increasing the number of adversely contrasting elements seen in the area and further contributing to reduced visual coherence.

The route continues to the east from the Ringgold Mill area, crossing the Little West Fork four times. The line would be seen by few people in this area due to dense vegetation and elevation changes along the banks of the Little West Fork. Motorists along Peacher's Mill Road would have brief views of the transmission line as the route crosses the road and continues to the east. These views would be similar to other objects present in the area.

The proposed route continues just east of Needmore Road, a major thoroughfare. There would be minor visual impacts along this alignment. Motorists' views of the line would be obscured by wooded areas along the roadsides at Needmore Road and TN 48. There are few homes between Needmore Road and TN 48, and available views of the line would be minimal.

The alignment would continue east of TN 48 and crosses several unimproved roads before passing over I-24 about a mile north of the US 79 interchange. Views by motorists on I-24 would be brief, mainly due to high travel speeds. Continuing east, the new line would pass over Spring Creek again and turn south to cross US 79. This area is heavily congested with numerous commercial establishments, billboards, and readily-seen infrastructure such as utility lines, street lights, and traffic signals. The new transmission line would add to the number of structures seen in the area. However, these new structures would be visually similar to other vertical and broadly horizontal elements currently present in the landscape. Closer to the Montgomery Substation, the new transmission line would be visually similar to existing laced-steel towers and wood-pole structures. Additional structures in new locations, however, would increase the number of adversely contrasting elements seen in the landscape. These incremental changes would add to existing disruptions to visual coherence and harmony.

The proposed switching station near TN 233 southwest of Woodlawn would affect the visual character of the area and reduce the existing Scenic Value Class from fair to poor. Residents closest to the switching station would be negatively impacted by a loss of scale in the landscape. The views would be disrupted by elements of discordant contrast, which would substantially reduce scenic harmony in the landscape. These impacts would be

reduced, however, by screening the switching station and disturbed areas with appropriate plantings as described below.

Lighting at the switching station would contribute to the visual impact. Lighting would adhere to TVA Substation Lighting Guidelines (TVA no date) and use "full cutoff" lights (i.e., no light emitted from the fixture at angles above the horizontal) for all continuously operated nocturnal securing illumination. Task lighting, mounted at heights of no more than 12 feet and used for temporary operational needs, would only be turned on when required. These measures would reduce potential lighting impacts.

Operation, construction, and maintenance of the proposed transmission line and switching station would not result in significant visual impacts if the mitigation measure specific to the new switching station listed below are implemented. There may be some additional minor visual discord during the construction period due to an increase in personnel and equipment and the use of laydown and materials storage areas. These minor visual obtrusions would be temporary until the proposed right-of-way and laydown areas have been restored through the use of standard BMPs (Muncy 1999).

Mitigation Measure:

- Plant a vegetative screen of mixed deciduous and evergreen shrub species, 10 foot minimum width, around all sides of the new switching station. Shrubs should have a mature height of 10-12 feet, and be 4.5 - 5 feet tall when planted, with a maximum spacing of five feet. Shrubs should not be planted within 20 feet of gates.

4.2.12. Cultural Resources

None of the archaeological resources identified during the various surveys (Buchner and Albertson 2003, Deter-Wolf and Karpynec 2004, Deter-Wolf and Wampler 2004, Deter-Wolf and Karpynec 2006) contain significant deposits that would be affected within the proposed transmission line ROW, along construction access roads, or at the switching station site.

The five previously recorded architectural properties that are recommended eligible for listing on the National Register of Historic Places (NRHP) (HS-65, MT-1406 - Idlewild, MT-1408 - Rose-Morris Cemetery, MT-1409 - Eupedon Farm, and Clarksville Base Historic District), and the three architectural properties that are listed on the NRHP (Allen House, Ringgold Mill Complex, and Whitehall), would not be affected by the proposed transmission line and switching station. Although TVA was unable to survey sites I-5 – 7, the SHPO, based on available information about these sites, determined that they would not be affected.

The Capehart/Wherry era housing area is on Fort Campbell in the Gardner Hills subdivision. At its closest point, it is about 750 feet from the proposed transmission line and views of the transmission line would be obscured by forest between the housing area and line. An existing road through the housing area would be used by construction traffic and one of the construction access roads to be developed terminates adjacent to Capehart/Wherry era housing (Figure 1-3). Construction traffic in this area would be of limited duration and impacts to the Capehart/Wherry era housing area would not be adverse.

TVA consulted with the Tennessee SHPO in early 2006 over the findings of the 2004 and 2005 surveys. In a letter dated April 3, 2006 (Appendix I), concurred with TVA's findings and recommendations. TVA also consulted with Fort Campbell in 2006 regarding the findings and recommendations of the various cultural resource surveys conducted on Fort Campbell property.

In a letter dated November 28, 2006, TVA and Fort Campbell consulted with the SHPO and other interested parties seeking their agreement with TVA's findings from the 2006 survey of the project area on Fort Campbell property. In a letter dated December 7, 2006 (Appendix I), the SHPO concurred with the finding that no archaeological resources eligible for listing on the NRHP occurred in the project area.

4.2.13. Post Construction Impacts - Electric and Magnetic Fields

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

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

However, equal or greater numbers of similar studies show no association or cannot reproduce data interpreted as demonstrating an association. No laboratory research has found cause and effect health impacts from EMF and certainly none that are adverse. Neither has any concept of how these fields could cause health effects achieved scientific consensus.

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

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

TVA's standard location practice has the effect of minimizing continuous public exposures to transmission line EMF. The transmission line route selection team uses a constraint model that place a 300-foot-radius buffer around occupied buildings, except schools, for which a 1,200-foot buffer is used. The purpose of these buffers is to reduce potential land use conflicts with yard trees, outbuildings, and ancillary facilities and potential visual impacts as well as exposures to EMF. Although not absolute location constraints, these buffers weigh heavily in location decisions, influencing selection of route options and alignments. Because EMF diminishes quickly with distance from the conductors, the routing of transmission lines using constraint buffers effectively reduces potential continuous public exposure to EMF. Crossing under lines or otherwise being near them for short periods may increase overall EMF exposure, but only minutely.

4.3. Summary of TVA Commitments and Proposed Mitigation Measures

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

General Best Management Practices for Clearing, Construction, and Maintenance

- TVA practices detailed in Appendices II, III, IV, and V, as well as in TVA's Best Management Practices guide (Muncy 1999) would be used during clearing, construction, and maintenance. EO 13112 directs all federal agencies to prevent and control the introduction and spread of invasive species resulting from their activities. TVA would use reseeding mixes that are certified free of invasive, exotic plant seeds when replanting disturbed areas.

Protection of Aquatic Resources

- All intermittent and perennial stream crossings would be designated as Category A or B with streamside management zones as described in Appendix VII. TVA would obtain the appropriate storm water permits from the State of Tennessee and comply with the provisions of those permits. TVA would coordinate storm water control efforts on Fort Campbell with Army staff.

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

Protection of Recreation Resources

- TVA would work with Fort Campbell staff to remove the Boy Scout camping pavilion near Fletcher Fork and rebuild it in a suitable location.

Protection of Visual Resources

- Plant a vegetative screen of mixed deciduous and evergreen shrub species, 10 foot. minimum width, around all sides of the new switching station. Shrubs should have a mature height of 10-12 feet, and be 4.5 - 5 feet tall when planted, with a maximum spacing of five feet. Shrubs should not be planted within 20 feet of gates.

