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PARADISE AND COLBERT COMBUSTION TURBINE PLANTS DRAFT ENVIRONMENTAL ASSESSMENT

Colbert, Lauderdale, and Morgan Counties, Alabama; Hardin, Lawrence, Montgomery, Sumner, Wayne, and Wilson Counties, Tennessee; and Muhlenberg and Todd Counties, Kentucky

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Symbols, Acronyms, and Abbreviations

AADT	Annual Average Daily Traffic
ADCNR	Alabama Department of Conservation and Natural Resources
ADEM	Alabama Department of Environmental Management
APE	Area of Potential Effect
ARAP	Aquatic Resources Alteration Permit
BACT	Best Achievable Control Technology
BMP	Best Management Practice
CAA	Clean Air Act
CBMPP	Construction Best Management Practices Plan
CCR	Coal Combustion Residuals
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CO	Carbon Monoxide
CO_2	Carbon Dioxide
CR	County Road
CT	Combustion Turbine
CWA	Clean Water Act
dB	Decibel(s)
dBA	A-weighted decibel
DLN	Dry Low-NO_X
EA	Environmental Assessment
EGU	Electrical Generating Units
EIS	Environmental Impact Statement
EMF	Electric and Magnetic Fields
EO	Executive Order
EPA	U.S. Environmental Protection Agency
EPCRA	Emergency Planning and Community Right to Know Act
ESA	Endangered Species Act
gpm	Gallons per Minute
GSA	Geologic Survey of Alabama
HAP	Hazardous Air Pollutant
HDD	Horizontal Directional Drilling
HUC	Hydrologic Unit Code
HUD	U.S. Department of Housing and Urban Development
IMP	Integrity Management Program
IPaC	Information for Planning and Consultation
IRP	Integrated Resource Plan
KAR	Kentucky Administrative Regulations
KDAQ	Kentucky Division of Air Quality
KDEP	Kentucky Department for Environmental Protection
KDFWR	Kentucky Department of Fish and Wildlife Resources
KHC	Kentucky Heritage Council
KPDES	Kentucky Pollutant Discharge Elimination System
KSNPC	Kentucky State Nature Preserves Commission
kV	Kilovolt
Ldn	Day-Night Sound Level
MMBTU	Million British Thermal Units
msl	Mean Sea Level
MW	Megawatt
NAAQS	National Ambient Air Quality Standards
NAVD	North American Vertical Datum
NEPA	National Environmental Policy Act
NFIP	National Flood Insurance Program

NGVD	National Geodetic Vertical Datum
NHPA	National Historic Preservation Act
NMSZ	New Madrid Seismic Zone
NO_X	Nitrogen Oxides
NO_2	Nitrogen Dioxide
NPDES	National Pollution Discharge Elimination System
NPS	National Park Service
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NRI	Nationwide Rivers Inventory
NSPS	New Source Performance Standards
OSH	Occupational Safety and Health
OSHA	Occupational Safety and Health Administration
PCB	Polychlorinated Biphenyls
Pb	Lead
PM	Particulate Matter
PSD	Prevention of Significant Deterioration
RCRA	Resource Conservation and Recovery Act
RM	River Mile
ROW	Right-of-Way
SHPO	State Historic Preservation Officer
SO_X	Sulfur Oxides
SO_2	Sulfur Dioxide
SR	State Road
SWPPP	Stormwater Pollution Prevention Plan
TCA	Tennessee Code Annotated
TDEC	Tennessee Department of Environment and Conservation
TL	Transmission Line
TPY	Tons per Year
TSS	Total Suspended Solids
TVA	Tennessee Valley Authority
TWRA	Tennessee Wildlife Resources Agency
USACE	U.S. Army Corps of Engineers
USC	United States Code
USCB	U.S. Census Bureau
USDA	U.S. Department of Agriculture
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WKP	Western Kentucky Parkway
WMA	Wildlife Management Area
WOUS	Waters of the United States
WWC	Wet Weather Conveyance

CHAPTER 1 – PURPOSE AND NEED FOR ACTION

1.1 Introduction

The Tennessee Valley Authority (TVA)'s generating assets include 21 natural gas-fueled combined cycle (CC) units at eight sites and 87 natural gas-fueled simple-cycle combustion turbine (CT) units at nine sites (TVA 2019b). Land based gas turbines are of two types: frame engines and aeroderivative engines. Eighty of the CT units are capable of using fuel oil and 60 are capable of quick start-up.

CT and CC units are designed to meet peaks in power demand very quickly. CTs operate much like a jet engine. The compressor draws air into the unit, compressing it, mixing it with fuel, and igniting it. As combustion occurs, gas expands through turbine blades connected to a generator to produce electricity. CC technology systems initially operate the same as traditional combustion turbines, but they also capture exhaust heat from the gas turbines and convert it to steam that is used to drive steam turbines to produce additional power (TVA 2020a).

Natural Gas-Fired Frame Combustion Turbines:

Natural-gas frame CT units are known as peaking units. They are expected to operate infrequently during short-duration, high demand periods.

Peaking units are essential for maintaining system reliability requirements, as they can start up quickly to meet sudden changes in either demand or supply.

Future CT needs are driven by demand for electricity, renewable energy development, and evolution of other peaking technologies.

Source: TVA 2019a

TVA completed its most recent Integrated Resource Plan (IRP) in 2019. The purpose of the IRP was to provide TVA with direction on how to best meet future electricity demand. The IRP process evaluated TVA's current energy resource portfolio and alternative future portfolios of energy resource options to meet future electrical energy needs of the TVA region while taking into account TVA's mission of serving the Tennessee Valley through energy, environmental stewardship, and economic development. As part of the IRP, TVA identified the gas fleet, including CTs, as playing a critical role in providing the flexibility needed to integrate renewable energy generation and promote distributed energy resources (TVA 2019a). Peaking units such as CTs are valuable in meeting electricity demand for shorter periods of high demand on summer and winter peak days, and their flexibility also plays a key role in successfully integrating renewable resources, which have variable and unpredictable generation patterns.

1.2 Purpose and Need

In Fiscal Year 2019, TVA completed a CT Modernization Study to evaluate the condition of TVA's current CT units and form recommendations for investments to ensure a reliable peaking fleet into the future. The study characterized TVA's existing frame CT fleet as one of three categories based on age and material condition:

- Reliable CT units, which have received some recent investment, are around 20 years old and expected to remain reliable at current funding levels.
- Challenged CT units, which have received some recent investment, are 40 or more years old and require refurbishment or replacement to ensure reliability.

- Most Challenged CT units, which have received little recent investment, are 40 or more years old and require refurbishment or replacement to ensure reliability.

Economic analysis of the Challenged group indicates that refurbishment is the prudent course of action. Based on age and material condition, units in the Most Challenged group would require significantly more investment in order to ensure an adequate level of reliability. Engineering and economic analysis indicates that the cost required to ensure performance of units within this category is greater than 50 percent of the cost of replacing with new peaking capacity. As such, it is prudent to replace these units with more efficient frame CT technology available today.

CT Units 1-20 located on the TVA's Allen Reservation in Memphis, Tennessee, and CT Units 1-16 located on TVA's Johnsonville Reservation in New Johnsonville, Tennessee (total of 1,400 megawatt [MW] capacity) were determined to be in the Most Challenged group and recommended for retirement and replacement. However, TVA is considering retaining a few CT units at Allen for the foreseeable future for the purpose of supporting emergency regional start needs. To maintain adequate reserves, the replacement peaking units would need to be in commercial operation prior to the retirement of the older CTs at Allen and Johnsonville. To provide the required capacity resulting from replacement of these CT units, TVA is proposing the addition of 1,500 MW of replacement frame CTs to be split between TVA's Paradise and Colbert sites for commercial operation no later than December 31, 2023. This replacement aligns with the 2019 IRP near-term actions to evaluate engineering end-of-life dates for aging generation units to inform long-term planning and to enhance system flexibility to integrate renewables and distributed resources. TVA is preparing an Environmental Assessment (EA) pursuant to the National Environmental Policy Act (NEPA) to evaluate the environmental impacts from construction and operation of these replacement frame CTs.

Therefore, the purpose of the proposed action is to replace the existing capacity from the retirement of 1,400 MW of frame CTs at the Allen and Johnsonville sites with the addition of 1,500 MW of CT capacity to be split between TVA's Paradise and Colbert sites for commercial operation no later than December 31, 2023. The impacts associated with the retirement and decommissioning of Allen and Johnsonville CTs were analyzed in the 2019 IRP and are incorporated by reference into the current EA. Based on the 2019 IRP analysis, impacts associated with the retirement and decommissioning of the Allen and Johnsonville CTs were determined to be minor and include the loss of 8 jobs at Allen and 28 jobs at Johnsonville. TVA would help offset this employment loss by placing some interested employees in available positions across the TVA service area. In addition to employment impacts, during the decade following the CT retirements, i.e., 2021–2030, annual average system-wide emissions of CO_2 would decrease by 0.6 percent.

Long-term actions related to the potential demolition of the CT units at Allen and Johnsonville are outside the scope of this EA and will be addressed by TVA at a future date, when TVA has a tangible proposal for the demolition or future disposition of those units.

1.3 Decision to be Made

This EA has been prepared to inform TVA decision makers and the public about the environmental consequences of the proposed action. The decision TVA must make is whether or not to construct and operate CT plants at the Paradise and Colbert reservations to replace the capacity lost as a result of retiring the CTs at Allen and Johnsonville, and to implement needed upgrades to the natural gas pipelines and transmission lines (TL) that will support the operation of the new Paradise and Colbert CT plants. TVA will use this EA to support the decision-making process and to determine whether an Environmental Impact Statement (EIS) should be prepared or whether a Finding of No Significant Impact may be issued.

1.4 Related Environmental Reviews

TVA's 2019 IRP provides direction for how TVA will meet the long-term energy needs of the Tennessee Valley region while fulfilling its mission of serving the Valley by providing low-cost reliable power, environmental stewardship, and economic development (TVA 2019a). TVA also released an accompanying EIS with the 2019 IRP that assesses the natural, cultural, and socioeconomic impacts associated with the implementation of the IRP (TVA 2019b). The proposed actions evaluated in this EA support TVA's preferred alternative, Target Power Supply Mix, as described in the IRP and accompanying EIS.

Other related environmental documents and materials were reviewed concerning this EA and are listed below. The contents of these documents help describe the affected properties and are incorporated by reference as appropriate.

- *Potential Paradise Fossil Plant Retirement EA (TVA 2019c)*
- *Paradise Coal Combustion Residuals (CCR) Management and Process Water Basins Supplemental EA (TVA 2018)*
- *Paradise CCR Management Operations EA (TVA 2017a).*
- *Colbert Fossil Plant Decontamination and Deconstruction EA (TVA 2016a)*
- *Ash Impoundment Closure EIS, Part II – Site Specific NEPA Review: Colbert Fossil Plant (TVA 2016c)*
- *Paradise Fossil Plant Units 1 and 2 Mercury and Air Toxics Standards Compliance Project, Muhlenberg County, Kentucky* (TVA 2013).

1.5 Scope of the Environmental Assessment and Summary of the Proposed Action

This EA evaluates the potential environmental, cultural, and socioeconomic impacts of the proposed construction and operation of CT plants at the Paradise and Colbert reservations. The impacts associated with the retirement and decommissioning of Allen and Johnsonville CTs were analyzed in the 2019 IRP and are incorporated by reference into the current EA. Long-term actions related to the potential demolition of the units are outside the scope of this EA and will be addressed by TVA in the future, when TVA has a tangible proposal for the demolition or future disposition of those units.

TVA's proposed action would result in the need for upgrades to the existing natural gas supply as well as actions necessary to connect the CT plants to TVA's existing transmission system, including TL network upgrades. Preliminary project scoping identified approximately 10 TLs, two for Paradise and eight for Colbert, which would require network upgrades. TVA separated these TL upgrades into two categories: TL upgrades that must be complete prior to the new CT plants in-service date on TVA's system and other impacting projects (two TLs for Paradise and four TLs for Colbert), and TL upgrades that may be completed, as and if necessary, after the CT plants are in service (four TLs for Colbert). TVA has scopes for the TL upgrades identified in the first category. However, details regarding the four TL network upgrades in the second category are still being reviewed for feasibility. Additional supplemental environmental analysis will be completed for this second category at a later time, as appropriate and necessary based on the results of the feasibility review. The scope of this EA, therefore, focuses on the impacts related to construction and operation of CT plants at Paradise and Colbert, the natural gas supply upgrades, and the six TL upgrades that must be completed prior to the new CT plants in-service date. A detailed description of the proposed action and alternatives considered are provided in Chapter 2.

TVA has performed a preliminary analysis and determined that the following resources will not be affected by the proposed action and are eliminated from further review in this EA.

- Prime Farmland – There are no prime farmland soils mapped within the proposed temporary and permanent use areas of the Paradise Reservation. Small areas of the Colbert Reservation are designated Prime Farmland. However, the project site is on land currently in industrial development and has been for over 50 years. Proposed offsite natural gas and TL upgrades would occur on previously developed sites or right-of-way (ROW) and would not require the conversion of prime farmland. Therefore, there would be no impacts to prime farmland soils and this resource is not evaluated any further in this EA. Accordingly, completion of Form AD 1006 and consultation on prime farmlands is not required (Farmland Protection Policy Act, 7 United States Code [USC] 4201).
- Land Use – Proposed activities would occur on previously disturbed land located within the plant boundaries or existing natural gas pipeline and transmission ROW. Therefore, no changes in land use are anticipated to occur with this project and this resource is not evaluated in this EA.

This EA was prepared consistent with Council on Environmental Quality (CEQ) regulations for implementing NEPA at 40 CFR 1500-1508 issued in 1978 (43 FR 55990, November 29, 1978), with minor revisions in 1979 and 1986, as well as TVA regulations at 18 CFR 1318 issued in 2020 (85 FR 17434, Mar. 27, 2020). Because TVA began this EA before CEQ's revised NEPA regulations (85 FR 43304-43376, July 16, 2020) became effective on September 14, 2020, TVA applied the previously promulgated 1978 CEQ regulations and TVA's 2020 NEPA regulations in the preparation of this EA (see 40 CFR 1506.13). TVA considered the possible environmental effects of the proposed action and determined that potential effects to the environmental resources listed below were relevant to the decision to be made and assessed the potential impacts on these resources in detail in this EA:

- Air Quality
- Climate Change and Greenhouse Gases
- Geology and Soils
- Groundwater
- Surface Water
- Floodplains
- Wetlands
- Aquatic Ecology
- Vegetation
- Wildlife
- Threatened and Endangered Species
- Visual Resources
- Cultural and Historic Resources
- Transportation
- Natural Areas, Parks and Recreation
- Noise
- Solid and Hazardous Waste
- Socioeconomics and Environmental Justice
- Public Health and Safety

TVA's action would satisfy the requirements of Executive Order (EO) 11988 (Floodplain Management), EO 11990 (Protection of Wetlands), EO 12898 (Environmental Justice), EO 13751 (Invasive Species); and applicable laws including the National Historic

Preservation Act (NHPA), Endangered Species Act (ESA), Clean Water Act (CWA), and Clean Air Act (CAA).

1.6 Public and Agency Involvement

TVA's public and agency involvement includes publication of a notice of availability and a 30-day public review of the draft EA. The availability of the draft EA was announced in newspapers that serve the Muhlenberg County, Kentucky and Colbert County, Alabama areas. In addition, the commercial natural gas provider at Paradise reached out to state and local officials as a part of their outreach effort, engaged with Kentucky Department for Environmental Protection (KDEP) and U.S. Environmental Protection Agency (EPA) regarding their air permit, and filed an application for Federal Energy Regulatory Commission review. In addition, the commercial natural gas provider at Colbert has communicated with affected property owners. The draft EA is also posted on TVA's website. TVA's inter-agency involvement includes circulation of the draft EA to local, state, and federal agencies and federally recognized tribes as part of the review. Chapter 5 provides a list of agencies, tribes, and organizations notified of the availability of the draft EA.

1.7 Necessary Permits or Licenses

TVA will obtain all necessary permits, licenses, and approvals required for the alternative selected. TVA anticipates the following permits or approvals would likely be required for implementing the proposed alternative.

- Storm Water Best Management Practices (BMPs) and Kentucky Pollutant Discharge Elimination System (KPDES), Tennessee Department of Environment and Conservation (TDEC), and Alabama Department of Environmental Management (ADEM) permit application and/or modification for all stormwater discharges associated with construction activity that disturb more than one acre of land.
- Modification of the existing KPDES and ADEM Permits at Paradise and Colbert for discharges from the proposed CT plants.
- Actions involving wetlands and/or stream crossings would be subject to federal CWA Section 404 permit requirements as well as state Section 401 water quality certification from KPDES, TDEC, and ADEM.
- Modification to Paradise's and Colbert's existing CAA Title V Operating Permits performed via Prevention of Significant Deterioration (PSD) review under the Clean Air Act.

