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FINAL ENVIRONMENTAL ASSESSMENT

WEST PLEASANT HILL 161-KV TRANSMISSION LINE

DeSoto County, Mississippi

TENNESSEE VALLEY AUTHORITY

MAY 2006

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ACRONYMS, ABBREVIATIONS, AND SYMBOLS

~	Approximately
°F	Degree Fahrenheit
APE	Area of Potential Effect
BMP	Best Management Practice
CFR	Code of Federal Regulations
e.g.	Latin term, *exempli gratia*, meaning “for example”
EIS	Environmental Impact Statements
EMF	Electric and Magnetic Fields
EPA	Electric Power Association
EO	Executive Order
GIS	Geographic Information System
i.e.	Latin term, id est, meaning “that is”
Inc.	Incorporated
kV	Kilovolt
LLC	Limited Liability Corporation
MDEQ	Mississippi Department of Environmental Quality
MS	Mississippi
MVA	Megavolt Amperes
NRHP	National Register of Historic Places
OSHA	Occupational Safety and Health Administration
PUD	Planned Unit Development
SHPO	State Historic Preservation Officer
SMZ	Streamside Management Zone
TVA	Tennessee Valley Authority
TVARAM	Tennessee Valley Authority Rapid Assessment Method
U.S.	United States
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service

CHAPTER 1

1. PURPOSE OF AND NEED FOR ACTION

1.1. Proposed Action: Provide Power Supply to Northcentral Mississippi Electric Power Association's Planned Substation

The Tennessee Valley Authority's (TVA) proposed action is to serve Northcentral Mississippi (MS) Electric Power Association's (EPA) planned substation by building an approximately 4.2-mile, 161-kilovolt (kV) transmission line connection from the existing Freeport-Miller 161-kV Transmission Line to the new substation by January 2007 (Figure 1-1). The right-of-way, located northwest of the Pleasant Hill Community in DeSoto County, Mississippi, would occupy approximately 50 acres.

TVA would also add switches on each side of the tap point in the Freeport-Miller 161-kV Transmission Line and in the transmission line to be built to West Pleasant Hill 161-kV Substation. TVA would provide equipment to Northcentral MS EPA that would be installed in the new substation to allowing metering and system protection.

1.2. Objectives of the West Pleasant Hill Delivery Point Project

Northcentral MS EPA presently serves the Pleasant Hill area in DeSoto County, Mississippi, primarily from the Mitchell's Corner 161-kV Substation. The rapid growth in the Pleasant Hill area is resulting in the overloading of this substation. The Mitchell's Corner transformer bank has a firm summer capability of 30 megavolt amperes (MVA). The loading on the substation reached 36.5 MVA during the summer of 2004 and is projected to reach 41.2 MVA by the summer of 2007. Planned developments including an industrial park scheduled to be operational in 2006 and several commercial facilities with numerous large retailers are expected to increase the power demands in the area. Overloading of this substation could result in an inadequate and unreliable power supply in the Pleasant Hill vicinity.

A new 161-kV substation and 161-kV transmission line connection would provide a second source of power in the area for Northcentral MS EPA to ensure a more reliable power supply.

1.3. Decisions

The primary decision before TVA is whether to build a new 161-kV transmission line to connect to the West Pleasant Hill 161-kV Substation. If the interconnection is built, other secondary decisions are involved. These include the following considerations:

- The timing of improvements
- The best route for a transmission line
- Determining any necessary mitigation and/or monitoring measures to implement to meet TVA standards and minimize potential damages to resources

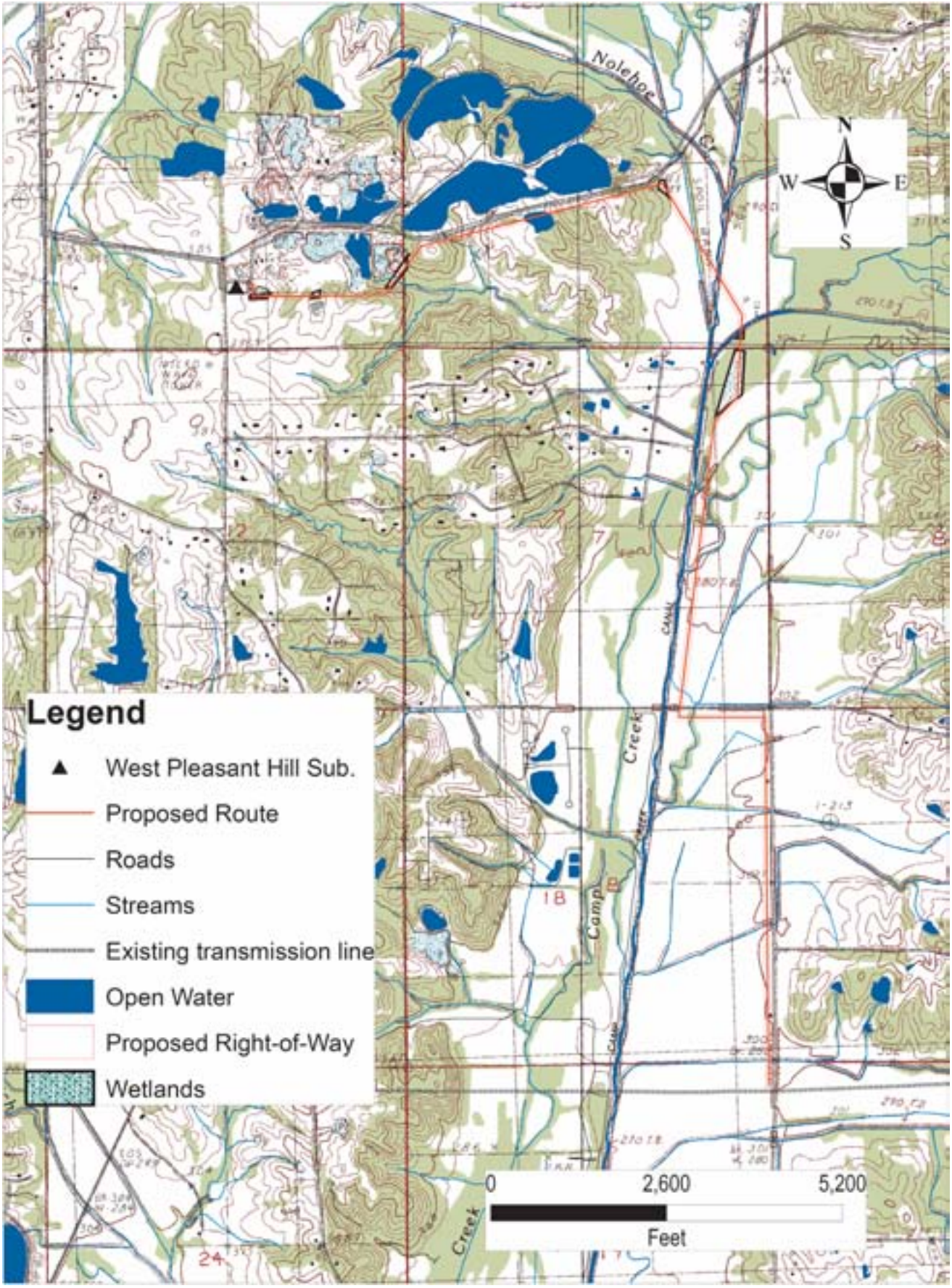

Figure 1-1. The Preferred Route for the Proposed West Pleasant Hill 161-kV Transmission Line in DeSoto County, Mississippi

1.4. Public Involvement

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

- Mississippi Department of Archives and History
- Mississippi Department of Environmental Quality
- Mississippi Department of Transportation
- Mississippi Natural Heritage Program
- U.S. Army Corps of Engineers

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

TVA held a public meeting in the project area on June 9, 2005. Using variations of ten possible route segments (Figure 1-2), six potential transmission line routes were presented to the public for comment. These routes are described in Section 2.5.5 of this document as Routes 1 through 6.

Public officials and 100 potentially affected property owners within these corridor routes were specifically invited to the meeting. TVA also invited other interested members of the public through newspaper advertisements and local news outlets. Total attendance at the meeting was 43.

During a 30-day public comment period following the open house, TVA accepted public comments on potential transmission line routes and other issues. A toll-free phone number and facsimile number were made available to facilitate comments. Comments were primarily related to the location of the transmission line relative to current or planned land uses. Several landowners raised issues such as commercial development and environmental concerns that were utilized immediately to adjust identified routes in order to reduce potential impacts. Many commenters provided information and land use updates that enhanced TVA's understanding of route issues and usage constraints. The commenters did not express a clear preference for any route option.

1.5. Necessary Permits or Licenses

A Section 404 Nationwide Permit #12 - Utility Line Crossing has been approved and a permit was issued by the U.S. Army Corps of Engineers (USACE) for the proposed project. In addition, a permit would be required from the State of Mississippi for construction site storm water discharge for the transmission line construction. TVA's Transmission Construction Organization would prepare the required erosion and sedimentation control plans and coordinate them with the appropriate state and local authorities. A permit would also be required for burning trees and other combustible materials removed during transmission line construction.

