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FINAL ENVIRONMENTAL ASSESSMENT

**OAK RIDGE NATIONAL LABORATORY PRIMARY 161-KV  
SUBSTATION AND TRANSMISSION LINE CONNECTIONS**  
Anderson and Roane Counties, Tennessee

TENNESSEE VALLEY AUTHORITY

MAY 2005

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**Proposed project:** Oak Ridge National Laboratory Primary 161-kV Substation and Transmission Line Connections  
Anderson and Roane Counties, Tennessee

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**Abstract:** The X-10 Substation, located at Oak Ridge National Laboratory (ORNL), is over 50 years old, and its equipment is obsolete and difficult to repair. In order to remedy power reliability problems and provide additional capacity for anticipated power demands, ORNL has contracted with the Tennessee Valley Authority (TVA) to design and construct a new 161-kilovolt (kV) substation and to install approximately 7 miles of 13-kV distribution lines at ORNL. The proposed substation would connect to TVA's Fort Loudoun-Spallation Neutron Source 161-kV Transmission Line, which is near the proposed substation site. Sewer and water lines to service the new substation would also be installed. The site of the new substation and the adjacent construction laydown area has been cleared by ORNL. With the exception of the 161-kV tap, all utility lines would parallel existing roadways.

Construction of the proposed facilities would result in the loss of some wooded habitat. Seventeen stream crossings are involved; however, potential effects to water quality and aquatic life would be minor and insignificant, as appropriate measures would be taken to prevent erosion and runoff of sediment. Potential effects to terrestrial life would also be minor and insignificant. There would be no effects to any threatened or endangered species listed by the Federal Government. Approximately 0.79 acre of wetlands would be affected. Compensatory wetland mitigation would not be necessary, as the affected acreage would be less than an acre. Thus, potential wetland effects would be insignificant. No historic resources would be affected. Potential effects to visual quality, navigation, natural areas, and recreation resources would be minor and insignificant.

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# TABLE OF CONTENTS

- 1. PURPOSE OF AND NEED FOR ACTION ..... 1**
  - 1.1. The Decision ..... 1
  - 1.2. Other Pertinent Environmental Reviews or Documentation ..... 1
  - 1.3. The Scoping Process ..... 3
  - 1.4. Necessary Federal Permits or Licenses..... 3
- 2. ALTERNATIVES INCLUDING THE PROPOSED ACTION ..... 5**
  - 2.1. Alternatives ..... 5
    - 2.1.1. Alternative A – Do Not Build Additional Transmission Facilities (No Action) ..... 5
    - 2.1.2. Alternative B – Construct Additional Transmission Facilities ..... 5
    - 2.1.3. Alternative C – Repair or Replace Existing Facilities at the Present Location..... 5
  - 2.2. Construction, Operation and Maintenance of the Proposed Power Lines and Substation .. 5
    - 2.2.1. Transmission Line Construction ..... 5
    - 2.2.2. Substation Construction ..... 8
    - 2.2.3. Operation and Maintenance ..... 8
  - 2.3. Project and Siting Alternatives ..... 9
  - 2.4. Comparison of Alternatives..... 9
  - 2.5. The Preferred Alternative ..... 10
- 3. AFFECTED ENVIRONMENT ..... 11**
  - 3.1. Terrestrial Ecology ..... 11
  - 3.2. Aquatic Life ..... 13
  - 3.3. Threatened and Endangered Species ..... 14
    - 3.3.1. Plants ..... 14
    - 3.3.2. Animals ..... 15
  - 3.4. Floodplains ..... 18
  - 3.5. Surface Water ..... 18
  - 3.6. Groundwater ..... 19
  - 3.7. Navigation..... 20
  - 3.8. Natural Areas..... 21
  - 3.9. Visual Quality..... 23
  - 3.10. Wetlands..... 24
  - 3.11. Cultural Resources..... 25
  - 3.12. Recreation ..... 26
- 4. ENVIRONMENTAL CONSEQUENCES ..... 29**
  - 4.1. Terrestrial Ecology ..... 29
    - 4.1.1. Plants ..... 29
    - 4.1.2. Animals ..... 29
  - 4.2. Aquatic Life ..... 30
  - 4.3. Threatened and Endangered Species ..... 31
    - 4.3.1. Plants ..... 31
    - 4.3.2. Animals ..... 31
  - 4.4. Floodplains ..... 32
  - 4.5. Surface Water ..... 33

4.6.	Groundwater .....	33
4.7.	Navigation .....	34
4.8.	Natural Areas .....	34
4.9.	Visual Quality .....	34
4.10.	Wetlands .....	35
4.11.	Cultural Resources .....	35
4.12.	Recreation .....	36
4.13.	Summary of TVA Commitments and Proposed Mitigation Measures .....	36
<b>5.</b>	<b>LIST OF PREPARERS .....</b>	<b>37</b>
5.1.	NEPA Project Management .....	37
5.2.	Other Contributors .....	37
<b>6.</b>	<b>LIST OF AGENCIES CONSULTED .....</b>	<b>39</b>
<b>7.</b>	<b>SUPPORTING INFORMATION.....</b>	<b>41</b>
7.1.	Literature Cited .....	41
7.2.	Glossary of Terms .....	42

## LIST OF APPENDICES

APPENDIX A – TENNESSEE VALLEY AUTHORITY RIGHT-OF-WAY CLEARING SPECIFICATIONS
APPENDIX B – TENNESSEE VALLEY AUTHORITY ENVIRONMENTAL QUALITY PROTECTION SPECIFICATIONS FOR TRANSMISSION LINE CONSTRUCTION
APPENDIX C – TENNESSEE VALLEY AUTHORITY TRANSMISSION CONSTRUCTION GUIDELINES NEAR STREAMS
APPENDIX D – TENNESSEE VALLEY AUTHORITY RIGHT-OF-WAY VEGETATION MANAGEMENT
APPENDIX E – CORRESPONDENCE

## LIST OF TABLES

Table 3-1. Water Body Crossings for the Proposed ORNL Substation and Associated Distribution Line and Utility Line Rights-of-Way Project .....	14
Table 3-2. Listed Plant Species Reported From Within 5 Miles of the Proposed Action .....	15
Table 3-3. Federally Listed and State-Listed Terrestrial Animal Species Reported From Anderson and Roane Counties, Tennessee .....	16
Table 3-4. State and Federally listed Aquatic Animal Species Known from Streams in the Vicinity of ORNL, Anderson and Roane Counties, Tennessee .....	18
Table 3-5. Wetlands in the Vicinity of the Proposed ORNL Substation and Along Distribution Line Rights-of-Way.....	25
Table 3-6. Recreation Facilities on Melton Hill Reservoir .....	26

## LIST OF FIGURES

Figure 1-1. ORNL Primary 161-kV Substation and Associated Lines.....	2
Figure 2-1. Single-Pole 161-kV Transmission Structures .....	6

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# CHAPTER 1

## 1. PURPOSE OF AND NEED FOR ACTION

### 1.1. The Decision

The Oak Ridge National Laboratory (ORNL) was established in 1943 as part of the Manhattan Project. The ORNL facilities are located on the Oak Ridge Reservation (ORR) in Anderson and Roane Counties, Tennessee, near the city of Oak Ridge. ORNL is currently managed by a partnership between the University of Tennessee and Battelle to support the U.S. Department of Energy's (DOE) mission in the Office of Science.

The X-10 Substation, which currently serves ORNL, is over 50 years old. Its equipment is obsolete and is difficult to repair. DOE has determined that a new substation is necessary to service the entire ORNL electrical power demand of 35 megawatts and to provide capacity for future electrical power demand. The reliability of the ORNL electric system needs to be improved by replacing obsolete equipment and by expanding and updating the local distribution system, which operates at a nominal voltage of 13 kilovolts (i.e., 13 kV).

DOE has contracted with the Tennessee Valley Authority (TVA) to design and construct all of the new distribution facilities as well as the 161-kV connection to the TVA transmission system. Thus, TVA's proposed action is to serve ORNL's planned new substation by building a new 161-kV connection from TVA's nearby Fort Loudoun-Spallation Neutron Source 161-kV Transmission Line to a new DOE substation by 2007. In addition, ORNL has requested that TVA design and construct the proposed substation and about 7 miles of 13-kV distribution lines, which would be built on about 4 miles of new right-of-way. As part of the substation construction, water and sewer lines would be run from the substation to connections near the ORNL robotics facility (Building 7600). TVA would also install 13-kV revenue-metering equipment at the substation. Locations of the proposed power lines, substation and laydown area, and the sewer and water lines are shown on Figure 1-1.

TVA must decide whether to build a new 161-kV transmission line to serve the planned ORNL substation that is needed to improve the electrical service to ORNL as well as whether to build the substation and distribution system additions. Other, secondary decisions include the following:

- Determining the appropriate time to undertake the improvements
- Determining the best route for transmission lines
- Determining appropriate mitigation measures to implement to meet TVA standards and minimize resource damage

### 1.2. Other Pertinent Environmental Reviews or Documentation

In 2001, DOE documented potential environmental effects of ORNL facility upgrades in its report number DOE/EA-1362, Finding of No Significant Impact and Final Environmental Assessment for the Oak Ridge National Laboratory Facilities Revitalization Project.

In September 2001, TVA performed an environmental review, i.e., Environmental Decision Record Number 14674, on providing a power delivery point to the Spallation Neutron Source at ORNL.

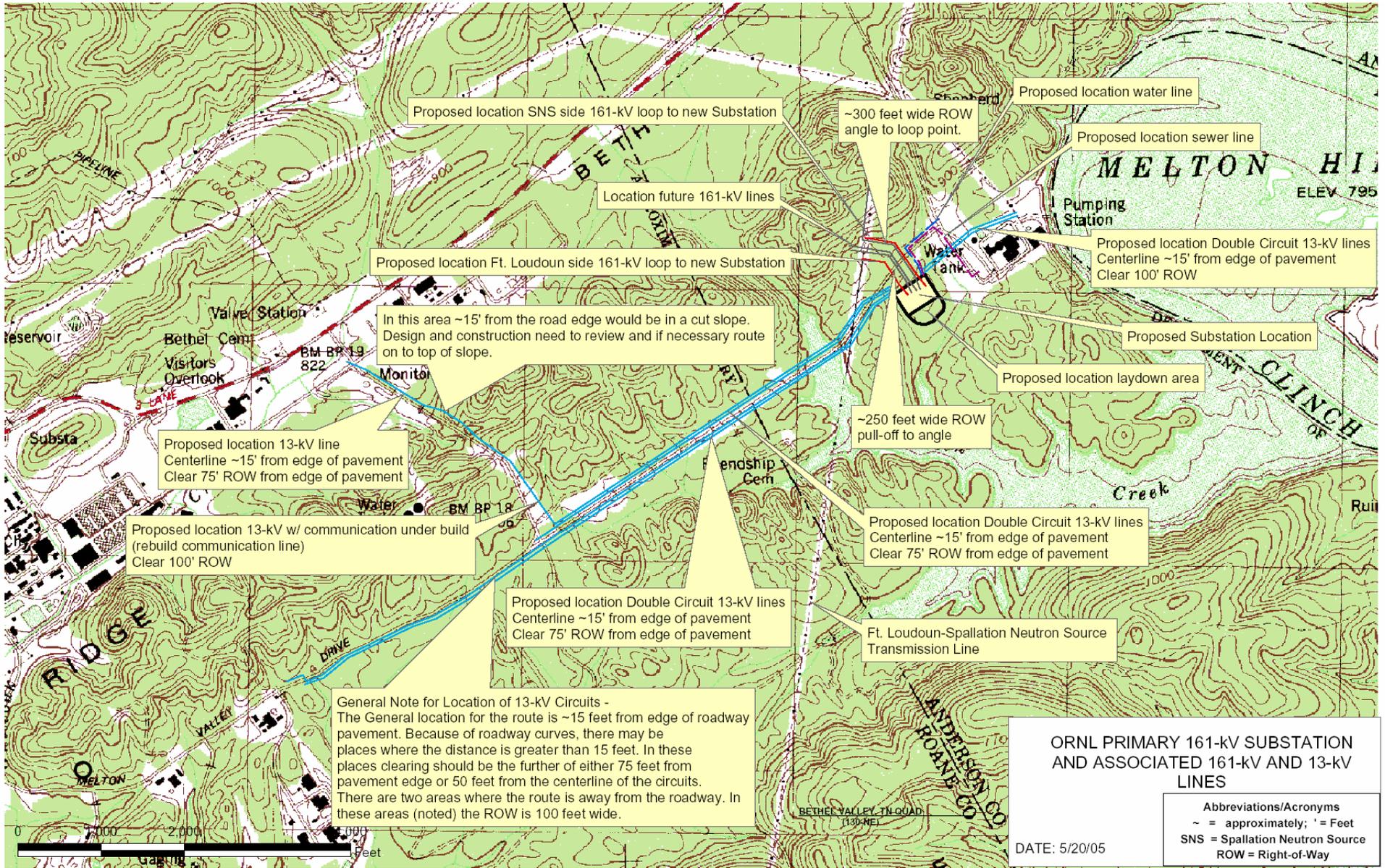


Figure 1-1. ORNL Primary 161-kV Substation and Associated Lines

### **1.3. The Scoping Process**

This project is wholly contained within the ORNL site on lands held by the United States of America and administered by DOE. The proposed action has been the subject of internal reviews by a network of designated environmental specialists. In addition to DOE, the Tennessee Department of Environment and Conservation (TDEC) and the Tennessee Historical Commission have been contacted to date concerning this project by TVA and DOE.