CHAPTER 2 – ALTERNATIVES

2.1 Description of Alternatives

During initial project planning, TVA considered a range of alternatives and specific screening criteria to provide for the reliable replacement of peaking generation as a result of retiring the CTs at Allen and Johnsonville. These criteria are described in the following sections.

2.2 Alternative Development

2.2.1 Generation Type

TVA considered various gas asset types for replacement of generation lost as a result of retiring the Allen and Johnsonville CTs. Since the replacement generation must be capable of meeting peak demand at short notice, gas-fired frame CTs were selected as the preferred generation type. The relatively low cost of gas-fired frame CTs per installed MW further reinforced the basis for their selection to replace the lost generation at Allen and Johnsonville.

2.2.2 Generation Location

Candidate sites for the location of new frame CTs were identified based on a desktop review of land parcels located near existing transmission access and near existing natural gas supply. Initial site screening resulted in 12 potential locations for new frame CTs. These 12 sites were then further evaluated using the following criteria summarized in Table 2-1.

Table 2-1. Summary of Criteria Evaluated to Determine the Location of the Frame CTs

Transmission • System upgrades needed • Locational value	**Site Considerations** • TVA owned vs Non-TVA owned sites • Site availability (available for purchase) • Land cost • Access to Water	**Operational Considerations** • Supply chain considerations • Staffing
Fuel Supply • Cost • Availability • Reliability • Operational considerations	**Environmental Considerations** • Environmental Regulations • Sensitive environmental/cultural resources present	**Financial and Planning Considerations** • Long Range Financial Plan • Integrated Resource Plan

Based on evaluation of the screening criteria, TVA proposes to construct new frame CTs at the Paradise Reservation and at the Colbert Reservation. These locations offered several advantages to alternative locations:

- The construction footprint for the new units could be located on previously disturbed land within existing TVA property as opposed to purchasing or utilizing greenfield property.
- The Paradise Reservation currently includes a CC plant. As such, the site has existing natural gas pipeline infrastructure that supports the CC plant that could also be utilized for the CT site.
- The Colbert Reservation includes existing natural gas infrastructure to support the existing CT plant that could also be utilized for the additional proposed CT units.
- Both brownfield locations have favorable air permitting prospects for new units and offer access to transmission infrastructure that serves remaining generating capacity as well as having the ability to serve additional capacity following the retirement of the coal plants.
- Throughout the operational history of both sites, extensive environmental reviews have been conducted which provided a level of confidence, for initial screening purposes, that there is a low potential for impacting sensitive environmental resources.

2.3 Location and Description

2.3.1 Paradise Reservation

TVA's Paradise Reservation is situated on 3,400 acres on the west bank of the Green River, east of the city of Drakesboro in Muhlenberg County, Kentucky. The 1,100-MW Paradise CC plant, completed in April 2017, was designed to replace Units 1 and 2 of the coal-fired Paradise Fossil Plant. TVA has since retired the remaining Unit 3 of the coal-fired Paradise Plant and is currently considering options for the disposition of the retired coal plant.

2.3.2 Colbert Reservation

TVA's Colbert Reservation is situated on 1,354 acres on the south shore of Pickwick Landing Reservoir, west of the city of Tuscumbia in Colbert County, Alabama. There are eight existing frame CT units at the Colbert CT plant. The retired coal-fired plant on the reservation is currently being demolished.

2.4 Description of Alternatives

2.4.1 Alternative A – No Action Alternative

Under Alternative A, TVA would not retire CT Units 1-20 at Allen or CT Units 1-16 at Johnsonville. These units would continue to operate as part of the TVA generation portfolio. In order for the existing units to remain operational, additional repairs and maintenance would be necessary in the future to maintain reliability. Any repairs proposed to the existing CTs would be evaluated under a separate NEPA review as needed.

2.4.2 Alternative B – Retirement of Allen CT Units 1-20 and Johnsonville CT Units 1-16 and Construction of CT Units at Paradise and Colbert

Under Alternative B, TVA would retire CT Units 1-20 at Allen and CT Units 1-16 at Johnsonville. However, TVA would retain a few Allen CT units (about 80 MW) for emergency regional black start purposes until a suitable alternative is in place. Although the specific units to be retained have not been identified, they would only be used for emergency purposes and would not be considered part of TVA's normal operational system. In order to replace the capacity lost as a result of retiring the Allen and Johnsonville CTs, TVA would construct and operate three new natural gas-fueled frame CT units (750 MW total) at Paradise and three natural gas-fueled frame CT units (750 MW total) at Colbert for a system total of 1,500 MW. Actions associated with implementation of this alternative are described below.

2.4.2.1 Actions Associated with Construction of the Frame CT Units at the Paradise Reservation

2.4.2.1.1 Construction of Frame CT Units and TL Upgrades on the Paradise Reservation

TVA would construct three new natural gas-fueled frame CTs on heavily disturbed lands located within the boundaries of the Paradise Reservation as shown in the conceptual layout in Figure 2-1. The overall Paradise CT plant project area consists of 1,089 acres of land that includes a portion of land outside of the reservation where TL upgrades required for the project would occur. The proposed CT plant would include three gas-fired frame CT generators with inlet evaporative cooling and three natural gas-fired dew-point gas heaters. Subsurface piles would be installed to support foundations for plant components, as required. In addition to these major equipment systems, the proposed CT facilities would include plant equipment and systems, such as natural gas metering and handling systems; instrumentation and control systems; transformers; and administration and warehouse/maintenance buildings. At full buildout, the CT plant would occupy approximately 4.4 acres of the 1,089-acre Paradise CT plant project area.

TVA would also construct and operate a 500-kilovolt (kV) switchyard, which would be situated on approximately 21 acres located southeast of the CT plant within the project area. The existing 500-kV TL would be re-configured to re-terminate at the proposed switchyard. Re-configuration would require re-routing/extending approximately 2.4 miles of the existing 500-kV TL. The re-route would start at an existing structure in the southeast portion of the CT plant project area, veer to the south around the existing fossil-plant cooling towers before turning northwest extending to the proposed 500-kV switchyard. The route of the new TL is shown on Figure 2-1. In addition to the re-route, three (3) short 500-kV "feeder" TLs, with lengths less than 0.2-mile, would be required to connect the new CT plant to the new switchyard. New 500-kV TL facilities would be supported by lattice steel towers constructed on concrete or laced steel foundations. Foundation backfill would consist of excavation spoil and crushed stone. Heights of the new TL structures would vary, depending on the terrain and existing obstacles on the reservation. All unit substation transformers would be oil-filled; therefore, concrete foundations and an oil containment system would be included. Other actions needed to support the CT plant at Paradise include re-terminating TLs and upgrading communications infrastructure within the plant boundary, which will require the installation of new tubular steel pole structures. New pole structures would typically utilize direct-buried foundations with supporting guy anchors, although some concrete foundations could become necessary.

TVA has identified four areas (totaling approximately 44.7 acres) within the Paradise project area that would be used for vehicle and equipment parking, materials storage, laydown, and construction administration during construction of the CT plant. In addition, two temporary use areas (9.4 acres) would be designated for light uses such as trailer placement or light vehicle parking during construction. The laydown and temporary use areas are all located on previously disturbed areas and, when construction is complete, they would be allowed to revert to their original use.

The CT plant would be fueled by a reliable supply of natural gas. Preliminary estimates indicate an upper bound of 165 million standard cubic feet per day of natural gas would be needed to fuel three frame CT units, running at maximum capacity. Similarly, the three gas heaters, which are required to raise the supplied natural gas above its dew point, would burn as much as 240,000 standard cubic feet of natural gas per day if running at the same maximum capacity. This demand would require construction and operation of a new natural gas compressor at an existing compressor station (see Section 2.4.2.1.2), piping to connect the CTs to the existing natural gas pipeline and metering station, and the expansion of the existing metering station into the disturbed area to the east of the existing station (Figure 2-1). The new, approximately 1,600-foot-long pipeline would be constructed in a trench of sufficient depth to bury the pipeline at 10 to 12 feet below grade. After the pipeline construction is completed, the trench would be backfilled with the stockpiled material and revegetated. This pipeline would be constructed and operated by TVA.

The CT plant would require up to 100 gallons per minute (gpm) of water for inlet air evaporative cooling in summer ambient temperatures. CT compressor washing requires demineralized water. The Paradise CC plant already has adequate capacity for demineralized water production that would be used for the CTs. Wash effluent would be collected in tanks and, after analysis, disposed of at an approved wastewater treatment facility offsite. Potable water for domestic use and safety showers would be obtained from the existing public supply.

Operating the CT plant would also require air emissions monitoring. Reduction of nitrogen oxide (NO_X) emissions from the CTs would be achieved through dry low-NO_X (DLN) combustion systems. Exhaust stacks would be equipped with continuous emissions monitoring systems. Emissions from the units would adhere to the requirements of Kentucky Division of Air Quality (KDAQ) and federal regulations.

Project materials and equipment would be primarily delivered to the project site by truck and placed in designated project laydown areas until used (See Figure 2-1). Some major equipment would be transported by rail. Modifications to the existing rail system within the Paradise CT project area may be required. These modifications would be minor and are expected to occur within the limits of the 30.8-acre laydown area shown on Figure 2-1. Roads within the Paradise CT plant project area would be maintained during the construction process.

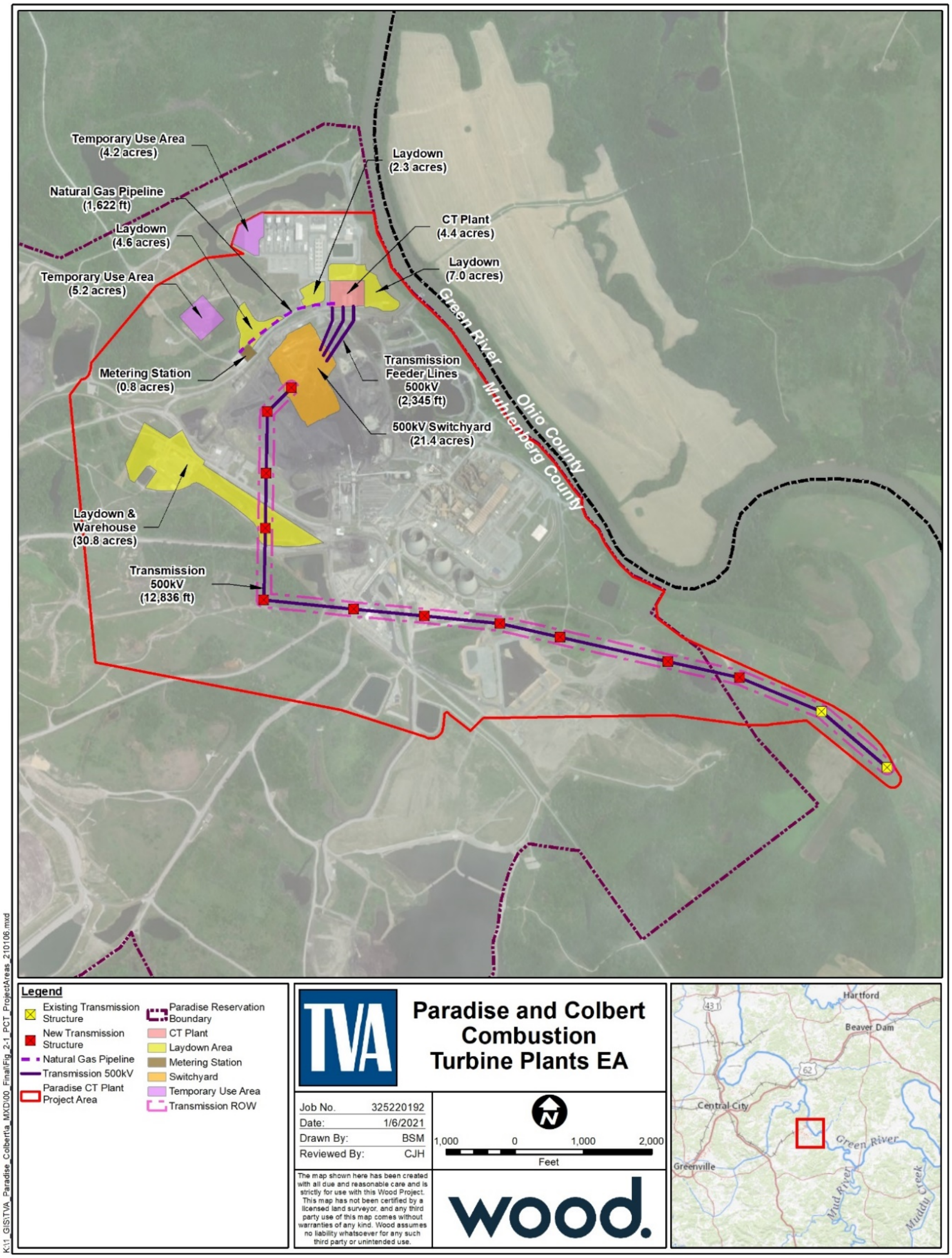

Figure 2-1. Paradise CT Plant Project Area

2.4.2.1.2 Offsite Construction of a Natural Gas Compressor

In order to provide the additional natural gas supply to the CTs at Paradise, a new natural gas-fired reciprocating internal combustion engine driving a reciprocating natural gas compressor, would be constructed at an existing compressor station located approximately 18 miles west of the Paradise CT project area in Muhlenberg County, Kentucky (Figure 2-2). The project would include new piping to tie the compressor into the existing pipeline system to serve the proposed CTs at Paradise. The compressor and pipelines would be constructed and operated by a commercial supplier. All project activities would be located within the existing compressor station property boundary and all project facilities would be located within the entirety of the existing graveled and paved area at the site. The combustion engine unit would be installed within the existing compressor building.

2.4.2.1.3 Offsite Upgrades to Existing TLs

The operation of the proposed CT plant at Paradise would require replacing pull-off jumpers and stingers at an existing substation, various upgrades to approximately 12.6 miles of TL (TL 5823) located in Sumner and Wilson Counties, and fiber optic ground wire installation on an approximately 52-mile TL (TL 6057) that extends south of the reservation (Figure 2-2) as described below.

TL 5823 – Approximately 12.6 miles of the approximately 21.5-mile 161-kV TL would be up-rated. Modifications would include adding a tower extension at a TL structure, sliding a conductor to raise the conductor height, cutting/re-splicing an existing conductor in two spans to raise conductor height, and replacing up to two existing TL structures.

TL 6057 – TVA proposes to replace the existing overhead ground wire with new fiber optic ground wire on the approximately 52.1 miles of the 500-kV TL. A helicopter would be used to assist in installation and modifications to several existing TL structures would be required to support the new fiber optic ground wire.

Upgrades are typically performed to increase the electrical capacity of the existing TL and would include the following:

- *Moving Features that Interfere with Clearance*. As more electricity is transmitted through the TL, the conductor (the cable that carries the current) temperature rises and the TL may sag. Features such as sheds or storage buildings located within the ROW may interfere with the ability to operate the TL safety and would be moved.
- *Replacement or Modification of Existing TL Structures or Installation of Intermediate TL Structure*. Typical TL structure replacement, extensions or installation of intermediate TL structures is performed with standard TL equipment such as bulldozers, bucket trucks, boom trucks, and forklifts. The result of this work is that the existing conductor is raised to provide the proper ground clearance. Disturbance is usually limited to an approximately 100-foot circumference around the work structure.
- *Conductor Modification.* Conductor modifications include conductor slides, cuts, or floating dead-ends to increase ground clearance. A cut involves removing a small amount of conductor and splicing the ends back together. A slide involves relocating the conductor clamp on the adjacent structure a certain distance toward the area of concern (i.e., “sliding” the clamp). No conductor is removed. A floating dead-end

shortens the suspension insulator string of a structure to gain elevation at the attachment point of the conductor, increasing a span's clearance. These improvements require the use of a bucket truck; disturbance is minimal and confined to the immediate area of the clearance issue.