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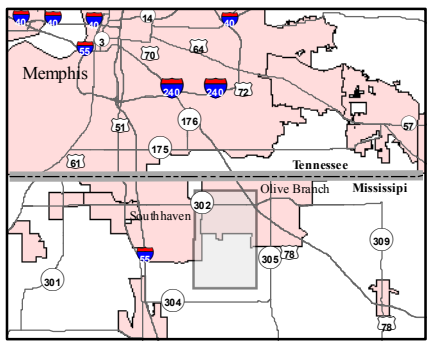

Project Location Map

Figure 1-2.
Proposed Route Alternatives
for the West Pleasant Hill 161-kV
Transmission Line Project in
DeSoto County, Mississippi

Legend

- Substation
- House
- Trailer
- Apartments
- Commercial/Industrial
- Barn
- Church
- School
- Tower
- Tank
- Wells
- Alternative Routes
- Right of Way
- County Line
- Railroads
- Roads/Streets
- Existing Transmission Lines
- Streams
- Constraint Buffer
- Cemeteries
- Openwater
- Floodplain
- Agriculture/Openland
- Commercial/Industrial
- Wetlands
- Forestland
- Residential

N

500 Feet

1 Miles

West Pleasant Hill Substation

Freeport - Miller 161-kV Transmission Line

Pleasant Hills Estates East

Summers Place

Spring Place Estates

College Hills

Bridgetower Subdivision

Camp Creek Canal

Bean Patch Creek

Nail Rd
Castle Pointe Dr
Roman Dell Cv
Roman Forest Dr
Roman Hill Dr
Roman Forest Rd
Fairlawn Cv
S Manor Cv
River Pointe Dr
East Pointe Dr
Meadow Pointe Dr
Shasta Lee Cv
Latham Dr
Davidson Rd
Autumn Pointe Cv
Church Rd
College Rd
Bridgeforth Loop
Northwood Dr
Northwood Cv
Camp Creek Cv
Cherry Tree Rd
Rolling Hill Dr
Redwood Ln
Spring Creek Dr
W Sandidge Rd
Maxwell Dr
Summers Creek Rd
Summers Place Dr
Sandidge Ext
Rebekah Dr
Oak Shadow
Spring Valley Dr
Driveway
Spring Lake Village
Spring Lakes Blvd
Craft Road
Mary Dudley Dr
College Blf
College Bluff Cv
Spring Xing
Springhill Dr
Dunn Ln E
Star Landing Rd E
Bienville Rd
Huron Rd
Huron Ct
Windermere Rd N
Windermere Rd S
Crystal Ct
Los Padres Dr
Maryart Cir
Victoria Dr
Big Horn Dr N
Okeechobee
Malone Rd
Pleasant View Cv
Laughter Rd N
McElroy Rd
Warren Rd
Allison Rd
Bethel Rd

CHAPTER 2

2. ALTERNATIVES INCLUDING THE PROPOSED ACTION

2.1. Introduction

A description of the various alternatives considered is provided in this chapter. Additional background information about transmission line construction, operation, and maintenance is also provided. This chapter has the following four major sections:

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

This chapter describes all of the alternatives explored and provides a detailed description of the necessary steps in constructing a transmission line.

2.2. Description of Alternatives

2.2.1. Alternative 1 – Do Not Construct the West Pleasant Hill 161-kV Transmission Line (No Action)

Under the No Action Alternative, TVA would not construct 4.2 miles of new 161-kV transmission line to serve the new West Pleasant Hill 161-kV Substation. As a result, the Northcentral MS EPA could decide to build the 4.2-mile transmission line itself. If it did so, the potential impacts resulting from the implementation of the No Action Alternative would be similar to those of the Action Alternative that are described in Chapter 4, and perhaps more severe depending on the route chosen and the construction methods used by Northcentral MS EPA.

Alternatively, in lieu of building its new substation Northcentral MS EPA could reconsider upgrading its Mitchell's Corner, Mineral Wells, and Olive Branch Substations and supplying the Pleasant Hill area from these substations. The upgrades would include replacing the existing transformers at Olive Branch with new, larger transformers and moving one of the old Olive Branch transformers to Mitchell's Corner and one to Mineral Wells. Three additional breakers would be added at Mineral Wells and two each at Olive Branch and Mitchell's Corner. Additionally, to accommodate the load transfers between the existing substations, this plan would require the construction of about 15 miles of new, three-phase distribution lines and would include the associated impacts of this construction.

Depending on the routes chosen by Northcentral MS EPA for these 15 miles, the potential for impacts are likely to be similar during construction and operation as the proposed construction of the 4.2-mile TVA 161-kV transmission line. It is, however, possible that the potential for impacts utilizing this 15-mile option could be greater than for the Action Alternative. This increased potential would result because of the greater number of miles of new transmission line needed compared to the maximum of 4.2 miles needed for the transmission line without the upgrades as proposed in Alternative 2.

Additionally, cost estimates indicated that the upgrade approach would have a capital cost about $2 million (50 percent) higher than the preferred alternative. Its overall cost, considering the energy losses resulting from serving the Pleasant Hill area at lower distribution voltages, would be about $2.3 million over the next 20 years.

Absent Northcentral MS EPA's doing either of these things, portions of the transmission system in the Pleasant Hill area of DeSoto County would continue to operate with a high risk level of interruption in certain situations, especially at times of high electricity use. This risk would likely increase over time as the electrical loads in the area grow due to ongoing and already planned development. Without a new 161-kV substation and new 161-kV transmission lines, these increasing power loads would not be able to be sustained by Northcentral MS EPA's Mitchell's Corner 161-kV Substation.

2.2.2. Alternative 2 – Construct and Operate the West Pleasant Hill 161-kV Transmission Line (Action)

Under the Action Alternative, TVA would construct and operate a new 4.2 mile 161-kV transmission line connecting the Freeport-Miller 161-kV Transmission Line with Northcentral MS EPA's planned West Pleasant Hill 161-kV Substation in DeSoto County, Mississippi. The transmission line would be built on new right-of-way 100 feet wide. TVA would also TVA would provide metering and protection equipment at the West Pleasant Hill 161-kV Substation and would also provide connections, which would transmit process data and equipment status from the substation to the TVA transmission and generation dispatchers.

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

2.3.1. Transmission Line Construction

2.3.1.1. Right-of-Way Acquisition and Clearing

Approximately 4.2 miles of new right-of-way 100 feet wide would be needed for the proposed West Pleasant Hill 161-kV Transmission Line that would be located between the existing Freeport-Miller 161-kV Transmission Line right-of-way and the new West Pleasant Hill 161-kV Substation.

TVA would purchase easements from landowners for the new right-of-way on private land. These easements would give TVA the right to construct, operate, and maintain the transmission line, as well as remove danger trees off the right-of-way. Danger trees are those trees that are located away from the cleared right-of-way, but are tall enough to pass within 5 feet of a conductor or strike a structure should it fall toward the transmission line. Fee title, i.e., ownership, for the land within the right-of-way remains with the landowner, and a number of activities may be continued on the property by the landowner. However, the easement agreement prohibits certain activities such as the construction of buildings and any other activities within the right-of-way that could interfere with the transmission line or create a hazardous situation.

Because of the need to maintain adequate clearance between tall vegetation and transmission line conductors, as well as to provide access for construction equipment, most trees and shrubs would be initially removed from the entire width of the right-of-way.

Equipment used during this right-of-way clearing would include chain saws, skidders, bulldozers, tractors, and/or low ground-pressure feller-bunchers. Marketable timber would be salvaged where feasible; otherwise, woody debris and other vegetation would be piled and burned, chipped, or taken off site. In some instances, vegetation may be windrowed along the edge of the right-of-way to serve as sediment barriers.

Streamside management zones (SMZs) would be established along intermittent and perennial streams; their width would be based on stream characteristics, slope, soil types, and other factors (see Muncy 1999). Vegetation removal in SMZs and wetlands would be restricted to trees tall enough, or with the potential soon to grow tall enough, to interfere with conductors. Clearing in SMZs would be accomplished using hand-held equipment or remote-handling equipment, such as a feller-buncher, in order to limit ground disturbance. *TVA Right-of-Way Clearing Specifications, Environmental Quality Protection Specifications for Transmission Line Construction, and Transmission Construction Guidelines Near Streams* (Appendices II, III, and IV) would be followed in clearing and construction activities.

Subsequent to clearing and construction, the right-of-way would be restored as much as is possible to its state prior to construction. Pasture areas would be reseeded with suitable grasses. Wooded areas would be restored using native grass and other low-growing species. Erosion controls such as silt fences would remain in place until adequate plant cover is established. Streamside areas would be revegetated as described in Appendices II through IV.

2.3.1.2. Access Roads

Permanent access roads would be needed to allow vehicle access to each structure and other points along the new right-of-way. Twelve access roads were identified along the proposed transmission line. The identified roads are primarily existing roads that include privately built, farm and field roads, some of which may need upgrading. Typically, the access roads are located on the right-of-way wherever possible and designed to avoid severe slope conditions and to minimize stream crossings. The roads are typically about 20 feet wide and surfaced with dirt or gravel. Along the new transmission line, TVA would obtain the necessary rights for these access roads from landowners. The access roads were identified and included in the environmental field review.

Culverts and other drainage devices, fences, and gates would be installed as necessary. Culverts installed in any permanent streams would be removed following construction. However, in wet-weather conveyances (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.

2.3.1.3. Construction Assembly Areas

A construction assembly area (laydown area) would be required for worker assembly, vehicle parking, and material storage. This area would typically be 5 to 10 acres is size, previously cleared, relatively flat, and adjacent to a paved road near the proposed transmission line. The laydown area would be leased for the duration of the construction period. The site would be graveled and fenced so that trailers used during the construction process for material storage and office space could be parked at this location. Following

the completion of construction activities, all trailers, unused materials, and construction debris would be removed from the site. Removal of the fence and restoration would be at the discretion of the landowner.

2.3.1.4. Structures and Conductors

The proposed 161-kV transmission line connection from the interconnection point at the Freeport-Miller 161-kV Transmission Line to the new substation would be built using single-steel-pole structures (Figure 2-1). Structure type and heights would vary according to the terrain and would range between 80 and 110 feet.

Figure 2-1. Single-Pole 161-kV Transmission Structure

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(s) is attached to the top of the structures. This ground wire may contain fiber optic communication cables.

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

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

2.3.1.5. Conductor and Ground Wire Installation

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

2.3.2. Operation and Maintenance

2.3.2.1. Inspection

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

2.3.2.2. Vegetation Management

Management of vegetation along the right-of-way would be necessary to ensure access to structures and to maintain an adequate distance between transmission line conductors and vegetation. The transmission line would be designed to meet a 25-foot minimum clearance for a 161-kV transmission line.

Management of vegetation along the right-of-way would consist of two different activities: namely, the felling of danger trees adjacent to the cleared right-of-way, as described in Section 2.4.1.1, and the control of vegetation within the cleared right-of-way.

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

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

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

2.4. Project and Siting Alternatives

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

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

2.4.1. Definition of Study Area

The first task in defining the study area was to identify a power source that could supply the identified objective. The most practical power source was the Freeport-Miller 161-kV Transmission Line, which is located approximately 4 miles south of the planned West Pleasant Hill 161-kV Substation. Based on this information, the study area was defined as an area in DeSoto County that is roughly rectangular, bounded by a line about 1,000 feet north and parallel to Church Road on the north, the city limits of Southhaven on the west, Craft Road on the east, and the Freeport-Miller 161-kV Transmission Line on the south (Figure 1-2).