CHAPTER 5

5. SUPPORTING INFORMATION

5.1. List of Preparers

Hugh S. Barger

Position:	Environmental Engineering Specialist
Education/Experience:	B.S. Engineering; 31 years experience in transmission line planning and preparation of environmental review documents
Involvement:	Project coordination, purpose and need, alternatives description

Barry L. Barnard

Position:	Specialist, Environmental Permitting and Compliance Support
Education/Experience:	B.S., Chemical Engineering; 35 years in air pollution compliance and impact assessment
Involvement:	Air Quality

W. Nannette Brodie

Position:	Senior Environmental Scientist
Education/Experience:	B.S., Geology, B.S., Environmental Science; 12 years experience in surface water quality and groundwater assessments; Registered Professional Geologist
Involvement:	Groundwater

Edward E. Clebsch

Position:	Contract Botanist
Education/Experience:	Ph.D., Botany, 56 years experience in field botany
Involvement:	Vegetation, Endangered and Threatened Species

Patricia B. Cox

Position:	Botanist
Education/Experience:	Ph.D. Botany, 27 years experience in plant taxonomy at university; 2 years experience in botanical field assessments
Involvement:	Vegetation, Endangered and Threatened Species

James P. Groton

Position:	Contract Wetlands Biologist
Education/Experience:	M.S. Forestry; B.S., Natural Resources; 15 years experience in wetlands assessment and delineation
Involvement:	Wetlands

Heather Hart

Position:	Contract Natural Areas Specialist
Education/Experience:	M.S. Soil Sciences; 2 years experience in natural areas reviews
Involvement:	Managed Areas

T. Hill Henry

Position:	Senior Zoologist
Education/Experience:	M.S., Zoology; 11 years experience in terrestrial endangered species
Involvement:	Wildlife, Endangered and Threatened Species

John M. Higgins

Position:	Water Quality Specialist
Education/Experience:	Ph.D., Environmental Engineering; 31 years experience in water resource management
Involvement:	Surface Water

Marianne M. Jacobs

Position:	Archaeological Technician
Education/Experience:	B.A., Religion emphasis Middle Eastern Archaeology; 5 years experience in archaeology
Involvement:	Cultural Resources

Clint Jones

Position:	Biologist - Aquatic Ecologist
Education/Education:	B.S., Wildlife and Fisheries Science. 14 years experience in environmental consultation and fisheries management
Involvement:	Aquatic Ecology, Endangered and Threatened Species

Roger A. Milstead

Position:	Floodplain Specialist
Education/Experience:	B.S., Civil Engineering; 29 years experience in floodplain and environmental evaluations. Registered Professional Engineer
Involvement:	Floodplains

Jason M. Mitchell

Position:	Natural Areas Specialist
Education/Experience:	M.P.A (Environmental Policy); B.S., Wildlife and Fisheries Science; 12 years experience in natural resource planning and ecological assessment with emphasis on sensitive resources
Involvement:	Managed Areas

Charles P. Nicholson

Position:	Senior NEPA Specialist
Education/Experience:	Ph.D., Ecology and Evolutionary Biology; 28 years of experience in zoology, endangered species studies, and NEPA compliance
Involvement:	NEPA Compliance and Document Preparation

W. Chett Peebles

Position:	Senior Landscape Architect
Education/Experience:	Bachelor of Landscape Architecture; 17 years experience in site planning and visual assessment. Registered Landscape Architect
Involvement:	Visual Resources

Richard L. Pflueger

Position:	Land Use and Recreation Specialist
Education/Experience:	M.B.A., B.S., Accounting; 28 years experience in recreation and economic development
Involvement:	Recreation

Kim Pilarski

Position:	Senior Wetlands Biologist
Education/Experience:	M.S., Geography, Minor Ecology; 11 years experience in wetlands assessment and delineation
Involvement:	Wetlands

Allan J. Trently

Position:	Contract Terrestrial Zoologist
Education/Experience:	M.S., Biology; 11 years experience working with terrestrial animals
Involvement:	Wildlife, Endangered and Threatened Species

W. Richard Yarnell

Position:	Archaeologist
Education:	B.S.; 35 years experience in cultural resource management
Involvement:	Cultural Resources

5.2. List of Agencies and Persons Consulted

Agencies specifically consulted for this project are listed below. Additional agencies consulted during the development of the EIS for the Middle Tennessee 500-kV Transmission Line are listed in TVA (2005).

Federal Agencies

U.S. Army Corps of Engineers, Nashville, Tennessee

U.S. Fish and Wildlife Service, Cookeville, Tennessee

U.S. Army, Fort Campbell, Kentucky

State Agencies

Tennessee Historical Commission, Nashville

5.3. Literature Cited

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5.4. Additional Figures

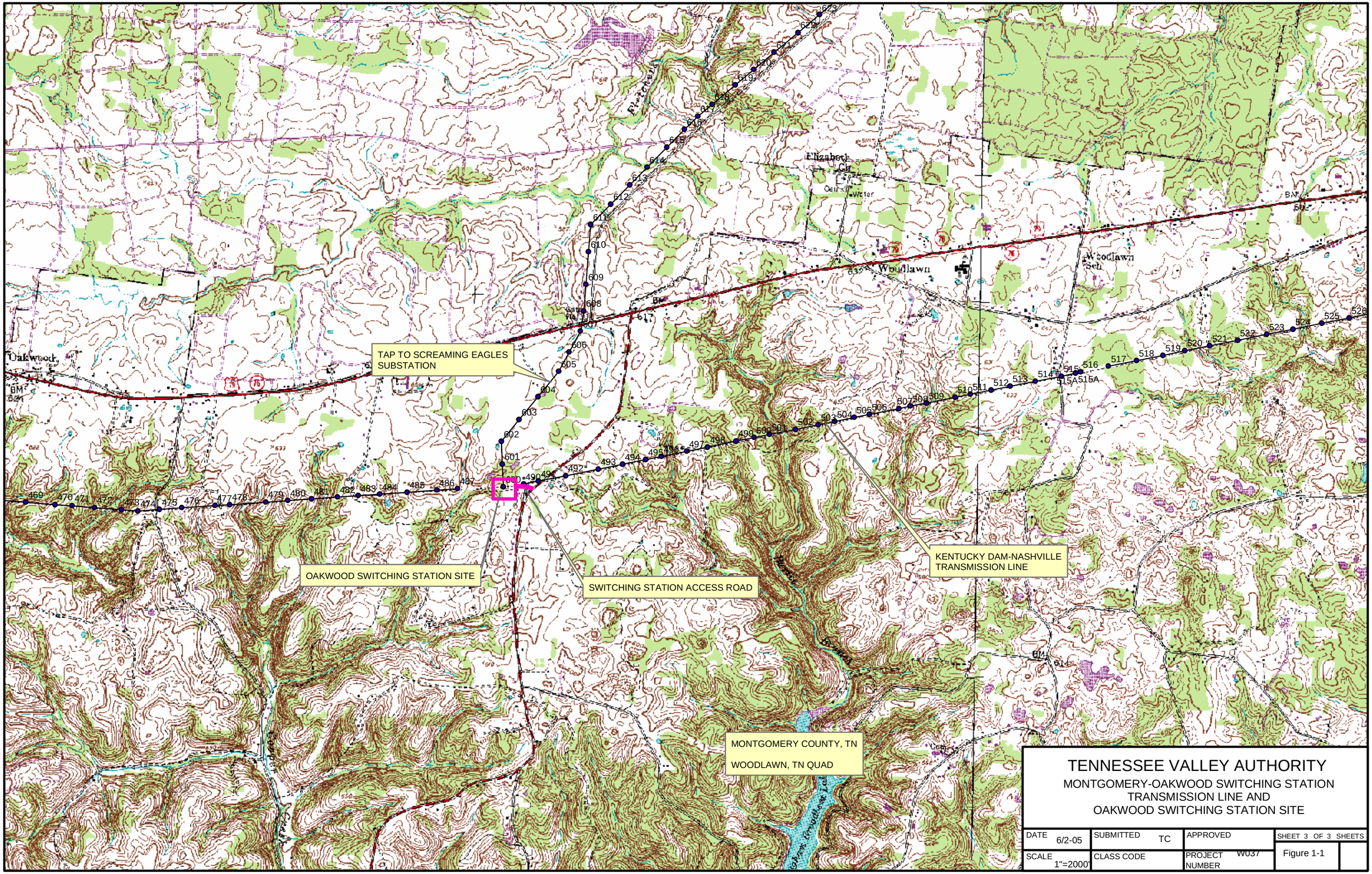
Figure 1-1. Proposed Oakwood Switching Station Site.

Figure 1-2. Proposed Montgomery-Oakwood Switching Station Transmission Line, Eastern Portion.

Figure 1-3. Proposed Montgomery-Oakwood Switching Station Transmission Line, Western Portion.

Figure 2-2. Proposed Oakwood Switching Station Alternative Sites.

Figure 2-3. Proposed Montgomery-Oakwood Switching Station Transmission Line Route Alternatives.