- *Conductor Replacement:* If the existing conductor size cannot support the TL's electrical load, the conductor must be replaced. Bucket trucks or other light-duty equipment are utilized for access and stringing equipment. Reels of conductor would be delivered to various staging areas along the ROW, and temporary clearance poles would be installed at road crossings to reduce interference with traffic. The new conductor would be connected to the old conductor and pulled down the TL through pulleys suspended from the insulators. A bulldozer and specialized tensioning equipment would be used to pull conductors to the proper tension. Crews would then clamp the wires to the insulators and remove the pulleys. Wire pulls vary in length but are limited to a maximum of five-mile pulls. Pull point locations depend on the type of structures supporting the conductor as well as the length of conductor being installed and are typically located along the most accessible path on the ROW (adjacent to road crossings or existing access roads). The area of disturbance at each pull point typically ranges from 200 to 300 feet along the ROW.
- *Adding Surcharge.* Adding rock or dirt (surcharge) to structure footing is sometimes required when height and/or loading modifications are made to a structure. These changes can create uplift on the existing tower footings or grillage, therefore requiring a stone base settlement to be placed around the existing footings. The additional burden prevents the tower from rising under certain conditions (i.e., weather conditions or conductor loading). Typical installation of surcharge is performed with tracked equipment with minimal ground disturbance. The stone is piled around the footings as required and the depth varies depending on the uplift on the affected structures.
- *Modification of Local Power Company Distribution Lines.* Local utilities' distribution lines can intersect TVA TLs. If the local utility crossing does not have adequate clearance, TVA requests that the local utility lower or re-route the crossing.
- *Fiber Optic Ground Wire Installation.* New fiber optic line can be installed with the help of a helicopter. Designated pull points along the TL corridor are used to set up cable reels of optic ground wire for installation. Pull point locations are typically located along the most accessible path on the ROW (adjacent to road crossings or existing access roads). Modifications to the existing TL are typically required along the length of the TL. Existing access roads would be used for the pull point locations.

Development of new permanent access roads to support upgrades to the existing TLs is not anticipated. However, depending on access needs, existing access roads may require modifications such as brush clearing or tree trimming to allow for passage of equipment and bucket trucks. Tree removal is not anticipated and if required would be a negligible amount. Modifications would generally be limited to the existing 20-foot-wide access road area, and, if needed, tree trimming to allow a vertical clearance of up to 12 feet. Minimal ground disturbance is expected in these areas, but, if the ground is disturbed, the access road area would be revegetated using native, low-growing plant species after required TL upgrade work is completed. Areas such as pasture, agricultural fields, or lawns would be returned to their former condition.

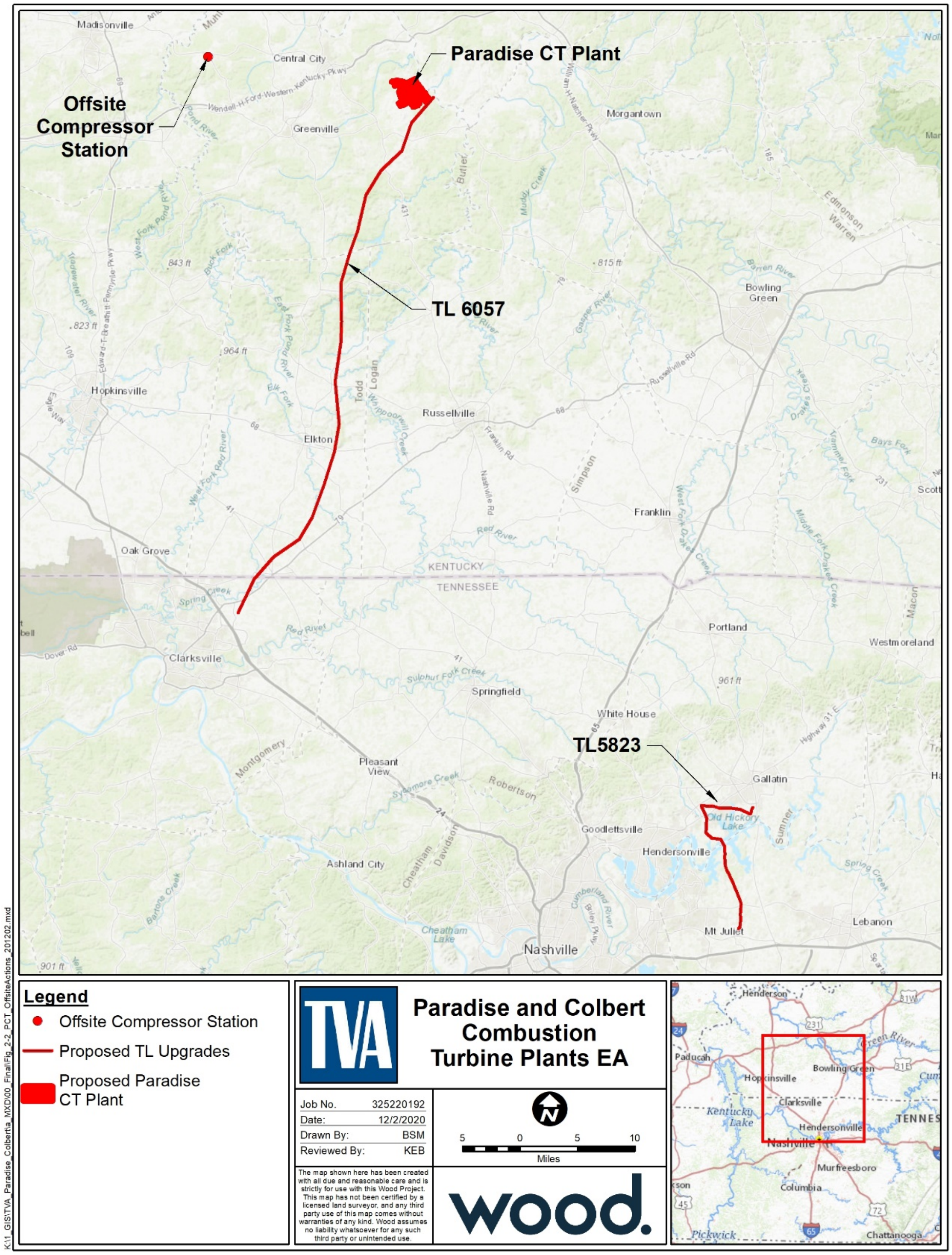

Figure 2-2. Offsite Related Actions Associated with the Proposed Combustion Turbine Plant at Paradise

2.4.2.2 Actions Associated with Construction of the Frame CT Units at the Colbert Reservation

2.4.2.2.1 Construction of Frame CT Units and TL Upgrades on the Colbert Reservation

Under Alternative B, TVA would construct three new natural gas-fueled frame CT units on heavily disturbed lands within the boundaries of the Colbert Reservation as shown on (Figure 2-3). The overall Colbert CT plant project area consists of 390.8 acres of land that includes a portion of land outside of the reservation where a natural gas line extension required for the project would occur. The proposed CT plant at Colbert would include three gas-fired frame CT generators with inlet evaporative cooling and three natural gas-fired dew-point gas heaters and plant equipment and systems similar to those described for CT construction at Paradise. Construction of a switchyard at Colbert, however, would not be necessary.

In order to provide power to the CT plant, TVA would construct three new 161-kV TLs to connect the existing switchyard to the new CT plant. The new TLs would be built to the north of the existing switchyard and would likely be constructed with double and single steel-pole structures of varying heights, depending on the terrain and existing obstacles on the reservation (See Figure 2-3). The new TL structures would either be erected on concrete foundations, or direct buried with spoil or gravel backfill. Some TL structures would likely require steel guy wires secured to buried anchors (e.g., wood logs or reinforced concrete), to support changes in line direction or tension. All unit substation transformers would be oil-filled; therefore, concrete foundations and an oil containment system would be included.

The CT plant would be fueled by a reliable supply of natural gas. Preliminary estimates indicate an upper bound of 165 million standard cubic feet per day of natural gas would be needed to fuel three frame CT units, running at maximum capacity. Similarly, the three gas heaters, which are required to raise the supplied natural gas above its dew point, would burn as much as 240,000 standard cubic feet of natural gas per day if running at the same maximum capacity. To accommodate for the maximum demand, a 20-inch diameter underground natural gas pipeline would be constructed that would run parallel to the existing 10-inch diameter natural gas pipeline lateral. The approximately one-mile pipeline would primarily be installed on the portion of the Colbert CT plant project area that is located on TVA-owned property; however, a portion would be built just south of the reservation (Figure 2-3) to connect the new lateral tie to the main distribution pipeline (see Section 2.4.2.2.2). The pipeline would be constructed in a trench of sufficient depth to bury the pipeline at a minimum of three feet below grade as measured from the top of the pipeline. Segments of the pipeline crossing Cane Creek, Old Lee Highway (County Road 20), U.S. Highway 72 (US 72), and the existing railroad adjacent to the highway would be installed using Horizontal Directional Drilling (HDD). Installation of the pipeline under US 72 and Cane Creek would require drilling from 10 to 60 feet below the surface. The natural gas pipeline would be constructed and operated by a commercial supplier and would require acquisition of a 35-foot permanent easement along the proposed pipeline length. In addition, incorporation of the new 20-inch loop line may require expansion of the existing metering station. The new pipeline would require expansion of the existing metering station to support the proposed upgrades. The station footprint would be expanded into an existing grassy area to the southeast as shown on Figure 2-3.

TVA has identified four areas (totaling approximately 58 acres) within the Colbert CT plant project area that would be used for vehicle and equipment parking, materials storage, laydown, and administration during construction of the CT plant. One approximately 9-acre site within the project area has been designated as a temporary use area that would be designated for light uses such as trailer placement or light vehicle parking during construction. Installation of the natural gas pipeline on TVA property is expected to require a 75-foot workspace along the entire route north of US 72 (i.e., 35 feet of permanent right of way and 40 feet of temporary workspace). In addition, three areas (2.7 acres) would be designated as construction staging and laydown during installation of the pipeline. All areas designated for laydown and temporary use are located on previously disturbed areas and once construction is complete, these areas would revert to their original use. The location of the proposed equipment laydown areas, temporary use areas, pipeline construction staging and laydown areas are shown on Figure 2-3.

Like Paradise, the CT plant at Colbert would require up to about 100 gpm of water for inlet air evaporative cooling in summer ambient temperatures and demineralized water for CT compressor washing. Potable water will be used to support these needs at Colbert, as well as for domestic uses and safety showers, and it will be supplied by the local provider via the existing water service mains to the reservation.

Operating the Colbert CT plant would also require air emissions monitoring. Reduction of nitrogen oxide (NO_X) emissions from the CTs would be achieved through dry low-NO_X (DLN) combustion systems. Exhaust stacks would be equipped with continuous emissions monitoring systems. Emissions from the units would adhere to the requirements of ADEM and federal regulations.

Project materials and equipment would be primarily delivered to the site by truck. Some major equipment would be transported to the Colbert site by rail. Onsite modifications to the rail system may be required. Construction materials would be delivered and placed in designated project laydown areas until used (See Figure 2-3). Roads within the Colbert CT plant project area would be maintained during the construction process.

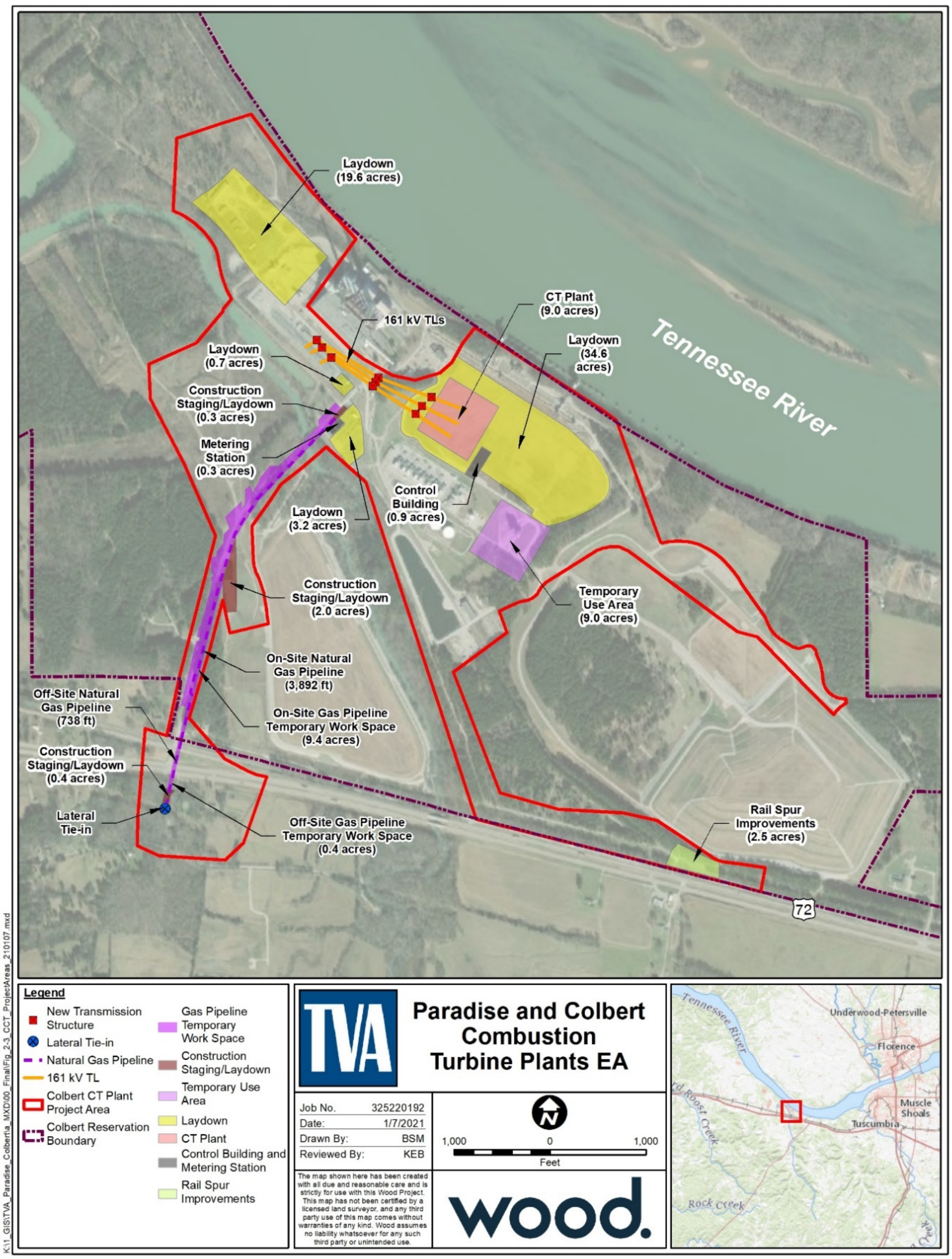

Figure 2-3. Colbert CT Plant Project Area

2.4.2.2.2 Offsite Existing Natural Gas Supply Upgrades

In order to provide the additional natural gas supply to the CTs at Colbert, a new lateral would be constructed and would tie into an existing interstate pipeline system (See Figure 2-3). Construction activities would be limited to the approximately two-acre area shown on Figure 2-3. A temporary bypass road would be constructed within this area to allow continued access to the residence located south of the proposed construction area throughout the construction period. Operation and maintenance of the proposed pipeline may require the commercial supplier to acquire a new or amended easement to the existing 30-foot pipeline easement. In addition, some upgrades to the existing gas receipt point (replacement of meters and regulators, etc.) located approximately 1.5 miles west of the proposed pipeline would be needed (Figure 2-4). The proposed pipeline would be constructed and operated by a commercial supplier.

2.4.2.2.3 Offsite Upgrades to Existing TLs

The operation of the proposed CT plant at Colbert would require various upgrades to four existing TLs located in northern Alabama (TL 5676 and TL 5670) and southern Tennessee (TL 5989 and TL 5617) (Figure 2-4). Upgrades would be performed to increase the electrical capacity of the existing TLs and would likely include the following actions as described below: moving features that interfere with clearance, replacing and/or modifying existing structures, installing intermediate structures, modifying or replacing some of the existing conductor in order to increase ground clearance, adding fill rock or dirt (surcharge) around the base of existing structures, and working with the local power companies to modify their lines.

TL 5676 – A 4.2-mile section of the existing 161-kV TL would be re-conductored, which may require modifications to existing TL structures.

TL 5670 – The 10.2-mile existing 161-kV TL would be re-conductored. Additionally, tower extensions would be required at several TL structures and one TL structure would be replaced to raise the conductor height. Additional modifications would also be performed by local power companies to lower crossings and by property owners to remove sheds inside the ROW.

TL 5989 – TVA would up-rate a 0.82-mile section of the existing 161-kV TL.

TL 5617 – TVA would up-rate an approximately 12.8-mile portion of the existing 161-kV TL. Modifications for this portion of TL would include cutting/re-splicing the conductor in the structure spans to raise the conductor height. Additionally, one structure on the tap line to the Loretto substation would be replaced.

Existing access roads to these TLs may require some modifications such as brush clearing or tree trimming to allow for access of equipment and bucket trucks. More details regarding these activities are described above in Section 2.4.2.1.3. As mentioned in Section 1.5, four additional TLs and an additional 24 miles of TL 5617 associated with the Colbert CT plant will need to be upgraded as a result of TVA’s proposed action. Additional details regarding these network upgrades, such as the exact locations of pull points or any potential pole replacements, are still being developed. Supplemental environmental analysis would be conducted as details become available.