This proposal was reviewed for consistency 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).

### **1.4. Necessary Federal Permits or Licenses**

Permits would be required from the state of Tennessee for construction site storm water discharge for the transmission and distribution 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. This project may require an Aquatic Resource Alteration Permit from the state of Tennessee.

Activities that involve soil disturbance at ORNL require a soil excavation and penetration permit from DOE. TVA or its contractors would secure appropriate permits from DOE prior to any soil excavation or penetration associated with construction activities.

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## CHAPTER 2

### 2. ALTERNATIVES INCLUDING THE PROPOSED ACTION

This chapter contains a description of the alternatives, construction details, operation and maintenance of the proposed facilities, and project alternatives. In addition, a summary of the anticipated environmental consequences of implementing the alternatives is provided.

#### 2.1. Alternatives

A reasonable range of alternatives was developed to meet the need to provide and maintain a reliable source of electric power to ORNL. Besides the No Action (i.e., a “no build”) Alternative, two action alternatives were developed. One of these action alternatives was eliminated for practical reasons. The alternatives are described below.

##### **2.1.1. Alternative A – Do Not Build Additional Transmission Facilities (No Action)**

Under Alternative A, the No Action Alternative, TVA would not construct a new transmission line, substation, or distribution lines. Consequently, ORNL would continue to operate with the current power distribution facilities and with obsolete substation equipment. This situation would limit the ability to meet any future load growth and would increase the risk of outage of ORNL’s electric service.

##### **2.1.2. Alternative B – Construct Additional Transmission Facilities**

Under this alternative, TVA would construct a new 161-kV transmission line from ORNL’s new substation to TVA’s Fort Loudoun-Spallation Neutron Source 161-kV Transmission Line. Also, TVA would construct the new substation and approximately 7 miles of 13-kV distribution lines for ORNL. The new lines would be located on approximately 4 miles of new right-of-way. Implementation of this alternative would update the power supply to ORNL, would improve the reliability of that supply, and would provide the capability to meet ORNL’s future power needs. All of the new facilities would be located on the ORNL site.

##### **2.1.3. Alternative C – Repair or Replace Existing Facilities at the Present Location**

DOE evaluated the option to repair or replace existing facilities. This option was eliminated from further consideration for two main reasons. First, the necessary work would be extensive, and extended outages to the present power supply would be necessary. Second, due to the age of the existing equipment, the availability of repair parts is very limited, and repairs may not be possible or economically justifiable.

### 2.2. Construction, Operation and Maintenance of the Proposed Power Lines and Substation

#### 2.2.1. Transmission Line Construction

##### Structures and Conductors

The proposed 161-kV transmission line loop connection to the existing TVA transmission line (i.e., the Fort Loudoun-Spallation Neutron Source 161-kV Transmission Line) would be

built primarily using single-steel poles (see Figure 2-1). Their height would vary according to the terrain and would average between 80 to 90 feet.



**Figure 2-1. Single-Pole 161-kV Transmission Structures**

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

The 13-kV distribution lines would be built using single-steel poles between 30 to 50 feet tall. The 13-kV lines would use post-type insulators attached directly to the pole.

Poles at angles in the line may require supporting guys. Some structures for larger angles could require two or three poles. Most poles would be imbedded directly 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-gravel mixture might be used. 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 includes trucks, truck-mounted augers and drills, as well as tracked cranes and bulldozers.

#### Right-of-Way Acquisition and Clearing

New right-of-way would be needed for the transmission and distribution lines. The right-of-way for the 161-kV connection would be 300 feet wide from the connection point to the first angle point and then 250 feet wide from that point to the substation (see Figure 1-1). The connection would be approximately 1,000 feet long. The distribution lines would be located along existing roadways, about 15 feet from the pavement edge. The cleared area required

for these lines would vary between 75 and 100 feet in width. These rights-of-way would be secured by mutual agreements between DOE and TVA.

Because of the need to maintain adequate clearance between tall vegetation and the power 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 includes chain saws, skidders, bulldozers, and 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. Vegetation removal in streamside management zones (SMZs) and wetlands would be restricted to trees tall enough, or with the potential soon to grow tall enough, to interfere with conductors. Clearing in SMZs would be accomplished using hand-held equipment or low-impact equipment, such as a feller-buncher, in order to limit ground disturbance. TVA has developed construction guidelines that protect environmental quality during construction. These guidelines, specifically, *Right-of-Way Clearing Specifications*, *Environmental Quality Protection Specifications for Transmission Line Construction*, and *TVA Transmission Construction Guidelines Near Streams*, are included as Appendices A, B, and C.

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

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

#### Access Roads

All of the lines described above can be accessed using existing roadways or directly from the line right-of-way. Construction of new access roads would not be necessary.

#### Construction Assembly Areas

A construction assembly area would be required for worker assembly, vehicle parking, and material storage. The area is located adjacent to the proposed substation site (see Figure 1-1). The area would be graveled and fenced, and trailers used for material storage and office space would be parked on the areas. Following the completion of construction activities, all trailers, unused materials, and construction debris would be removed from the site.

#### Conductor and Ground Wire Installation

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

### **2.2.2. Substation Construction**

#### Substation Site Preparation

The new substation site would be cleared and graded to promote proper site drainage. A storm water permit would be obtained prior to grading. Best Management Practices (BMPs) as described by Muncy (1999) would be used to minimize erosion and sedimentation. A portion of the site would be graded level. However, fill material from external sources would not be needed and excavated material would not be spoiled off site. The substation yard would be stabilized with gravel, and the balance of the site would be revegetated.

An underground water line and sewer line would be installed as shown on Figure 1-1. These lines would be buried along existing road right-of-way. BMPs as described by Muncy (1999) would be used to minimize erosion and sedimentation during the installation of these lines.

#### Substation Structures and Equipment

TVA would design and construct a standard substation capable of reducing the voltage from 161 kV to 13 kV. The substation would use a steel framework and buses (solid electrical connectors). Six circuit breakers would provide protection for the high-voltage side. Other equipment would include isolating switches, grounding, lightning protection, three 161-13-kV transformer banks, protective relays, and metering equipment.

### **2.2.3. Operation and Maintenance**

#### Inspection

Periodic inspections of 161-kV transmission lines are typically performed from the ground and by aerial surveillance using a helicopter. These inspections are conducted to locate damaged conductors, insulators, or structures, and to identify 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 and immediately adjacent to the right-of-way is noted. These observations are then used to plan corrective maintenance or routine vegetation management. The distribution lines would be inspected periodically by ORNL staff. Because the distribution lines would be adjacent to existing roads, routine visual inspections would likely be used.

#### 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 power line conductors and vegetation. National Electric Safety Code standards require a minimum clearance of 24 feet for a 161-kV transmission line.

Management of vegetation along the right-of-way would consist of two different activities, i.e., the felling of “danger trees” adjacent to the cleared right-of-way 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 low-growing plant species while discouraging tall-growing plant species. A vegetation-reclearing plan would be developed for each power 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 from the ground with backpack sprayers or sprayers mounted on a vehicle. Because the distribution lines would be readily accessible from existing roads, mechanical mowing would likely be the preferred method for managing vegetation in the right-of-way.

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. Appendix D contains a list of the herbicides and adjuvants (ingredients added to the herbicide solution to increase its effectiveness) currently used by TVA in right-of-way management. This list may change over time as new herbicides are developed or new information on presently approved herbicides becomes available. Vegetation management activities will be coordinated in advance with ORNL staff.

Other than vegetation management, little other power line maintenance work would normally be required. The transmission line structures and other components typically last several decades. In the event that a structure must be replaced, the structure would normally be lifted out of the ground by crane-like equipment, and the replacement structure would be inserted into the same hole or an immediately adjacent hole.

### **2.3. Project and Siting Alternatives**

DOE selected the proposed substation site based on their consideration of available land on the ORNL site and the proximity of the existing TVA 161-kV transmission line. Because the substation is funded by DOE and is within 2,000 feet of a suitable TVA transmission line, TVA's policies require that a delivery point be provided to DOE's ORNL site. The short distance between the ORNL substation site and the Fort Loudoun-Spallation Neutron Source 161-kV Transmission Line resulted in limited alternative locations for the 161-kV connections.

The 13-kV distribution lines were located along existing roads because this arrangement minimized clearing and facilitated access for line construction and maintenance. This route selection was easily integrated into the existing ORNL 13-kV network. The low traffic levels along these roads were judged to pose minimal hazards to the lines.

### **2.4. Comparison of Alternatives**

Under the No Action Alternative (Alternative A), the proposed upgrades to the ORNL power distribution system would not be made. Likewise, the 161-kV substation and associated utilities would not be built. If this alternative were adopted, there would be no construction-related effects to the environment. However, if the proposed action were not undertaken, ORNL would continue to experience power reliability problems, and repairs to the existing system would be likely. Also, under the No Action Alternative, ORNL would not have the ability to meet anticipated future electric power demands.

If Alternative B (Construct Additional Transmission Facilities) were adopted, TVA would construct a new 161-kV substation and a tap to the 161-kV Fort Loudoun-Spallation Neutron Source Transmission Line. Water and sewer lines to serve the new substation

would be installed. In addition, TVA would construct new 13-kV distribution lines on approximately 4 miles of new right-of-way at ORNL. These upgrades would improve the reliability of ORNL's power system and would accommodate future power demands. Because construction of the new lines and facilities would involve vegetation clearing and ground disturbance (for the buried sewer and water lines), some terrestrial habitat would be disturbed. Less than an acre of wetlands would be affected by construction activities. No threatened or endangered species listed at the Federal level would be affected. Although there would be some potential environmental effects from the proposed actions, these would be minor and insignificant.

Alternative C (Repair or Replace Existing Facilities at the Present Location) was deemed infeasible, because this alternative would require extended power outages and because repair of some aging equipment, if even possible, was not considered economically justifiable.

## **2.5. The Preferred Alternative**

TVA's preferred alternative is Alternative B – Construct Additional Transmission Facilities. Adoption of this alternative would accommodate ORNL's need for additional, reliable electric power and would not cause significant environmental impacts.

## CHAPTER 3

### 3. AFFECTED ENVIRONMENT

ORNL is located in Anderson and Roane Counties on Bethel Valley Road, approximately 5 miles south of the city of Oak Ridge. Access to ORNL is restricted to the general public for security reasons. This chapter serves to provide a description of the physical environment in the vicinity of the proposed action. In particular, existing conditions of the environmental resources that could be affected by the proposed project are described below.

#### 3.1. Terrestrial Ecology

The proposed project lies within the Tennessee section of the Ridge and Valley Physiographic Province as defined by Fenneman (1938). The Ridge and Valley Province lies between the Blue Ridge Mountains and the Cumberland Plateau and is characterized by prominent, northwest-trending ridges and their adjacent valleys. The Tennessee River flows through this province, roughly paralleling the alignment of the valleys. The ridges are occasionally bisected by creeks or rivers flowing into the Tennessee River from adjacent provinces.