A geographic information system (GIS) based routing map and color orthophotography were developed. The GIS data generated a “constraint” model that served to guide the siting process by identifying obvious routing conflicts or sensitive areas including, but not limited to, houses, rivers, historical sites, and wetlands.

Nearly all existing urban development in the proposed study area is residential, and except along the older streets in Pleasant Hill, the homes are all within subdivisions. Very few homes front onto the main roads. Growth has been very rapid in DeSoto County, averaging 2 to 4 percent per year, which is higher than the national average.

Utilities of all types in the proposed project area have been hard-pressed to keep up with the demands for service. Major trunk sewer lines are being extended along the major streams in the study area. Camp Creek, west of Craft Road, is the major drainage channel for the area, with Lick Creek and Nolehoe Creek feeding into it north of Church Road. Bean Patch Creek drains the western part of the study area, and flows into Camp Creek south of the study area. Ultimately, all the drainage goes into the Coldwater River. Camp Creek and Bean Patch Creek both have broad floodplain areas that are primarily used for farm fields. Camp Creek has been channelized to increase flow rates, but heavy rains have

caused unexpected flooding of some homes in the area. Stream confluences and parts of the original stream courses remain as fragmented wetlands.

Most undeveloped upland areas, as well as some lowlands, are considered prime for residential and neighborhood support development. Most of the existing residential development is on half-acre, or larger, lots, and is of fairly recent vintage and well maintained. Planned Unit Development (PUD) is a common zoning tool in the area that allows a mix of development types within large land parcels that are prevalent in the area. Most of the remaining undeveloped land is held by members of just a few local families, and they are also responsible for much of the recent development in the area. The core of the Pleasant Hill Community is much older and has older buildings that have been renovated or rehabilitated for their current uses as various offices and businesses.

Major roads in DeSoto County are built mostly along section lines. Some roads are discontinuous, with the same road names appearing in different parts of the county. In many cases, though, the long-term plans are to connect the roads as needed. In fact, Starr Landing Road is proposed to connect along the Freeport-Miller 161-kV Transmission Line in the future; Malone Road is proposed north/south along the Southaven eastern city limit; and Craft Road is planned for a connection northward and for five-lane expansion southward. Church Road, a major east/west road in the study area, was only recently extended through the study area. College Road has a significant jog in the Pleasant Hill Community, but is an older east/west roadway.

Sandidge Road is an exception. It crosses Church Road and runs past the proposed West Pleasant Hill 161-kV Substation site and county rubbish landfill entrance, then turns east (where it is also known as Davidson Road) to provide access to a major sand and gravel operation. The road beyond the landfill entrance has been relocated in the past and is now gated and closed to the public. It continues generally eastward across Nolehoe and Camp Creeks to Olive Branch. Northcentral MS EPA has existing transmission lines that lead to the proposed substation site and formerly served its 46-kV substation located at this site. These transmission lines are located on a 75-foot easement along this unpaved road.

Except within subdivisions, most property is rectangular, as is common in sectionalized land. The terrain is rolling, and the tree cover on most areas is unmanaged deciduous forest. The flat floodplain fields of Bean Patch Creek and Camp Creek are farmed for wheat, corn, and soybeans. The property owner of the Bean Patch Creek fields credibly reports having a long-term plan to develop a golf course on the property.

The reported 100-year floodplain of Camp Creek extends to Craft Road. The owners along Camp Creek anticipate future building development, particularly on the more elevated east side of Craft Road. North of College Road, Craft Road is flanked on the west by an 8–inch, high-pressure natural gas line and on the east by a trunk sewer line recently installed by the USACE. The sewer construction jogs west along College Road to parallel the west side of Camp Creek Canal.

2.4.2. Collect Data

Geographic data, such as topography, land use, transportation, environmental features, cultural resources, near-term future development, and land conservation information were collected for the entire study area. Analysis of the data was aided by using GIS. This system allowed the multitude of factors of the study area to be examined simultaneously to

develop and evaluate numerous options and scenarios to determine the route or routes that would best meet project needs, including avoiding or reducing potential environmental impacts.

Maps were created to show regional opportunities and constraints clearly. Sources included 1 inch = 500 feet aerial photography, county tax maps/property boundaries, U.S. Geological Survey digital line graphs, digital elevation models, National Wetlands Inventory, and cultural resource data, among others. Aerial photography was interpreted to obtain land use and land cover data, such as forests, agriculture, wetlands, houses, barns, commercial and industrial buildings, churches, and cemeteries. Data were analyzed both manually and with GIS. Manual calculations from aerial photographs, tax maps, and other sources included the number of road crossings, stream crossings, and property parcels.

2.4.3. Develop General Route Options and Potential Transmission Line Routes

Three sites were identified in the Freeport-Miller 161-kV Transmission Line as possible tap locations. TVA would install a line switch on each side of the tap and another switch at the beginning of the tap line to provide the required operational flexibility. These switches are manually operated, and require all-weather access for operating personnel. Locations at Craft Road, Pleasant Hill Road, and just behind the fire hall at Bridgetown Subdivision provide the basic requirements of accessibility and a reasonable level of flood risk. The Craft Road location would require switches just within the margins of the identified 100-year floodplain.

Transmission line alternative routes were projected from each tap site to the proposed substation (see Figure 1-2):

- Route 1 (Segments 1, 5, 7, and 9) – Beginning from the Bridgetown tap, the westernmost route would be due north along the section line, crossing College Road, passing east of Shiloh Baptist Church and cemetery, and running along the north side of Church Road to West Sandidge Road, where it would parallel existing distribution lines to the planned substation. The transmission line route length would be 3.6 miles.

- Route 2 (Segments 1, 3, 6, 7, and 9) – A variant of Route 1, this alternative would use the same Bridgetown tap point and would follow the north side of College Road for a short distance before crossing the Bean Patch Creek floodplain, paralleling a tributary stream to the property line, then north to cross and parallel Church Road before reaching the planned substation. The tributary stream buffer would be retained and would provide a screen for the transmission line from the high-end residential subdivision, Spring Place Estates, currently under construction to the east of Segment 6. The transmission line route length would be 3.4 miles.

- Route 3 (Segments 2, 4, 3, 5, 7, and 9) – Three potential route options would be possible from the Pleasant Hill Road tap point in the Freeport-Miller 161-kV Transmission Line. Route 3 would run through the Bean Patch Creek floodplain in Segment 4. The transmission line route length would be 4.4 miles.

- Route 4 (Segments 2, 4, 6, 7, and 9) – This Pleasant Hill Road tap point route alternative would also go through the Bean Patch Creek floodplain, then using

Segment 6, it would skirt the Spring Place Estates development. The transmission line route length would be 3.7 miles.

- Route 5 (Segments 2, 8, and 9) – This Pleasant Hill Road tap point route alternative would follow a section line north, mostly along property lines, to cross Pleasant Hill Road and continue north along the east side, to then cross Church Road and continue to the planned substation. This route alternative (2.8 miles) is the shortest route alternative studied; however, it would border numerous existing homes, especially in the Summers Place Subdivision, and divide a major family farm.

- Route 6 (Segment 10) - The Craft Road tap point route alternative is the easternmost of the alternatives considered. It would extend along the west side of Craft Road in the floodplain fields, cross Church Road, and continue north to cross Lick Creek and Camp Creek, turning west at the closed Sandidge Road (also known as Davidson Road). It would then parallel the existing transmission lines for about 0.6 mile and before going around the south side of the DeSoto County rubbish landfill to reach the planned substation. The transmission line route length would be 4.2 miles.

2.4.4. Establish and Apply 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, property, and right-of-way acquisition cost being the most important elements. Information gathered and comments made at the public meeting and subsequent comment period were taken into account, while refining criteria to be specific to the study area.

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. For each category described, a higher score means a bigger constraint. For example, a greater number of streams crossed or impacted, a longer transmission line route length, or a greater number of historic resources affected would give an alternative transmission line route a worse score.

- *Engineering Criteria*: Total length of the transmission route, length of new right-of-way and rebuilt right-of-way, 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 acres, open water, sensitive stream (those supporting endangered or threatened species), perennial and intermittent streams, wetlands, rare species habitat, natural area, and wildlife management areas

- *Land Use Criteria*: The number of fragmented property parcels, schools, houses, commercial or industrial buildings, barns, and parkland crossings

- *Cultural Criteria*: Archaeological and historic sites, churches, and cemeteries

Scores for each of the alternatives were calculated by adding individual criterion values for each potential transmission line route. The resulting sum values were evaluated using standard statistical techniques and were assigned a ranking for each route in each subcategory (engineering, environmental, land use, and cultural).

A weighted score was produced for each transmission line route in each subcategory. This made it possible to understand which routes would have the lowest and highest impacts on engineering, environmental, land use, and cultural resources. Finally, to determine total impacts, the scores from each category were combined for an overall score.

2.4.5. Route Evaluation

Following the public open house and subsequent comment period, all of the identified route alternatives were discovered to have conflicts with PUDs or existing or planned infrastructure, including roads, sewers, and natural gas lines. Rapid development of Pleasant Hill area is converting land located above the 100-year flood level to residential PUD. The remaining land in the area is being used to accommodate supporting infrastructure.

Routes 1, 2, 3, 4, and 5 were considered to have significant conflicts with ongoing or planned development along Segments 5 and 6 (Figure 1-2). Route 6 had only one conflict. This involved an existing high-pressure gas line, which runs along Craft Road north of College Road. A relocation of Route 6 to the west, away from the road and the gas line resulted in this being the only proposed route among the alternatives that would avoid significant land use conflicts.

2.5. Identification of the Preferred Alternative

Alternative 2 – Construct the West Pleasant Hill 161-kV Transmission Line (Action) is TVA's preferred alternative. TVA would construct approximately 4.2 miles of 161-kV transmission line along Alternative Route 6 (Figure 1-1). The proposed project would affect approximately 50 acres of new right-of-way.