2.4.2.3 CT Project Construction

Site preparation work, CT plant construction, and offsite TL upgrades would begin in 2021, and the plants would begin commercial operation in 2023. Equipment used during the construction phase would include trucks, truck-mounted augers and drills, excavators, as well as tracked cranes and bulldozers. Low ground-pressure-type equipment would be used in specified locations (such as areas with soft ground) to reduce the potential for environmental impacts per TVA BMPs. TVA estimates a maximum of 185 workers would be employed onsite at the peak of the two-year construction period for each plant site. This does not include the construction workforce needed for pipeline or offsite TL upgrades as this work is not centralized in one location for any significant period of time. Once constructed, four to six employees would be needed to operate the CTs at both Paradise and Colbert in addition to current staff.

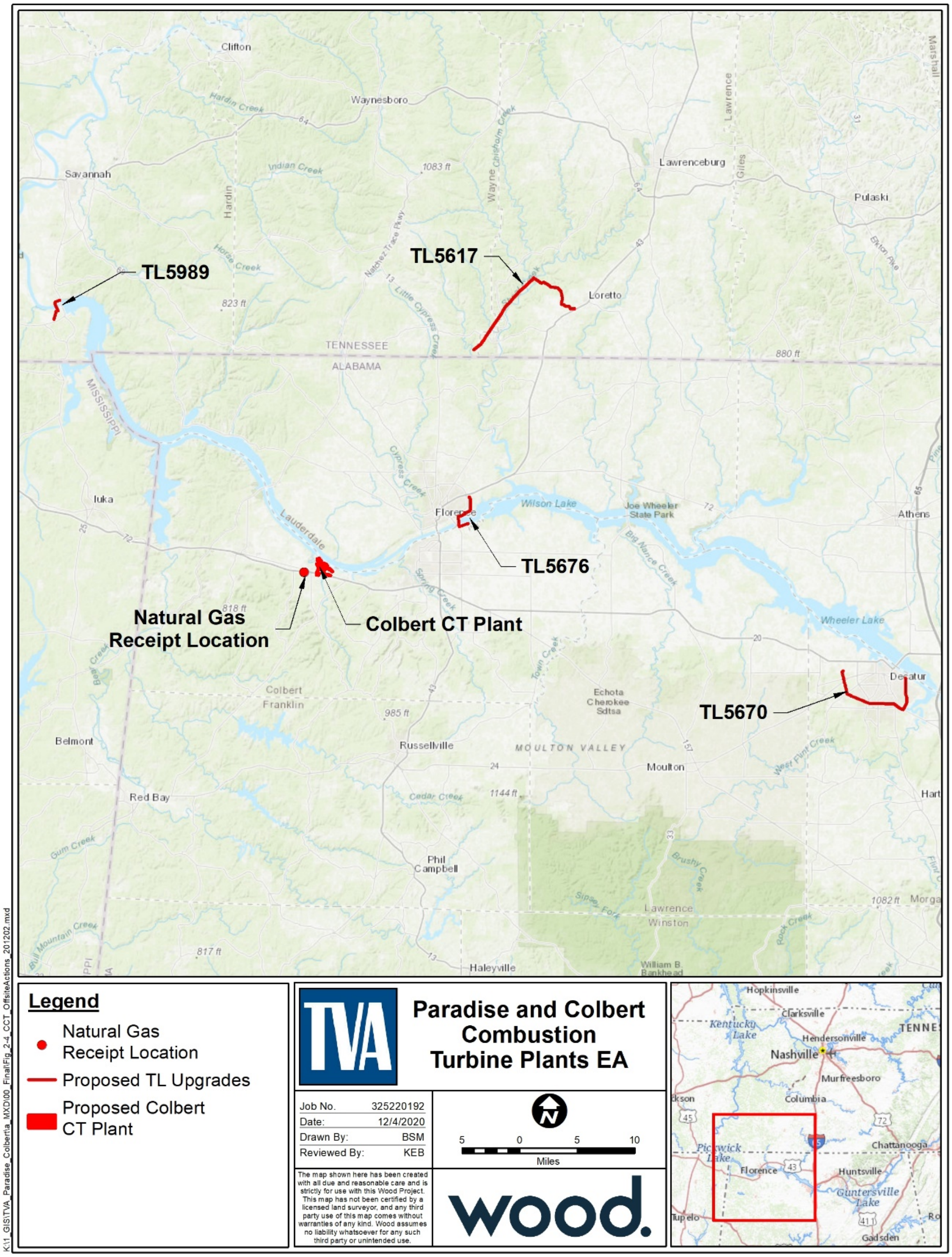

Figure 2-4. Offsite Related Actions Associated With the Proposed Combustion Turbine Plant at Colbert

2.5 Comparison of Alternatives

The environmental impacts of each of the alternatives under consideration are summarized in Table 2-2. These summaries are derived from the information and analyses provided in the Affected Environment and Environmental Consequences sections of each resource in Chapter 3.

Table 2-2. Summary and Comparison of Alternatives by Resource Area

Resource	Alternative A	Alternative B
Air Quality	No change from existing conditions. Benefits to regional air quality that may be associated with operation of newer, more efficient CT units would not be realized.	Temporary minor construction impacts associated with emissions from onsite vehicles and equipment as well as generation of fugitive dust. Operational emissions at the Paradise CT plant would be decreased due to the shutdown of Paradise coal-fired Unit 3. Operation of the Colbert CT Plant would result in an increase in local emissions. These emissions would be monitored and would comply with permit limits. No exceedances of National Ambient Air Quality Standards expected.
Climate Change and Greenhouse Gases	No impact.	Temporary localized, minor greenhouse gas emissions during construction activities. Operational emissions would be negligible relative to regional and national GHG levels and would not impact climate change.
Geology and Soils	No impact.	Minor temporary increase in soil erosion, minimized with BMPs.
Groundwater	No impact.	Minor impacts to soil resources; however, the use of BMPs would minimize impacts to groundwater. Minor localized, temporary impacts associated with dewatering activities potentially used to control groundwater infiltration into excavation sites.
Surface Water Resources	No impact.	Temporary, minor impacts to surface waters associated with sedimentation from stormwater runoff during construction activities and potential temporary stream crossings at offsite TL upgrades. Impacts would be minimized through implementation of BMPs during construction and operation.
Floodplains	No impact.	Minor impacts on floodplains and their natural and beneficial values.

Resource	Alternative A	Alternative B
		There is no practicable alternative to locating portions of laydown areas at Colbert in the floodplain. Therefore, construction laydown areas within the floodplain would be consistent with EO 11988. Upon completion of the pipeline upgrades, the laydown and temporary use areas would be returned to existing conditions. New TL construction would adhere to the TVA subclass review criteria for location in floodplains. Fill, gravel, or other access road modifications in the floodway would be removed and construction areas and access roads returned to pre-construction conditions upon completion of the project.
Wetlands	No impact.	Minor impacts. Total estimated impacts to wetlands at all project sites include 0.04 acres at Paradise, 0.03 acres associated with Paradise offsite TLs upgrades, and 0.22 acres associated with Colbert offsite TLs. Potential impacts to wetlands would be minimized through further avoidance and implementation of erosion and sedimentation BMPs and site-specific Stormwater Pollution Prevention Plan to reduce potential sediment-laden runoff into adjacent or downgradient wetlands.
Aquatic Ecology	No impact.	Minor, temporary impacts from stormwater runoff during construction activities that would be minimized through the implementation of BMPs.
Vegetation	No impact.	Minor impacts. Clearance of disturbed herbaceous vegetation and forest (approximately 9.5 acres at Paradise and approximately 5 acres at Colbert). Projects expected to impact locally common vegetation with limited conservation value. Impacted forest communities are common within project vicinities and impacts to forest resources would

Resource	Alternative A	Alternative B
		be negligible compared to the total amount of forest land in the region.
Wildlife	No impact.	Minor impacts due to heavily disturbed habitats proposed for removal at the CT plant project areas, small size and discrete locations of offsite TL project areas, and amount of similar, suitable habitat in project area vicinities.
Threatened and Endangered Species	No impact.	Due to the relatively small amount of habitat being permanently impacted across the landscape, the short duration of actions at TLs, and use of BMPs, listed threatened and endangered species would not be impacted. Project activities are within the bounds of impacts analyzed in TVA's Bat Strategy Programmatic Section 7 ESA consultation. The conservation measures required for this project will be implemented. No impacts would occur to federally listed bats.
Visual Resources	No impact.	Minor impacts; temporary visual discord during construction activities.
Cultural and Historic Resources	No impact.	No impact.
Transportation	No impact.	Temporary, minor impacts to traffic on area roadways associated with CT plant construction activities.
Natural Areas, Parks and Recreation	No impact.	Minor, temporary impacts during construction activities.
Noise	No impact.	Short-term minor adverse impact related to construction activities at the Paradise and Colbert CT plant sites. Construction activities associated with the installation of the natural gas-fired reciprocating engine at the existing compressor station to support the CT units at Paradise would be negligible as there are no sensitive noise receptors within one mile of the of the existing compressor station. Construction of natural gas upgrades at the Colbert CT plant may result in notable increase in

Resource	Alternative A	Alternative B
		noise levels at four nearby receptors. However, these impacts would be temporary and would be limited to daylight hours. All operational noise impacts would be negligible to minor.
Solid and Hazardous Waste	No impact.	No impact. Solid and hazardous wastes generated during construction and operation of the CT plants at Paradise and Colbert would be managed in accordance with established procedures and applicable regulations.
Socioeconomics and Environmental Justice	No impact.	Beneficial short-term impacts during construction. Four to six employees needed to operate CTs at Paradise and Colbert. No long-term disproportionate impacts to low-income or minority communities.
Public Health and Safety	No impact.	The operation of the proposed CT units at both Paradise and Colbert would adhere to TVA guidance and be consistent with standards established by OSHA and applicable state requirements. Therefore, worker and public health and safety during project operation would be maintained and impacts would be minimal.
Cumulative Effects	No impact.	Minor cumulative effects to transportation.

2.6 TVA's Preferred Alternative

TVA has identified Alternative B, as its preferred alternative. Under the preferred alternative, TVA would construct three new natural gas-fueled frame CT units (750 MW total) at Paradise and three frame CT units (750 MW total) at Colbert for a system total of 1,500 MW, which would replace the capacity lost as a result of retiring the Allen and Johnsonville CTs. This replacement aligns with the 2019 IRP near-term actions to evaluate engineering end-of-life dates for aging generation units to inform long-term planning and to enhance system flexibility to integrate renewables and distributed resources.

2.7 Summary of Mitigation Measures, and BMPs

Mitigation measures and BMPs identified in Chapter 3 to avoid, minimize, or reduce adverse impacts to the environment are summarized below. Additional project-specific BMPs may be applied as appropriate on a site-specific basis to enable efficient maintenance of construction projects and further reduce potential impacts on environmental resources including air, surface water, and groundwater.

Best Management Practices include:

- Fugitive dust produced from construction activities would be controlled by BMPs (e.g., wet suppression), as stated in the TVA's fugitive dust control plans required under existing Clean Air Act Title V operating permits.
- Low ground-pressure-type equipment would be used in specified locations (such as areas with soft ground) to reduce the potential for environmental impacts, per TVA BMPs.
- BMPs described in *A Guide for Environmental Protection and Best Management Practices for Tennessee Valley Authority Construction and Maintenance Activities, Revision 3* (TVA 2017b) and in specific state regulatory sediment and erosion control handbooks would be outlined in the project-specific Stormwater Pollution Prevention Plan (SWPPP), Construction Best Management Practices Plan (CBMPP), or BMP plan, as required, that would be implemented to minimize erosion during site preparation. Appropriate BMPs would be followed, and all proposed project activities would be conducted in a manner to ensure that waste materials are contained and the introduction of pollution materials to the receiving waters minimized. Areas where soil disturbance could occur would be stabilized and vegetated with native or non-native, non-invasive grasses and mulched.

Mitigation measures include:

- TVA would establish a 50-foot buffer around the stream located within a laydown and warehouse area at Paradise and avoid any ground disturbing actions within the buffer to avoid direct impacts to the stream.
- New TL construction would adhere to the TVA subclass review criteria for TL location in floodplains.
- Any road improvements proposed in floodplains but not floodways would be constructed in such a manner that upstream flood elevations would not be increased by more than 1.0 foot.
- During construction, the commercial natural gas provider at Colbert would develop an evacuation plan prior to mobilization to relocate flood-damageable, loose, or valuable equipment out of the floodplain during a flood.
- To prevent obstruction in the floodway due to construction or modification of the access roads to TL 6057 Structures 7-10 in the Green River floodway; TL 5823 Structure 94 in the Bulls Creek floodway; and TL 5670 Structures 137 and 140 in the Clark Spring Branch Tributary floodway: (1) any fill, gravel or other modifications in the floodway that extend above the pre-construction road grade would be removed after completion of the project; (2) this excess material would be spoiled outside of the published floodway; and (3) the area would be returned to its pre-construction condition.
- At Colbert, the portions of the natural gas pipeline trench that would be located within the floodplain would be backfilled such that the final settled ground elevation would be no higher than the pre-construction ground elevation.
- A number of activities associated with the proposed project were addressed in TVA's programmatic consultation completed in April 2018 with the USFWS on routine actions with potential to affect federally listed bats in accordance with ESA

Section 7(a)(2). For those activities with potential to affect bats, TVA committed to implementing specific conservation measures.

- The conservation measures required for this project are identified on pages 5-7 of the TVA Bat Strategy Project Screening Form (Appendix B), and they will be implemented as part of the proposed project. Project activities are within the bounds of impacts analyzed in TVA's Bat Strategy Programmatic Section 7 ESA consultation.
- If the timing of proposed actions within 660 feet of the two osprey nests at Colbert, two osprey nests at Paradise, and one on TL 5676 cannot be modified to avoid nesting seasons, coordination with the USDA Wildlife Services would be required to ensure compliance under the EO 13186 [Responsibilities of Federal Agencies to Protect Migratory Birds].

CHAPTER 3 – AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

3.1 Air Quality

3.1.1 Affected Environment

3.1.1.1 Air Quality

The Clean Air Act (CAA) (as amended) is the comprehensive law that protects air quality by regulating emissions of air pollutants from stationary sources (e.g., power plants) and mobile sources (e.g., automobiles). It requires the EPA to establish National Ambient Air Quality Standards (NAAQS) and directs the states to develop State Implementation Plans to achieve these standards. This is primarily accomplished through permitting programs that establish limits for emissions of air pollutants. The CAA also requires EPA to set standards for emissions of hazardous air pollutants.

NAAQS have been established to protect the public health and welfare with respect to six criteria air pollutants: carbon monoxide (CO), nitrogen dioxide (NO_2), ozone, particulate matter (PM), sulfur dioxide (SO_2), and lead (Pb). Primary standards protect public health, while secondary standards protect public welfare (e.g., visibility, crops, forests, soils, and materials) (EPA 2020h).

In accordance with the CAA Amendments of 1990, all counties are designated with respect to compliance, or degree of noncompliance, with NAAQS. These designations include:

- Attainment – any area where air quality achieves the NAAQS;
- Nonattainment – any area with air quality worse than the NAAQS; and
- Unclassified – not enough data to determine attainment status.

The Paradise CT Plant project area and the offsite compressor station are both located in Muhlenberg County, Kentucky. Air quality in Muhlenberg County is protected by air quality regulations found in Title 401, Chapters 50–68 of the Kentucky Administrative Regulations (KAR). Muhlenberg County is currently in attainment with ambient air quality standards referenced in Chapters 51 and 53.

The proposed offsite TL upgrades would occur on various portions of existing TLs located in Sumner County, TN (TL 5823) and Muhlenberg and Todd counties, Kentucky (TL 6057). All of these counties are currently in attainment with all NAAQS (EPA 2020e) and applicable state regulations.

The Colbert CT Plant project area and the adjacent gas line upgrade are located in Colbert County, Alabama. Air quality in Colbert County is protected by air quality regulations found in ADEM Administrative Code. Colbert County is currently in attainment with air quality standards referenced in Section 335-3-1-.03 of the ADEM Administrative Code. As stated above for Paradise, the proposed CT plant at Colbert would be subject to both federal and state regulations that impose permitting requirements and specific standards for expected air emissions.

Proposed offsite upgrades to TL to support the CT plant at Colbert would occur in Morgan County (TL 5670) and Lauderdale and Colbert counties (TL 5676) in Alabama, and Wayne and Lawrence counties (TL 5617), and Hardin County (TL 5989) in Tennessee. All of these counties are currently in attainment with all NAAQS (EPA 2020e) and applicable state regulations.