Botanically, the portion of the Ridge and Valley Physiographic Province spanned by the proposed project area coincides with the Ridge and Valley of the Oak-Chestnut Forest Region defined by Braun (1950). Forests of this region have a large component of various oak, pine, and hickory species. More specifically, pines dominate the canopy in younger forests, with deciduous species replacing the pines in older stands. The deciduous components of these forests are characterized by red oak, white oak, red maple, sweet gum, sourwood, sassafras, tulip poplar, and dogwood.

The plant communities observed within the proposed project area are common and representative of the region. No uncommon plant communities were observed in the project area. However, several unique terrestrial resources have been reported from Anderson and Roane Counties. These include 13 heronries and 31 caves. No caves are known to occur within 200 feet of the project area, and no heronries occur within 0.5 mile of the project area.

Invasive exotic plant species encountered along the proposed routes include Chinese privet, sericea lespedeza, multiflora rose, Nepalese browntop, and Japanese honeysuckle. All of these species have the potential to impact native plant communities adversely due to their ability to spread rapidly and displace native vegetation. A portion of the proposed project is on land in which the native vegetation has been altered extensively as a result of previous land-use history (e.g., clear-cuts and grass-dominated areas maintained by mowing).

The proposed substation and power line project would affect small areas within the ORNL site. The potentially affected areas consist of young (estimated 20- to 30-year-old) forests, a recently logged forest, early successional thickets, and mowed areas. The following areas are potentially impacted by the proposed work.

#### Substation Site and Laydown Area

The substation site and the laydown area were recently logged by ORNL. Stumps, logging debris, and standing cull trees now occupy this 16-acre site. Evidence of raccoons and

white-tailed deer was observed. Although no other terrestrial animals were observed during the field visit, some common, opportunistic species such as coyote, eastern cottontail, and Carolina wren are expected to use this altered habitat. The site for the substation and laydown area was predominately oak forest before it was logged.

#### 161-kV Transmission Tap Right-of-Way

The predominantly oak forest habitat along the right-of-way for the 161-kV tap to the Fort Loudoun-Spallation Neutron Source Transmission Line has been partially logged. Approximately 50 percent of the area has been cleared; the rest remains forested habitat. Carolina wrens were observed using this site. Although no other terrestrial animals were observed at the time, common, opportunistic species such as coyotes, white-tailed deer, and raccoons probably use this site. The remaining forested area contains mostly hardwood tree species with scattered areas of pine and eastern red cedar. The hardwood forest is dominated by tulip poplar, red maple, and sweet gum, with dogwood and redbud in the understory.

#### 13-kV Distribution Line Rights-of-Way

The proposed 13-kV distribution line routes consist of approximately 3 miles of double-circuit lines and 1 mile of single-circuit line. The proposed route parallels Melton Valley Drive and existing overhead and underground utilities and has been largely modified by previous agricultural activities. Approximately 20 percent of the proposed right-of-way consists of paved areas, mowed vegetation, and maintained right-of-way. Approximately 80 percent of the area is forested. Less than 1 percent is considered as being old-field or thicket habitat types. The mowed areas are dominated by fescue, broom sedge, bluestem, and poverty oat grass. The forested area is dominated by tulip poplar, red maple, and sweet gum, with scattered areas of pine and eastern red cedar. The area that is comprised of old-field and thicket is dominated by blackberry, Chinese lespedeza, and red cedar.

Brown thrasher, sharp-shinned hawk, wild turkey, chipping sparrow, eastern tufted titmouse, Carolina chickadee, and garter snake were observed using these areas. White-tailed deer and field sparrows were observed in this early-successional habitat. The balance of the area contains a forested habitat dominated by hardwood trees, such as red and white oak, yellow poplar, red maple, sourwood, and American beech, and mixed with a few red cedar and Virginia pine. Some of the larger Virginia pines were killed by southern pine beetles during a recent outbreak. White-tailed deer, red-eyed vireo, pine warbler, and worm-eating warbler were observed in this forest.

Ospreys have been reported from Roane County and nearby Knox County. The osprey currently has "No Status" in Tennessee. The osprey feeds primarily on fish and is found near large bodies of water, such as the nearby Melton Hill Reservoir. The closest nesting record for this species occurs on Melton Hill Reservoir about 0.6 mile from the project area. Marginally suitable habitat for the osprey may exist where the 13-kV lines would cross the Bearden Creek embayment. During the field visit, an osprey was observed near Shepherd Cemetery, less than 0.5 mile northeast of the proposed project area.

#### Water and Sewer Line Routes

The proposed water and sewer lines would exit the proposed substation site on the south side of Melton Valley Drive. The lines would be buried under Melton Valley Drive and would follow the northern shoulder of the road a short distance to the intersection of the access road to Building 7600. The water line would connect to an existing water main at that point. The sewer line would follow the access road shoulder in a southeast direction to its junction with an existing sewer line near Building 7600 (see Figure 1-1). The lines would

cross over an existing stream culvert under Melton Valley Drive near the substation site. A few upland chorus frogs were heard calling from the stream. Road shoulders are mowed regularly, and encroaching woody vegetation is trimmed back periodically.

Approximately half of the area in the immediate vicinity is forested, and half is within the area being cleared for the substation site. Common tree species in the vicinity include sweet gum, tulip poplar, red maple, eastern red cedar, and Virginia pine. Dogwoods and redbuds are common in the understory. Common terrestrial animals such as eastern cottontail, northern cardinal, indigo buntings, and Carolina wrens are typical of such habitats.

### **3.2. Aquatic Life**

The Ridge and Valley Province has many low-gradient, generally linear streams with tributaries that join at “right angles.” Streams tend to be highly productive and display a variety of substrate assemblages and aquatic habitats. This region harbors a great diversity of freshwater invertebrate, mussel, and fish species (Etnier and Starnes, 1993).

The project area falls within two watersheds that are divided by Melton Valley Drive. The Melton Branch watershed drains the area west of the divide, and Bearden Creek drains the area east of the divide. The project area has 17 perennial or intermittent streams that occur within the proposed distribution line and utility line rights-of-way (see Table 3-1). Typically, perennial streams can support a permanent assemblage of aquatic biota including invertebrates, reptiles, amphibians, and fish. Intermittent streams flow during only a portion of the year, and their flow usually ceases in dry summer months and during extended dry periods. These streams have a strong bed and bank structure, receive both surface and subsurface flow, and support a limited amount of aquatic biota. Three wet-weather conveyances (WWCs) and one pond occur within the project area (see Table 3-1). WWCs usually only flow for 24 to 48 hours after a rain event, receive negligible subsurface flow, and maintain weak to moderate bed and bank structure. These factors make survival difficult for aquatic biota in these conveyances. The pond has riprap lining the entire shoreline and appears to be man-made or a possible sinkhole that has filled with water. Ponds provide habitat for fishes, macroinvertebrates, aquatic macrophytes, and amphibians.

The project also crosses the Bearden Creek embayment of Melton Hill Reservoir. The aquatic community in Melton Hill Reservoir is similar to those found in other reservoirs along the Tennessee River system. Common fish species include largemouth bass, various sunfish, catfish, and striped bass. Those amphibians, reptiles, and invertebrates common to the area are found in the reservoir. Aquatic life in the Bearden Creek embayment is similar to that found elsewhere in the reservoir.

**Table 3-1. Water Body Crossings for the Proposed ORNL Substation and Associated Distribution Line and Utility Line Rights-of-Way Project**

Stream	Route Location	Stream Classification	Proposed SMZ Classification
Pond	13-kV line substation to lake	pond	BMP
Unnamed tributary to Melton Branch	MVD <sup>1</sup>	permanent	A (50 feet)
Unnamed tributary to Melton Branch	MVD	intermittent	A (50 feet)
Unnamed tributary to Melton Branch	MVD	permanent	A (50 feet)
Erosion ditch 3 feet wide by 3 feet deep	MVD	WWC	BMP
Unnamed tributary to Melton Branch	MVD	permanent	A (50 feet)
Culvert drain under MVD	MVD	WWC	BMP
Unnamed tributary to Melton Branch	MVD	permanent	A (50 feet)
Unnamed tributary to Bearden Creek	MVD	intermittent	A (50 feet)
Unnamed tributary to Bearden Creek	MVD	permanent	A (50 feet)
Unnamed tributary to Bearden Creek	MVD	intermittent	A (50 feet)
Unnamed tributary to Bearden Creek	MVD	permanent	A (50 feet)
Unnamed tributary to Bearden Creek	MVD	permanent	A (50 feet)
Unnamed tributary to Bearden Creek	MVD	intermittent	A (50 feet)
Unnamed tributary to Bearden Creek	MVD	permanent	A (50 feet)
Unnamed tributary to Bearden Creek	MVD	intermittent	A (50 feet)
Bearden Creek embayment	MVD	permanent	A (50 feet)
Unnamed tributary to Bearden Creek	Substation	permanent	A (50 feet)
Unnamed tributary to Bearden Creek	Substation		
Unnamed tributary to Bearden Creek	Substation		
Unnamed tributary to Bearden Creek	Substation		
Unnamed tributary to Bearden Creek	Substation	permanent	A (50 feet)
Unnamed tributary to Bearden Creek	Substation		
Unnamed tributary to Bearden Creek	Sewer Line	WWC	BMP
Unnamed tributary to Melton Branch	MVD Access Rd	permanent	A (65 feet)

<sup>1</sup>MVD is the abbreviation for Melton Valley Drive.

### 3.3. Threatened and Endangered Species

#### 3.3.1. Plants

Review of the TVA Natural Heritage database indicated that no federally listed plant species are known to occur within 5 miles of the proposed project area. However, 23 state-listed plant species are known from within 5 miles of the proposed project. These species are listed in Table 3-2.

Field inspection of the project area conducted in April 2005 revealed that these plant species are not present on lands that could be affected by the proposed activities. No other federally listed or state-listed plant species or suitable habitats for such species were found.

**Table 3-2. Listed Plant Species Reported From Within 5 Miles of the Proposed Action**

Common Name	Scientific Name	State Status
Spreading false-foxglove	<i>Aureolaria patula</i>	Threatened
Heavy-fruited sedge	<i>Carex gravida</i>	Special Concern
Sedge	<i>Carex oxylepis</i> var. <i>pubescens</i>	Special Concern
Appalachian bugbane	<i>Cimicifuga rubifolia</i>	Threatened
Pink lady-slipper	<i>Cypripedium acaule</i>	Endangered, Commercially Exploited
Tall larkspur	<i>Delphinium exaltatum</i>	Endangered
Northern bush-honeysuckle	<i>Diervilla lonicera</i>	Threatened
Waterweed	<i>Elodea nuttallii</i>	Special Concern
Running strawberry-bush	<i>Euonymus obovatus</i>	Special Concern
Witch-alder	<i>Fothergilla major</i>	Threatened
Goldenseal	<i>Hydrastis canadensis</i>	Special Concern, Commercially Exploited
Butternut	<i>Juglans cinerea</i>	Threatened
Short-head rush	<i>Juncus brachycephalus</i>	Special Concern
Canada lily	<i>Lilium canadense</i>	Threatened
Loesel's twayblade	<i>Liparis loeselii</i>	Proposed Threatened
Mountain honeysuckle	<i>Lonicera dioica</i>	Special Concern
American ginseng	<i>Panax quinquefolius</i>	Special Concern, Commercially Exploited
Pale green orchid	<i>Platanthera flava</i> var. <i>herbiola</i>	Threatened
Pursh's wild-petunia	<i>Ruellia purshiana</i>	Special Concern
River bulrush	<i>Scirpus fluviatilis</i>	Special Concern
Shining ladies'-tresses	<i>Spiranthes lucida</i>	Threatened
Northern white cedar	<i>Thuja occidentalis</i>	Special Concern
Three-parted violet	<i>Viola tripartite</i> var. <i>tripartita</i>	Special Concern

### 3.3.2. Animals

Review of the TVA Natural Heritage database indicated that three federally listed and 17 state-listed terrestrial animal species have been reported from Anderson and Roane Counties, Tennessee. These species are listed in Table 3-3.