TENNESSEE VALLEY AUTHORITY

MONTGOMERY-OAKWOOD SWITCHING STATION TRANSMISSION LINE AND OAKWOOD SWITCHING STATION SITE

DATE 6/2-05	SUBMITTED TC	APPROVED	SHEET 3 OF 3 SHEETS
SCALE 1"=2000'	CLASS CODE	PROJECT NUMBER W037	Figure 1-1

R2- PROPOSED CHANGE IN ROUTE ON HARRIS PROPERTY

PROPOSED ROUTE FOR THE MONTGOMERY-OAKWOOD SWITCHING STATION 161-kV TRANSMISSION LINE (ON CUMBERLAND-MONTGOMERY 500kV NORTH ROUTE) (100' WIDE ROW)

PROPOSED CONSTRUCTION ACCESS - USE PROPOSED CONSTRUCTION ACCESS FOR CUMBERLAND-MONTGOMERY 500-kV NORTH ROUTE (TYP).

PROPOSED ROUTE FOR THE MONTGOMERY-OAKWOOD SWITCHING STATION 161-kV TRANSMISSION LINE ON MONTGOMERY SUBSTATION PROPERTY.

MONTGOMERY 500-kV SUBSTATION

MONTGOMERY COUNTY, TN

CLARKSVILLE, TN QUAD

TENNESSEE VALLEY AUTHORITY

MONTGOMERY-OAKWOOD SWITCHING STATION
TRANSMISSION LINE AND
OAKWOOD SWITCHING STATION SITE

DATE 6/2/05	SUBMITTED TC	APPROVED	SHEET 1 OF 3 SHEETS
SCALE 1"=2000'	CLASS CODE	PROJECT NUMBER W0375	Figure 1-2 | 2

POINT OF CONNECTION TO THE SCREAMING EAGLES TAP LINE. A SWITCH WILL BE INSTALLED ON THE OAKWOOD AND MONTGOMERY SIDES OF THE CONNECTION POINT.

PROPOSED CONSTRUCTION ACCESS FOR NEW PORTION OF ROUTE (TYP).

R2 - PROPOSED CHANGE FOR FLETCHER CREEK

PROPOSED NEW ROUTE FOR THE MONTGOMERY-OAKWOOD SWITCHING STATION 161-kV TRANSMISSION LINE (100' WIDE ROW)

PROPOSED CONSTRUCTION ACCESS - USE PROPOSED CONSTRUCTION ACCESS FOR CUMBERLAND-MONTGOMERY 500-kV NORTH ROUTE (TYP).

PROPOSED ROUTE FOR THE MONTGOMERY-OAKWOOD SWITCHING STATION 161-kV TRANSMISSION LINE (ON CUMBERLAND-MONTGOMERY 500-kV NORTH ROUTE) (100' WIDE ROW)

PROPOSED NEW ROUTE TO GO AROUND EXISTING RESIDENTIAL DEVELOPEMENT.

NEW PROVIDENCE, TN QUAD

CLARKSVILLE, TN QUAD

MONTGOMERY COUNTY, TN

TENNESSEE VALLEY AUTHORITY

MONTGOMERY-OAKWOOD SWITCHING STATION
TRANSMISSION LINE AND
OAKWOOD SWITCHING STATION SITE

DATE 6/2/05	SUBMITTED TC	APPROVED	SHEET 2 OF 3 SHEETS
SCALE 1"=2000'	CLASS CODE	PROJECT NUMBER W037	Figure 1-3

TAP TO SCREAMING EAGLES SUBSTATION

Site Alternative 2 where Cumberland-Montgomery route crosses 161-kV TL

MONTGOMERY-BARKLEY TRANSMISSION LINE

Site Alternative 1 at tap to Screaming Eagles

Oakwood Switching Station
Alternative Site Locations

Scale: 1"=2000'

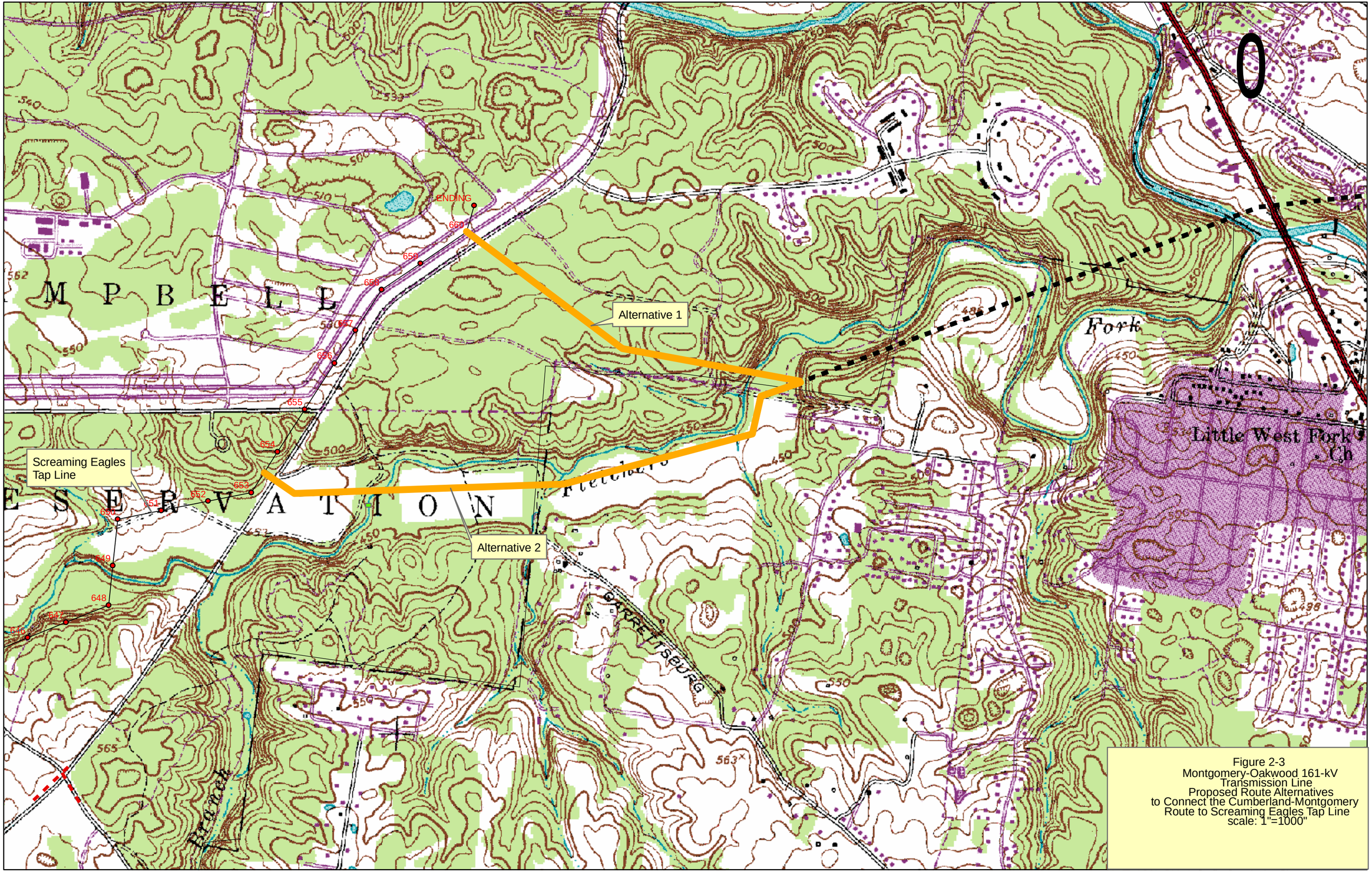


Figure 2-3
Montgomery-Oakwood 161-kV
Transmission Line
Proposed Route Alternatives
to Connect the Cumberland-Montgomery
Route to Screaming Eagles Tap Line
scale: 1"=1000"

APPENDIX I – CORRESPONDENCE

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December 20, 2005

TENNESSEE HISTORICAL COMMISSION
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
2941 LEBANON ROAD
NASHVILLE, TN 37243-0442
(615) 532-1550

Mr. J. Bennett Graham
Tennessee Valley Authority
400 West Summet Hill Dr.
Knoxville, Tennessee, 37902-1499

RE: TVA, 161 KV LINE/MONTGOMERY/SCREAMING, UNINCORPORATED, MONTGOMERY COUNTY

Dear Mr. Graham:

In response to your request, received on Wednesday, November 30, 2005, we have reviewed the documents you submitted regarding your proposed undertaking. Our review of and comment on your proposed undertaking are among the requirements of Section 106 of the National Historic Preservation Act. This Act requires federal agencies or applicant for federal assistance to consult with the appropriate State Historic Preservation Office before they carry out their proposed undertakings. The Advisory Council on Historic Preservation has codified procedures for carrying out Section 106 review in 36 CFR 800. You may wish to familiarize yourself with these procedures (Federal Register, December 12, 2000, pages 77698-77739) if you are unsure about the Section 106 process.