CHAPTER 3

3. AFFECTED ENVIRONMENT

3.1. Introduction

Chapter 3: Affected Environment succinctly describes the existing condition of the environmental resources and factors of the DeSoto County, Mississippi, project area that would affect or that would be affected by implementing either Alternative 1 or Alternative 2. This information establishes the baseline conditions against which the decision maker and the public can compare the potential effects of the two alternatives under consideration.

3.2. Terrestrial Ecology

3.2.1. Terrestrial Plants

The proposed project occurs in the Mississippi Valley Loess Plains Province (Chapman et al. 2004). The province is composed of irregular plains, gently rolling hills, and bluffs near the Mississippi River. Within this province is the Loess Plains ecoregion, an area of gently rolling to irregular plains with a thick loess layer that thins eastward.

Botanically, oak-hickory, oak-hickory-pine, and some mixed mesophytic forests were once the dominant natural vegetation. The Loess Plains ecoregion was once a highly productive agriculture area. Many of these areas are now comprised of cropland, including pine plantations, or have reverted to a mixed forest landscape.

Field inspections in January 2006 of the areas associated with the proposed transmission line reveal that vegetation consists of a mixture of common native species and exotic invasives. The proposed transmission line would run adjacent to roadways, cross agricultural fields, and cut through fragmented forested areas. Existing plant communities observed within the proposed project area include herbaceous vegetation, deciduous forests, and deciduous woodlands.

Herbaceous vegetation accounts for approximately 77 percent of the proposed transmission line right-of-way. Of this, 45 percent is composed of managed fields, old fields, and roadsides comprised of fescue, Johnson grass, broomsedge, lespedeza, ragweed, henbit, curly dock, pokeweed, goldenrod, blackberry, and Japanese honeysuckle. Row crops comprised of either soybeans or corn account for an additional 30 percent and a kudzu patch accounts for 2 percent.

Deciduous forests account for 13 percent of the proposed project area and are composed of a combination of bottomland species and dry woodland species. The dominant canopy species include sycamore, box elder, river birch, red maple, southern red oak, cow oak, willow oak, cherrybark oak, post oak, Shumard's oak, sweetgum, cottonwood, honey locust, pignut hickory, and green ash. Understory species include American hornbeam, winged elm, black cherry, paw paw, persimmon, red buckeye, winged sumac, elderberry, privet, blackberry, farkleberry, and eastern red cedar. Vine and herbaceous species include cat briar, poison ivy, grape vine, crossvine, saw briar, cutleaf grape fern, and Japanese honeysuckle.

Deciduous woodlands occupy 10 percent of the project area and occur within palustrine areas along streams and associated wetlands. Palustrine areas would include any inland wetland which lacks flowing water including marshes and swamps as well as bogs, fens, and floodplains. The dominant species include black willow, cottonwood, American hornbeam, winged sumac, box elder, sycamore, cherrybark oak, pin oak, willow oak, river birch, giant cane, privet, Christmas fern, cutleaf grape fern, and Japanese honeysuckle.

The plant communities observed along the proposed project route are common and representative of the region. No uncommon plant communities were observed on the proposed project route.

Along the proposed transmission line right-of-way, a small patch of kudzu occurs in an open area along the edge of a row crop field. Several additional invasive species were observed within the proposed transmission line corridor including Johnson grass, Chinese privet, Japanese honeysuckle, and lespedeza. All of these species have the potential to impact native plant communities adversely because of their ability to spread rapidly and displace native vegetation. Approximately 77 percent of the proposed project would occur on land in which the native vegetation has previously been altered as a result of land use history (e.g., roadsides, row crops, and pasture).

3.2.2. Terrestrial Animals

The landscape in the project area is highly fragmented including a patchwork of residential, agriculture, old field, and forested habitats. Residential areas and maintained agricultural fields provide limited wildlife habitat. Old fields containing shrub-scrub habitat make up less than 10 percent of the proposed transmission line right-of-way. Birds found in this habitat include Carolina wren, white-eyed vireo, northern cardinal, and field and song sparrows. Mammals found in these habitats include white-tailed deer, least shrew, and hispid cotton rat.

Forested habitat makes up approximately 23 percent of the proposed transmission line right-of-way. Birds found in these habitats include hairy and downy woodpeckers, Carolina chickadees, tufted titmice, American robins, yellow-throated warblers. All forested stands in the project area are highly fragmented and have limited value to forest interior species.

3.3. Threatened and Endangered Species

The Mississippi and TVA Natural Heritage databases indicated that no federally or state-listed plant species are known from DeSoto County, Mississippi. Additionally, field surveys of the proposed project area conducted in January 2006 found no federally or state-listed plant species present on lands that would be affected by the proposed activities.

One federally listed and three state-listed terrestrial animal species are known from DeSoto County, Mississippi (Table 3-1). No federally or state listed terrestrial animal species were observed during field investigations in 2006.

Table 3-1. Federally and State-Listed Terrestrial Animal Species Reported From DeSoto County, Mississippi

Common name	Scientific name	Status[a]	
		Federal	State
Birds			
Cliff swallow	*Petrochelidon pyrrhonota*	-	NOST (S3)
Interior least tern	*Sterna antillarum athalassos*	END	END (S3)
Reptiles			
Mississippi map turtle	*Graptemys pseudogeographica kohni*	-	NOST (S4)
Ouachita map turtle	*Graptemys ouachitensis*	-	NOST (S4)

[a] Status code: **END =** Endangered; **NOST** - Mississippi Natural Heritage Program does not assign status codes to state-listed species; this designation indicates the species is tracked by the Mississippi Natural Heritage Program due to its rarity in the state; **S3** - rare or uncommon with 21 to 100 occurrences; **S4** - widespread, abundant, and apparently secure in the state, but with cause for long-term concern (more than 101 occurrences)

Cliff swallows nest on cliffs, the mouths of caves, and on bridges and dams. The only potential nesting site along the proposed transmission line route is a bridge on Church Road. No cliff swallow nests were observed in this location.

Interior least terns nest on sandbars in the Mississippi River and on mainland sandy areas up to a mile from the river. Prime habitat has less than 10 percent vegetation cover, the presence of large amounts of driftwood, and little human disturbance (Nicholson 1997). Nesting interior least terns have been found at two sites in DeSoto County, Mississippi, and three sites in the adjacent Crittenden County, Arkansas (Jones 2002). All of these sites are over 20 miles from the proposed project area. Additionally, no interior least tern habitat occurs along the proposed transmission line route.

Mississippi map turtles inhabit large rivers and their backwaters, but also occupy lakes, ponds, sloughs, bayous, oxbows, and occasionally marshes (Ernst et. al 1994). Habitat for this species occurs within Camp Creek.

Ouachita map turtles primarily inhabit rivers, but have also been found in lakes, oxbows, and river-bottom swamps. Sand and silt bottoms are preferred over those of gravel, stone, or mud (Ewert 1979). Habitat for this species occurs within Camp Creek.

No federally listed aquatic animal species are known to occur in stream drainages of the affected project area. Although not known from DeSoto County, two state-listed (S3) species, black buffalo (*Ictiobus niger*) and steelcolor shiner (*Cyprinella whipplei*), are known from the Coldwater River drainage. Habitat for black buffalo is not present in the project area. Previous fish surveys (Ross et al. 2001) have not located the steelcolor shiner within the Camp Creek drainage; however, suitable habitat may occur. No designated critical habitat for any listed species occurs in the project area.

3.4. Wetlands

Wetlands are areas inundated by surface water or groundwater such that vegetation (hydrophytes) adapted to saturated soil conditions are prevalent. Wetland substrates consist predominantly of undrained hydric soil—soils that are saturated with water and usually deprived of oxygen. Wetland examples include palustrine areas (described as lacking flowing water including marshes and swamps as well as bogs, fens, wet meadows, and floodplains) and lacustrine areas (described as lake-associated including freshwater marshes, aquatic beds, as well as lakeshores).

The proposed transmission line project is located in the Upper and Lower Camp Creek subwatersheds (hydrologic unit code: 08030204-299 and 298) of the Coldwater River, which drain into the Yazoo River watershed. Approximately 11 percent of the Yazoo River watershed is comprised of wetland areas that are mapped predominantly as bottomland wetland habitat in the floodplains of river and streams within the watershed (Guedon and Thomas 2004). The 4.2 mile proposed transmission line would cross cropland, channelized streams, and upland and bottomland forest.

Activities in wetlands are regulated under Section 404 of the Clean Water Act, as well as EO 11990. Under Section 404, the USACE established a permit system to regulate activities in Waters of the United States, including wetlands. This requires that authorization under either a Nationwide General Permit or an Individual Permit be obtained to conduct specific activities in wetlands. Additionally, water quality certification issued by the Mississippi Department of Environmental Quality (MDEQ) would also be required under Section 401 (Strand 1997). EO 11990 requires that all federal agencies minimize the destruction, loss, or degradation of wetlands and preserve and enhance the natural and beneficial values of wetlands in carrying out the agency's responsibilities. The federal "no-net-loss" policy for wetlands states an interim goal of no overall net loss of the nation's remaining wetlands and the long-term goal of increasing the quality and quantity of the nation's wetlands resource base (White House Office on Environmental Policy 1993).

Wetland determinations along the proposed transmission line rights-of-way and access roads were conducted according to USACE standards that require documentation of hydrophytic vegetation, hydric soil, and wetland hydrology (Environmental Laboratory 1987; Reed 1997). Broader classification definitions of wetlands, such as the one used by the U.S. Fish and Wildlife Service (USFWS) (Cowardin et al. 1979), and the TVA Environmental Review Procedures definition (TVA 1983), were also considered in this review. Using a TVA-developed modification of the *Ohio Rapid Assessment Method* (Mack 2001) specific to the TVA region (TVARAM), wetlands were categorized by their functions, sensitivity to disturbance, rarity, and irreplaceability. The categorization was used to evaluate impacts and to determine the appropriate levels of mitigation for wetland impacts.

For wetlands crossed more than once by a proposed transmission line route or access road, a separate USACE wetland determination form was completed for each crossing. However, for the entire wetland, a single TVARAM form was completed. The TVARAM is designed to distinguish between three categories of wetlands.