The eastern hellbender is a large, aquatic salamander. This species typically inhabits cool, well-oxygenated small streams or rivers. This salamander occurs within a 3-mile radius of the project area in the Clinch River. Habitat for this species does not occur in the proposed project area.

The Black Mountain salamander appears to be restricted to the Cumberland Mountains and the northern half of the Cumberland Plateau. This species inhabits streams and springs with steep to moderate gradients and coarse gravel or rocky substrates. Habitat for this species does not occur in the proposed project area.

**Table 3-3. Federally Listed and State-Listed Terrestrial Animal Species Reported From Anderson and Roane Counties, Tennessee**

Common Name	Scientific Name	Federal Status	State Status
<b>Amphibians</b>			
Eastern Hellbender	<i>Cryptobranchus alleganiensis</i>	-	In Need of Management
Black Mountain Salamander	<i>Desmognathus welteri</i>	-	In Need of Management
Tennessee Cave Salamander	<i>Gyrinophilus palleucus</i>	-	Threatened
Four-toed Salamander	<i>Hemidactylium scutatum</i>	-	In Need of Management
<b>Mammals</b>			
Indiana Bat	<i>Myotis sodalis</i>	Endangered	Endangered
Gray Bat	<i>Myotis grisescens</i>	Endangered	Endangered
Allegheny Woodrat	<i>Neotoma magister</i>	-	In Need of Management
Smoky Shrew	<i>Sorex fumeus</i>	-	In Need of Management
Southeastern Shrew	<i>Sorex longirostris</i>	-	In Need of Management
<b>Birds</b>			
Sharp-shinned Hawk	<i>Accipiter striatus</i>	-	In Need of Management
Bachman's Sparrow	<i>Aimophila aestivalis</i>	-	Endangered
Cerulean Warbler	<i>Dendroica cerulea</i>	-	In Need of Management
Swainson's Warbler	<i>Limnothlypis swainsonii</i>	-	In Need of Management
Bald Eagle	<i>Haliaeetus leucocephalus</i>	Threatened	In Need of Management
Appalachian Bewick's Wren	<i>Thryomanes bewickii altus</i>	-	Endangered
Common Barn Owl	<i>Tyto alba</i>	-	In Need of Management
<b>Reptiles</b>			
Eastern Slender Glass Lizard	<i>Ophisaurus attenuatus longicaudus</i>	-	In Need of Management

The Tennessee cave salamander is restricted to shallow water systems in caves or sinkholes. No caves were found during this field survey. Of the 13 cave records in Anderson and Roane Counties, 7 occur within a 3-mile radius of the project area; however, none exist within 200 feet of the project area. Suitable habitat does not exist for this species within the project area.

The four-toed salamander occurs around bogs, marshes, or vernal pools, usually within forested habitats. This species is most often associated with sphagnum-dominated, temporary pools. Habitat for this species was not found in the proposed project area.

Indiana bats hibernate in caves during winter months, but utilize mature forests during the summer months. Optimal Indiana bat forest habitat is characterized by a closed canopy of trees, an open mid-story, nearby riparian zones for foraging, and trees with exfoliating bark or cavities for roosting. No caves or forested habitat suitable for Indiana bats exists within the project area. The nearest known historical over-wintering cave is located near Norris Dam, over 20 miles away. However, Indiana bats have not used this cave for hibernating in recent years.

Gray bats occupy caves year round. Large maternity roosts form in caves near large reservoirs and rivers during summer months. However, the bats roost in other caves during winter. Gray bats have been reported from three caves in Anderson and Roane Counties. Potential roost sites do not occur in the project area. However, gray bats likely forage over

the adjacent Melton Hill Reservoir as well as where the 13-kV lines would cross the Bearden Creek embayment.

The Allegheny woodrat is a large rodent that nests in rocky crevices, caves, and bluff faces. Habitat for this species does not occur in the proposed project area.

The southeastern shrew and smoky shrew inhabit a wide variety of habitats ranging from grasslands to forests, and usually prefer moist woodlands near wetlands, bogs, or streams with decaying logs or leaf litter. These species were not observed during the field visit. However, with the exception of the proposed substation site, suitable habitat exists throughout the proposed project area.

The sharp-shinned hawk occurs in mixed pine-hardwoods and is more common during spring and fall migration than during the summer. The species has been reported within a 3-mile radius of the project area. A sharp-shinned hawk was observed along the proposed 13-kV line right-of-way during field visits.

The Bachman's sparrow is native to the southeastern United States and inhabits savannahs with grassy openings and mature trees, usually pines. This species has been reported within a 3-mile radius of the project area; however, habitat for this species does not occur in the proposed project area.

The cerulean warbler is a common summer resident of the moderately moist hardwood forests of the Cumberland Mountains. It occupies mixed-age to mature stands, usually those with an open understory and scattered canopy gaps. Although cerulean warblers have been observed within a 3-mile radius of the project area, habitat for this species does not occur within the proposed project area.

The Swainson's warbler inhabits bottomland forests that have a dense, woody understory. Suitable habitat for this species does not occur in the proposed project area.

Bald eagles feed primarily on fish and are often found near large bodies of water, such as Melton Hill Reservoir. No nests or individuals were found during the field survey, and none have been reported within a 3-mile radius of the project area. Marginally suitable habitat for the bald eagle may exist where the 13-kV lines would cross the Bearden Creek embayment.

The Appalachian Bewick's wren is usually found in thick, woody hedges or brush piles within relatively open land, such as farmyards or young clear-cuts. Suitable habitat for this species does not occur in the proposed project area.

The barn owl feeds primarily in open habitats and nests in hollow trees or abandoned man-made structures. Marginal feeding habitat for this species may exist along the existing rights-of-way of the proposed 13-kV distribution line corridors.

The eastern slender glass lizard occurs in early successional and old-field habitats having loose soil conducive for burrowing. Suitable habitat for this species is not known to occur within the proposed project area.

A search of the TVA Natural Heritage database indicated that several state and federally listed aquatic animal species are known to occur in streams in the Clinch River system in Anderson and Roane Counties in the vicinity of this proposed substation and utility line

connections (see Table 3-4). The majority of these species are reported from the Clinch River.

No listed species are known to occur within the utility line or substation construction footprints. However, populations of Tennessee Dace, deemed in need of management in Tennessee, may be present in tributary streams to the Clinch River in the vicinity of the project. Because the other species that are reported to occur in the area occur only in the main stem of the Clinch River, they are not likely to be present in the small tributary streams that would potentially be affected by this project.

**Table 3-4. State and Federally listed Aquatic Animal Species Known from Streams in the Vicinity of ORNL, Anderson and Roane Counties, Tennessee**

Common Name	Scientific Name	Federal Status	State Status
<b>Fish</b>			
Highfin Carpsucker	<i>Carpionodes velifer</i>	-	In Need of Management
Blue Sucker	<i>Cycleptus elongatus</i>	-	Threatened
Tennessee Dace	<i>Phoxinus tennesseensis</i>	-	In Need of Management
<b>Mussels</b>			
Spectaclecase	<i>Cumberlandia monodonta</i>	Candidate	No Status <sup>1</sup>
Pink mucket	<i>Lampsilis abrupta</i>	Endangered	Endangered
Pyramid pigtoe	<i>Pleurobema rubrum</i>	-	No Status

<sup>1</sup>No official status, but considered sensitive by the state of Tennessee

### 3.4. Floodplains

The proposed double-circuit 13-kV distribution lines would cross the Bearden Creek embayment of Melton Hill Reservoir in Anderson County, Tennessee, along with several minor floodplain areas in Roane County, Tennessee. The 100-year floodplain for the Bearden Creek embayment is defined as the area below elevation 796.2 feet mean sea level. The 500-year or “critical action” floodplain is defined as the area below elevation 796.4. The proposed ORNL Primary 161-kV Substation, underground water and sewer lines, and other transmission lines would not be located within the 100-year floodplain. The Probable Maximum Flood elevation, i.e., the maximum flood level that could be expected to occur, is 814.7 feet mean sea level at Bearden Creek. The elevation of the proposed substation would be above the 820 elevation, i.e., above the Probable Maximum Flood elevation.

### 3.5. Surface Water

Precipitation in the project area averages about 55 inches per year. The wettest month is March, which averages 5.7 inches of precipitation, and the driest month is October, with 3.0 inches. The average annual air temperature is 58 degrees Fahrenheit (°F) and ranges from a monthly average of 37°F in January to 77°F in July. Stream flow varies with rainfall and averages about 20 inches of runoff per year, which is approximately 1.4 cubic feet per second per square mile of drainage area.

The project area drains to the Clinch River at Melton Hill Reservoir via Bearden Creek and to the Clinch River downstream of Melton Hill Dam via Whiteoak Creek and its tributary Melton Branch. Bearden Creek is classified by TDEC for fish and aquatic life, recreation,

irrigation, and livestock watering and wildlife. Whiteoak Creek and Melton Branch are classified for fish and aquatic life, recreation, and irrigation. Downstream of Whiteoak Creek (Clinch River Mile [CRM] 20) the river is classified for domestic and industrial water supply, fish and aquatic life, recreation, irrigation, and livestock watering and wildlife. Upstream of Whiteoak Creek to CRM 39.6, the Clinch River is also classified for navigation.

Whiteoak Creek is on the state 303 (d) list as impaired, which means that it does not fully support its designated uses, due to unknown toxicity from a major industrial point source. The Clinch River arm of Watts Bar Reservoir (extending to Melton Hill Dam) is listed as impaired due to the presence of polychlorinated biphenyls (PCBs), chlordane, and mercury from industrial point source and contaminated sediments. Melton Hill Reservoir is listed as impaired due to the presence of PCBs and chlordane from contaminated sediments.

### **3.6. Groundwater**

The project area is underlain by Ordovician and Cambrian-aged rocks of the Valley and Ridge aquifer. The Valley and Ridge aquifer consists of folded and faulted carbonate, sandstone, and shale, which form a series of narrow, elongated ridges and slightly broader intervening valleys that follow a northeast-to-southwest trend. Soluble carbonate rocks and easily eroded shales underlie the valleys in the province, and more erosion-resistant siltstone, sandstone, and cherty dolomite underlie ridges. The arrangement of the northeast-trending valleys and ridges are the result of a combination of folding, thrust faulting, and erosion. Compressive forces from the southeast have caused these rocks to yield, first by folding and subsequently by repeatedly breaking along a series of thrust faults. The result of the faulting is that geologic formations are repeated several times across the region. Carbonate-rock aquifers in the Chickamauga, the Knox, and the Conasauga Groups are repeated throughout the Valley and Ridge Physiographic Province (Lloyd and Lyke, 1995).

Groundwater in the Valley and Ridge aquifers is primarily stored in and moves through fractures, bedding planes, and solution openings in the rocks. These aquifers are typically present in valleys and rarely present on the ridges. Most of the carbonate-rock aquifers are directly connected to sources of recharge, such as rivers or lakes, and solution activity has enlarged the original openings in the carbonate rocks. In the carbonate rocks, the fractures and bedding planes have been enlarged by dissolution of part of the rocks. Slightly acidic water dissolves some of the calcite and dolomite that compose the principal aquifers. Most of this dissolution takes place along fractures and bedding planes where the largest volumes of acidic groundwater flow (Lloyd and Lyke, 1995).

Groundwater movement in the Valley and Ridge Province is localized and is restricted by the repeating sequence of rock layers created by thrust faulting. Older rocks, primarily the Conasauga Group and the Rome Formation, have been displaced upward over the top of younger rocks (the Chickamauga and the Knox Groups) along thrust fault planes, forming a repeating sequence of permeable and less permeable hydrogeologic units. The repeating sequence, coupled with the stream network, divides the area into a series of adjacent, isolated, shallow groundwater flow systems. The water moves from the ridges where the water levels are high toward lower water levels adjacent to major streams that flow parallel to the long axes of the valleys. Most of the groundwater is discharged directly to local springs or streams (Lloyd and Lyke, 1995).