3.1.1.2 Other Pollutants and Air Quality Concerns

Nitrogen oxides (NO_X) are a group of highly reactive gases, including NO_2, that contain varying amounts of nitrogen and oxygen. NO_X emissions contribute to ground-level ozone, fine particulate matter, regional haze, acid deposition and nitrogen saturation. Natural sources of NO_X include lightning, forest fires and microbial activity; major sources of human-produced NO_X emissions include motor vehicles, electric utilities, industrial boilers, nitrogen fertilizers and agricultural burning (TVA 2016b).

Sulfur oxides (SO_X) are compounds of sulfur and oxygen molecules. Sulfur dioxide (SO_2) is the predominant form found in the atmosphere. Most SO_2 is produced from the burning of fossil fuels (coal and oil), as well as petroleum refining, cement manufacturing and metals processing. In addition, geothermic activity, such as volcanoes and hot springs, can be a significant natural source of SO_2 emissions (World Bank Group 1998).

Hazardous Air Pollutants (HAPs), commonly referred to as air toxics, are pollutants that are known or suspected to cause cancer or other serious health effects or adverse environmental effects. The CAA identifies 187 pollutants as HAPs (EPA 2020a). Most HAPs are emitted by human activities, including mobile sources (motor vehicles), stationary sources (factories, refineries, and power plants), and indoor sources (building materials and activities such as dry cleaning).

States are required to establish an air operating program under Title V of the CAA. Regulations to implement this operating program, 40 CFR Part 70, require each major source of air pollutant emissions to obtain an operating permit, typically issued by the state environmental agency, that consolidates all of the air pollution control requirements into a single, comprehensive document covering all aspects of air pollution activities at a facility. In attainment areas, Title V major source thresholds, the level of potential emissions that require sources to obtain a Title V permit, are 100 tons per year (tpy) for each criteria pollutant, 10 tpy for each individual HAP and 25 tpy for total HAPs.

Sources that emit less than10 tpy of a single HAP or less than 25 tpy of a combination of HAPs are referred to as area sources, as opposed to major sources. Emissions from individual area sources are relatively small. However, if located in heavily populated areas that contain a number of area sources, emissions can be of concern.

3.1.1.3 Characterization of Existing Site Operations

The Paradise reservation currently includes a natural gas-fired CC plant which is a major source as defined by 401 KAR 51:001. The Paradise Fossil Plant previously included three coal-fired generating units: Units 1 and 2 were replaced with the Paradise CC plant in spring 2017, and Unit 3 was retired from service on February 1, 2020. The Colbert CT Plant currently operates eight (8) simple-cycle natural gas fired CT units and is a major source as defined by ADEM Administrative Code R. 335-3-16-.01.

3.1.2 Environmental Consequences

3.1.2.1 Alternative A – No Action Alternative

Under Alternative A, TVA would continue to operate Units 1-20 of Frame CTs at Allen and Units 1-16 of Frame CTs at Johnsonville. Because no changes to operations are foreseen, air pollutant emissions would be unchanged. Consequently, air quality would not be affected. However, any benefits to regional air quality associated with operation of newer, more efficient units would not be realized under this alternative.

3.1.2.2 Alternative B – Retirement of Allen CT Units 1-20 and Johnsonville CT Units 1-16 and Construction of CT Units at Paradise and Colbert

Under Alternative B, TVA is proposing to retire a total of 450 MW of Allen Frame CTs (Units 1-20) and a total of 950 MW of Johnsonville Frame CTs (Units 1-16) and construct about 1,500 MW of gas-fired frame CTs consisting of three Frame CTs (250 MW each) at Paradise and three Frame CTs (250 MW each) at Colbert to replace the capacity lost as result of these retirements.

3.1.2.2.1 Paradise CT Plant Project Area, Offsite Natural Gas Upgrade, and Offsite TL Upgrades

<u>Construction Impacts</u>

Onsite and offsite construction activities associated with the CT plant at Paradise would result in emissions from the operation of construction equipment driven on paved and unpaved roads, and fugitive dust suspension from clearing, grading and other activities on unpaved areas. Fugitive dust produced from construction activities would be temporary and controlled by BMPs (e.g., wet suppression) as stated in the TVA's fugitive dust control plans required under existing Clean Air Act Title V operating permits.

Equipment used during the construction phase would include trucks, truck-mounted augers and drills, excavators, as well as tracked cranes and bulldozers. Low ground-pressure-type equipment would be used in specified locations (such as areas with soft ground) to reduce the potential for environmental impacts per TVA BMPs. Combustion of gasoline and diesel fuels by internal combustion engines (vehicles, generators, construction equipment, etc.) would generate local emissions of CO, CO_2, ozone, NO_X, PM, SO_2, and volatile organic compounds (VOCs). However, new emission control technologies and fuel mixtures have significantly reduced vehicle and equipment emissions, and it is expected that all vehicles and equipment would be properly maintained, which also would reduce emissions. Air quality impacts from construction activities would depend on both man-made factors (intensity of activity, control measures, etc.) and natural factors such as wind speed and direction, soil moisture and other factors. However, even under unusually adverse conditions, these emissions would have, at most, a minor transient impact on offsite air quality that is well below the applicable ambient air quality standard.

Equipment used during clearing of ROW for the proposed onsite 500-kV TL would include chain saws, skidders, bulldozers, tractors, and/or low ground-pressure feller-bunchers. Marketable timber would be salvaged where feasible; otherwise, woody debris and other vegetation would be piled and burned, chipped, or taken off site. TVA would adhere to all appropriate state and county regulatory requirements if burning of landscape waste is conducted. Impacts from these actions would be temporary and minimal.

Equipment used to support the proposed offsite TL upgrades may include mowers, chain saws, skidders, and bucket trucks. Equipment operation would produce small increases in emissions from combustion engines and particulates from mowing and localized land disturbance. Such emissions, however, are localized and temporary. No tree clearing is expected to be required as upgrades would occur along established and maintained TL and access road ROWs.

Overall, effects to air quality from construction–associated activities would be temporary and localized. Emissions would only affect the immediate project area and would have limited effects to off–site areas.

Description of Simple Cycle Operations

TVA requires a combination of peaking and baseload generation capabilities to meet electricity demands that fluctuate daily. Baseload generation needs are typically met by the operation of nuclear and coal-fired plants, which are well suited to continual, steady operation with low cost per kilowatt hour generation ($/kWh). To meet peak demand (demands above baseload), TVA must bring units on- and off-line for a few hours at a time to match capacity to demand. Although $/kWh costs are higher for CTs than for CCs, nuclear or coal-fired units, the quicker response time for natural gas-fired CTs allows for a more cost-effective means by which to accommodate frequent demand fluctuations.

Simple-cycle configuration is the condition where only useful energy for electricity generation is captured from the expansion of gases, which occurs when natural gas is combusted in the presence of air. The products of combustion pass through a turbine attached to a generator, which produces electricity as the turbine shaft turns. Simple-cycle plants are best suited for peaking power due to their lower capital cost and intermittent operation to meet peaking power requirements, which can change within minutes. The typical startup time for a coal-fired boiler is four to six hours whereas the typical startup time for a natural gas or fuel oil-fired combustion turbine operating in simple-cycle mode is 10 to 30 minutes.

Simple cycle CTs were selected for development at Paradise and Colbert to fulfill peak generating needs (i.e., operated infrequently during high demand periods for short durations, but capable of being started up at short notice). Peaking resources are essential for maintaining system reliability requirements since they can start up quickly and meet sudden changes in demand or supply. Frame CT units were specifically selected as they have inherently low cost per installed MW, versus aeroderivative units. They also better integrate with renewable resources, such as solar, by filling in the gaps created by intermittent generation.

The proposed simple-cycle CT facilities to be constructed at Paradise and Colbert would include three CT units at each site. Each CT unit would have a gross electrical generating capacity of 229 MW at 59 degrees Fahrenheit (^{o}F). The CT units are equipped with DLN combustion for control of NO_X emissions; there are no add-on controls such as selective catalytic reduction. An evaporative cooling system is installed at the compressor inlet of each CT. As the CT units require the temperature of the natural gas at the turbine interface to be above the dew point, three natural gas-fired heaters are included at each location. Both facilities would also include ancillary equipment as needed, such as natural gas metering and handling systems, instrumentation and control systems, transformers, buildings, etc. The CTs would operate during periods of peak demand when sufficient generating capacity may not be available from other TVA assets and to maintain transmission system reliability.

Regulatory Air Permit Requirements

Construction of both proposed plants are subject to permitting programs that regulate the construction of new stationary sources of air pollution, typically referred to as New Source Review (NSR). Major NSR is applicable to major sources under PSD which are sources that have 250 tpy of potential emissions of any criteria pollutant or 100 tpy for specifically listed source categories. There are two NSR permitting programs, based on the attainment status of the area in which the proposed project is located. In attainment areas, PSD is the applicable permitting program. In nonattainment areas, the applicable permitting program is nonattainment NSR. As both plants are located in attainment areas, any significant emission increases from the proposed projects would be subject to PSD pre-construction review to ensure air quality in the area is protected and attainment status is maintained.

PSD review is required if the project by itself is a major source or if the facility is already a major source (both Paradise and Colbert are major sources) and the project will constitute a major modification (i.e., any physical change or change in the method of operation of a major stationary source that would result in a significant emissions increase of a regulated pollutant and a significant net emissions increase of that pollutant from the major stationary source). Significant emission increase levels, for purposes of PSD, were established as allowable increases in air pollutants over a baseline level that would not have a detrimental impact to air quality.

For new emission units, increases are calculated using the “actual to potential” test, meaning that emissions from new emission units must be evaluated for the potential emission/worst-case scenario, which may far exceed anticipated actual emissions from normal operation. Net emission increases for new emission units are defined as the potential increase in emissions from the project and any other increases and decreases in baseline actual emissions at the major stationary source that are contemporaneous with the change and otherwise creditable.

Both plants have existing Title V permits, which are required for facilities which have emissions exceeding the major source thresholds for criteria pollutants, HAPs, and in certain cases, greenhouse gases (GHGs). Each plant’s Title V permit includes emission limits (as established by federal/state/local regulation) and include the data tracking, recordkeeping, and reporting measures to verify compliance.

Construction of the proposed equipment at both Paradise and Colbert require modification of both Title V permits. Permit modifications will incorporate limitations from applicable state and federal regulations, including the following:

- New Source Performance Standards (NSPS):40 CFR 60, Subpart KKKK is applicable to all stationary gas CT units with a heat input at peak load equal to or greater than 10 MMBTU (Million British Thermal Units) per hour for which construction or modification is commenced after February 18, 2005. Under this NSPS, NO_X emissions while firing natural gas are limited to 15 parts per million, corrected to 15% O_2, and SO_2 emissions are limited to 0.06 pounds SO_2 per MMBTU.

- 40 CFR 60, Subpart TTTT is applicable to CT electrical generating units constructed after January 8, 2014, for the control of GHG emissions. For CT units of the size and capacity considered under this alternative, the proposed CO_2 emission standard is 1,100 pounds per megawatt–hour of generation (120 pounds CO_2 per MMBTU). EPA has recently promulgated a rule with an effective date of March 15, 2021 that includes a significant contribution finding specific to electric generating units (EGUs), reaffirming EGUs as a listed source category for purposes of GHG NSPSs.

These, and other potentially applicable state and federal regulations, will be evaluated when final permit modification applications are prepared to ensure that appropriate limitations based on the most recent regulatory updates are incorporated.

Emissions from the proposed CT plants would meet these applicable standards, as well as any additional requirements established by state and local regulations.

Operational Impacts

Emissions from natural gas-fired plants are lower than emissions from other fossil plants. Emissions of SO_2 are very low, and direct emissions of NO_X and CO_2 are low relative to other fossil plants (TVA 2019b). Natural gas-fired plants also do not emit mercury.

Potential annual-emission estimates are provided in Table 3-1, which presents emission contributions from both CT operations and gas heater operations. CT emissions vary with ambient temperature and operating configuration. Annual emission estimates are based on CT performance at 59°F, which is deemed most representative of site annual-average temperature, and baseload operations occurring approximately 3,400 hours per CT per year. Because variation in ambient temperatures has negligible impacts on gas heater performance, annual emissions are based on the gas-heater burner's maximum heat input and annual operations occurring approximately 3,400 hours per gas heater per year.

Anticipated baseload operating hours would be expected to be lower based on TVA's experience at other simple cycle CT plants.

To check for PSD applicability, contemporaneous creditable emission increases and decreases are used to determine the net emission increase. The net emission increase for the project was determined by adding the anticipated emissions from the proposed CT Plant to the actual baseline emissions from the recently installed CC plant (2017) and subtracting the baseline emissions from Paradise coal-fired Unit 3 (2020 shutdown). The result of this netting analysis was a net emission decrease for each regulated pollutant as shown in the following table. Therefore, PSD review does not apply.

Table 3-1. Net Emission Analysis – Paradise CT Plant

	Emissions (tons/year)				
Pollutant	**Potential Paradise CT**	**2017 Paradise CC**	**Retired Paradise Coal Fired Unit 3**	**Difference (net increase)**	**PSD Significance Threshold**
CO	307	58.2	-506	-141	100
NO_X	627	695	-3,988	-2,666	40
SO_2	6.8	12.8	-2,829	-2,809	40
PM	46.4	81	-409	-282	25
PM_{10}	160	162	-814	-492	15
$PM_{2.5}$	128	162	-683	-393	10
VOC	36.6	45.6	-111	-29	40
Lead (Pb)	<0.01	0.01	-0.1	-0.09	0.6
SO_3 as H_2SO_4	0.5	7.1	-441	-433	7
CO_{2e}	1,367,414	2,541,000	-4,827,711	-919,297	75,000

Although the Paradise CT will not require a PSD evaluation, it must meet the requirements and limits provided in KDAQ and federal regulations. The Paradise plant-site currently operates under a Title V operating permit, which will require a modification for the proposed project. TVA has taken the first step in compliance with air permit requirements as the netting analysis, HAP evaluation, and appropriate application forms have been completed and were submitted to KDAQ in early December 2020. The project has also been formally discussed with the agency.

A commercial gas company (Texas Gas Transmission, LLC) proposes to install a new natural gas-fired reciprocating engine at an existing compressor station. The facility currently operates under Tile V permit V-15-064, issued by KDEP on May 4, 2016. Texas Gas has submitted an application to KDEP for a minor revision to the facility's Title V permit to reflect the new equipment (Texas Gas Transmission, LLC 2020). The engine would be installed in an existing compressor building in place of two engines that were removed several years ago. The primary air emission sources at the existing facility are one natural gas-fired reciprocating engine and three natural gas-fired turbines that all drive natural gas compressors. Emissions at the existing site also result from natural gas venting activities and fugitive equipment leaks from natural gas piping and components. Table 3-2 summarizes the annual estimated emission rates of criteria pollutants from the proposed new facilities and existing facilities. Total emissions from the compressor station will increase by 10 percent as a result of the proposed upgrades.

Table 3-2. Estimated Criteria Pollutant Emission Rates Associated with the Natural Gas Upgrades to Support the Paradise CT Plant

	Annual Potential Emissions (tpy)				
	NOx	**CO**	**VOC**	**SO_2**	**PM10**
New Project Emissions	18.11	5.58	8.99	0.07	1.22
Existing Emissions	166.42	131.91	35.66	0.47	9.21
Totals	**184.53**	**137.49**	**44.65**	**0.54**	**10.43**

Source: Texas Gas Transmission, LLC 2020

An air dispersion modeling analysis for the project was conducted as part of that application (Texas Gas Transmission, LLC 2020). The modeled concentrations meet the NAAQS for all pollutants when combined with the existing ambient background concentrations. The existing compressor station is located in an attainment area and the emission increases associated with the proposed project will be below the threshold requirements for PSD permitting, and the facility will remain a PSD minor source. Therefore, impacts to air quality associated with the installation of the natural gas-fired engine at the offsite compressor station would be minor.

3.1.2.2.2 Colbert CT Plant Project Area, Offsite Natural Gas Loop Line, and Offsite TL Upgrades

Construction Impacts

Onsite and offsite construction activities associated with the CT plant at Colbert would be similar to those described for construction of the CT plant at Paradise and would be minor and temporary.

Operational Impacts

Potential emissions from the Colbert CT Plant are anticipated to exceed PSD significance thresholds, as shown in Table 3-3. These emissions are based on approximately 3,400 hours of baseload operations per CT per year. As described for the proposed Paradise CT plant, the basis upon which the emissions were estimated are established upon a conservatively high operating scenario (i.e., 3,400 hours of baseload operations).