Category 1 wetlands are described as "limited quality waters." They are considered to be a resource that has been degraded, has limited potential for restoration, or is of such low functionality, that lower standards for avoidance, minimization, and mitigation can be applied. Category 2 includes wetlands of moderate quality and also wetlands that are degraded but could be restored. Category 3 generally includes wetlands of very high

quality and wetlands of concern regionally and/or statewide, such as wetlands that provide habitat for threatened or endangered species.

Six wetlands (W1, W2, W3, W4, W5, and W6) were located during a ground survey conducted in January 2006 to identify all jurisdictional wetlands within the proposed right-of-way (Table 3-2).

Table 3-2. Wetlands Located Along the Proposed Project Transmission Line Right-of-Way

Wetland Identification	Wetland Classification[1]	Estimated Wetland Acreage Within Right-of-Way	TVARAM	
			Score	Category
W1	PFO1E	~1.4	39	2
W2	PFO1E	~0.1	39	2
W3	PFO1A	~0.3	49	2
W4	PFO1E/PEM1C	~0.7	57	2
W5	PFO1E	~0.2	33	2
W6	PFO1A/PUBHx	~0.4	46	2
TOTAL ACREAGE		**~3.1**		

~ = Approximate
[1] Classification codes as defined in Cowardin et al. 1979: PFO = Palustrine forested; PEM = Palustrine emergent; PUB = Pond

Wetlands W1 and W2 are parts of one large bottomland forested wetland that is seasonally saturated or flooded and located in the floodplain of Camp Creek Canal and bisected by Church Road. Dominant vegetation in both wetlands include sweet gum, Nuttall's oak, and swamp chestnut oak.

Wetland W3 formed along a terraced seep, perhaps a result of historical grading in the surrounding upland area. Dominant vegetation in this temporarily flooded wetland includes willow oak, sweet gum, and Nuttall's oak.

Wetland W4 is located within a ravine and contains two drainage ways. It is a seasonally saturated or flooded bottomland complex with a peninsula of emergent vegetation. Dominant vegetation includes cherrybark oak, cottonwood, Nuttall's oak, and sweet gum.

Wetland W5 is a seasonally saturated or flooded area located along the southern boundary of the county landfill. Dominant vegetation includes Nuttall's oak, cottonwood, and sweet gum.

Wetland W6 contains an open water zone with an associated forested wetland fringe. This wetland is classified as palustrine, ponded (excavated), forested, permanently flooded wetland. The wetland is located along the southern boundary of the county landfill, and appears to have been partially filled as a result of grading associated with the landfill. Hydric soil indicators are not present, perhaps due to sedimentation resulting from grading within and around the wetland. However, hydrophytic vegetation dominates the regularly inundated and saturated soils. Of the estimated 0.4-acre wetland area, 0.2 acre is forested

wetland and 0.2 acre is open water. Dominant vegetation includes Nuttall's oak, sweetgum, and cottonwood.

Wetlands W1, W2, W3, W4, and W5 are jurisdictional and regulated by the USACE under the Clean Water Act. Although the hydric soil parameter is absent in Wetland W6, this wetland meets the USFWS wetland definition and may be considered jurisdictional by the USACE as well. All of the wetlands identified within the proposed project area function in flood control and storm water retention, erosion control, and toxicant absorption and offer wildlife habitat. All of the affected wetlands scored in Category 2 using the TVARAM, indicating moderate provision of the above listed wetland functions (Table 3-2).

3.5. Aquatic Ecology

The proposed transmission line project is located in the Camp Creek Canal watershed, which drains to the Coldwater River in the Yazoo River watershed of the Mississippi River basin. The streams in this watershed typically display relatively low-gradient, meandering streams with sandy bottoms that are sourced from predominantly agricultural landscapes. Due to channelization, most of the streams in this region no longer display these meandering patterns.

The Yazoo River watershed has a total of 119 native fish species with 48 of these known from within DeSoto County (Ross and Brenneman 1991). Current sampling information for streams within the project area is lacking, but based on historical collections, this area is anticipated to be similar in community composition to surrounding areas. The surrounding land use in the project area is primarily agriculture. Due to periodic and chronic perturbations, fishery communities in agricultural areas tend to be less diverse than those in an undisturbed system.

Field surveys documented a total of 15 watercourses and one pond within the proposed transmission line right-of-way area and the associated access roads. The 15 watercourses consisted of seven perennial streams, three intermittent streams, and five wet-weather conveyances. Only one of the perennial streams that would be crossed by the proposed transmission line has not been previously channelized. This stream contains mostly gravel substrate and has a forested riparian zone with a thick understory. Of the other channelized perennial streams, one has a 15- to 30-foot riparian zone of sparse hardwoods, four have active agricultural fields on both sides of the stream with some having herbaceous vegetative bank cover or small willows within the channel, and the last, located at College Road, has recently undergone sewer line construction and had no vegetation or erosion control measures in place along the banks. Two of the identified intermittent streams drain out of ponds. Both have forested riparian zones, but one also has herbaceous cover while the other is deep incised with active erosion. The third intermittent stream meanders along and within the proposed right-of-way and has a riparian zone of a few sycamore trees thickly covered with kudzu.

Three wet-weather conveyances are channelized, two of which have wooded riparian zones. The third flows into one of the intermittent streams and has the same sycamore and kudzu riparian zone. The remaining two wet-weather conveyances are located in agricultural fields. The pond that would be crossed by the proposed right-of-way is located in an open field between one of the intermittent streams and a wet-weather conveyance.

3.6. Managed Areas

The TVA and Mississippi Natural Heritage database indicated that no managed areas and/or ecologically significant sites are within 3 miles of the proposed project. Additionally, no Nationwide Rivers Inventory streams or Wild and Scenic Rivers are within 3 miles of the project area.

3.7. Recreation

Recreation in the project area is largely informal and dispersed. Primary activities include hunting, off-road vehicle use and wildlife observation and occur primarily on privately owned land. There are no developed recreational facilities in the project area.

3.8. Floodplains

The proposed transmission line would cross the identified floodplain of Camp Creek in DeSoto County, Mississippi.

3.9. Groundwater

Located in the Coastal Plain Physiographic Province, the project area is underlain by the Tertiary units of the Mississippi embayment aquifer system that is divided into nine hydrogeologic units. Four of these aquifer units, the Middle Claiborne, Lower Claiborne-Upper Wilcox, Middle Wilcox, and Lower Wilcox, underlie the proposed project area. Gravity is the principal driving force for groundwater movement within the Mississippi embayment aquifer system (Renken 1998).

A unit of the Middle Claiborne aquifer, locally known as the Sparta Sand, outcrops in the project area and consists of a thick sequence of sand and interbedded clay (MDEQ 2004a). The Sparta Sand is underlain by the Zilpha Clay, a confining unit. However, the Zilpha Clay is very thin or nonexistent in many of the northern Mississippi counties. The Winona Sand and the Tallahatta Formation underlie the Zilpha Clay and the Sparta Sand. Together with the Meridian Sand, the Winona Sand and the Tallahatta Formation, form the Lower Claiborne-Upper Wilcox aquifer. The Middle Wilcox and the Lower Wilcox aquifers underlie the Lower Claiborne-Upper Wilcox aquifer, both consisting of undifferentiated sands of the Wilcox Group.

Throughout Mississippi and in the project area, groundwater is abundant and public and private wells pump water from several aquifers. The primary source for the public water supply for DeSoto County is groundwater (USEPA 2005). Public water systems are supplied from deeper aquifers, while private wells are usually cased in shallow aquifers. Contamination of groundwater occurs when contaminants such as pesticides and fertilizers from agriculture runoff seep into the aquifer. Most public water sources are protected from contamination due to the depth of the wells and the natural protection provided by overlying clay (confining) layers.

3.10. Surface Water

Precipitation in the proposed project area averages about 55 inches per year with the wettest month in March at 5.8 inches and the driest month in August at 3.0 inches. The

average annual air temperature is 62°F, ranging from a monthly average of 40°F in January to 82°F in July.

The proposed project area drains to Camp Creek of the Coldwater River of the Tallahatchie River in the Yazoo River watershed of the Mississippi River basin. Camp Creek is classified by the state (MDEQ 2004b) for fish and wildlife. Camp Creek is on the state 303(d) list as impaired for aquatic life support due to biological impairment.

3.11. Visual Resources

Visual resources are evaluated based on existing landscape character, distances of available views, sensitivity of viewing points, human perceptions of landscape beauty/sense of place (scenic attractiveness), and the degree of visual unity and wholeness of the natural landscape in the course of human alteration (scenic integrity).

The proposed transmission line route would span approximately 4.2 miles in an area of DeSoto County that has experienced significant growth during the last decade. Landscape character within this area has experienced dynamic change. As an area once known for its pastoral dairy and beef cattle farms, it has grown rapidly into a retail and residential area and may now be considered chiefly suburban in character. Existing views in the area are typified by sprawling developments of single family homes, retail centers, and the construction activities associated therewith. Occasionally, and amidst the growth southward from the metropolitan area of Memphis, Tennessee, views open across remaining farm and lowland areas. Along the proposed transmission line route, the existing scenic attractiveness is common and the scenic integrity is low.

The transmission line route, as proposed, begins at a tap point location along the existing Freeport-Miller 161-kV Transmission Line that runs east to west and perpendicular to Craft Road between the Dunn Lane and McElroy Road intersections. From this tap point, the proposed route travels north along Craft Road, an improved two-lane roadway, for slightly less than a mile before reaching and crossing College Road. Within this section, several private residences are visible within the foreground-viewing distance (up to 0.5 mile from the observer). Existing transmission lines and distribution lines are also visible within the foreground-viewing distance. Views into the middleground-viewing distance (0.5 mile to 4.0 miles from the observer) include residential developments set about mature vegetation and up from the Camp Creek lowlands.

As the proposed route crosses College Road and continues north, views remain consistent about the gently sloping topography, and vegetation continues to partially screen views of residential development to the west in the middleground over narrow bands of agricultural fields that line the roadway. The roadway is slightly raised approaching the Church Road intersection and appears as a low causeway through the lowland fields. Upon reaching Church Road, views of residential development increase to the west through mature vegetation and views of agricultural operations continue to the north. Church Road is a heavily traveled east/west roadway with an average daily traffic in excess of 3000 vehicles per day (Mississippi Department of Transportation 2004).