The carbonate rocks that form the valleys of the Valley and Ridge aquifer are typical of karst systems. The term "karst" refers to carbonate rocks (limestone and dolostone) in

which groundwater flows through solution-enlarged channels and bedding planes within the rock. Karsts are characterized by sinkholes, springs, disappearing streams, and caves. Karst systems are easily contaminated, as underground waters can travel long distances through conduits with no chance for natural filtering processes of soil or bacterial action to diminish the contamination (TDEC, 2002).

An inventory of karst features on the ORR, conducted by ORNL, identified numerous indications of karst development that vary from site to site. Surface evidence of karst development includes sinking streams (swallets) and overflow swallets, karst springs and overflow springs, enterable caves, and numerous sinkholes of varying size. In general terms, karst appears most developed in association with the Knox Group carbonate bedrock. The highest density of sinkholes occurs in the Knox Group. Enterable caves on the reservation are almost exclusively restricted to the Knox Group bedrock. Large springs in the Knox typically occur along the base of the ridges underlain by the Knox. Many appear to have been used for water supply purposes prior to DOE presence. The Clinch River is believed to represent the base level to which all groundwater in carbonate bedrock on the ORR would ultimately discharge, if not to surface water features on the reservation (ORNL, 2002).

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

Sources for public water supply for Anderson and Roane Counties are mainly from surface water. Some groundwater is used to supply small communities and private wells in both counties (TDEC, 2003). Total fresh groundwater withdrawals during 1995 from Anderson County were about 1.35 million gallons per day and 1.91 million gallons per day from Roane County (USGS, 1995).

### **3.7. Navigation**

Melton Hill Reservoir is open to commercial navigation, and vessels can lock through Melton Hill Dam. However, due to the lack of commercial traffic, the U.S. Coast Guard no longer maintains commercial navigation aids on the reservoir. Although vessels can travel upstream as far as Clinton (at CRM 59), commercial traffic on this part of the Clinch River is rare.

The proposed 13-kV distribution lines would cross several small streams. However, only the Bearden Creek embayment is accessible to recreational watercraft. Recreational boaters frequently use the mouth of the Bearden Creek embayment, and the adjacent portion of Melton Hill Reservoir is a popular boating area. Recreational watercraft or fishing boat access is possible to the Melton Valley Drive causeway across Bearden Creek, near the proposed substation site. However, due to heightened security, this part of the embayment will likely be restricted to recreational watercraft in the near future. Required clearance for 13-kV transmission lines is 35 feet above normal pool elevation, or 27 feet above the regulated high-water elevation.

### 3.8. Natural Areas

A review of the TVA Natural Heritage database indicated that the proposed project is within six natural areas (NAs) and within 3 miles of 47 additional NAs. No Nationwide Rivers Inventory streams are in the vicinity.

The ORR consists of 33,749 acres of mostly contiguous, native eastern, deciduous forestlands in Anderson and Roane Counties. It is owned by DOE. Three major DOE facilities, one of which is ORNL, occupy approximately one-third of the ORR. Waste/remediation sites account for approximately 3,500 acres, and the remaining land area is used primarily for environmental research, remediation, education, compliance monitoring, utilities, security, protection of natural and cultural resources, wildlife management, and limited recreation. Over 1,100 vascular plant species and over 315 wildlife species are found on the ORR, and several are listed by the state of Tennessee as threatened or endangered.

The proposed project lies within the boundaries of three areas on the ORR that are designated for environmental research and/or resource management and protection. These areas include the Oak Ridge National Environmental Research Park (ORNERP), the National Environmental Research Park Biosphere Reserve, and the Oak Ridge State Wildlife Management Area (WMA). These are described below.

- The Oak Ridge National Environmental Research Park** was established in 1980 by DOE. Managed by ORNL, the 20,000-acre park is used as an outdoor laboratory for studying present and future environmental consequences from energy-related issues. It provides protected land for the use of education and research in environmental sciences (ORNL, 2002). ORNERP includes many areas designated as NAs, reference areas (RAs), aquatic natural areas (ANAs), and aquatic reference areas (ARAs). Designated NAs are areas that have been established to protect state-listed or federally listed rare species on the ORR. Designated RAs are areas representative of the vegetative communities of the southern Appalachian region or that possess unique biotic features. They are important as sources of baseline information for long-term observations and monitoring and are set aside for the exclusive use of nonmanipulative environmental research for definite or indefinite periods of time. ANAs and ARAs are used for study and reference areas. The Tennessee dace, a fish species deemed in need of management by the state of Tennessee, is found in many of the ANAs. For the purposes of this review, all four designations were considered as NAs.

On the ORNERP, there are 25 NAs, two ANAs, eight RAs, and three ARAs within a 3-mile radius of the proposed work. Of these 38 areas, the proposed work is within one NA and one RA and within 0.5 mile of three additional NAs. These areas are described below.

**RA 29 ORNL Rocky Limestone Forest** is an area on Haw Ridge south of the main ORNL complex. Much of this area is dry, rocky woods dominated by oaks and cedars. It is potential habitat for tall larkspur. The proposed 13-kV lines (southwest end) would be located within this RA.

**NA 26 Melton Valley Lily Area** is in a forested Melton Branch headwater stream bottomland, part of which is a forested wetland. It is habitat for the Canada lily. The proposed 13-kV lines (southwest end) would be located within this NA.

**NA 14 White Cedar Area**, approximately 0.2 mile southeast of the proposed work, is an area with a small, shale cliff that slopes steeply into Melton Hill Reservoir. White cedar,

northern bush honeysuckle, and spreading false-honeysuckle, all state-listed plant species, are found here.

**NA 36 Bearden Creek Water Gap and Wetland** is located approximately 0.3 mile southwest of the proposed work. It includes the narrow gap in Haw Ridge through which Bearden Creek passes along with the upper portion of the Bearden Creek embayment southeast of the gap. A narrow floodplain forested wetland in the gap is flanked by steep slopes. Two state-listed species, Canada lily and tall larkspur, are found here.

**NA 7 Walker Branch Embayment Barren** is located approximately 0.5 mile northeast of the proposed work. This is a large area with a variety of forest types and mowed sections along a pipeline and a power line right-of-way. Tall larkspur, a plant species considered endangered in Tennessee, is found throughout the site. The bald eagle is also found here.

Within a 3-mile radius of the proposed work, there are an additional 21 NAs and seven RAs. There are also two ANAs and three ARAs within 3 miles of the proposed work.

- **Oak Ridge National Environmental Research Park Biosphere Reserve** was designated in 1988 and covers primarily the same land area as the Research Park described above. Biosphere reserves are areas of terrestrial and coastal ecosystems that are internationally recognized within the framework of the United Nations Education, Scientific, and Cultural Organization Man and the Biosphere Program. The reserve is managed by ORNL, which oversees conservation, development, and support functions. It is part of the internationally recognized Southern Appalachian Man and the Biosphere (ORNL, 2002).
- **Oak Ridge State WMA** is an area that covers most of the ORR. The Tennessee Wildlife Resources Agency manages wildlife resources on the ORR in cooperation with ORNL under agreements with DOE to meet various objectives including population control through hunting, trapping, and removal; restoration of wildlife species; and preservation and enhancement of wildlife habitats (ORNL, 2002).

Other managed areas within 3 miles of the proposed work include two parks, a greenway, a refuge, and five TVA Habitat Protection Areas (HPAs). These are described below.

**Clark Center Park** is located approximately 2.2 miles northeast of the proposed work and contains approximately 80 acres along Melton Hill Reservoir in the area between Gallaher Bend and Freels Bend on the ORR. This facility is currently under the jurisdictional control of DOE and provides a recreational area accessible to the public.

**Melton Hill Park**, approximately 2.3 miles northeast of the proposed work, is a 120-acre public park managed by Knox County Parks and Recreation.

**Gallaher Bend Greenway**, located approximately 0.9 mile east of the proposed work, is an experimental public greenway within the ORNERP. Opened in December 1997, it is a linear park or open space established along a natural corridor that provides quiet walkways and bicycle paths.

**Three Bend Scenic and Wildlife Refuge Area** is located within approximately 1.1 miles of the proposed work. It is a 2,920-acre area managed by the Tennessee Wildlife Resources Agency in cooperation with DOE. It is located in the ORR's buffer zone on Solway, Freels,

and Gallaher Bends on the north shore of Melton Hill Lake in Anderson County. The area provides an important habitat for numerous threatened, endangered, and rare animal species. Bald eagles have been seen there. Two state-listed plants, i.e., the Canada lily and tall larkspur, are found here. It contains Clark Center Park.

**Stubbs Bluff TVA HPA** is a 20-acre area with a north-facing forested bluff with limestone outcrops and cliffs. This HPA is located approximately 1.8 miles southeast of the proposed work and provides habitat for ginseng and smooth honeysuckle.

**Pumping Station Outcrops TVA HPA** contains habitat for false foxglove. This HPA is located approximately 2.4 miles northeast of the proposed work on a 6-acre area along a narrow strip of shoreline with low wooded outcrops of limestone.

**Hickory Creek Bluffs TVA HPA** is a 24-acre area of deciduous forest on a steep, rocky, river bluff. It is habitat for Appalachian bugbane and ginseng and is located approximately 2.5 miles southeast of the proposed work.

**Pine Top TVA HPA** is located approximately 2.6 miles south of the proposed work. It consists of a 10-acre young white pine plantation on a ridge top. It features a closed canopy with patches of young hardwoods. It is habitat for pink lady-slipper.

**Hewitt Bluff TVA HPA**, located approximately 2.8 miles northeast of the proposed work, is a 35-acre area with deciduous forest on rocky and, in some areas, cliff-like bluffs. It provides habitat for Appalachian bugbane and ginseng.

### 3.9. Visual Quality

An area's physical, biological, and cultural features define its visual landscape character. Scenic integrity indicates the degree of unity or wholeness of the visual character. Scenic attractiveness is the evaluation of outstanding or unique natural features, scenic variety, seasonal change, and strategic location (TVA, 2003). The more subjective perceptions of aesthetic quality and sense of place are influenced by where and how the landscape is viewed. Views of a landscape are described in terms of what is seen in foreground (within 0.5 mile of the observer), middleground (1 to 4 miles from the observer), and background distances. In the foreground, details of objects are easily distinguished in the landscape. Objects in the middleground may be distinguishable, but their details are weak and they tend to merge into larger patterns. Details and colors of objects in the background are not normally discernible unless they are especially large and stand alone.

The proposed substation site and associated infrastructure would be located approximately 2 miles east of the ORNL main campus (Building 4500 area) along Melton Valley Drive. Access to the area is from Bethel Valley Road. Melton Valley Drive is partially controlled by traffic barriers and is restricted to persons having access from Bethel Valley Road. This section is considered a part of ORNL's exclusion area, and access is limited to roadways and parking areas. Traffic is generally very light except during shift changes.

The substation site was previously wooded but has been logged recently by ORNL. Vegetation ranges from mature pines to native hardwoods. The topography is gently sloping, and the substation site would be visible from Bearden Creek to the south. The existing Fort Loudoun-Spallation Neutron Source Transmission Line can be seen from Bearden Creek as it traverses the waterway. Scenic attractiveness is common. Scenic

integrity is low to moderate, and is mainly a result of the ongoing timber harvest at the substation site.

The proposed double-circuit 13-kV lines would follow right-of-way adjacent to Melton Valley Road for approximately 1.5 miles, traversing mainly low-lying land in the valley between Haw Ridge to the north and Copper Ridge to the south. The proposed line would split on the northwest side of the road and follow an existing local road to the vicinity of White Oak Avenue. Additional minor improvements, including the 161-kV loop, water line, and sewer line, would be constructed near the proposed substation site.

### 3.10. Wetlands

Wetland determinations were performed according to U.S. Army Corps of Engineers (USACE) standards (Environmental Laboratory, 1987), which require documentation of hydrophytic vegetation (Reed, 1997), hydric soils, and wetland hydrology. However, broader definitions of wetlands, such as the wetland definition used by the U.S. Fish and Wildlife Service (Cowardin et al., 1979) were also considered in this review. Wetlands were classified according to the Cowardin system.

TVA has developed a version of the Ohio Rapid Assessment Method (ORAM v.5.0; Mack, 2001) specific to the TVA region. This version, known as TVARAM, is used in guiding wetland mitigation decisions. All of the wetlands identified in the proposed right-of-way were evaluated with the TVARAM, as all would potentially be subject to new disturbance. The following three categories of wetlands are distinguished in TVARAM.