After considering the documents you submitted, we determine that THERE ARE NO NATIONAL REGISTER OF HISTORIC PLACES LISTED OR E LIGIBLE PROPERTIES AF FECTED BY THIS UNDERTAKING. We have made this determination either because of the specific location, scope and/or nature of your undertaking, and/or because of the size of the area of potential effect; or because no listed or eligible properties exist in the area of potential effect; or because the undertaking will not alter any characteristics of an identified eligible or listed property that qualify the property for listing in the National Register or alter such property's location, setting or use. Therefore, we have no objections to your proceeding with your undertaking.

If you are applying for federal funds, license or permit, you should submit this letter as evidence of consultation under Section 106 to the appropriate federal agency, which, in turn, should contact us as required by 36 CFR 800. If you represent a federal agency, you should submit a formal determination of eligibility and effect to us for comment. You may find additional information concerning the Section 106 process and the Tennessee SHPO's documentation requirements at www.state.tn.us/environment/hist/sect106.shtm. You may direct questions or comments to Joe Garrison (615) 532-1550-103. This office appreciates your cooperation.

Sincerely,

Herbert L. Harper
Executive Director and
Deputy State Historic
Preservation Officer

HLH/jyg

TENNESSEE HISTORICAL COMMISSION
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
2941 LEBANON ROAD
NASHVILLE, TN 37243-0442
(615) 532-1550

February 22, 2006

Mr. J. Bennett Graham
Tennessee Valley Authority
400 W. Summit Hill Drive
WT 11D - Cultural Resources
Knoxville, Tennessee 37902

RE: TVA, ARCHAEOLOGICAL ASSESSMENT, OAKWOOD 161-LV LINE/R3 REROUTE, UNINCORPORATED, MONTGOMERY COUNTY, TN

Dear Mr. Graham:

At your request, our office has reviewed the above-referenced archaeological survey report in accordance with regulations codified at 36 CFR 800 (Federal Register, December 12, 2000, 77698-77739). Based on the information provided, we concur that the project area contains no archaeological resources eligible for listing in the National Register of Historic Places.

If project plans are changed or archaeological remains are discovered during construction, please contact this office to determine what further action, if any, will be necessary to comply with Section 106 of the National Historic Preservation Act.

Your cooperation is appreciated.

Sincerely,

Herbert L. Harper
Executive Director and
Deputy State Historic
Preservation Officer

HLH/jmb

TENNESSEE HISTORICAL COMMISSION
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
2941 LEBANON ROAD
NASHVILLE, TN 37243-0442
(615) 532-1550

December 7, 2006

Mr. Thomas Maher
Tennessee Valley Authority
400 W. Summit Hill Drive
WT 11D - Cultural Resources
Knoxville, Tennessee 37902

RE: TVA, ARCHAEOLOGICAL ASSESSMENT. OAKWOOD 161-KV LINE & ACCESS ROAD, FT. CAMPBELL, MONTGOMERY COUNTY, TN

Dear Mr. Maher:

At your request, our office has reviewed the above-referenced archaeological survey and testing report in accordance with regulations codified at 36 CFR 800 (Federal Register, December 12, 2000, 77698-77739). Based on the information provided, we concur that the project area contains no archaeological resources eligible for listing in the National Register of Historic Places.

If project plans are changed or archaeological remains are discovered during construction, please contact this office to determine what further action, if any, will be necessary to comply with Section 106 of the National Historic Preservation Act.

Your cooperation is appreciated.

Sincerely,

Richard G. Tune
Deputy State Historic
Preservation Officer

RGT/jmb

APPENDIX II – TENNESSEE VALLEY AUTHORITY RIGHT-OF-WAY CLEARING SPECIFICATIONS

1. General - The clearing contractor shall review the environmental evaluation documents (Categorical Exclusion Checklist, Environmental Assessment, or Environmental Impact Statement) for the project or proposed activity, along with all clearing and construction appendices, conditions in applicable general and/or site-specific permits, the storm water pollution prevention plan, and any Tennessee Valley Authority (TVA) commitments to property owners. The contractor shall then plan and carry out operations using techniques consistent with good engineering and management practices as outlined in TVA's Best Management Practice (BMP) manual (Muncy, 1992, and revisions thereto). The contractor will protect areas that are to be left unaffected by access or clearing work at and adjacent to all work sites. In sensitive areas and their buffers, the contractor will retain as much native ground cover and other vegetation as possible.

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

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

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

4. Streamside Management Zones - The clearing contractor must leave as many rooted ground cover plants as possible in buffer zones along streams and other bodies of water or wet-weather conveyances thereto. In such streamside management zones (SMZ), tall-growing

tree species (trees that would interfere with TVA's National Electric Safety Code clearances) shall be cut, and the stumps may be treated to prevent resprouting. Low-growing trees identified by TVA as marginal electrical clearance problems may be cut, and then stump treated with growth regulators to allow low, slow-growing canopy development and active root growth. Only approved herbicides shall be used, and herbicide application shall be conducted by certified applicators from the TVA's Transmission, Operations, and Maintenance organization after initial clearing and construction. Cutting of trees within SMZs must be accomplished by using either hand-held equipment or other appropriate clearing equipment, such as a feller-buncher. The method will be selected based on site-specific conditions and topography to minimize soil disturbance and impacts to the SMZ and surrounding area. Disturbed soils in SMZs must be stabilized by appropriate methods immediately after the right-of-way is cleared. Stabilization must occur within the time frame specified in applicable storm water permits or regulations. Stumps within SMZs may be cut close to the ground but must not be removed or uprooted. Trees, limbs, and debris shall be immediately removed from streams, ditches, and wet areas using methods that will minimize dragging or scarring the banks or stream bottom. No debris will be left in the water or watercourse. Equipment will cross streams, ditches, or wet areas only at locations designated by TVA after the application of appropriate erosion control BMPs consistent with permit conditions or regulatory requirements.

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

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

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

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

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

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

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

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

11. Burning - The contractor shall obtain applicable permits and approvals to conduct controlled burning. The contractor will comply with all provisions of the permit, notification, or authorization including burning site locations, controlled draft, burning hours, and such other conditions as stipulated. If weather conditions such as wind speed or wind direction change rapidly, the contractor's burning operation may be temporarily stopped by TVA's field engineer. The debris to be burned shall be kept as clean and dry as possible and stacked and burned in a manner that produces the minimum amount of smoke. Residue from burning will be disposed of according to permit stipulations. No fuel starters or enhancements other than kerosene will be allowed.

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

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

14. Vehicle Servicing - Routine maintenance of personal vehicles will not be performed on the right-of-way. However, if emergency or "have to" situations arise, minimal/temporary maintenance to personal vehicles will occur in order to mobilize the vehicle to an off-site maintenance shop. Heavy equipment will be serviced on the right-of-way, except in designated sensitive areas. The clearing or reclearing contractor will properly maintain these

vehicles with approved spill protection controls and countermeasures. If emergency maintenance in a sensitive or questionable area arises, the area environmental coordinator or construction environmental engineer will be consulted. All wastes and used oils will be properly recovered, handled, and disposed/recycled. Equipment shall not be temporarily stored in stream floodplains, whether overnight or on weekends or holidays.

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

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

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

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

19. Brush and Timber Disposal (Reclearing) - The reclearing contractor shall place felled tree boles in neat stacks at the edge of the right-of-way, with crossing breaks at least every 100 feet. Property owner requests shall be reviewed with the project manager or right-of-way specialist before accepting them. Lop and drop activities must be specified in the contract and on plan and profile drawings with verification with the right-of-way specialist before conducting such work. When tree trimming and chipping is necessary, disposal of the chips on the easement or other locations on the property must be with the consent of the property owner and the approval of the right-of-way specialist. No trees, branches, or chips shall remain in a surface water body or be placed at a location where washing into a surface water or groundwater source might occur.