After crossing Church Road, the proposed route travels almost 0.5 mile before assuming a westerly course nearing the planned West Pleasant Hill 161-kV Substation. Within this segment, views open to the north for almost 0.5 mile over the DeSoto County Landfill. Mature vegetation is dense to the south, but views are predominated by the landfill and the

starkly contrasting landscape character. As the proposed route nears Sandidge Road and the partially completed West Pleasant Hill 161-kV Substation, views remain similar as do topography and vegetation surrounding the landfill.

3.12. Cultural Resources

Northern Mississippi has been the location of human occupation for over 12,000 years. The prehistory and history of the area is generally divided into six broad periods: Paleo-Indian (10,000-8000 BC); Archaic (8000-1000 BC); Gulf Formational Period (1100-300 BC); Woodland (300 BC-AD 900); Mississippian (AD 1000-1700); and Historic (AD 1700-present). Prehistoric land use and settlement varies during each period, but generally short- and long-term habitation sites are located on floodplains and alluvial terraces along rivers and tributaries. Specialized campsites tend to be located on older alluvial terraces and in the uplands.

The Historic Period is represented by settlement in the region by Europeans, European Americans, and African Americans and the subsequent removal of Native American tribes. The dominant tribes in the area in this period were the Chickasaw, Choctaw, and the Natchez. It is generally believed that Hernandez de Soto's expedition entered the area and stayed with the Chickasaw in the winter of 1540-41. Later excursions into the area by French, Spanish, and English traders and explorers occurred during the 17th and 18th centuries. Clashes between the native Choctaw and Chickasaw and Europeans continued through the 18th century.

The Mississippi territory was created in 1798 and was admitted into statehood in 1817. DeSoto County was created in 1836 from parts of Monroe and Washington counties. The county was located on rich agricultural land due to its close proximity to the Mississippi and Coldwater Rivers. The county seat, Hernando, served as a trading post for early settlers and soon became a center of commerce. The county remained a center for agricultural production well into the 20th century; however, during the early 1980s, large farms disappeared as subdivisions and commercial development took over.

The Area of Potential Effect (APE) for archaeological resources was identified to be the 4.2-mile transmission line corridor and for historic/architectural resources to be any structures within a 0.5-mile radius surrounding the corridor. Prior to any survey, a records search was conducted, and no previously recorded sites were located in the APE.

Three new archaeological sites (22DS772, Site 2, and Site 3) were identified during the archaeological survey conducted in December 2005 (Thomas 2006). Due to agricultural disturbances, these sites are considered ineligible for listing on the National Register of Historic Places (NRHP).

The historic/architectural survey conducted in September 2005 identified one historic structure approximately 0.4 mile east of the transmission line corridor. This structure did not exhibit any unique architectural features and could not be associated with any event(s) or person(s) of historic significance. Therefore, this structure is considered ineligible for listing on the NRHP.

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CHAPTER 4

4. ENVIRONMENTAL CONSEQUENCES

4.1. Introduction

Chapter 4: Environmental Consequences and Chapter 3: Affected Environment form the detailed scientific and analytic basis for the summary comparisons presented in Chapter 2, Section 2.2: Description of Alternatives.

This chapter presents the detailed predicted effects of implementing Alternative 1 – Do Not Construct the West Pleasant Hill 161-kV Transmission Line (No Action) and Alternative 2 – Construct and Operate the West Pleasant Hill 161-kV Transmission Line (Action).

4.2. Effects of Alternative 1 – Do Not Construct the West Pleasant Hill 161-kV Transmission Line (No Action)

In general, factors outside of TVA's control are expected to continue to influence the landscape of the region. These factors include private and public activities associated with industrial and residential development and associated infrastructure.

As discussed in Section 2.2.1, should TVA not build the proposed 4.2-mile transmission line, Northcentral MS EPA would still need to meet the load demands in the project area. This could lead to impacts that are equal or more severe than those identified for the Action Alternative.

4.3. Effects of Alternative 2 – Construct and Operate the West Pleasant Hill 161-kV Transmission Line (Action)

4.3.1. Terrestrial Ecology

4.3.1.1. Terrestrial Plants

Under the Action Alternative, approximately 13 acres of forest within the proposed project right-of-way would be converted to, and maintained as, early successional habitat. Past land use practices have altered the native vegetation on approximately 77 percent of the proposed project area. No significant changes to the terrestrial plant community are anticipated from the implementation of the proposed project. Therefore, since no uncommon plant communities were encountered along the proposed project route, project-related impacts to the terrestrial plant ecology are expected to be minor and regionally insignificant.

4.3.1.2. Terrestrial Animals

The Action Alternative would convert a limited amount of forested land to early successional habitat. This forested land consists of small, isolated fragmented areas with little to no forest interior. No important or unique habitat would be affected by the proposed actions. The proposed project would not result in adverse impacts to terrestrial animal species.

4.3.2. Threatened and Endangered Species

The proposed transmission line corridor is not expected to result in adverse impacts to any federally or state-listed species.

Habitat required for interior least terns does not exist along the proposed transmission line route, and the closest nesting habitat is over 20 miles from the project site. The Action Alternative would have no direct, indirect, or cumulative effects on interior least terns.

Only one potential nesting site for cliff swallows was identified along the proposed transmission line route. No cliff swallow nests were found at this bridge crossing during field investigations in January 2006. The nearest known cliff swallow nesting colony is 18 miles from the proposed transmission line route. The proposed actions would have no direct, indirect, or cumulative effects on cliff swallows.

Mississippi and Ouachita map turtles may occur in Camp Creek which the proposed transmission line route would cross. Best Management Practices (BMPs) designed to control stream bank erosion would be implemented at Camp Creek and other stream crossings throughout the project. With the use of BMPs, no direct, indirect, or cumulative effects on Mississippi and Ouachita map turtles would occur.

Although steelcolor shiners are not likely present in the Camp Creek drainage, should it occur in the project area streams, the stream protection measures outlined in Section 4.3.4 and BMPs would provide adequate protection for all aquatic life, including this species. Therefore, no direct, indirect, or cumulative effects are anticipated to steelcolor shiners.

4.3.3. Wetlands

Each of the six forested wetlands identified along the proposed right-of-way is part of larger forested wetland complexes that extend outside the proposed right-of-way. Portions of these wetland complexes totaling 2.9 acres would be cleared and converted to scrub-shrub or emergent wetland habitat that would be spanned by the proposed transmission lines. Clearing would be done by nonmechanical means, and/or by the use of a feller-buncher located outside of the wetland. The construction of the proposed transmission line would require one structure to be placed within an identified wetland boundary. Other than the placement of this structure, no additional fill would occur within the affected wetlands. Appropriate BMPs would be implemented during construction in each of the six wetland boundaries to minimize wetland impacts.

Future TVA right-of-way maintenance activities would follow guidelines described in Section 2.3.2.2 and Appendix V to avoid or minimize impacts to wetlands. These guidelines include the avoidance of entry by mechanized equipment during vegetation management when the ground is saturated and aerial application of herbicides on scrub-shrub wetlands, as this practice unnecessarily kills low-growing shrubs, vines, and herbaceous species.

The conversion of the small sections of forested wetland in the proposed project area as a result of the transmission line construction (Table 3-2) would be an insignificant impact to the area, because the level of wetland function currently provided by the larger wetland complex would not be altered. Additionally, no significant cumulative impact would occur to the 11 percent of wetland area currently comprising the Yazoo River basin. With the implementation of the proposed project, however, the USACE Vicksburg Regulatory Office would require that the conversion of 2.9 forested wetlands to scrub-shrub and emergent

habitat be mitigated at the 2:1 ratio. Mitigation credits of 5.8 acres would be purchased from Greenhead Farms LLC Delta Mitigation Bank in Tallahatchie County, Mississippi.

4.3.4. Aquatic Ecology

Aquatic life could potentially be affected by the proposed project either directly by the alteration of habitat conditions within the stream or indirectly due to modification of the riparian zone and storm water runoff resulting from construction and maintenance activities along the transmission line corridor. Potential impacts due to removal of streamside vegetation within the riparian zone include increased erosion and siltation, loss of instream habitat, and increased stream temperatures. Other potential construction and maintenance impacts include alteration of stream banks and stream bottoms by heavy equipment and runoff of herbicides into streams. Siltation has a detrimental effect on many aquatic animals adapted to riverine environments. Turbidity caused by suspended sediment can negatively impact spawning and feeding success of many fish species (Sutherland et. al. 2002).

Watercourses that were identified in the proposed project area as wet-weather conveyances would be protected by standard BMPs as identified in Muncy (1999). These BMPs are designed in part to minimize erosion and subsequent sedimentation in streams.

All perennial and intermittent streams along the proposed transmission line would be protected by Standard Stream Protection (Category A), as defined in Muncy (1999). This category of protection is based on the variety of species and habitats that exist in perennial and intermittent streams and the state and federal requirements to avoid harming these aquatic ecosystems. A 50-foot SMZ width for these streams was determined by the category of protection and the slope of the stream banks as stipulated in Muncy (1999).

With the appropriate stream protection requirements and the use of standard BMPs as outlined in Muncy (1999), all potential direct, indirect, or cumulative impacts to aquatic resources as a result of the construction, operation, and maintenance of the proposed transmission line would be insignificant.

4.3.5. Managed Areas

No managed areas are within 3 miles of the proposed project, therefore, no impacts to managed areas are anticipated as a result of implementation of the proposed action.

4.3.6. Recreation

No developed recreational facilities would be affected by the proposed project. Any impacts to other public recreation resources, facilities, and activities are anticipated to be temporary and insignificant. Cumulative effects of the proposed action are also insignificant.

4.3.7. Floodplains

Portions of the proposed transmission line and tap structure would be located within the Camp Creek 100-year floodplain in DeSoto County, Mississippi. For compliance with EO 11988, an overhead transmission line and related support structures are considered a repetitive action in the 100-year floodplain. Although, the tap structure would be located within the floodplain, the switch would be installed well above the 100-year flood elevation.