- **Category 1** wetlands are described as “limited quality waters.” They are considered a degraded resource with limited potential for restoration or of such low functionality that lower standards for avoidance, minimization, and mitigation can be applied.
- **Category 2** includes wetlands of moderate quality and wetlands that are degraded but that could be restored. Avoidance and minimization are the preferred mitigation methods for Category 2 wetlands.
- **Category 3** generally includes wetlands of very high quality and wetlands of regional or statewide concern, such as wetlands that provide habitat for threatened or endangered species. All practicable attempts should be made to avoid any disturbance of Category 3 wetlands and their buffer zones.

Seven wetland areas were delineated in the vicinity of the proposed substation site and distribution line right-of-way (see Table 3-5). No wetlands were found in the areas that would be affected by construction of the proposed 161-kV tap or the proposed water and sewer lines that would service the substation. A 0.23-acre forested wetland (W07) is located in a creek bottom adjacent to the substation site, but the wetland would be avoided. All of the delineated wetlands occur in floodplains, riparian zones, and headwater areas associated with tributaries to the Clinch River, including Bearden Creek and Melton Branch. Wetland W01, located near the western end of the project area, is within the Melton Branch watershed. The remaining wetlands (W02 through W07) are in the Bearden Creek watershed.

Each of these wetland areas meets the USACE parameters for jurisdictional wetlands that may be regulated under the Clean Water Act. All wetlands would require a jurisdictional

determination from the USACE and TDEC before TVA could initiate any action in these wetlands.

**Table 3-5. Wetlands in the Vicinity of the Proposed ORNL Substation and Along Distribution Line Rights-of-Way**

ID	Classification <sup>1</sup>	TVARAM Score	TVARAM Category	Location	Affected Wetland Acreage <sup>2</sup>
W01	Forested	42.5	2	13-kV line	0.04
W02	Emergent	44.0	2	13-kV line	0.15
W03	Forested	34.0	2	13-kV line	0.04
W04	Forested	46.5	2	13-kV line	0.03
W05	Forested	45.5	2	13-kV line	0.08
W06	Forested	44.5	2	Substation	0.45
W07	Forested	62.0	3	Substation	0 <sup>3</sup>
<b>Total</b>					<b>0.79</b>

<sup>1</sup>Classifications are according to Cowardin et al. (1979) and take into account any previously cleared right-of-way of existing roads or utility lines.

<sup>2</sup>Acreage of wetlands in the right-of-way was calculated from estimated intercept length multiplied by 100 feet (width of proposed right-of-way), divided by the number of square feet per acre.

<sup>3</sup>Wetland W07 is located adjacent to the substation site, but it would not be affected.

The functions performed by these wetlands include attenuation of flood flows, nutrient cycling, contaminant removal and transformation, sediment retention, wildlife habitat, and maintenance of biological and landscape diversity. The ecological and economic values provided by these functions include sustaining wildlife and fish resources, flood control, water quality improvement and maintenance, preservation of biodiversity, and ecosystem support via nutrient cycling, biomass production, and nutrient export.

### 3.11. Cultural Resources

The archaeological Area of Potential Effect (APE) consists of the 5-acre substation site, the adjacent 3-acre laydown area, and approximately 4 miles of distribution line right-of-way. This right-of-way is from 75 to 300 feet wide, depending on the route segment. The APE for historic structures includes a 0.5-mile area surrounding the proposed improvements, as well as any areas where the proposed project would alter existing topography or vegetation within view of a historic resource. A Phase I survey was performed between March 3 and March 16, 2005, by TRC, a contractor, in accordance with Section 106 of the National Historic Preservation Act (Deter-Wolf and Karpynec, 2005). Shovel testing within the APE revealed that soils throughout the project area have been extensively disturbed by plowing, erosion, and prior road construction. No previously unrecorded archaeological sites were present within the APE.

Prior archaeological investigations on the ORR identified several pre-World War II sites in the vicinity of the project (DuVall and Souza, 1996; Fielder et al., 1977). Four of the sites (602A, 603A, 617A, and 641A) are located along Ramsey Drive near the proposed project site, and they were reexamined during the recent survey. Of these four sites, only one, 602A, is situated within the APE for the proposed 13-kV distribution line. Site 602A, an early twentieth-century house site, was found to lack integrity and was considered ineligible for inclusion in the National Register of Historic Places (NRHP).

A historical/architectural survey of the APE was conducted the week of March 14, 2005. This survey confirmed that no previously unrecorded architectural resources are located within the APE.

New Bethel Church is located approximately 1,000 feet from the project area. The church was listed in the NRHP in 1992 as part of the Oak Ridge Multiple Property Submission. No additional architectural resources are located within the project APE. The Graphite Reactor, which figured prominently in the Manhattan Project, is a National Historic Landmark. However, the Graphite Reactor is not within the APE and would not be affected by the proposed action.

### 3.12. Recreation

Various developed public recreation facilities are available on Melton Hill Reservoir. These facilities are listed below in Table 3-6. The table also lists the major recreation facilities at each site with the exception of Melton Hill Dam Reservation, which also includes 55 campsites. Clark Center Park and Melton Hill Park (see Section 3.8) are approximately 5 river miles (3 miles by air) from the proposed substation. These are the two closest public recreation facilities.

**Table 3-6. Recreation Facilities on Melton Hill Reservoir**

Recreation Area	Clinch River Mile <sup>1</sup>	Picnic Tables	Pavilions	Toilet Buildings	Parking Spaces	Ramps
Melton Hill Dam Reservation	23	31	3	3	184	2
Hickory Creek Park	28.2 L	0	1	0	0	1
Knoxville Stars Soccer Field	28.2 L	0	0	0	0	0
Melton Hill Park	37 L	3	1	0	4	2
Clark Center Park	37.5 R	30	3	1	31	2
Guinn Road Park	41 L	0	1	0	4	1
Melton Hill Marina	43.1 L	3	0	0	0	0
Haw Ridge Park	44.0 R	0	0	0	0	0
Solway Park	44.0 R	5	0	0	30	1
Bull Run Park	46.3 L	0	0	0	15	2
Melton Lake Park (Oak Ridge Marina)	50.1 R	4	1	3	69	3
Gibbs Ferry	53.3 R	4	1	0	5	3
Lost Bottom Park	53.9 L	0	0	0	5	2
Clinton City Park	58.7 R	10	0	1	3	2
Eagle Bend Ramp	62.7 L	0	0	0	8	2
<b>Total:</b>		<b>90</b>	<b>11</b>	<b>8</b>	<b>358</b>	<b>23</b>

<sup>1</sup>The “L” and “R” following the river mile indicate either left or right bank, when facing downstream.

Recreational boating and fishing occur on Melton Hill Reservoir, and the wide portion of the river near the mouth of Bearden Creek embayment is a popular boating area. The Bearden

Creek embayment is shallow but is open to fishing. However, access to the embayment near the proposed substation site may be restricted in the future for security reasons.

Much of the ORR is restricted access to the general public for security reasons. Informal recreation activities occur in the form of hunting in the Oak Ridge WMA. In 2004, a portion of the project area was open to hunting on a limited basis. However, these hunts may be subject to cancellation in the future. No hunting or other recreational use occurs in the immediate vicinity of the project.

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## CHAPTER 4

### 4. ENVIRONMENTAL CONSEQUENCES

A discussion of the potential effects of the proposed action is provided below. The discussion is organized by potentially affected resource in the same order as the previous chapter. Adoption of Alternative A, the No Action Alternative, would not affect these resources, as there would be no immediate change in the physical environment of the area. For similar reasons, long-term, cumulative changes in the local environment are expected to be minor and insignificant under the No Action Alternative. However, taking no action would likely cause continued reliability problems for the ORNL power supply, and future demands for additional power might not be able to be met. Following is a discussion of the potential effects of implementing Alternative B.

#### 4.1. Terrestrial Ecology

##### 4.1.1. Plants

No uncommon plant communities were encountered along the proposed project route. Although some site clearing would be necessary, the extent of the changes in the general plant and community would be minimal. Thus, any project-related impacts to the terrestrial plant ecology of the region are expected to be insignificant as a result of the proposed Action Alternative.

##### 4.1.2. Animals

As stated previously, most of the proposed project area has been altered by previous land-use history. Therefore, any project-related impacts due to the introduction and spread of invasive terrestrial plant species are expected to be insignificant.

All of the important and unique terrestrial resources (caves and heronries) recorded in Anderson and Roane Counties are at adequate distances from the proposed project area, and no adverse impacts to these sensitive resources are expected. All known osprey nests are greater than 0.5 mile from the project area, and no new nests were found during the field visit. Thus, no adverse impacts to this species are expected. Overall, the implementation of the Action Alternative would displace or disrupt wildlife to a minor extent. Thus, potential impacts to terrestrial animals and their habitats would not be significant.

##### Substation Site and Laydown Area

The recent logging of the substation site has greatly altered the habitat of the site. Wildlife species occurring in the vicinity are considered regionally and locally common, and most have been displaced by the removal of tree cover. These displaced animals will most likely reestablish in the adjoining forest habitat that occurs along the south and west borders of the site. Construction of the substation would permanently convert the habitat from forest to an industrial landscape. Overall, no significant direct, indirect, or cumulative impacts to terrestrial animal species are expected from the construction of this substation.

##### 161-kV Transmission Line Tap Right-of-Way

Timber removal from a portion of the proposed right-of-way for the 161-kV tap was performed in conjunction with the logging of the substation site. However, prior to

construction of the tap, the right-of-way would be completely cleared. Conversion of this forest to a maintained open habitat and the subsequent creation of more edge habitat would result in a change of animal species that would use this area. However, no significant impacts to terrestrial animals are expected from the construction and operation of the 161-kV transmission line.

#### 13-kV Distribution Line Rights-of-Way

Construction of the distribution lines would increase the width of the existing power line and road rights-of-way, adding to the open old-field habitat and removing some of the current oak forest habitat. No additional edge habitat would be created because of the parallel configuration of the proposed lines to the existing lines and road. Terrestrial animals using the forest habitat would be displaced to nearby forested areas, but adverse impacts would be minor. Those terrestrial animals using old-field habitat would gain some additional habitat. No significant impacts to terrestrial animals are expected from the construction and operation of these distribution lines.

#### Water and Sewer Lines

Minimal habitat disturbance and conversion are expected to occur from construction of the water and sewer line along their proposed routes. Thus, no significant impacts to terrestrial animals are expected from the construction of the water line or the sewer line.

## **4.2. Aquatic Life**

As stated in Section 2.2.1, BMPs would be used to protect stream crossings during construction and right-of-way maintenance. These BMPs are designed to minimize erosion and subsequent sedimentation in streams. All the crossings of perennial and intermittent streams as well as the Bearden Creek embayment would be afforded Standard Stream (i.e., Category A) Protection. This category of protection calls for establishing a 100-foot-wide (i.e., 50 feet from each stream bank) SMZ. Within this SMZ, vegetation removal and soil disturbance would be kept to a minimum to protect surface water quality. However, because of the steepness of the surrounding slope, an unnamed tributary to Melton Branch would have an SMZ extending 65 feet from each bank.

Additional Standard Stream Protection measures include designing stream crossings to avoid erosion problems and long-term changes in water flow and allowing for the natural movement of fish and other aquatic life. Cutting of trees within the SMZ would be done with hand-held equipment or other mechanical-clearing equipment that causes minimal soil disturbance and damage to low-lying vegetation. Trees to be removed from the SMZ may be cut close to the ground but would not be removed or uprooted.

During power line maintenance activities, trees and other vegetation within the SMZ would be controlled with backpack-applied spot-use herbicide to remove tree seedlings and other regrowth. Maintenance activities along streams would be by mechanical cutting or by selective use of herbicides registered with the USEPA. Application of these chemicals would be in accordance with USEPA label restrictions and TVA BMPs. The sewer and water lines would be buried, and appropriate BMPs would be taken to prevent runoff into nearby waters. Likewise, appropriate BMPs would be applied during the installation of the steel support structures for the power lines and during substation construction to prevent degradation of surface water.