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

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

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

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

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

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

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APPENDIX III – TENNESSEE VALLEY AUTHORITY ENVIRONMENTAL QUALITY PROTECTION SPECIFICATIONS FOR TRANSMISSION LINE CONSTRUCTION

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

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

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

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

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

   Unless ponding previously occurred (i.e., existing low-lying areas), water should not be allowed to pond on the structure sites except around foundation holes; the water must be directed away from the site in as dispersed a manner as possible. At tower or structure sites, some means of upslope interruption of potential overland flow and diversion around the footings should be provided as the first step in construction-site preparation. If leveling is necessary, it must be implemented by means that provide for continuous gentle, controlled, overland flow or percolation. A good grass cover, straw, gravel, or other protection of the surface must be

maintained. Steps taken to prevent increases in the moisture content of the in-situ soils will be beneficial both during construction and over the service life of any structure.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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APPENDIX IV – TENNESSEE VALLEY AUTHORITY TRANSMISSION CONSTRUCTION GUIDELINES NEAR STREAMS

Even the most carefully designed transmission line project eventually will affect one or more creeks, rivers, or other type of water body. These streams and other water areas are protected by state and Federal law, generally support some amount of fishing and recreation, and, occasionally, are homes for important and/or endangered species. These habitats occur in the stream and on strips of land along both sides (the streamside management zone [SMZ]) where disturbance of the water, land, or vegetation could have an adverse effect on the water or stream life. The following guidelines have been prepared to help Tennessee Valley Authority (TVA) Transmission Construction staff and their contractors avoid impacts to streams and stream life as they work in and near SMZs. These guidelines expand on information presented in "A Guide for Environmental Protection and Best Management Practices for TVA Construction and Maintenance Activities."

Three Levels of Protection

During the preconstruction review of a proposed transmission line, TVA Resource Stewardship staff will have studied each possible stream impact site and will have identified it as falling into one of three categories: (A) standard stream protection, (B) protection of important permanent streams, or C) protection of unique habitats. These category designations are based on the variety of species and habitats that exist in the stream as well as state and Federal requirements to avoid harming certain species. The category designation for each site will be marked on the plan and profile sheets. Construction crews are required to protect streams and other identified water habitats using the following pertinent set(s) of guidelines:

(A) Standard Stream Protection

This is the standard (basic) level of protection for streams and the habitats around them. The purpose of the following guidelines is to minimize the amount and length of disturbance to the water bodies without causing adverse impacts on the construction work.

Guidelines:

1. All construction work around streams will be done using pertinent Best Management Practices (BMPs) such as those described in "A Guide for Environmental Protection and Best Management Practices for TVA Construction and Maintenance Activities," especially Chapter 6, Standards and Specifications.

2. All equipment crossings of streams must comply with appropriate state permitting requirements. Crossings of all drainage channels, intermittent streams, and permanent streams must be done in ways that avoid erosion problems and long-term changes in water flow. Crossings of any permanent streams must allow for natural movement of fish and other aquatic life.

3. Cutting of trees within SMZs must be accomplished by using either hand-held equipment or other appropriate clearing equipment (e.g., a feller-buncher) that would result in minimal soil disturbance and damage to low-lying vegetation. The method will be selected based on site-specific conditions and topography to minimize soil disturbance and impacts to the SMZ and surrounding area. Stumps can be cut close to ground level but must not be removed or uprooted.

4. Other vegetation near streams must be disturbed as little as possible during construction. Soil displacement by the actions of plowing, disking, blading, or other tillage or grading equipment will not be allowed in SMZs; however, a minimal amount of soil disturbance may

occur as a result of clearing operations. Shorelines that have to be disturbed must be stabilized as soon as feasible.

(B) Protection of Important Permanent Streams

This category will be used when there is one or more specific reason(s) why a permanent (always-flowing) stream requires protection beyond that provided by standard BMPs. Reasons for requiring this additional protection include the presence of important sports fish (trout, for example) and habitats for Federal endangered species. The purpose of the following guidelines is to minimize the disturbance of the banks and water in the flowing stream(s) where this level of protection is required.

Guidelines:

1. Except as modified by guidelines 2-4 below, all construction work around streams will be done using pertinent BMPs such as those described in "A Guide for Environmental Protection and Best Management Practices for TVA Construction and Maintenance Activities," especially Chapter 6, Standards and Specifications.

2. All equipment crossings of streams must comply with appropriate state (and, at times, Federal) permitting requirements. Crossings of drainage channels and intermittent streams must be done in ways that avoid erosion problems and long-term changes in water flow. Proposed crossings of permanent streams must be discussed in advance with Resource Stewardship staff and may require an on-site planning session before any work begins. The purpose of these discussions will be to minimize the number of crossings and their impact on the important resources in the streams.

3. Cutting of trees within SMZs must be accomplished by using either hand-held equipment or other appropriate clearing equipment (e.g., a feller-buncher) that would result in minimal soil disturbance and damage to low-lying vegetation. The method will be selected based on site-specific conditions and topography to minimize soil disturbance and impacts to the SMZ and surrounding area. Cutting of trees near permanent streams must be limited to those required to meet National Electric Safety Code and danger tree requirements. Stumps can be cut close to ground level but must not be removed or uprooted.

4. Other vegetation near streams must be disturbed as little as possible during construction. Soil displacement by the actions of plowing, disking, blading, or other tillage or grading equipment will not be allowed in SMZs; however, a minimal amount of soil disturbance may occur as a result of clearing operations. Shorelines that have to be disturbed must be stabilized as soon as possible and revegetated as soon as feasible.

(C) Protection of Unique Habitats

This category will be used when, for one or more specific reasons, a temporary or permanent aquatic habitat requires special protection. This relatively uncommon level of protection will be appropriate and required when a unique habitat (for example, a particular spring run) or protected species (for example, one that breeds in a wet-weather ditch) is known to occur on or adjacent to the construction corridor. The purpose of the following guidelines is to avoid or minimize any disturbance of the unique aquatic habitat.

Guidelines:

1. Except as modified by Guidelines 2-4 below, all construction work around the unique habitat will be done using pertinent BMPs such as those described in "A Guide for Environmental Protection and Best Management Practices for TVA Construction and Maintenance Activities," especially Chapter 6, Standards and Specifications.

2. All construction activity in and within 30 meters (100 feet) of the unique habitat must be approved in advance by Resource Stewardship staff, preferably as a result of an on-site planning session. The purpose of this review and approval will be to minimize impacts on the unique habitat. All crossings of streams also must comply with appropriate state (and, at times, Federal) permitting requirements.

3. Cutting of trees within 30 meters (100 feet) of the unique habitat must be discussed in advance with Resource Stewardship staff, preferably during the on-site planning session. Cutting of trees near the unique habitat must be kept to an absolute minimum. Stumps must not be removed, uprooted, or cut shorter than 0.30 meter (1 foot) above the ground line.

4. Other vegetation near the unique habitat must be disturbed as little as possible during construction. The soil must not be disturbed by plowing, disking, blading, or grading. Areas that have to be disturbed must be stabilized as soon as possible and revegetated as soon as feasible, in some cases with specific kinds of native plants. These and other vegetative requirements will be coordinated with Resource Stewardship staff.

Additional Help

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

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Comparison of Guidelines Under the Three Stream and Water Body Protection Categories (page 1)

Guidelines	A: Standard	B: Important Permanent Streams	C: Unique Water Habitats
1. Reference	• All TVA construction work around streams will be done using pertinent BMPs such as those described in "A Guide for Environmental Protection and Best Management Practices for TVA Construction and Maintenance Activities," especially Chapter 6, BMP Standards and Specifications.	Except as modified by guidelines 2-4 below, all construction work around streams will be done using pertinent BMPs such as those described in "A Guide for Environmental Protection and Best Management Practices for TVA Construction and Maintenance Activities," especially Chapter 6, BMP Standards and Specifications.	• Except as modified by guidelines 2-4 below, all construction work around the unique habitat will be done using pertinent BMPs such as those described in "A Guide for Environmental Protection and Best Management Practices for TVA Construction and Maintenance Activities," especially Chapter 6, BMP Standards and Specifications.
2. Equipment Crossings	• All crossings of streams must comply with appropriate state and Federal permitting requirements. • Crossings of all drainage channels, intermittent streams, and permanent streams must be done in ways that avoid erosion problems and long-term changes in water flow. • Crossings of any permanent streams must allow for natural movement of fish and other aquatic life.	• All crossings of streams must comply with appropriate state and Federal permitting requirements. • Crossings of drainage channels and intermittent streams must be done in ways that avoid erosion problems and long-term changes in water flow. • Proposed crossings of permanent streams must be discussed in advance with Resource Stewardship staff and may require an on-site planning session before any work begins. The purpose of these discussions will be to minimize the number of crossings and their impact on the important resources in the streams.	• All crossings of streams also must comply with appropriate state and Federal permitting requirements. • All construction activity in and within 30 meters (100 feet) of the unique habitat must be approved in advance by Resource Stewardship staff, preferably as a result of an on-site planning session. The purpose of this review and approval will be to minimize impacts on the unique habitat.