Table 3-3. Potential Annual Emission Estimates and PSD Applicability Thresholds – Colbert CT Plant

	Emissions (tons/year)	
Pollutant	**Potential Colbert CT Plant**	**PSD Applicability Thresholds**
CO	342	100
NO_X	368	40
SO_2	6.52	40
PM	33.6	25
PM_{10}	116	15
$PM_{2.5}$	93	10
VOC	34.5	40
Pb	<0.01	0.6
Sulfuric Acid	0.47	7
CO_2e	1,306,000	75,000

For the Colbert CT Plant, for which there are no creditable increases or decreases of emissions in the contemporaneous period, anticipated emissions and the net emission increase from the proposed modification exceed PSD applicability thresholds for several pollutants. As such, the project is subject to PSD.

PSD does not prevent sources from increasing emissions, but instead it preserves and protects air quality, ensures economic growth will occur in a manner consistent with preserving clean air resources. It also ensures any increase in air pollution to which PSD applies is made only after careful evaluation of all consequences of such a decision and after adequate procedural opportunities for informed public participation are provided (EPA 2019).

PSD requires installation of Best Available Control Technology (BACT), an air quality analysis, additional impact analysis, and public involvement. Further detail on each of these requirements is provided below.

- BACT is an emission limitation which is based on the maximum achievable degree of control. BACT is determined on a case-by-case basis and considers the energy, environmental, and economic impact of the proposed limitation. BACT can be an add-on pollution control device or a modification of the production process or method or, in some cases, a design, equipment, work practice or operational standard, if an emission standard is infeasible.
- An air quality analysis is performed to demonstrate that the new emissions from a proposed modification, in conjunction with other applicable emissions increases and decreases from existing sources, will not cause or contribute to a violation of any applicable NAAQS or PSD increment. The analysis includes an assessment of existing air quality, which may include ambient monitoring and air dispersion modeling, as well as dispersion modeling predictions of ambient concentrations resulting from the proposed project and future growth associated with the project.
- Additional impact analyses evaluate the other impacts caused by an increase in emissions, such as ground and water pollution impacts on soils, decreases in

visibility caused by the emissions and associated growth. Associated growth is growth in the area due to the proposed modification, including industrial, commercial, and residential.

- Public participation allows the public to review and comment on the permit before it is issued.

TVA has begun the process of complying with PSD requirements with the submission of Class I and Class II modeling protocols to ADEM in August 2020. The PSD program provides extra protection for large pristine areas of the US, such as national parks, forests, and wildlife refuges, referred to as Class I areas. Class II areas are areas that are in attainment or noted to be unclassifiable. Based on the location of the Colbert Plant, both Class I and Class II areas are potentially impacted, therefore a protocol for each has been submitted.

Based on this PSD analysis, ADEM is expected to issue a construction permit, which allows initial unit operations for approximately one year. The terms of the construction permit will be rolled into the existing Colbert Title V operating permit via a Title V permit modification after the initial 365 days.

Natural Gas Upgrades

Operation of the proposed pipeline(s) could result in a small increase in emissions from the increased operation of compressor stations but would have little overall effect on air quality.

The CTs at Paradise and Colbert are intended to meet future demand since they are intended to replace the loss of peaking capacity related to closure of the old units at Allen and Johnsonville. Emission estimates presented above, represent conservatively high operating conditions, as it is unlikely these emissions would be generated from peaking operations. While the new generation units would result in an increase in local emissions, compliance with PSD requirements, as described above, ensures there is no significant impact to or deterioration of air quality due to the proposed project.

3.2 Climate Change and Greenhouse Gas

3.2.1 Affected Environment

“Climate change” refers to any substantive change in measures of climate, such as temperature, precipitation, or wind lasting for an extended period (decades or longer) (EPA 2016). The amount of warming projected beyond the next few decades, by these studies, is directly linked to the cumulative global emissions of GHGs (e.g., CO_2, methane). In 2014, U.S. GHG emissions totaled 6,870 million metric tons (15.1 trillion pounds) of carbon dioxide equivalents. This 2014 total represents a 7 percent increase since 1990 but a 7 percent decrease since 2005 (EPA 2016). This carbon overload is caused mainly by activities that burn fossil fuels such as coal, oil, and gas or by releasing stored carbon by cutting down forests.

Climate change is primarily a function of excessive CO_2 in the atmosphere. CO_2 is the primary GHG emitted through human activities. Forested areas that absorb and store CO_2 from the atmosphere via a process known as carbon sequestration help to reduce levels of CO_2 in the atmosphere. Activities associated with the proposed action that produce CO_2 are primarily related to emissions related to fossil-fuel-powered equipment (e.g., bulldozers, loaders, haulers, trucks, generators) used during construction activities and from operation of the proposed CT plants.

Additional GHGs that contribute to climate change include methane, nitrous oxide (NO_X) and fluorinated gases (such as hydrofluorocarbons and sulfur hexafluoride). Methane is emitted during production and transport of oil and natural gas as well as coal. Livestock and other agricultural practices also produce methane emissions. Nitrous oxide is emitted during combustion of fossil fuels and from agricultural and industrial practices. Fluorinated gases do not occur naturally and are emitted from a variety of industrial processes as well as commercial and household uses (EPA 2016).

As indicated in the IRP, CO_2 emissions from the TVA power system have decreased by 51 percent since 1995 (TVA 2019b). This decrease is mainly due to the retirement of coal plants, which emit large quantities of CO_2 relative to other types of electrical generation, and the replacement of coal generation with nuclear and natural gas-fueled generation. Nuclear generation does not result in emissions of CO_2, and the CO_2 output rate from natural gas fueled electricity generation is about half that of coal (TVA 2019b). As a generation fleet, TVA has demonstrated a commitment to continued reduction and management of GHG emissions while maintaining a balanced generation portfolio.

3.2.2 Environmental Consequences

3.2.2.1 Alternative A – No Action Alternative

Under Alternative A, TVA would not retire Units 1-20 of Frame CTs at Allen and Units 1-16 of Frame CTs at Johnsonville. However, under this alternative, TVA would make the repairs needed to maintain operation of these units, and associated emissions from refurbishment activities is expected to be negligible. As such, any incremental impact to GHG emissions or climate change associated with the No Action alternative would be negligible.

3.2.2.2 Alternative B – Retirement of Allen CT Units 1-20 and Johnsonville CT Units 1-16 and Construction of CT Units at Paradise and Colbert

3.2.2.2.1 Paradise CT Plant Project Area, Offsite Natural Gas Upgrade, and Offsite TL Upgrades

Construction Impacts

Construction-related CO_2 emissions associated with the Paradise CT plant would occur from internal combustion engines during site preparation, facility construction and minor TL upgrades and would result in a minor temporary increase in CO_2 emissions. The emissions from construction-related activity are expected to be insignificant.

Impacts Associated with Forest Clearing

EPA's quantification tool was used to estimate the carbon sequestration that may be lost from clearing of forested land within the Paradise CT project area to support construction of the 500-kV TL (EPA 2020g). Assuming 9.5 acres of forested areas (the land cover with the greatest potential carbon sink) are completely cleared to accommodate construction activities and, using EPA's estimate for carbon sequestered annually by forested areas as a whole, TVA estimates that the conversion of these forested lands would result in the loss of approximately 7.3 metric tons of carbon sequestered in one year. This loss of carbon sequestered, or stored, is very small relative to the carbon sequestered in local and regional forested areas. Overall, carbon sequestration within forests in the region has increased due to net increases in forest areas (e.g., conversion of farmland to forested areas), improved forest management, as well as higher vegetation growth productivity rates and longer growing seasons. Existing forested lands in Muhlenberg County (estimated at 126,000 acres) sequester approximately 97,020 metric tons of carbon per year. By comparison, therefore, the loss of 7.3 metric tons of carbon sequestration due to construction phase clearing of forests in the Paradise CT Plant project area is considered insignificant.

Operational Impacts

As noted in Section 3.1.2.2.1, operation of the CT units at Paradise would result in a net emission decrease of regulated pollutants, including GHGs. However, operation of the proposed pipeline(s) (both onsite and offsite) at Paradise would result in emissions of CO_2 from increased operation of compressor plants and emissions of small quantities of methane during gas extraction, processing, storage, and transport. However, based on estimates of CO_2 emissions for the state of Kentucky by the U.S. Energy Information Administration (EIA 2020), total emissions of CO_2 for the state were 114 million metric tons and emissions from the US were 6,870 million metric tons in 2017. Therefore, the potential emissions for the natural gas upgrades would represent an insignificant increase in regional and national emissions.

As indicated in the IRP, CO_2 emissions from the TVA power system have decreased by 51 percent since 1995 (TVA 2019b). This decrease is mainly due to the retirement of coal plants, which emit large quantities of CO_2 relative to other types of electrical generation, and the replacement of coal generation with nuclear and natural gas-fueled generation. Nuclear generation does not result in emissions of CO_2, and the CO_2 output rate from natural gas fueled electricity generation is about half that of coal (TVA 2019b). As a generation fleet, TVA has demonstrated a commitment to continued reduction and management of GHG emissions while maintaining a balanced generation portfolio. Therefore, the operation of the CT plant at Paradise would not negatively impact regional and national GHG emissions or climate change.

3.2.2.2.2 Colbert CT Plant Project Area, Offsite Natural Gas Loop Line, and Offsite TL Upgrades

Construction Impacts

GHG emissions from construction activities associated with the Colbert CT plant would be similar to those described for the Paradise plant and would be expected to be insignificant.

Impacts Associated with Forest Clearing

EPA's quantification tool was used to estimate the carbon sequestration that may be lost from clearing of forested land within the Colbert CT project area to support construction of onsite transmission lines connecting the existing switchyard to the proposed CT plant and the proposed natural gas upgrades (EPA 2020g). Assuming five acres of forested areas (the land cover with the greatest potential carbon sink) are completely cleared to accommodate these construction activities and, using EPA's estimate for carbon sequestered annually by forested areas as a whole, TVA estimates that the conversion of these forested lands would result in the loss of approximately 4 metric tons of carbon sequestered in one year. Existing forested land in Colbert County (estimated at 193,000 acres) sequester approximately 148,610 metric tons of carbon per year. By comparison, therefore, the loss of 10 metric tons of carbon sequestration due to construction phase clearing of forests in the Colbert CT plant project area is considered insignificant.

Operational Impacts

The units proposed at Colbert would result in an increase in local emissions of GHGs; however, based on estimates of CO_2 emissions for the state of Alabama by the U.S. Energy Information Administration (EIA 2020), total emissions of CO_2 for the state were 108 million metric tons in 2017. Therefore, the potential emissions from the CT plant would represent a 1.1 percent increase in state emissions and approximately 0.02 percent of emissions on a national scale. However, as noted in the 2019 IRP, during the decade following the CT retirements, i.e., 2021–2030, annual average system-wide emissions of CO_2 would decrease by 0.6 percent. Thus, the operation of the CT plant at Colbert would not negatively impact regional and national GHG emissions or climate change.

3.3 Geology and Soils

3.3.1 Affected Environment

3.3.1.1 Geologic Setting

The Paradise Reservation lies within the Shawnee Hills section of the Interior Plateau Physiographic Province in Northwestern Kentucky (Fenneman 1938). The reservation is underlain by Pennsylvanian-aged bedrock of the Carbondale Formation, which consists of shale, coal, sandstone, and limestone. The most extensively mined coal seams listed within this formation includes the No. 9 and No. 11 seams (USGS 2001). Extensive strip mining operations have significantly altered the topography and geology within the vicinity of the plant and, as such, large areas of the property are underlain by deep mine spoil deposits. However, depth to bedrock across the proposed CT plant site is variable, ranging from 4 feet to over 90 feet below ground surface (S&ME 2020a).

The Colbert Reservation lies within the Highland Rim Section of the Interior Plateau Physiographic Province (Fenneman 1938). The primary bedrock underlying the Colbert Reservation is Tuscumbia limestone, a cherty limestone characterized by fine to medium grained fossils and layers of chert nodules (USGS 2020b). This Mississippian age bedrock may be overlain by residual and alluvial deposits. Depth to bedrock is variable, ranging from 17 feet to more than 67 feet below ground surface with differential solution activity and weather producing an irregular bedrock surface (S&ME 2020b).

The proposed offsite TL upgrades are located in Tennessee, Kentucky, and Alabama, and are primarily included in two sections of the Interior Plateau Physiographic Province, the Highland Rim Section and the Nashville Basin (TVA 2019d). The Highland Rim section is a plateau that occupies much of central Tennessee and parts of Kentucky and northern Alabama. The bedrock of the Highland Rim is Mississippian limestones, chert, shale, and sandstone. The Nashville Basin section is an oval area in middle Tennessee with an elevation about 200 feet below the surrounding Highland Rim. The bedrock is comprised of generally flat-lying limestones (TVA 2019d).

3.3.1.2 Geologic Hazards

3.3.1.2.1 Seismic Events

According to the USGS illustration of expected frequency of damaging earthquakes, the Paradise and Colbert reservations are located within an area with a moderate seismic hazard (USGS 2018). This rating is based on an historical earthquake having a magnitude of 7.5 to 8 that occurred within the New Madrid Seismic Zone (NMSZ) approximately 146 miles and 137 miles from each site, respectively (S&ME 2020a and 2020b).

The NMSZ is located along the Mississippi Valley in the areas of western Kentucky and Tennessee, southwestern Missouri, and northwest Arkansas. The NMSZ is best known for a series of intense earthquakes which occurred in 1811 and 1812. These earthquakes were estimated to have magnitudes ranging from 7.0 to 8.6 and caused significant disruption at the ground surface (landslides, fissures, sand boils, lateral spreads, subsidence, submergence, and uplift) and damage to structures (S&ME 2020a and 2020b).

3.3.1.2.2 Faulting

Based on a review of the USGS website, which contains information on faults and associated folds in the United States that are believed to be sources of more than six earthquakes having a magnitude greater than 6 during the Quaternary Period (the past 1,600,000 years including Holocene Epoch), there are no known faults of this age located within the vicinity of the Paradise and Colbert reservations or the proposed TL upgrades (USGS 2020c).

3.3.1.3 Karst Topography

“Karst” refers to a type of topography that is formed when rocks with a high carbonate content, such as limestone and dolomite, are dissolved by groundwater to form sink holes, caves, springs, and underground drainage systems. Karst topography forms in areas where limestone and dolomite are near the surface. There is no evidence of a karst environment on or near the Paradise CT plant project area (TVA 2017a).

Karst features have been identified in the bedrock at the Colbert Reservation. The bedrock in such areas is characterized by differential weathering and solution activity producing deep bedrock cuts and sharp peaks known as “pinnacle and cutter” topography (TVA 2016c), which results in the variable depth to bedrock noted above. No other evidence of other karst features is present on the Colbert CT plant project area (Geologic Survey of Alabama [GSA] 2020).

3.3.1.4 Soils

According to the Natural Resources Conservation Service (NRCS) web soil survey (USDA NRCS 2020), most of the soils on the Paradise CT plant project area are mapped as Fairpoint-Bethesda and the Bethesda-Fairpoint complex which are generally silty clay loams. Most of the other soils are mapped as dumps, Pits and Udorthents (fill material). This material consists of those lands that had previously been disturbed by surface mining practices. Unconsolidated overburden materials overlying bedrock include alluvial and residual soils and strip mine spoil. Soils mapped on the Paradise CT plant project area are shown on Table 3-4.

As indicated on the NRCS online web soil survey, the soils on the Colbert site are predominantly urban land, mostly covered by streets, parking lots, buildings, and other structures. Approximately 30 percent of the Colbert CT project area is mapped as the Decatur-Urban land complex, which is a mixture of Decatur soil and urban land, and 23 percent is mapped as urban land. The remaining soil types present within the project area are forms of silt loam, including Fullerton cherty silt loam, Fullerton gravelly silt loam (together comprising 29 percent of the project area) and Fullerton-Bodine complex (USDA NRCS 2020). Soils mapped on the Colbert CT plant project area are shown on Table 3-5.

Table 3-4. Soil Types Mapped Within the Paradise CT Plant Project Area

Soil Mapping Unit	Acres	Percent of Total
Belknap silt loam,	11.3	1.9%
Bethesda-Fairpoint complex	121.5	20.0%
Fairpoint-Bethesda complex	248.3	40.9%
Weinbach silt loam	11.7	1.9%
Lindside silt loam	3.0	0.5%
Oatwood silt loam	3.7	0.6%
Wellston silt loam	10.7	1.8%
Zanesville silt loam	11.4	1.9%
Pits	5.6	0.9%
Udorthents	123.0	20.2%

Source: USDA NRCS 2020

Table 3-5. Soil Types Mapped Within the Colbert CT Plant Project Area

Soil Mapping Unit	Acres	Percent of Total
Capshaw Silt Loam	8.9	2.3%
Decatur silt loam	21.8	5.6%
Decatur-Urban land complex	118.5	30.3%
Emory silt loam	10.1	2.6%
Fullerton gravelly silt loam	114.0	29.2%
Fullerton-Bodine complex	2.0	0.5%
Tupelo-Colbert complex	11.7	3.0%
Urban Land	89.0	22.8%
Water	14.8	3.8%

Source: USDA NRCS 2020

3.3.2 Environmental Consequences

3.3.2.1 Alternative A – No Action Alternative

Under Alternative A, there would be no project-related impacts to geologic resources or soils as TVA would not construct the CT plants at the Paradise or Colbert reservations.