A small area around the tap structure would be filled in order to provide a safe operating platform for the switch. The construction of the support structures for the transmission line would not be expected to result in any increase in flood hazard either due to increased flood elevations or to changes in flow-carrying capacity of the streams being crossed. To minimize adverse impacts on natural and beneficial floodplain values, the rights-of-way would be revegetated where natural vegetation is removed and the removal of unique vegetation would be avoided. BMPs would be used during construction activities.

The planned West Pleasant Hill 161-kV Substation would be located outside of the 100-year floodplain.

4.3.8. Groundwater

To avoid impacts on groundwater, BMPs would be used during construction (Muncy 1999). During revegetation and maintenance activities, use of fertilizers and herbicides would be considered with caution before application and applied according to the manufacturers' labels. Herbicides with groundwater contamination warnings would not be used. With these precautions and the use of BMPs, impacts to groundwater from the proposed action would be insignificant.

4.3.9. Surface Water

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

However, TVA routinely includes precautions in the design, construction, and maintenance of its transmission line projects to minimize these potential impacts. Permanent stream crossings would be designed not to impede runoff patterns and the natural movement of aquatic fauna. Temporary stream crossings and other construction and maintenance activities would comply with appropriate state permit requirements and TVA requirements as described in Muncy (1999). Canopies in all SMZs would be left undisturbed unless there were no practicable alternative. Right-of-way maintenance would employ manual and low-impact methods wherever possible. In areas requiring chemical treatment, only USEPA-registered herbicides would be used in accordance with label directions designed in part to restrict applications in the vicinity of receiving waters and to prevent unacceptable aquatic impacts. Proper implementation of these controls is expected to result in only minor temporary impacts to surface waters. No cumulative impacts are anticipated.

4.3.10. Visual Resources

Consequences of the impacts to visual resources are examined based on changes between the existing landscape and the landscape character after alteration, identifying changes in the landscape character based on commonly held perceptions of landscape beauty and the aesthetic sense of place. The impacts to visual resources are described in the same manner as the existing visual resources, from west to east along the proposed route.

Under the Action Alternative, TVA would install a tap point in the existing Freeport-Miller 161-kV Transmission Line and construct approximately 4.2 miles of 161-kV transmission line to the West Pleasant Hill 161-kV Substation. Primary viewer groups would include: residents who live within the foreground-viewing distance, motorists who travel the roadways that cross or come within 0.5 mile of the proposed route, students and visitors to the Lewisburg Elementary School and the new Lewisburg Middle/High School, and visitors to the county landfill located off of Sandidge Road.

As the proposed line route leaves the tap point located off of Craft Road approximately 1.8 miles south of Church Road, residents in the vicinity of Dunn Lane would have foreground views of the proposed transmission line and associated structures in context with the existing Freeport-Miller 161-kV Transmission Line. Motorists traveling Craft Road would have views of the transmission line as it would parallel the roadway north approaching College Road. The number of views would generally be high as Craft Road receives moderate to heavy traffic presently and is planned for expansion in the near future. However, the duration of these available views would be relatively short and in context with existing distribution lines in the vicinity.

Nearing College Road, the number and duration of available views would remain consistent while the proposed route leaves the Craft Road right-of-way and moves along a maintained gas line right-of-way along Camp Creek. Within this segment approaching Church Road, residents living along Cherry Tree Road to the west would have views of the proposed transmission line and associated structures intermittently through existing vegetation that lines Camp Creek. Views of this nature would be limited to those residents living in the vicinity of the Cherry Tree Road and Rolling Hill Road intersection. The views available to these residents would vary based on seasonal changes in the existing vegetation that partially screens views to the east.

At the Church Road crossing, motorists would have brief foreground views of the proposed transmission line between structures. Some residents along Cherry Tree Road would have views of the transmission line to the north as the route crosses Church Road and spans the open agricultural fields before turning sharply to the east and into mature vegetation. Views from this point to the terminus at the West Pleasant Hill 161-kV Substation would generally be confined to those visitors to, and employees of, the DeSoto County Landfill. Existing vegetation along Church Road near the intersection of Sandidge Road prevents views that would otherwise be available to motorists from within the foreground-viewing distance, and there is sparse residential development surrounding the landfill for 0.5 mile. Views of the proposed transmission line would generally not be available from the background-viewing distance (4.0 miles and beyond the observer) due to the moderate topography and the existing vegetation.

The proposed transmission line would span lowland or undeveloped areas in DeSoto County, Mississippi, and lie in close proximity to existing and proposed locations for residential development and heavily traveled secondary roadways. Temporary visual discord associated with the construction of this proposed transmission line project would be probable as residents and motorists would have views of increases in personnel and equipment, as well as material and equipment staging areas. These impacts to the existing landscape character associated with the construction phases of the project would be temporary in nature and would not result in a prolonged adverse impact. The Action Alternative, as proposed, would also result in the incremental addition of the number of contrasting vertical elements in the landscape and 4.2 miles of transmission line. However,

the changes that would be discernable from the viewing positions described in Section 3.3.10 at the conclusion of the construction phases of the project would not contribute to a substantial loss of the existing landscape character and scenic value. Impacts to visual resources associated with the Action Alternative would be insignificant.

4.3.11. Cultural Resources

Three previously unrecorded archaeological sites (22DS772, Site 2, and Site 3) and one previously unrecorded historic structure were identified within the APE of the proposed transmission line. The historic structure did not exhibit any unique architectural features and could not be associated with any event(s) or person(s) of historic significance. These historic properties were recommended ineligible for listing on the NRHP. The Mississippi State Historic Preservation Officer (SHPO) did not respond within 30 days, and in allowing the SHPO an opportunity to provide input, TVA has fulfilled the Section 106 responsibilities. No significant impacts to cultural resources are anticipated.

4.4. Post Construction Impacts

4.4.1. 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 lines discussed in this document 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.

4.4.2. Other Impacts

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

4.5. Irreversible and Irretrievable Commitment of Resources

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

The rights-of-way used for the transmission lines would not be irreversibly committed and could be returned to other uses upon retirement of the line. In the interim, compatible uses of the right-of-way could continue.

Forest products and related wildlife that might have grown on the presently forested portions of the right-of-way would be lost for the life of the project. No locally or regionally significant lost forest or agricultural production would be expected.

4.6. Unavoidable Adverse Effects

After completion of the transmission line:

- Trees would not be permitted to grow within the right-of-way or to a determined height adjacent to the right-of-way that would endanger the transmission line.
- Clearing and construction would result in the disruption of some wildlife, but no permanent habitat changes would occur except in the wooded areas previously described.
- Any burning of cleared material would result in some short-term air pollution.

- Clearing, tree removal, and excavation for pole erection would result in a small amount of localized siltation.

- Transmission line visibility would be minimized through the location; however, there would be some degree of visual effect on the landscape in the project area.

4.7. Relationship Between Local Short-Term Uses of the Environment and Long-Term Productivity

The construction and operation of the proposed transmission line would supply electricity to meet the present and foreseeable expected loads at the new West Pleasant Hill 161-kV Substation. This would be accomplished by a localized shift of a small amount of land to use for electric power transmission. If, during the useful life of the transmission line, it is no longer needed or technology renders it obsolete, it can be removed with relatively little difficulty. The land encumbered by the right-of-way could be returned to its previous use or used for other purposes.

The principal change in short-term use of the right-of-way would be the exclusion of trees and permanent structures. The amount of forest being lost is approximately 13 acres within the right-of-way area, and areas removed from production are dispersed along the length of the transmission line. The right-of-way cannot support building construction for the life of the project, but the social and economic benefits of the project should outweigh this small loss.

4.8. 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:

Protection of Aquatic Resources

- All intermittent and perennial watercourse crossings would be designated as Category A, Standard Stream Protection, as outlined in Muncy (1999), and a 50-foot SMZ would be implemented.

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

Wetland Mitigation

- To minimize impact to wetlands, BMPs would be implemented during construction and maintenance.

- Compensatory mitigation at 2:1 would be implemented for the approximately 2.9 acres of Category 2 forested wetlands that would be converted to scrub-shrub and emergent wetlands. Mitigation credits of 5.8 acres would be purchased from Greenhead Farms LLC Delta Mitigation Bank in Tallahatchie County, Mississippi.

General Best Management Practices for Clearing, Construction, and Maintenance

- TVA practices detailed in Appendices II, III, IV, and V 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.

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CHAPTER 5

5. SUPPORTING INFORMATION

5.1. List of Preparers

Hugh S. Barger
Position: Environmental Engineer - Siting and Environmental Design
Involvement: Purpose of and Need for Action; Alternatives Including Proposed Action

Kelly R. Baxter
Position: Botanist
Involvement: Terrestrial Ecology - Terrestrial Plants; Threatened and Endangered Species - Terrestrial Plants

W. Nannette Brodie
Position: Environmental Specialist, Professional Geologist
Involvement: Groundwater

Britta P. Dimick
Position: Contract Wetlands Biologist
Involvement: Wetlands

Travis H. Henry
Position: Zoologist
Involvement: Terrestrial Ecology - Terrestrial Animals; Threatened and Endangered Species - Animals

John M. Higgins
Position: Water Quality Specialist
Involvement: Surface Water

Marianne M. Jacobs
Position: Archaeologist Technician
Involvement: Cultural Resources

Clint Jones
Position: Biologist – Aquatic Ecologist
Involvement: Aquatic Ecology

Anita E. Masters
Position: Senior NEPA Specialist
Involvement: NEPA Compliance and Document Preparation

W. Allen Miller
Position: Civil Engineer - Siting and Environmental Design
Involvement: Project and Siting Alternatives

Roger A. Milstead
Position: Floodplain Specialist
Involvement: Floodplains

Richard L. Pflueger
Position: Land Use and Recreation Specialist
Involvement: Recreation

Kim Pilarski
Position: Senior Wetlands Biologist
Involvement: Wetlands

Jon C. Riley
Position: Landscape Architect
Involvement: Visual

Jan K. Thomas
Position: Contract Natural Areas Specialist
Involvement: Managed Areas

5.2. List of Agencies and Persons Consulted

Federal Agencies

U.S. Army Corps of Engineers

State Agencies

Mississippi Department of Archives and History
Mississippi Department of Environmental Quality
Mississippi Department of Transportation
Mississippi Natural Heritage Program

5.3. Literature Cited

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APPENDIX I – CORRESPONDENCE

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January 17, 2006

Mr. Sam McGahey
Mississippi Department of Archives and History
Historic Preservation Division
618 E. Pearl Street
Jackson, Mississippi 39201

Dear Mr. McGahey:

TENNESSEE VALLEY AUTHORITY PROPOSED 4.2-MILE FREEPORT-MILLER TAP TO WEST PLEASANT HILL, DESOTO COUNTY, MISSISSIPPI

The Tennessee Valley Authority (TVA) plans to construct and operate a 4.2-mile (6.76-kilometer) transmission tap line (TL) in DeSoto County, Mississippi. The proposed 100-foot (30.5 meter) wide TL corridor would involve construction of new TL between the West Pleasant Hill substation and the Freeport-Miller TL.