Comparison of Guidelines Under the Three Stream and Water Body Protection Categories (page 2)

Guidelines	A: Standard	B: Important Permanent Streams	C: Unique Water Habitats
3. Cutting Trees	• Cutting of trees within SMZs must be accomplished by using either hand-held equipment or other appropriate clearing equipment (e.g., a feller-buncher) that would result in minimal soil disturbance and damage to low-lying vegetation. The method will be selected based on site-specific conditions and topography to minimize soil disturbance and impacts to the SMZ and surrounding area. • Stumps can be cut close to ground level but must not be removed or uprooted.	• Cutting of trees with SMZs must be accomplished by using either hand-held equipment or other appropriate clearing equipment (e.g., a feller-buncher) that would result in minimal soil disturbance and damage to low-lying vegetation. The method will be selected based on site-specific conditions and topography to minimize soil disturbance an impacts to the SMZ and surrounding area. • Cutting of trees near permanent streams must be limited to those meeting National Electric Safety Code and danger tree requirements. • Stumps can be cut close to ground level but must not be removed or uprooted.	• Cutting of trees within 30 meters (100 feet) of the unique habitat must be discussed in advance with Resource Stewardship staff, preferably during the on-site planning session. Cutting of trees near the unique habitat must be kept to an absolute minimum. • Stumps must not be removed, uprooted, or cut shorter than one foot above the ground line.
4. Other Vegetation	• Other vegetation near streams must be disturbed as little as possible during construction. • Soil displacement by the actions of plowing, disking, blading, or other tillage or grading equipment will not be allowed in SMZs; however, a minimal amount of soil disturbance may occur as a result of clearing operations. • Shorelines that have to be disturbed must be stabilized as soon as feasible.	• Other vegetation near streams must be disturbed as little as possible during construction. • Soil displacement by the actions of plowing, disking, blading, or other tillage or grading equipment will not be allowed in SMZs; however, a minimal amount of soil disturbance may occur as a result of clearing operations. • Shorelines that have to be disturbed must be stabilized as soon as possible and revegetated as soon as feasible.	• Other vegetation near the unique habitat must be disturbed as little as possible during construction. • The soil must not be disturbed by plowing, disking, blading, or grading. • Areas that have to be disturbed must be stabilized as soon as possible and revegetated as soon as feasible, in some cases with specific kinds of native plants. These and other vegetative requirements will be coordinated with Resource Stewardship staff

APPENDIX V – TVA ENVIRONMENTAL QUALITY PROTECTION SPECIFICATIONS FOR TRANSMISSION SUBSTATION OR COMMUNICATIONS CONSTRUCTION

1. General - TVA and/or the assigned Contractor and subcontractors shall plan, coordinate, and conduct his or her operations in a manner which protects the quality of the environment and complies with TVA's environmental expectations discussed in the pre-construction meeting (including clearing and grading, or re-clearing and removal or dismantling). This specification contains provisions which shall be considered in all TVA and contract construction, dismantling, or forensic operations. If the contractor and his or her subcontractors fail to operate within the intent of these requirements, TVA will direct changes to operating procedures. Continued violation will result in a work suspension until correction or remedial action is taken by the contractor. Penalties and contract termination will be used as appropriate. The costs of complying with the Environmental Quality Protection Specifications are incidental to the contract work, and no additional compensation will be allowed. At all site perimeters, structure, foundation, conduit, grounding, fence, drainage ways, etc. appropriate protective measures to prevent erosion or release of contaminants will be taken immediately upon the end of each step in a construction, dismantling, or forensic sequence, and those protective measures shall be inspected and maintained throughout the construction and site stabilization and rehabilitation period.

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

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

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

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

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

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

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

6. Refuse Disposal - Designated TVA and/or contractor and subcontractor(s) personnel shall be responsible for daily inspection, cleanup, and proper labeling, storage and disposal of all refuse and debris produced by his or her operations and by his or her employees. Suitable refuse collecting facilities will be required. Only state-approved disposal areas shall be used. Disposal containers such as dumpsters or roll-off containers shall be obtained from a proper waste disposal contractor. Solid, special, construction/demolition and hazardous wastes as well as scrap are part of the potential refuse generated and must be properly managed with emphasis on reuse, recycle, or possible give away, as appropriate, before they are handled as waste. Records of the amounts generated shall be provided to the site's or project's designated environmental specialist. Contractor(s) and subcontractor(s) must meet similar provisions on any project contracted by TVA. Final debris, refuse, product, and material removal is the responsibility of the contractor; unless special written agreement is made with the ultimate TVA owner of the site.

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

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

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

The clearing contractor erected erosion and/or sedimentation control shall be maintained and (when TVA or contract construction personnel are unable)the construction crew(s) shall maintain BMPs such as silt fences on steep slopes and adjacent to any stream, wetland, or other water body. Additional BMPs may be required for areas of disturbance created by construction activities and at sequential steps of construction at the same location on site. BMPs will be inspected, by the TVA field engineer or other designated TVA or contractor and/or subcontractor(s)personnel, routinely and during periods of high runoff, and any necessary repairs will be made as soon as practicable. BMP inspections and any required sampling will be conducted in accordance with permit requirements. Records of all inspections and sampling results will be maintained onsite, and copies of inspection forms and sampling results will be forwarded to the TVA project manager or supporting environmental specialist.

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

10. Turbidity and Blocking of Streams - Construction, dismantling, or forensic activities in or near Streamside Management Zones or other bodies of water shall be controlled to prevent the water turbidity from exceeding state or local water quality standards for that stream. **All conditions** of a general storm water permit, Aquatic Resource Alteration Permit or a site specific permit **shall be met** including monitoring of turbidity in receiving streams and/or storm water discharges and implementation of appropriate erosion and sediment control measures.

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

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

    Mechanized equipment shall not be operated in flowing or standing water on substation, switching station or telecommunication sites.

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

11. Floodplain Evaluation - During the planning and design phase of the substation or communications facility, floodplain information should be obtained to avoid locating flood-damageable facilities in the 100-year floodplain. If the preferred site is located within a floodplain area, alternative sites must be evaluated and documentation prepared to support a determination of "no practicable alternative" to siting in the floodplain. In addition, steps taken to minimize adverse floodplain impacts should also be documented.

12. Clearing - No construction, dismantling, or forensic activities may clear additional site or right-of-way vegetation or disturb remaining retained vegetation, stumps, or regrowth at locations other than the structure, substation or communication site or access thereto. TVA and the

construction, dismantling, or forensic contractor(s) must provide appropriate erosion or sediment controls for areas they have disturbed after each disturbance that have previously been re-stabilized after clearing operations. Control measures shall be implemented as soon as practicable after disturbance in accordance with applicable federal, state, and/or local storm water regulations.

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

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

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

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

    D. Rehabilitation species shall use species designated by Federal guidance that are low maintenance native species appropriate for the site conditions that prevail at that location.

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

    F. The site must be protected from species designated by the Federal Invasive Species Council and must not be the source of species that can be transported to other locations via equipment contaminated with viable materials; thus the equipment must be inspected and any such species material found must be removed and destroyed prior to transport to another location.

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

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

16. RENOVATION OR DEMOLITION DEBRIS MAY NOT BE BURNED.

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

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

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

20. Smoke and Odors - TVA and/or the Contractor(s) and subcontractor(s) shall properly store and handle combustible material which could create objectionable smoke, odors, or fumes. The Contractor and subcontractor(s) shall not burn refuse such as trash, rags, tires, plastics, or other debris.

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

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

23. Damages - The movement of construction, dismantling, or forensic crews and equipment shall be conducted in a manner which causes as little intrusion and damage as possible to crops, orchards, woods, wetlands, and other property features and vegetation. The contractor and subcontractor(s) will be responsible for erosion damage caused by his or her actions and employees; and especially for creating conditions that would threaten the stability of the right-of-way or site soil, the structures, or access to either. When property owners prefer the correction of ground cover condition or soil and subsoil problems themselves, the section of the project to

so handled shall be documented with an implementation schedule and a property owner signature obtained.