3.3.2.2 Alternative B – Retirement of Allen CT Units 1-20 and Johnsonville CT Units 1-16 and Construction of CT Units at Paradise and Colbert

Grading and site preparation activities associated with the construction of the CT plant at Paradise have the potential to disturb soil stability and increase erosion. Despite these proposed actions, impacts to soil resources associated with surface disturbances related to the proposed construction activities are expected to be minor, as BMPs described in the project-specific SWPPP would be implemented to minimize erosion during clearing and site preparation.

The proposed CT plant at Paradise would be constructed on a site that is heavily disturbed and comprised of fill material. Onsite and local geologic and geomorphic features within and around the proposed CT plant features were evaluated during the screening level geotechnical investigation at the site. The geotechnical exploration did not encounter any onsite features that would prohibit development of a CT plant at Paradise. As identified in the report (S&ME 2020a), the design of the CT plant would address soils and materials susceptible to liquefaction, soil strength and slope stability, differential settlement potential, seismic considerations, and fill material selection and compaction requirements. These design considerations are expected to minimize any effects on geological and soil resources.

Construction of the natural gas compressor at the offsite existing compressor station to support the CT plant at Paradise would occur on previously developed paved or gravel areas and only minor amounts of excavation would be required. Therefore, there would be no impacts to geology or soils.

Proposed offsite TL upgrades associated with the proposed Paradise CT plant would require minimal ground disturbance and may result in increased erosion. BMPs described in *A Guide for Environmental Protection and Best Management Practices for Tennessee Valley Authority Construction and Maintenance Activities, Revision 3* (TVA 2017b) and outlined in the project-specific SWPPP would be implemented to minimize erosion during site preparation. Therefore, impacts to soils would be minor.

Onsite construction activities at Colbert would also include grading and site preparation that would result in minor impacts to soil resources. Impacts to groundwater would be minor and minimized through implementation of BMPs outlined in the project-specific SWPPP.

Similar to the proposed CT plant at Paradise, the proposed CT plant at Colbert would be constructed on a site that is heavily disturbed. Onsite and local geologic and geomorphic features within and around the proposed CT plant features were evaluated during the screening level geotechnical investigation at the site. The geotechnical exploration did not encounter any onsite features that would prohibit development of a CT plant at Colbert. As identified in the report, the design of the CT plant would address soils and materials susceptible to liquefaction, soil strength and slope stability, differential settlement potential, seismic considerations, and fill material selection and compaction requirements (S&ME 2020b). These design considerations are expected to minimize any effects on geological and soil resources.

Offsite upgrades to the existing natural gas supply at Colbert would require minimal ground disturbance and would not impact regional geologic conditions as BMPs outlined in the CBMPP would be implemented to minimize erosion during land clearing and site preparation. Therefore, impacts to geology or soils would be minor.

Offsite TL upgrades associated with the construction of the CT plant at the Colbert Reservation would be similar to the TL upgrades described for construction of the CT plant at the Paradise Reservation. As described above, the impacts would be localized and minimized with the appropriate use of BMPs and erosion control measures. Therefore, impacts associated with soil erosion during construction activities would be minimized with implementation of BMPs and would be minor.

Operation of the CT plants at Paradise and Colbert would not impact soils or geological resources.

3.4 Groundwater

3.4.1 Affected Environment

3.4.1.1 Regional Aquifers

Regional aquifers within five miles of the Paradise Reservation are represented by the bedrock carbonate aquifer and the alluvial aquifer associated with the Green River. Water-bearing units at the Paradise Reservation include the following units (from surface to depth): coal-mine spoils/fill, alluvium/residuum, and the bedrock carbonate aquifer (Carbondale Formation). Groundwater flow generally follows surface topography with flow toward the Green River and Jacobs Creek (Stantec 2020b). Based on borings collected in June 2020, depth to groundwater ranges from 13 feet to approximately 38 feet across the proposed project site (S&ME 2020a).

The Tuscumbia-Fort Payne aquifer (Tuscumbia Limestone bedrock aquifer) is the regional water-bearing aquifer underlying the Colbert Reservation. The groundwater flow direction is toward the north northeast to the Tennessee River/Pickwick Reservoir (Stantec 2020a). Based on borings collected in May 2020, depth to groundwater ranges from 14 feet to over 50 feet across the proposed CT plant site (S&ME 2020b).

Groundwater within the carbonate bedrock of the Highland Rim and Nashville Basin provinces associated with the offsite TL upgrades is encountered at depths ranging from 50 to 200 feet (TVA 2019d). Groundwater directional flow is generally reflective of site topography and local geologic conditions.

3.4.1.2 Groundwater Use

Most of the public water supply in Muhlenberg County is sourced from the Green River and provided by a water utility (Central City Water and Sewer System) (Stantec 2020b, 2020c, and 2020d). Previous studies identified four wells (three domestic and one industrial well) within two miles of the plant reservation. Two of the domestic wells were reviewed in 2003 by TVA and were found to no longer exist. No new public drinking water sources have been located near the reservation (TVA 2019c).

Three public water supply utilities are present within a five-mile radius of the Colbert Reservation: the Colbert County Rural Water System, the Cherokee Water Department, and the Hawk Pride Mountain Water System. Only one, the Hawk Pride Mountain Water System, supplies approximately 1,350 customers with groundwater supplied by two wells that are approximately five miles east-southeast of the Colbert Reservation and that were completed in the Tuscumbia-Fort Payne bedrock aquifer (Stantec 2020a).

Groundwater use across Tennessee, Kentucky, and Alabama (area spanned by the proposed TL upgrades) is variable and dependent upon several factors including groundwater availability and quality, surface water availability and quality, and population. Groundwater use is typically characterized by municipal public supply wells in densely populated areas and is generally limited to private domestic water supply wells in rural areas (TVA 2019d).

3.4.1.3 Groundwater Quality

No directly applicable groundwater monitoring data are available from TVA's monitoring network for the proposed CT plant at Paradise. However, TVA has established three networks of monitoring wells within separate areas on the Paradise Reservation: Gypsum Disposal Area, Peabody Ash Pond, and Slag Pond Area. Groundwater from these wells is monitored in accordance with the requirements of the EPA Final Disposal of Coal Combustion Residuals from Electric Utilities Rule (CCR Rule). Monitoring results from samples taken in 2019 show arsenic as the only constituent detected above groundwater protection standards at the Peabody Ash Pond Unit and Slag Pond Unit (Stantec 2020c and 2020d). No constituents detected above the groundwater protection standards were recorded in the certified monitoring well network for the Paradise Gypsum Disposal Area Unit (Stantec 2020b).

At Colbert, a groundwater monitoring well network has been established for the Ash Disposal Area 4, located southeast of the proposed CT plant. For the 2019 assessment monitoring, cobalt and arsenic were detected at levels above groundwater protection standards (Stantec 2020a).

The quality of groundwater in the TVA region largely depends on the chemical composition of the aquifer in which the water occurs. Groundwater in the carbonate bedrock present in the Highland Rim and Nashville Basin (where the proposed TL upgrades would occur) may contain high sulfide or sulfate concentrations in places. However, the chemical quality of most groundwater in the overall TVA region is within heath-based drinking water standards identified by the EPA (TVA 2019d).

The Safe Drinking Water Act of 1974 established the sole source aquifer protection program that regulates certain activities in areas where the aquifer (water-bearing geologic formations) provides at least half of the drinking water consumed in the overlying area. No sole source aquifers exist in Tennessee, Kentucky, or Alabama (EPA 2020f).

3.4.2 Environmental Consequences

3.4.2.1 Alternative A – No Action Alternative

Under Alternative A, there would be no change in groundwater conditions at the reservations that would be associated with construction of the proposed CT plants. TVA would continue to monitor the groundwater at the former coal-fired plant sites at Paradise and Colbert in accordance with federal and state requirements and would institute corrective actions if needed.

3.4.2.2 Alternative B – Retirement of Allen CT Units 1-20 and Johnsonville CT Units 1-16 and Construction of CT Units at Paradise and Colbert

Construction of CT plant components at Paradise would require below ground construction activities that may encounter groundwater. Such activities include installation of deep foundations, if needed, to support the proposed CT plant and associated facilities, as well as the development of the natural gas pipeline trench to bury the pipeline at 10 to 12 feet below grade. Additionally, shallow excavation is also expected to be required for proposed construction of the onsite TL. If groundwater is encountered during any of these activities, dewatering activities would be used to control groundwater infiltration into the excavation site. However, because such activities and their effects to groundwater patterns or availability are localized and generally limited to the construction phase, impacts from construction are expected to be minor.

Construction of the natural gas compressor at the existing compressor station is not expected to adversely impact groundwater quality or supply. Construction of the project facilities as well as activities in the temporary workspaces would occur on a previously developed sites and minimal excavation would be required. Therefore, there would be no impacts to groundwater.

Proposed TL upgrades associated with the Paradise CT plant would require minimal ground disturbance and impacts to groundwater associated with TL upgrades are not anticipated. During revegetation and maintenance activities, impacts to groundwater would be minor and mitigated through use of BMPs as described in *A Guide for Environmental Protection and Best Management Practices for Tennessee Valley Authority* (TVA 2017b). As such, impacts to groundwater associated with ROW maintenance would be minor.

Demineralized water currently used at the Paradise CC plant would be used for the proposed CTs. Potable water would be obtained from the existing public supply. Therefore, no impacts to groundwater associated with operation of the CT plant are anticipated.

Onsite and offsite construction activities associated with the construction of the CT plant at the Colbert Reservation would be like those described for construction of the CT plant at the Paradise Reservation. Although preliminary geotechnical analysis indicates that shallow foundation systems could be used for some plant facilities, deeper foundations may be required to support others. If shallow groundwater is encountered, trench dewatering activities would be used during installation of the pipeline. However, because such activities and their effects are localized, and generally limited to the construction phase, impacts from construction are expected to be minor.

Groundwater impacts associated with the proposed TL upgrades to support the CT Plant at Colbert would be the same as described for Paradise and would be associated with TL maintenance and revegetation activities. These impacts would be minimized with the implementation of BMPs (TVA 2017b) and would be minor.

No impacts to groundwater are expected from operation of the proposed facilities at Colbert. Demineralized water for CT compressor washing would be trucked to the site. Potable water would be obtained from the existing public supply.

3.5 Surface Water Resources

3.5.1 Affected Environment

3.5.1.1 Paradise CT Plant Project Area, Offsite Natural Gas Upgrade, and Offsite TL Upgrades

Surface water features identified on the Paradise CT plant project area are shown on Figure 3-1. The Paradise CT plant project area is drained by permitted storm water outfalls, wet weather conveyances, red water ditches (which ultimately flow to either the bottom ash pond or fly ash pond), the condenser cooling water discharge (Outfall 005), and process and storm water discharges from the fly (Outfall 001) and bottom ash impoundment systems (Outfall 002). The plant intake for Units 1 and 2 is located approximately at Green RM 100.6 and the intake for Unit 3 is located at RM 100.3.

The Green River basin contains approximately one-fourth of Kentucky's land area and is the largest drainage basin in the state with a total of 18,858 acres (KDEP 2014). Reservoirs have been constructed by the U.S. Army Corps of Engineers (USACE) on the Rough, Nolin, and Barren Rivers, as well as on the main stem of the Green River in the upper basin. Major sources of stream contamination in the upper basin are agriculture (sediment, nutrients, and pesticides); mining or drilling (chloride); on-site and municipal wastewater-treatment systems (decomposable organic matter, nutrients, and bacteria); and urban storm water runoff (metals, nutrients, and sediment).

3.5.1.1.1 Surface Water Quality

The federal CWA requires all states to identify all waters where required pollution controls are not sufficient to attain or maintain applicable water quality standards and to establish priorities for the development of limits based on the severity of the pollution and the sensitivity of the established uses of those waters. States are required to submit reports to the EPA. The term "303(d) list" refers to the list of impaired and threatened streams and water bodies identified by the state.

The overall water quality in the Green River Basin is good. Two segments of the Green River upstream of the Paradise CT plant project area and the entire 8,210-acre Green River Reservoir are listed on the state 303(d) report as impaired and only partially support their designated uses. One impaired segment from Green River Mile (RM) 210.4 to Green RM 250.2 is designated for primary contact recreation water and fish consumption uses. The listed pollutants of concern include *E. coli* and mercury in fish tissue from an unknown source. The other impaired segment is from Green RM 283.10 to Green RM 309.0 and is also designated for primary contact recreation water. The listed pollutant is fecal coliform from a package plant or other permitted small flow discharges. The Green Reservoir is designated for fish consumption. The listed pollutants of concern are mercury and Polychlorinated Biphenyls (PCBs) in fish tissue (KDEP 2016). Jacobs Creek and the portion of the Green River adjacent to the Paradise Reservation are currently not assessed. The Green River at Green RM 189-290, approximately 90 miles upstream, is on the Nationwide Rivers Inventory (NRI; USNPS 2020); however, no NRI streams or Wild and Scenic Rivers are located near the Paradise CT plant project area.

3.5.1.1.2 Existing Wastewater Streams

The majority of the process flows (including any CCR discharges) ceased in February 2020, when the fossil plant was retired. However, all flows are not expected to cease completely until sometime in 2021. Currently, stations sumps, water treatment plant flows, sewage treatment, minimal cooling water, and fire protection water through the bottom ash sluice system, in addition to other ancillary waste streams, are still flowing and being discharged. To better facilitate the closure of both the ash and bottom ash impoundments a series of process water basins are in the process of being constructed and should begin discharging through Outfall 002B sometime in 2020-2021.

Currently the KPDES permit KY00004201 (modified and effective September 1, 2020) requires monitoring of all the above-mentioned outfalls on a tiered basis based on current conditions. These tiers have different monitoring requirements and limits (KDEP 2020).

The existing plant site runoff is regulated under the KPDES Permit KY0004201. Existing facilities and BMPs are used to ensure compliance with the permit conditions. Some plant runoff is directed through the fly ash and the bottom ash impoundment systems, whereas other runoff goes directly to the Green River or Jacobs Creek through permitted discharge points.

The Paradise CC Plant was added to the grid in late 2016. The KPDES permit KY011902 for this facility was effective on September 1, 2016 and was later incorporated into the Paradise Fossil Plant KPDES Permit KY0004201 (KDEP 2020) and includes discharges to the Green River of storm water and internal Outfall 102 (cooling tower blowdown) from Outfall 101 located at approximately Green RM 99.4 and raw water intake for cooling water from Outfall 103. The parameters monitored and/or limited from Outfall 101 are flow, temperature, total suspended solids (TSS), pH and acute whole effluent toxicity. For Outfall 102, monitoring is required for flow, pH, free available chlorine, total residual oxidants oxidant discharge time, total chromium, total zinc, and priority pollutants. For Outfall 103, the facility intake, monitoring requirements include flow, intake velocity, and intake inspection.

3.5.1.1.3 Surface Water Features

TVA contractors conducted field surveys in September and October 2020 to delineate surface water features within the Paradise CT plant project area and the offsite TL upgrades and associated access roads (Wood 2020 a-c). These features are summarized in Table 3-6. Surface water features identified on the Paradise CT plant project area are shown on Figure 3-1.

Table 3-6. Surface Water Features within Paradise CT Plant Project Area and Associated Offsite TL Upgrade Areas

	Stream Type					
	Ephemeral		Intermittent		Perennial	
Project Area	Number	Length (ft)	Number	Length (ft)	Number	Length (ft)
Paradise CT Plant Project Area	4	2,496	3	2,185	1	1,113
TL 5823	1	100	-	-	-	-
TL 6057	1	39	1	25	-	-

Source: Wood 2020a-Wood 2020c

Surface water features identified in the offsite TL upgrades associated with the Paradise CT plant are shown in Appendix A, Figures A-1 through A-6. Surface water streams within the offsite TL upgrades project areas would be expected to be designated for warm water aquatic habitat, primary contact recreation, secondary contact recreation, and domestic water supply (KDOW 2013). Streams are designated as High-Quality Waters of the State when they are not listed on the 303(d) list as impaired or when they are not designated as Outstanding National Resource Waters or Exceptional Waters. None of the streams identified within the offsite TL upgrades are designated as High-Quality Waters of the State.

The Paradise CT plant offsite natural gas compressor station is located within a previously developed area. No surface water features occur within the project area of this facility.