TVA Cultural Resources staff identified the archaeological Area of Potential Effects (APE) to be the actual boundaries of the TL corridor (4.2 miles by 100 feet, or approximately 51 acres). The architectural / historical APE was determined to be the TL corridor plus a 0.5 mile (0.8 kilometer) radius along either side of the TL corridor where the TL may lie within view of historic resources.

TRC was contracted by TVA to conduct a cultural resources survey of the APE. Prior to the field survey, TRC conducted archival research to identify all documented historic properties within and near the APE and to identify the types of sites likely to be encountered during the survey. A review of records, maps, and reports at the Mississippi Department of Archives and History (MDAH) in Jackson indicated that several portions of the project corridor have been previously surveyed, as have areas adjacent to or near the proposed TL. No sites have been previously reported within the 100-foot TL corridor. No previously inventoried historic architectural properties listed in, or eligible for listing in the National Register of Historic Places (NRHP) were identified in the TL corridor or the surrounding 0.5-mile architectural APE.

Following the archival research, TRC conducted the cultural resources survey. Please find enclosed the report titled, *Cultural Resources Survey for the Proposed 4.2-mile Freeport-Miller Tap to West Pleasant Hill Project, DeSoto County, Mississippi.*

The TRC archaeological survey for the 4.2 miles of TL corridor was conducted in September and December, 2005. The archaeological survey identified three (3) new archaeological sites (22DS772, Site 2, and Site 3). These sites include three historic artifact scatters, one of which has a prehistoric component. The results of investigations indicate that these archaeological sites are not eligible for listing in the NRHP. No further investigations are recommended for these archaeological sites.

In September 2005, TRC conducted an architectural / historical inventory within the one-half mile APE along either side of the proposed 4.2-mile TL corridor. TRC identified one (1) previously unrecorded property (DS-1) in the architectural APE that is 50 years of age or older or that exhibit exceptional architectural and/or historical significance. It is the opinion of TRC that DS-1 is not eligible for listing in the NRHP because it does not exhibit any unique architectural features nor is DS-1 associated with any event(s) or person(s) of historical significance.

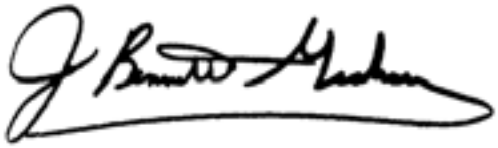
It is TRC's opinion that no cultural resources potentially eligible for the NRHP would be affected by the proposed undertaking, and no further investigations are recommended.

TVA has reviewed the enclosed report and agrees with the recommendations of the authors. Pursuant to 36 CFR Part 800, we are seeking your concurrence with TVA's findings and recommendations regarding the following:

- TVA Cultural Resources staff identified the archaeological APE to be the actual boundaries of the TL corridor (4.2 miles by 100 feet, or approximately 51 acres). The architectural / historical APE was determined to be the TL corridor plus a 0.5 mile radius along either side of the TL corridor where the TL may lie within view of historic resources;
- No previously recorded archaeological sites are located within the archaeological APE;
- No previously recorded historic properties are located within the architectural APE;
- Three new archaeological sites were encountered during the archaeological survey. Archaeological sites 22DS772, Site 2, and Site 3 are recommended not eligible for listing in the NRHP;
- Historic property DS-1 is not eligible for listing in the NRHP because it does not exhibit any unique architectural features nor is DS-1 associated with any event(s) or person(s) of historical significance; and
- That the proposed undertaking would have no effect on historic properties listed in or eligible for listing in the NRHP.

Should you have any questions or comments, please contact Richard Yarnell at 865/632-3463 or wryarnell@tva.gov.

Sincerely,



J. Bennett Graham
Manager and Senior Archaeologist
Cultural Resources

Enclosure

DEPARTMENT OF THE ARMY

VICKSBURG DISTRICT, CORPS OF ENGINEERS
4155 CLAY STREET
VICKSBURG, MISSISSIPPI 39183-3435

REPLY TO
ATTENTION OF:

February 13, 2006

Operations Division
Regulatory

SUBJECT: Permit Requirements for the Construction/Installation of a new transmission line approximately 6 miles in length with 100 feet right-of-way and Replacement of 11.5 miles of 69-kV Line on existing right-of-way in Scott County, Mississippi

Mr. Hugh Barger
Enviornmental Engineer
Tennessee Valley Authority
1101 Market Street
Chattanooga, Tennessee 37402-2801

Dear Mr. Barger:

Based upon the information furnished on January 6, 2006, it appears that Department of the Army permit requirements for the proposed work in sections 2, 11, 14, 23, 26, and 35 T6N-R9E, sections 3-4, 7-8, and 18 T5N-R9E, and sections 13-14, 21-23, 28-31 T5N-R8E will be authorized by Nationwide Permit No. 12, as specified in the January 15, 2002, Federal Register, Issuance of Nationwide Permits; Notice (67 FR 2020-2095) and in the February 13, 2002, Federal Register, Issuance of Nationwide Permits; Notice; Correction (67 FR 6692-6695), provided the activity complies with the Nationwide Permit Special Conditions (enclosure 1), the Nationwide Permit General Conditions (enclosure 2), and the Regional Conditions (enclosure 3). It is your responsibility to read and become familiar with the enclosed conditions in order for you to ensure that the activity authorized herein complies with the Nationwide Permits.

This authorization is contingent upon the successful completion of the mitigation as described in your mitigation plan (enclosure 4).

This verification is valid until the NWP is modified, reissued, or revoked. All of the existing NWPs are scheduled to be modified, reissued, or revoked prior to March 18, 2007. It is incumbent upon you to remain informed of changes to the NWPs. We will issue a public notice when the NWPs are reissued. Furthermore, if you commence or are under contract to commence this activity before the date that the relevant nationwide permit is modified or revoked, you will have twelve (12) months from the

date of the modification or revocation of the NWP to complete the activity under the present terms and condition of this nationwide permit. Upon completion of the activity authorized by this Nationwide Permit, please fill out the enclosed certification of compliance (enclosure 5) and return it to our office.

This authorization was based upon a preliminary determination that there appear to be jurisdictional areas on the property subject to regulation pursuant to Section 404 of the Clean Water Act. An appeals form has been enclosed for your review (enclosure 6).

Thank you for advising us of your plans. If you change your plans for the proposed work or if the proposed work does not comply with the conditions of the Nationwide Permit, please contact Ms. Jennifer Fryar, telephone (601) 631-5853, fax (601) 631-5459, or e-mail address: regulatory@mvk02.usace.army.mil. In any future correspondence concerning this project, please refer to identification No. MVK-2006-63.

Sincerely,

Robert Stewart

for Michael F. McNair, R.F.
Team Leader, Permit Section
Regulatory Branch

Enclosures

March 29, 2006

Mr. Mike McNair
Vicksburg District Office
U. S. Army Corps of Engineers
4155 Clay Street
Vicksburg, MS 39183-3435

Dear Mr. McNair:

The Tennessee Valley Authority (TVA) is planning a new transmission line project in Desoto County, Mississippi. This new line would be approximately 4.2 miles in length built on new right-of way from the existing Freeport-Miller transmission line to a new substation to be built by Northcentral Mississippi Electric Power Administration. This line would be located on new right-of-way 100 feet in width.

TVA staff has performed a field survey of the line for wetlands. They have determined that the new transmission line would cross six wetlands. Five of these wetlands are classified as forested with a total acreage of all types is about 2.55 acres. I have enclosed a map showing the line route and the wetlands which are highlighted in green.
A tabular listing and the data sheets for these wetlands are also enclosed. Clearing will be required for the forested wetlands. No impacts are expected to the remaining 0.55 acres of wetlands.

TVA's normal practices for clearing and line construction in wetlands include:

1. During line clearing, construction, and maintenance, identified wetlands, streams, and drainage-ways would not be modified so as to alter their natural hydrological patterns.

2. Hydric soils would not be disturbed or modified in any way that would alter their hydrological properties.

3. Initial right-of-way clearing within forested wetlands would be accomplished using accepted silvicultural practices for timber or vegetation harvesting within wetlands.

4. Within streamside or riparian zones (e.g., Streamside Management Zone), trees would be cut just above the ground line and stumps would not be uprooted or removed. Stumps would not be uprooted or removed in wetlands.

5. If mechanical means (i.e., mowing) are used to maintain right-of-way areas surrounding or proximal to identified wetlands, such maintenance will be accomplished without the use of heavy (i.e., tracked) equipment.

6. No herbicide would be broadcast applied within 50 feet of a permanent stream or wetland except those labeled for such use.

Clearing in wetlands is normally accomplished using either hand-held or other appropriate clearing equipment, such as a feller-buncher. The clearing method is selected based on site-specific conditions and topography to minimize soil disturbance and impacts to the wetlands. TVA has found that in many cases using a low ground pressure feller-buncher to cut and remove trees results in less ground disturbance than cutting trees with chainsaws and dragging them out of the wetlands.

We are requesting your concurrence that the above mentioned work can be approved under Nationwide Permit 12 guidelines. We look forward to hearing from you as soon as possible. If you have any questions, please call me at (423) 751-3131.

Sincerely,

Hugh S. Barger
Environmental Engineer
Siting and Environmental Design

Enclosures

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.

Revision July 2003

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 1 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

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APPENDIX V – 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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