24. Final Site Cleanup and Inspection - The contractor's designated person shall ensure that all construction, dismantling, or forensic related debris, products, materials, and wastes are properly handled, labeled as required and removed from the site. Upon completion of those activities that person and a TVA designated person shall walkdown the site and complete an approval inspection.

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

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

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

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

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

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

When slopes become hazardous to farm tractors and rotary mowers, TVA may use a variety of herbicides specific to the species present with a variety of possible application techniques. When scattered small segments of tall-growing vegetation are present but accessibility along the right-of-way is difficult or the path to such segments is very long compared to the amount present, herbicides may be used.

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

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

TVA's experience initially was completely with hand clearing. World War II manpower shortages forced TVA to look toward developments in herbicide research. An era of near exclusive use of herbicides existed. Then, because of the discovery of residue accumulations with many pesticides and price increases of herbicides, high-volume applications lost favor, and TVA sought other modes of vegetation control. Farm equipment of greater power and efficiency allowed use of tractor-mounted rotary mowers. These mowers not only cut the tall saplings and seedlings on the right-of-way, they shatter the stump and the supporting near-surface root crown. The tendency of resistant species is to resprout from the root crown, and shattered stumps produce a multistem dense stand in the immediate area. Repeated use of the mowers on short-cycle reclearing with many original stumps regrowing in the above manner creates a single-species thicket or monoculture. With the original large root system and multiple stems, the resistant species can and usually do produce regrowth at the rate of 5-10 feet in a year. In years with high rainfall, the growth can reach 12-15 feet in a single year.

These created, dense, monoculture stands can become nearly impenetrable for even large tractors. Such stands have low diversity, little wildlife food or nesting potential, and become a property owner concern. They tend to spread off the right-of-way into more desirable species areas. Increasingly, TVA is receiving complaints about the shatter sapling debris density. The potential exists for insect invasion or fungus infection resulting from the easy invasion of damaged specimens or debris. Once started, such infestations or invasions can spread into valuable timber of the same or related species off the right-of-way.

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

The above-named universities strongly recommend low-volume herbicide applications since their research demonstrates much wider plant diversity after such applications. They report better ground erosion protection and the development of more wildlife food plants and cover plants. In most situations, there is increased development of wild flowering plants and shrubs. In conjunction with herbicides, the diversity and density of low-growing plants provide control of tall-growing species through competition.

Wildlife managers are specifically requesting the use of herbicides in place of rotary mowing in order to avoid damage to nesting and tunneling wildlife. This method retains groundcover year-round with a better mix of food species and associated high-protein insect populations for birds in the right seasons. Most also report less damage to soils (even when compared with rubber-tired equipment).

Property owners interested in tree production are requesting use of low-volume applications rather than hand or mechanical clearing because of the insect and fungus problems in damaged vegetation and debris left on rights-of-way. The insect and fungus invasions such as pine tip moth, oak leaf blight, sycamore and dogwood blight, etc., are becoming widespread across the nation.

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

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

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

Approved Herbicides for Usage on TVA Rights-of-Way

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

Approved Herbicides for Bare Ground Areas

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

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

Approved TGRs for Use on TVA Property

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

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

These herbicides have been evaluated in extensive studies at universities in support of registration applications and label requirements. Most have been reviewed in the U.S. Forest Service (USFS) Vegetation Management Environmental Impact Statements (EISs), and those evaluations are incorporated here by reference. The result of these reviews has been a consistent finding of limited environmental impact beyond that of control of the target vegetation. All the listed herbicides have been found to be of low-environmental toxicity to resources (including buffer zones for listed threatened or endangered species) when applied by trained applicators following the label and registration procedures.

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

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

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

TVA currently uses primarily low-volume applications of foliar and basal applications of Accord (Glyphosate) and Accord (Glyphosate)-Arsenal (Imazapyr) tank mixes. Glyphosate is one of the most widely used herbicidal active ingredients in the world and has been continuously the subject of numerous exhaustive studies and scrutiny to determine its potential impacts on humans, animals, and the environment.

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

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

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

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

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

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

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

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

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

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APPENDIX VII – DESCRIPTIONS OF AFFECTED STREAMS IN THE PROPOSED OAKWOOD, TENNESSEE 161-KV TRANSMISSION LINE AND SWITCHING STATION PROJECT AREA

Stream Name	Watercourse Type[1]	Streamside Management Zone Classification	Description
Unnamed	WWC	Standard BMPs	Dry; deeply entrenched; high erosion potential
Unnamed	WWC	Standard BMPs	Dry; deeply entrenched; moderate to high erosion potential
Unnamed	WWC	Standard BMPs	Dry; shallow, narrow channel in middle of access road; high erosion potential
Unnamed	WWC	Standard BMPs	Dry; moderate erosion potential
Unnamed	WWC	Standard BMPs	Dry; deeply entrenched; moderate to high erosion potential
Little West Fork	Perennial	Category B (65 ft)	Flowing; wide channel; cobble, gravel, sand, silt substrates; livestock impacting forested floodplain (but not streambanks); high erosion potential
Unnamed	WWC	Standard BMPs	Dry; culverted under existing driveway; impacted by residences; low erosion potential
Unnamed	WWC	Standard BMPs	Dry, shallow channel; drops sharply off hillside; crosses existing farm drive; high erosion potential
Unnamed	WWC	Standard BMPs	Dry; culverted under existing driveway; impacted by residence; low erosion potential
Unnamed	WWC	Standard BMPs	Dry; moderate erosion potential
Unnamed	WWC	Standard BMPs	Dry; shallow channel; low erosion potential
West Fork Red River	Perennial	Category B (65 ft)	Flowing; wide channel; cobble, gravel, sand, silt substrates; forested floodplain; high erosion potential
Unnamed	WWC	Standard BMPs	Dry, large channel; cobble, gravel, soil substrates; high erosion potential
Unnamed	WWC	Standard BMPs	Dry, short channel; drain farm field; low to moderate erosion potential
Unnamed	WWC	Standard BMPs	Dry; drains farm field; deeply entrenched; moderate to high erosion potential
Spring Creek	Perennia	Category B (75 ft)	Flowing; wide channel; impacted by residences cobble, gravel, sand, silt substrates; moderate erosion potential
Unnamed	WWC	Standard BMPs	Dry, shallow channel; culverted under existing driveway; low erosion potential
Unnamed	WWC	Standard BMPs	Dry, shallow channel; culverted under existing driveway; low erosion potential
Unnamed	WWC	Standard BMPs	Dry; culverted under existing farm drive; moderate to high erosion potential
Unnamed	WWC	Standard BMPs	Dry, shallow channel; impacted by cows; low erosion potential
Unnamed	WWC	Standard BMPs	Dry; impacted by cows; high erosion potential
Unnamed	WWC	Standard BMPs	Dry; impacted by cows; low to moderate erosion potential
Unnamed pond	Intermittent	Category A	Pond; shallow; impacted by cows; high erosion potential