Various BMPs would be applied during construction and maintenance to protect water quality. These measures have been shown to prevent or reduce degradation of water quality effectively. With the implementation of these protective measures, the construction, maintenance, and operation of the proposed project would not result in significant direct, indirect, or cumulative impacts to aquatic life.

### **4.3. Threatened and Endangered Species**

#### **4.3.1. Plants**

A field inspection of the project area was conducted in April 2005. No federally listed or state-listed plant species or suitable habitats for these species were found within the areas that could be affected by the proposed activities. Thus, adoption of the Action Alternative would not affect any threatened or endangered plant species.

#### **4.3.2. Animals**

Implementation of the Action Alternative could temporarily disturb some state-listed terrestrial animal species but would not result in any significant adverse impacts to any protected animal species. Because appropriate precautions would be taken during construction and operation of the proposed facilities to prevent adverse effects to water quality (see Section 4.2), potential effects to sensitive aquatic species in the immediate vicinity of the project would be short term and insignificant. There would be no effects to the two federally listed mussel species (see Table 3-4) that occur in the Clinch River. Potential effects to protected terrestrial species are described by location below.

##### Substation Site and Laydown Area

Suitable habitat does not exist at the proposed substation site for any of the state-listed or federally listed terrestrial animal species occurring in Roane and Anderson Counties, Tennessee. Thus, construction, operation, and maintenance of the proposed 161-kV substation would not affect any threatened or endangered terrestrial animal species.

##### 161-kV Transmission Tap Right-of-Way

Suitable habitat for the smoky shrew and the southeastern shrew may occur within the unlogged portion of the proposed 161-kV transmission line loop project area. Because of the wide range of habitat preferences of these two shrew species and the abundance of suitable habitat nearby, no significant adverse impacts to these two state-listed species are expected. Suitable habitat does not exist at the proposed 161-kV transmission line loop site for any of the other state-listed or federally listed species occurring in Roane and Anderson Counties, Tennessee. Construction and subsequent operation and maintenance of the tap lines between the proposed substation and the Fort Loudoun-Spallation Neutron Source 161-kV Transmission Line would not affect any federally listed as threatened or endangered terrestrial animal species.

##### 13-kV Distribution Line Rights-of-Way

The wooded edges of the forest bordering the existing rights-of-way offer habitat for sharp-shinned hawks during migration. Displacement of this wooded edge away from the existing Melton Valley Drive may benefit this species. The open, grassy areas within the rights-of-way provide foraging and breeding habitat for southeastern and smoky shrews as well as limited foraging habitat for barn owls. An increase in this habitat could be beneficial for both species. Although individuals of all these species may experience disturbance from the

proposed action, the creation of additional right-of-way for the new distribution lines would provide additional suitable habitat within a few years.

Suitable foraging habitat for gray bats exists where the distribution lines would cross the Bearden Creek embayment. Construction of the 13-kV lines would not reduce the value of this possible foraging area for this bat species. Bearden Creek embayment may also provide marginally suitable foraging habitat for bald eagles. The embayment in the proposed project area is quite shallow and is already obstructed by the causeway for Melton Valley Drive. Overhead power lines, i.e., the Fort Loudoun-Spallation Neutron Source 161-kV Transmission Line, cross the embayment near the causeway (see Figure 1-1). The addition of the 13-kV lines would not adversely impact potential foraging habitat for the bald eagle or any of the above-listed species. Suitable habitat for Indiana bats does not exist along the proposed rights-of-way. Right-of-way clearing work would be accomplished during the winter months, when the bats are hibernating in caves. Therefore, there would be effect to Indiana bats. Thus, the installation, operation, and maintenance of the proposed 13-kV distribution lines would not affect federally listed as threatened or endangered terrestrial animal species.

#### Water and Sewer Line Routes

Small areas of suitable habitat for the smoky and southeastern shrews occur within the area where the proposed water line would be installed. Direct mortality and temporary disturbance of individuals could potentially occur during construction of the water line. Because of the wide range of habitat preferences of these species and the abundance of suitable habitat nearby, no adverse impacts are expected for these species. Suitable habitat does not exist at this site for any of the other state-listed or federally listed species occurring in Roane and Anderson Counties, Tennessee. Installation of the proposed water and sewer lines to the substation would not affect any federally listed as threatened or endangered terrestrial animal species.

#### **4.4. Floodplains**

EO 11988 (Floodplain Management) requires Federal agencies to determine if proposed actions will occur in a floodplain and consider alternatives to avoid adverse effects and incompatible development in floodplains. The proposed 13-kV distribution lines would cross several floodplain areas. With respect to EO 11988, an overhead power line and related support structures are considered a repetitive action in the 100-year floodplain. The construction of the support structures for the power line are not expected to result in any increase in flood hazard either as a result of increased flood elevations or changes in flow-carrying capacity of the streams being crossed. To minimize adverse impacts on natural and beneficial floodplain values, the rights-of-way would be revegetated where natural vegetation is removed, and the removal of unique vegetation would be avoided. Appropriate BMPs would be used during construction activities. The TVA subclass review criteria for transmission line location in floodplains would be followed to ensure floodplain impacts would be minimized. Thus, construction, operation, and maintenance of the proposed power lines would not have significant effects on floodplains.

The proposed ORNL Primary 161-kV Substation, underground water line, underground sewer line, and other transmission lines would not be located within the 100-year floodplain, which would comply with EO 11988. Therefore, these proposed facilities would not affect floodplains.

#### **4.5. Surface Water**

Sources of potential effects to surface water are varied. Soil disturbances associated with construction activities can potentially result in adverse water quality impacts. Soil erosion and sedimentation can clog small streams and threaten aquatic life. In addition, the removal of the tree canopy along stream crossings can increase water temperatures and algal growth, and can decrease dissolved oxygen, and cause adverse impacts to aquatic biota. Improper use of herbicides to control vegetation could result in runoff to streams and subsequent aquatic impacts.

TVA routinely includes specific precautions in the design, construction, and maintenance of its transmission line projects to minimize these potential impacts (see Appendices A, B, C, and D). 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 is 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. Because these measures would be in place, potential effects to surface water quality from runoff would be minor and insignificant.

The ORNL site is known to have contained contaminated sites, and there is concern about exposing contaminated soil and its movement off site during ground-disturbing activities. No contamination is known to occur on the substation site, along the water and sewer line routes, or on the right-of-way for the 161-kV connector.

Prior to any soil-disturbing activities, TVA would secure an excavation and penetration permit from DOE (see Section 1.4). In addition, DOE would provide a health physicist to be on site during construction to detect any potential contamination. Should potential contaminants be found, DOE would take appropriate measures to contain the contamination and manage the situation in accordance with DOE and ORNL procedures and applicable state and Federal regulations. With these environmental safeguards in place, the proposed undertaking is not expected to introduce contaminants into surface waters.

#### **4.6. Groundwater**

BMPs as described in Muncy (1999) would be used to avoid contamination of groundwater in the project area. ORNL has done extensive geologic and hydrologic investigations of the area. Several sinkholes and caves are located on the campus but fall outside of the project area. A Source Water Protection Area is located near the project site; however, the proposed right-of-way is outside of the protection zone. Several small springs are located near the right-of-way. Therefore, during revegetation and maintenance activities, fertilizers and herbicides would not be applied in areas that flow to groundwater infiltration zones (i.e., springs, wells, and sinkholes), as stated in the BMPs. Construction activities would seek to avoid springs as practicable. However, if springs are encountered and cannot be avoided during construction, BMPs would be used to control sediment infiltration. With the use of

these BMPs, potential impacts to groundwater from these actions would be minor and insignificant.

#### **4.7. Navigation**

The proposed 13-kV distribution lines would cross only one navigable water body, i.e., the Bearden Creek embayment. At this crossing, the distribution lines would be immediately parallel to the roadway across the embayment. Public access to this part of the embayment is currently discouraged and will likely be prohibited in the near future for security reasons. Nevertheless, the elevation of the conductors at the crossing would be such that adequate clearance would be provided to avoid contact with watercraft, especially sailboat masts. Thus, implementation of the proposed action would not result in potential adverse effects to navigation.

#### **4.8. Natural Areas**

Under the Action Alternative, the proposed substation and its associated utility lines would be constructed on the ORR at the site proposed. The work is on the ORR and the areas designated as a National Environmental Research Park, a Biosphere Reserve, and a WMA. Within these four vast NAs are areas specifically identified and designated as NAs to preserve rare or critical habitat and listed plant and wildlife species. Five of these NAs are within 0.5 mile of the proposed work. Due to the nature of the proposed work, no adverse impacts to these nine NAs are anticipated as a result of constructing the substation, the 161-kV tap, and the water and sewer lines at the proposed site.

Two of the NAs on ORNERP, namely, RA 29 ORNL Rocky Limestone Forest and NA 26 Melton Valley Lily Area, would be crossed by the proposed 13-kV line near the western end of the line, approximately 2.7 miles southwest of the proposed substation. The loss of some buffer area on the edge of NA 26 is not expected to have a significant effect on the protection of the Canada lily, as the species was not found in or adjacent to this area of buffer loss. RA 29 also would sustain the loss of some area, but no protected species would be impacted. Therefore, no adverse impacts to these NAs are anticipated as a result of installing the 13-kV distribution lines.

Due to the nature of the work proposed and because the distance is sufficient (0.6 to 2.8 miles), no adverse impacts are anticipated from the construction and operation of the proposed substation and installation of its associated utility lines for all other NAs listed in the Affected Environment Section above. Any potential direct, indirect, or cumulative effects to these resources would be minor and insignificant.

#### **4.9. Visual Quality**

Visual consequences were examined in terms of visual changes to the existing landscape caused by the proposed actions. The new substation site and associated transmission and distribution lines would likely not be seen by the general public. ORNL employees, particularly those working in the Building 7600 area, would occasionally see the substation as they pass this section of Melton Valley Drive. Views of transmission equipment and new lines would be visually similar to other industrial structures and equipment on site at ORNL. For recreation users along Bearden Creek, views of the proposed substation would likely be obscured by existing vegetation and severe angles from the water. For residents at

Gallaher Bend, details of the substation would be obscure, as viewing distances would be 1 mile and greater.

Operation, construction, and maintenance of the proposed power lines, water lines, and sewer lines would be visually insignificant. There may be some minor visual discord during the construction period due to an increase in personnel and equipment. These minor visual obtrusions would be temporary until the proposed right-of-way and laydown area have been restored through the use of TVA standard BMPs (Muncy, 1999). Therefore, any direct, indirect, and cumulative visual impacts resulting from this project are expected to be minor and insignificant.

#### **4.10. Wetlands**

Construction of power lines or transmission facilities such as substations can result in the loss of wetland acreage and habitat due to hydrologic alteration caused by filling, dredging, drainage, or diversion of water flows. Similarly, construction and maintenance of power lines can cause changes in wetland types and condition. Specifically, clearing of right-of-way can cause forested wetlands to be converted to open water habitats or either emergent or scrub-shrub wetlands.

There are six wetlands with a combined estimated area of 0.79 acre that would be affected by the proposed action. These wetlands meet USACE parameters for wetlands that may be federal jurisdictional wetlands under the Clean Water Act. Five of these wetlands (W01, W02, W03, W04, and W05), totaling 0.34 acre, occur within the proposed right-of-way of the 13-kV distribution lines that would run parallel to Melton Valley Drive. A total area of 0.45 acre would be affected by clearing around the proposed substation. No wetlands lie within the proposed right-of-way of the new 161-kV tap or within the route of the proposed water and sewer lines that would connect to the new substation.

Potentially affected wetlands include 0.64 acre of forested wetlands and 0.15 acre of emergent wetlands (see Table 3-5). The potential impacts to emergent wetlands were determined to be insignificant because, except for the temporary disturbance associated with construction, no long-term loss of wetland functions would occur, provided that impacts would be minimized, appropriate BMPs would be implemented to control erosion and sedimentation, and all Federal and state permit conditions would be met.

Clearing the proposed right-of-way would convert approximately 0.19 acre of jurisdictional forested wetlands (W01, W03, W04, W05, and W06) to emergent wetland or scrub-shrub wetland habitat. These wetlands were all determined to be Category 2.