Stream Name	Watercourse Type[1]	Streamside Management Zone Classification	Description
Unnamed pond	Intermittent	Category A	Pond; shallow; impacted by cows; high erosion potential
Unnamed	WWC	Standard BMPs	Dry, shallow channel; low erosion potential
Unnamed	WWC	Standard BMPs	Dry, shallow channel; low erosion potential
Unnamed	WWC	Standard BMPs	Dry; moderate erosion potential
Unnamed	WWC	Standard BMPs	Dry; low erosion potential
Unnamed	WWC	Standard BMPs	Dry; moderate to high erosion potential
Spring Creek	Perennial	Category B (65 ft)	Flowing; wide channel; cobble, gravel, sand, silt substrates; high erosion potential
Unnamed	WWC	Standard BMPs	Dry; small, shallow channel; drains field; low erosion potential
Unnamed	WWC	Standard BMPs	Dry, shallow channel; drains cornfield; high erosion potential
Unnamed	WWC	Standard BMPs	Dry, shallow channel; drains cornfield; high erosion potential
Spring Creek	Perennial	Category B (65 ft)	Flowing; adjacent to existing farm drive; moderate erosion potential
Unnamed	WWC	Standard BMPs	Dry; crosses access road; moderate to high erosion potential
Unnamed	WWC	Standard BMPs	Dry, shallow channel; drains cornfield; high erosion potential
Unnamed	WWC	Standard BMPs	Dry, shallow channel; drains tobacco field; high erosion potential
Spring Creek (overflow channel)	Intermittent	Category B (50 ft)	Dry (some water in pools); overflow channel for Spring Ck; sand, gravel substrates; high erosion potential
Unnamed	WWC	Standard BMPs	Dry, short channel; culverted under existing farm drive; low erosion potential
Unnamed	WWC	Standard BMPs	Dry, shallow channel; low erosion potential
Unnamed	WWC	Standard BMPs	Dry; moderate erosion potential
Unnamed	WWC	Standard BMPs	Dry; low erosion potential
Spring Creek	Perennial	Category B (65 ft)	Flowing, wide channel; cobble, gravel, sand substrates; high erosion potential
Unnamed	WWC	Standard BMPs	Dry; on existing farm drive; drains farm field; moderate to high erosion potential
Unnamed	Intermittent	Category A	Flowing; crosses existing farm drive; channelized, concrete channel at crossing; cobble, gravel, sand substrates; drains farm fields; low to moderate erosion potential
Unnamed	WWC	Standard BMPs	Dry; drains farm field; crosses existing farm drive; moderate erosion potential
Spring Creek	Perennial	Category B (100 ft)	Flowing; cobble, gravel, sand substrates; moderate to high erosion potential
Unnamed	Intermittent	Category A	Very little flow; bedrock, boulder, gravel substrates; moderate to high erosion potential
Unnamed	WWC	Standard BMPs	Dry; drains farm field; moderate erosion potential
Unnamed	WWC	Standard BMPs	Dry; drains farm field; moderate erosion potential
Unnamed	WWC	Standard BMPs	Dry; drains farm field and road; deeply entrenched; moderate erosion potential

Stream Name	Watercourse Type[1]	Streamside Management Zone Classification	Description
Unnamed	WWC	Standard BMPs	Dry, small, shallow channel; drains farm field; moderate erosion potential
Spring Creek	Perennial	Category B (65 ft)	Flowing; wide channel; cobble, gravel, sand, silt substrates; high erosion potential
Spring Creek	Perennial	Category B (65 ft)	Flowing; wide channel; sand, silt substrates; moderate to high erosion potential
Spring Creek	Perennial	Category B (65 ft)	Flowing; high erosion potential
Unnamed	WWC	Standard BMPs	Dry
Fletchers Fork	Perennial	Category B (50 ft)	Flowing; cobble, gravel sand substrates; high erosion potential
Unnamed	WWC	Standard BMPs	Dry
Little West Fork	Perennial	Category B (100 ft)	Flowing; low to moderate erosion potential
Unnamed	WWC	Standard BMPs	Dry
Unnamed	WWC	Standard BMPs	Dry
Unnamed	WWC	Standard BMPs	Dry
Unnamed	WWC	Standard BMPs	Dry
Pond	Pond	Standard BMPs	southwest corner of property; heavily used by cattle; poor water quality
Unnamed	Intermittent	Category A	15 ft wooded riparian zone; pasture outside of riparian zone; impounded 100 ft downstream of property line
Unnamed	WWC	Standard BMPs	channel 6 ft wide and 4 ft deep; flows into Fletcher Fork
Fletchers Fork	Perennial	Category B (50 ft)	channel 15-30 ft wide and braided; flows adjacent to JW01 (wetland); clean cobble substrate; subterranean flow with pools; fish present in pools
Unnamed	Intermittent	Category A	20 ft wooded riparian zone on west side then pasture; wooded on east side; WWC east of channel has been dammed by landowner with brush; channel 25 ft wide and 5 ft deep
Unnamed	Intermittent	Category A	Tobacco field on each side with 10 ft wooded riparian zone; channel 20 ft wide and 10 ft deep; channel full of junk cars and farm equipment

[1] WWC = wet weather conveyance; perennial and intermittent stream types determined by level of flow and evidence of aquatic life at time of site visit.
[2] All Category A SMZ widths are 50 feet.

APPENDIX VIII – NOISE DURING TRANSMISSION LINE CONSTRUCTION AND OPERATION

At high levels noise can cause hearing loss, at moderate levels noise can interfere with communication, disrupt sleep, and cause stress, and at low levels noise can cause annoyance. Noise is measured in decibels (dB), a logarithmic unit, so an increase of 3 dB is just noticeable and an increase of 10 dB is perceived as a doubling of sound level. Because not all noise frequencies are perceptible to the human ear, A-weighted decibels (dBA), which filter out sound in frequencies above and below human hearing, are typically used in noise assessments.

Both the Environmental Protection Agency (EPA) and the Department of Housing and Urban Development (HUD) have established noise guidelines. EPA guidelines are based on an equivalent sound level day/night (DNL) which is a 24-hour average sound level with 10 dB added to hours between 10 PM and 7 AM since people are more sensitive to nighttime noise. EPA recommends a guideline of DNL less than 50 dBA to protect the health and well-being of the public with an adequate margin of safety. HUD guidelines use an upper limit DNL of 65 dBA for acceptable residential development and an upper limit DNL of 75 dBA for acceptable commercial development. TVA generally uses the EPA guideline of 55 dBA DNL at the nearest residence and 65 dBA at the property line in industrial areas to assess the noise impact of a project. In addition, TVA gives consideration to the Federal Interagency Committee on Noise (FICON 1992) recommendation that a 3 dB increase indicates possible impact, requiring further analysis when the existing DNS is 65 dBA or less.

Annoyance from noise is highly subjective. The FICON used population surveys to correlate annoyance and noise exposure (FICON 1992). Table J-1 gives estimates of the percentage of typical residential populations that would be highly annoyed from a range of background noise and the average community reaction description that would be expected.

Table J-1. Estimated annoyance from background noise (FICON 1992).

Day/Night Level (dBA)	Percent Highly Annoyed	Average Community Reaction
75 & above	37	Very severe
70	25	Severe
65	15	Significant
60	9	Moderate
55 & below	4	Slight

For comparative purposes, typical background DNLs for rural areas range from about 40 dBA in undeveloped areas to 48 dBA in mixed residential/agricultural areas (Cowan 1993). Noise levels are typically higher in higher density residential and urban areas. Background noise levels greater than 65 dBA can interfere with normal conversations, requiring people to speak in a raised voice in order to carry on a normal conversation.

Construction Noise

Construction noise impacts would vary with the number and specific types of equipment on the job, the construction methods, the scheduling of the work, and the distance to sensitive noise receptors such as houses. Typical construction activities are described in Section 2.1.1. Maximum noise levels generated by the various pieces of construction equipment typically range from about 70 to 85 dBA (Bolt, Beranek and Newman 1971). An exception would be the use of track drills for building roads and installing foundations in rocky areas; track drills have a typical maximum noise level of 98 dBA. At a reference distance of 50 feet from the noise source, equivalent noise levels for the various phases of construction activity range from about 76 to 85 dBA without use of track drills. With use of track drills, which is not expected to be widespread, equivalent noise levels for the road construction and foundation installation phases would increase from 84 or 85 dBA to 94 dBA. Helicopter noise and noise from blasting could exceed these noise levels.

Project-related construction noise levels would likely exceed background noise levels by more than 10 dBA at distances from within 500 feet in developed areas to over 1000 feet in rural areas with little development. These distances are without the use of track drills; drilling activities could increase the distances by an additional 500 feet. A 10 dBA increase would be perceived as a large increase over the existing noise level and could result in annoyance to adjacent residents. The residential noise level guideline of 55 dBA could also be exceeded for residences near construction activities.

Construction activities would be limited to daylight hours. Because of the sequence of construction activities, construction noise at a given point along the transmission line would be limited to a few periods of a few days each. These measures would reduce the duration of noise impacts on nearby residents.

Operational Noise

Transmission lines can produce noise from corona discharge, which is the electrical breakdown of air into charged particles. Corona noise is composed of both broadband noise, characterized as a crackling noise, and pure tones, characterized as a humming noise. Corona noise is greater with increased voltage and also affected by weather. It occurs during all types of weather when air ionizes near irregularities such as nicks, scrapes, dirt, insects on the conductors. During dry weather, the noise level is low and often indistinguishable off the ROW from background noise. In wet conditions, water drops collecting on the conductors can cause louder corona discharges.

Periodic maintenance activities, particularly vegetation management, would produce noise comparable to that of some phases of transmission line construction. This noise, particularly from bush-hogging or helicopter operation, would be loud enough to cause some annoyance. It would, however, be of very short duration and very infrequent occurrence.