Individual and cumulative wetland impacts would be minimized through implementation of appropriate BMPs during clearing and construction. Because the total area of Category 2 forested wetlands is less than an acre, no compensatory mitigation is required to offset potential impacts to these wetlands. Thus, the proposed activities would not result in significant effects to wetlands.

#### **4.11. Cultural Resources**

Site 602A, an archaeological resource consisting of an early twentieth-century house site, lies within the APE of the proposed action. Because this site lacks integrity and the potential for further research, it is considered ineligible for inclusion in the NRHP. The other

three archaeological sites in the vicinity are outside the APE and would not be affected by the proposed undertaking. In a letter of April 25, 2005, the Deputy State Historic Preservation Officer concurred that the project area contains no archaeological resources eligible for listing in the NRHP (see Appendix E).

The New Bethel Valley Church was listed in the NRHP in 1992. The structure retains its architectural integrity; however, the historic setting has been compromised by the construction of more modern facilities at ORNL to the north and south along Bethel Valley Road. The proposed activities would not have any additional adverse impacts on this structure. The Graphite Reactor, which was designated as a National Historic Landmark in 1966, is located outside the APE and would not be affected by the proposed actions. Thus, TVA determined that implementation of the Action Alternative would not affect any historic properties that are potentially eligible, eligible, or currently listed in the NRHP. The State Historic Preservation Officer did not respond to TVA's request for concurrence with this determination.

#### **4.12. Recreation**

The nearest developed facilities available for public recreation are located approximately 3 miles from the proposed project site. Because of this distance, the proposed action would not affect developed recreation opportunities. Because the project site is a restricted area, construction, operation, and maintenance of the proposed power facilities and upgrades would not affect informal recreation opportunities.

#### **4.13. Summary of TVA Commitments and Proposed Mitigation Measures**

TVA would implement the following routine measures to reduce the potential for adversely affecting water quality, aquatic life, and wetlands.

- Appropriate BMPs as described in Muncy, 1999, would be implemented during construction and maintenance activities.
- During construction, the environmental quality protection specifications as described in Appendices A, B, C, and D would be implemented to reduce the potential for adverse environmental effects.

## CHAPTER 5

### 5. LIST OF PREPARERS

#### 5.1. NEPA Project Management

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 Involvement: Threatened and Endangered Aquatic Animal Assessment

##### **Kelly R. Baxter**

Position: Contract Biologist – Botany  
 Education/Experience: M.S., Horticulture; B.S., Botany; 2 years experience in field biology and impact assessment  
 Involvement: Terrestrial Biology Assessment; Threatened and Endangered Plant Assessment

##### **W. Nanette Brodie**

Position: Senior Environmental Scientist  
 Education/Experience: B.S., Environmental Science; B.S., Geology; Professional Geologist; 11 years in environmental analyses, surface water quality, and groundwater hydrology  
 Involvement: Groundwater Assessment

##### **K. Brandon Chance**

Position: Contract Biologist – Aquatic/Fisheries  
 Education/Experience: M.S., Environmental Biology; B.A., Biology; 5 years field biology experience  
 Involvement: Aquatic Ecology Assessment

**Jenny K. Fiedler**

Position: Contract Terrestrial Zoologist  
Education/Experience: M.S., Wildlife Science; B.S., Biology – Environmental Emphasis; 6 years field biology experience  
Involvement: Terrestrial Biology Assessment; Threatened and Endangered Animal Assessment

**James P. Groton**

Position: Contract Wetlands Biologist  
Education/Experience: M.S., Forestry; B.S., Natural Sciences; 25 years environmental impact assessment; 15 years wetlands assessment and delineation  
Involvement: Wetlands Assessment

**John M. Higgins**

Position: Water Quality Specialist  
Education/Experience: Ph.D., Environmental Engineering; B.S. and M.S., Civil Engineering; Registered Professional Engineer; 30 years environmental engineering and water resources management  
Involvement: Surface Water Quality Assessment

**Marianne Jacobs**

Position: Archaeological Technician  
Education/Experience: B.A., Religion/Middle Eastern Archaeology; 6 years in Middle Eastern archaeology; 4 years southeastern U.S. archaeological field experience  
Involvement: Cultural Resources Assessment

**Roger A. Milstead**

Position: Manager, Flood Risk and Data Management  
Education/Experience: B.S., Civil Engineering; Registered Professional Engineer; 29 years floodplain and environmental evaluations  
Involvement: Floodplain Risk Assessment

**W. Chett Peebles**

Position: Specialist, Landscape Architect  
Education/Experience: Bachelor of Landscape Architecture; Registered Landscape Architect; 17 years visual impact analysis and site planning  
Involvement: Visual Assessment

**Deborah K. Ruth**

Position: Specialist, Navigation Infrastructures  
Education/Experience: B.S., Agricultural Engineering; 2 years experience in Navigation; 5 years in Resource Stewardship; 5 years in River Operations Forecast Center  
Involvement: Navigation Assessment

**Jan K. Thomas**

Position: Contract Natural Areas Specialist  
Education/Experience: M.S., Human Ecology; 10 years in health and safety research, environmental restoration, technical writing; 2 years in natural area reviews  
Involvement: Natural Areas Assessment

## CHAPTER 6

### 6. LIST OF AGENCIES CONSULTED

#### **Federal Agency**

U.S. Department of Energy, Oak Ridge National Laboratory

#### **State Agencies**

Tennessee Department of Environment and Conservation

Tennessee Historical Commission

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## CHAPTER 7

### 7. SUPPORTING INFORMATION

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## 7.2. Glossary of Terms

<b>°F</b>	abbreviation for degree Fahrenheit
<b>ANA</b>	acronym for aquatic natural area
<b>APE</b>	acronym for Area of Potential Effect
<b>ARA</b>	acronym for aquatic reference area
<b>biota</b>	a generic, collective term for living organisms
<b>BMP</b>	acronym for Best Management Practice
<b>conductor</b>	cables or “wires” that carry electrical current
<b>CRM</b>	acronym for Clinch River Mile
<b>distribution line</b>	a power line that delivers electrical power to local users or endpoints
<b>DOE</b>	acronym for U.S. Department of Energy
<b>e.g.</b>	abbreviation for Latin term, <i>exempli gratia</i> , meaning “for example”
<b>EO</b>	acronym for Executive Order
<b>et al.</b>	abbreviation for Latin term, <i>et alii</i> (masculine), <i>et aliae</i> (feminine), or <i>et alia</i> (neutral) meaning “and others”
<b>guy</b>	a cable anchored in the ground that helps stabilize a structure

<b>HPA</b>	acronym for habitat protection area
<b>hydrophytic</b>	a type of plant that typically grows in or near water or wet areas
<b>i.e.</b>	abbreviation for Latin term, id est, meaning “that is”
<b>kV</b>	abbreviation for kilovolt, one thousand volts
<b>laydown area</b>	a construction area where components are constructed or stored
<b>macroinvertebrate</b>	a non-microscopic animal lacking a backbone, such as a worm or insect
<b>macrophytes</b>	a non-microscopic plant
<b>megawatt</b>	a measure of electrical power equivalent to one million watts
<b>NA</b>	acronym for natural area
<b>NEPA</b>	acronym for National Environmental Policy Act
<b>NRHP</b>	acronym for National Register of Historic Places
<b>ORAM</b>	acronym for the Ohio Rapid Assessment Method
<b>ORNERP</b>	acronym for Oak Ridge National Environmental Research Park
<b>ORNL</b>	acronym for Oak Ridge National Laboratory
<b>ORR</b>	acronym for Oak Ridge Reservation
<b>PCB</b>	acronym for polychlorinated biphenyl
<b>revenue-metering equipment</b>	equipment that determines the amount of electric power distributed
<b>riparian</b>	having to do with a shoreline
<b>RA</b>	acronym for reference area
<b>SMZ</b>	acronym for streamside management zone
<b>TDEC</b>	acronym for Tennessee Department of Environment and Conservation
<b>transmission line</b>	a power line, usually high-voltage, used to transfer electrical power from one interconnection point to another
<b>TVA</b>	acronym for Tennessee Valley Authority
<b>TVARAM</b>	acronym for Tennessee Valley Authority Rapid Assessment Method
<b>U.S.</b>	abbreviation for United States
<b>USACE</b>	acronym for U.S. Army Corps of Engineers
<b>USEPA</b>	acronym for U.S. Environmental Protection Agency
<b>USGS</b>	acronym for U.S. Geological Survey
<b>WMA</b>	acronym for wildlife management area
<b>WWC</b>	acronym for wet-weather conveyance, a stream bed that has running water only after rainfall events

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## APPENDIX A – 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.

Revision July 2003

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## APPENDIX B – 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.

Revision July 2003

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## APPENDIX C – 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 Waterbody Protection Categories (page 1)**

Guidelines	A: Standard	B: Important Permanent Streams	C: Unique Water Habitats
<p><b>1. Reference</b></p>	<ul style="list-style-type: none"> <li>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.</li> </ul>	<p>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.</p>	<ul style="list-style-type: none"> <li>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.</li> </ul>
<p><b>2. Equipment Crossings</b></p>	<ul style="list-style-type: none"> <li>All crossings of streams must comply with appropriate state and Federal permitting requirements.</li> <li>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.</li> <li>Crossings of any permanent streams must allow for natural movement of fish and other aquatic life.</li> </ul>	<ul style="list-style-type: none"> <li>All crossings of streams must comply with appropriate state and Federal permitting requirements.</li> <li>Crossings of drainage channels and intermittent streams must be done in ways that avoid erosion problems and long-term changes in water flow.</li> <li>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.</li> </ul>	<ul style="list-style-type: none"> <li>All crossings of streams also must comply with appropriate state and Federal permitting requirements.</li> <li>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.</li> </ul>

## Comparison of Guidelines Under the Three Stream and Waterbody Protection Categories (page 2)

Guidelines	A: Standard	B: Important Permanent Streams	C: Unique Water Habitats
<b>3.</b>  <b>Cutting Trees</b>	<ul style="list-style-type: none"> <li>• 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.</li> <li>• Stumps can be cut close to ground level but must not be removed or uprooted.</li> </ul>	<ul style="list-style-type: none"> <li>• 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 and impacts to the SMZ and surrounding area.</li> <li>• Cutting of trees near permanent streams must be limited to those meeting National Electric Safety Code and danger tree requirements.</li> <li>• Stumps can be cut close to ground level but must not be removed or uprooted.</li> </ul>	<ul style="list-style-type: none"> <li>• 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.</li> <li>• Stumps must not be removed, uprooted, or cut shorter than 1 foot above the ground line.</li> </ul>
<b>4.</b>  <b>Other Vegetation</b>	<ul style="list-style-type: none"> <li>• Other vegetation near streams must be disturbed as little as possible during construction.</li> <li>• 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.</li> <li>• Shorelines that have to be disturbed must be stabilized as soon as feasible.</li> </ul>	<ul style="list-style-type: none"> <li>• Other vegetation near streams must be disturbed as little as possible during construction.</li> <li>• 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.</li> <li>• Shorelines that have to be disturbed must be stabilized as soon as possible and revegetated as soon as feasible.</li> </ul>	<ul style="list-style-type: none"> <li>• Other vegetation near the unique habitat must be disturbed as little as possible during construction.</li> <li>• The soil must not be disturbed by plowing, disking, blading, or grading.</li> <li>• 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</li> </ul>

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## **APPENDIX D – 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

<u>Trade Name</u>	<u>Active Ingredients</u>	<u>Label Signal Word</u>
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

<u>Trade Name</u>	<u>Active Ingredients</u>	<u>Label Signal Word</u>
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

<u>Trade Name</u>	<u>Active Ingredients</u>	<u>Label Signal Word</u>
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-teratogenic, 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.

Revision July 2003

## **APPENDIX E – CORRESPONDENCE**

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April 25, 2005, Correspondence From Herbert L. Harper, Tennessee Historical Commission  
(Page 1 of 1)



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

April 25, 2005

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

RE: TVA, ARCHAEOLOGICAL ASSESSMENT, ORNL TRANSMISSION LN CONSTRUCTION,  
OAK RIDGE, ROANE COUNTY, TN

Dear Mr. Graham:

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

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

Your cooperation is appreciated.

Sincerely,

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

HLH/jmb