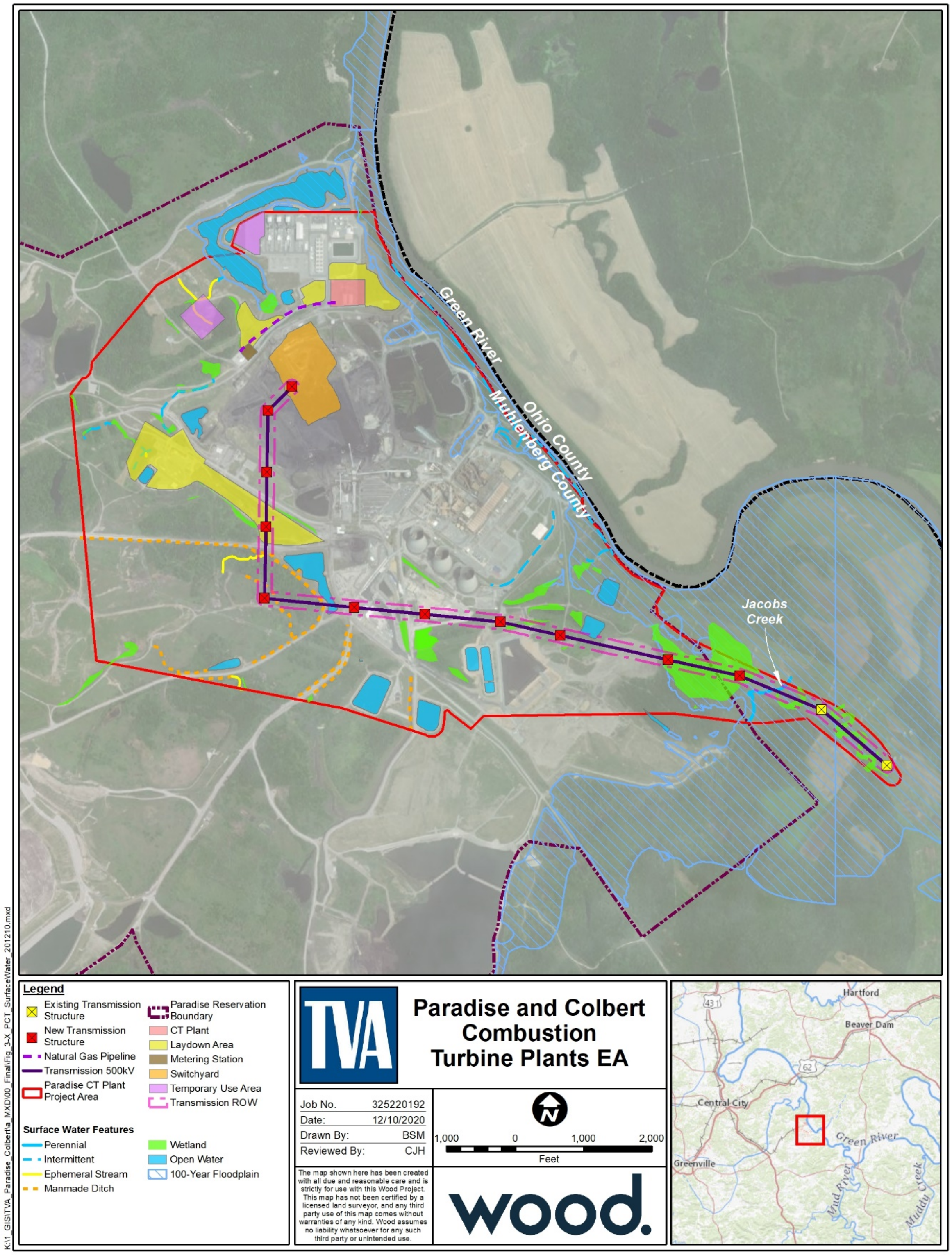

Figure 3-1. Surface Water Features Within the Paradise CT Plant Project Area

3.5.1.2 Colbert CT Plant Project Area, Offsite Natural Gas Loop Line, and Offsite TL Upgrades

Surface water features identified on the Colbert CT plant project area are shown on Figure 3-2. The Colbert CT plant project area is located on TVA's Pickwick Reservoir on the Tennessee River in Alabama at Tennessee RM 245 near the community of Barton. The nearest major cities are Florence, Sheffield, Muscle Shoals, and Tuscumbia, Alabama, about 10 miles east of the site. The site is drained by Cane Creek, which is classified for the uses of swimming and fish and wildlife. The Tennessee River/Pickwick Reservoir is classified for the uses of public water supply, fish and wildlife, swimming, and other whole body water contact sports (ADEM 2017).

River flow rates past the site are regulated by Wheeler Dam upstream and Pickwick Dam downstream. The Tennessee River in the vicinity of the site has experienced historical pollution problems due to poor treatment from municipal and industrial treatment facilities and nonpoint sources (TVA 2003).

3.5.1.2.1 Surface Water Quality

TVA has taken action to improve water quality and flows within its reservoirs. Most notably, TVA monitors the ecological condition of its reservoirs as part of the Vital Signs Monitoring Program which was initiated by TVA in 1990. Reservoirs throughout the Tennessee Valley have been monitored for physical and chemical characteristics of waters, sediment contaminants, benthic macroinvertebrates (bottom-dwelling animals such as worms, mollusks, insects, and snails living in or on the sediments), and fish community assemblage. Five key indicators (i.e., dissolved oxygen, chlorophyll, fish, bottom life, and sediment contaminants) are monitored and contribute to a final rating that describes the "health" and integrity of an aquatic ecosystem.

The reservoir ecological health evaluation system is reviewed each year, and improvements needed to address problems are identified. These improvements include installing equipment to add oxygen to the water as it flows through dams and adjusting reservoir flows. The overall ecological condition of Pickwick Reservoir rated "fair" in 2018 (TVA 2020d). Ecological health ratings for the reservoir have fluctuated between "good" and "fair", but scores have been lower, overall, since 2008. Weather conditions, particularly the timing and amount of rainfall, and the related changes in runoff have proven to be major factors in the variation of ecological health scores for Pickwick and many other reservoirs (TVA 2020d).

The section of the Tennessee River/Pickwick Reservoir near the Colbert Reservation has been listed on the most recent ADEM 303(d) list as impaired because of nutrients from agriculture (ADEM 2018a). Cane Creek also runs through the Colbert CT plant project area and is also listed as impaired for nutrients due to agriculture reasons.

3.5.1.2.2 Existing Wastewater Streams

National Pollution Discharge Elimination System (NPDES) Permit number AL0003867 (ADEM 2018b) covers water discharges at the Colbert Fossil Plant and the CT plant. Drainage from the Colbert Reservation discharges to both Cane Creek and the Tennessee River. Process wastewater discharges from the facility are permitted under NPDES permit and include outfalls that are sampled, monitored, and reported on monthly discharge monitoring reports. The intake is no longer used, and most discharges are primarily, if not completely, driven by precipitation. The existing Colbert CTs discharge to a process water basin that discharges to Outfall 0011 to Cane Creek. The NPDES permit requires that pH, total suspended solids, oil and gas, TSS, ammonia as N, arsenic, copper, iron and selenium be monitored/reported.

3.5.1.2.3 Surface Water Features

TVA contractors conducted field surveys in September and October 2020 to delineate surface water features within the Colbert CT plant project area and the offsite TL upgrades and associated access roads (Wood 2020d, Wood 2020e-h). These features are summarized in Table 3-7. Surface water features identified on the Colbert CT plant project area are shown on Figure 3-2.

Table 3-7. Surface Water Features within Colbert CT Plant Project Area and Associated Offsite TL Upgrade Areas

	Stream Type					
	Ephemeral		Intermittent		Perennial	
Project Area	**Number**	**Length (ft)**	**Number**	**Length (ft)**	**Number**	**Length (ft)**
Colbert CT Plant Project Area*	-	-	1	650	1	1,885
TL 5676	-	-	-	-	-	-
TL 5617	-	-	-	-	6	744
TL 5670	3	135	1	447	-	-
TL 5989	-	-	-	-	-	-

* The Tennessee River is located adjacent to the site but not included in the table.
Source: Wood 2020d-Wood 2020h

Surface water features identified in the survey areas for the offsite TL upgrades associated with the Colbert CT plant are shown in Appendix A, Figures A-7 through A-20. The streams within the TL 5617 project area are classified by the state of Tennessee for fish and aquatic life, recreation, livestock watering and wildlife and irrigation designations (TDEC 2013). A portion of Shoal Creek is also listed as Exceptional Tennessee Waters, domestic water supply, and industrial water supply. A portion of Brewer Branch is also listed as Exceptional Tennessee Waters, and Factory Creek is also listed as a trout stream and for domestic water supply. The project area for TL 5670 is located in Alabama, and the streams would be designated for fish and wildlife uses. Surface water features were not observed within the TL 5676 or TL 5989 survey areas.

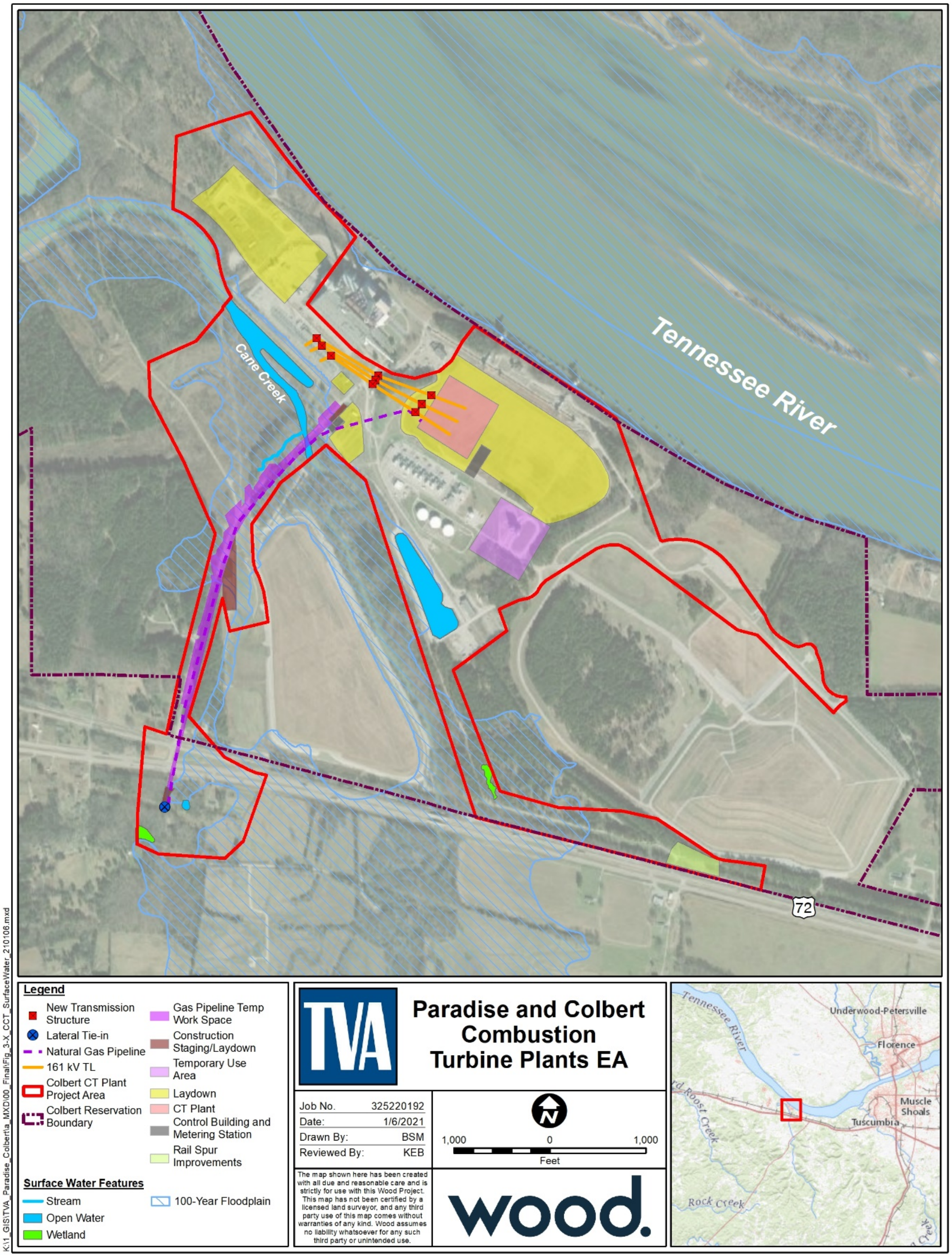

Figure 3-2. Surface Water Features Within the Colbert CT Plant Project Area

3.5.2 Environmental Consequences

3.5.2.1 Alternative A – No Action Alternative

Under Alternative A, there would be no project-related impacts to surface water resources as TVA would not construct the CT plants at Paradise or Colbert and associated TL upgrades would not be required. It is assumed that current operations would not create any additional impacts. The need for repair and maintenance of the existing CT units at Allen or Johnsonville would not cause any additional impacts to surface waters with implementation of proper BMPs and management of hazardous and solid wastes.

3.5.2.2 Alternative B – Retirement of Allen CT Units 1-20 and Johnsonville CT Units 1-16 and Construction of CT Units at Paradise and Colbert

3.5.2.2.1 Paradise CT Plant Project Area, Offsite Natural Gas Upgrade, and Offsite TL Upgrades

Construction Impacts

Soil disturbances associated with construction of the CT plant at Paradise could potentially result in adverse water quality impacts. Soil erosion and sedimentation can accumulate in small streams and threaten aquatic life. Construction activities where surface water could be impacted by stormwater include:

- Preparation of laydown and temporary use areas
- Construction of the CT plant and associated equipment and systems such as natural gas metering and handling systems, instrumentation, and control systems, etc.
- Construction of the switchyard
- Reconfiguration of the onsite TL
- Construction of the natural gas pipeline

During construction, TVA would comply with all appropriate state and federal permit requirements. The current KPDES permit would require development of a project-specific BMP. This plan would identify specific BMPs to address construction-related impacts. Appropriate BMPs would be followed, and all proposed project activities would be conducted in a manner to ensure that waste materials are contained, and the introduction of pollution materials to the receiving waters would be minimized. Areas where soil disturbance could occur would be stabilized and vegetated with native or non-native, non-invasive grasses and mulched.

The natural gas pipeline would be constructed in a trench in a disturbed area. BMPs listed above would be used to minimize impacts associated with clearing and site preparation.

Sanitary Wastewater

With an increased onsite workforce, it would be necessary to make arrangements to provide additional restroom facilities. During the construction phase, temporary toilet facilities would be provided by a licensed vendor and sanitary wastewater would be disposed at an approved facility.

Portable toilets would be provided for the construction workforce to support the proposed offsite TL upgrades as needed. These toilets would be pumped out regularly, and the sewage would be transported by tanker truck to a publicly owned wastewater treatment works that accepts pump out.

Equipment Washing and Dust Control

Equipment washing and dust control discharges would be handled in accordance with BMPs described in the Best Management Practices Plan required by the site's KPDES Permit KY0004201 to minimize construction impacts to surface waters.

Equipment washing and dust control discharges associated with the offsite TL upgrades would be handled in accordance with BMPs described in the SWPPP for water-only cleaning.

Hydrostatic Testing

Onsite hydrostatic testing will have the option to use potable or surface waters and would be covered under the current KPDES Permit KY000420.

Surface Water Features

One proposed laydown and warehouse area would encompass approximately 577 linear feet of a potentially jurisdictional stream (Figure 3-1). TVA will establish a 50-foot buffer around the stream and will avoid any ground disturbing actions within the buffer to avoid direct impacts this feature. In addition, as shown on Figure 3-1, approximately 565 feet of ephemeral stream is located within one of the proposed temporary use areas. Based on current guidance, ephemeral streams are non-jurisdictional features. As no jurisdictional streams would be impacted by the work proposed at the Paradise CT plant project area, no additional permitting or stream mitigation would be expected. With proper implementation of these controls, only minor temporary impacts to local surface waters would be expected during the construction phase. Construction activities would avoid other surface water features within the Paradise CT plant project area. Therefore, no streams would be directly impacted by the proposed project.

The installation of the natural gas-fired reciprocating engine at an existing compressor station to support the Paradise CT plant would include new natural gas piping to tie the new compressor into the existing pipeline system. No surface water features are present within the existing compressor station site. BMPs would be utilized during the construction phase to minimize offsite erosion discharges.

Construction activities associated with the proposed offsite TL upgrades have the potential to temporarily affect surface water via storm water runoff. Soil erosion and sedimentation can accumulate in small streams and threaten aquatic life. TVA would comply with all appropriate state and federal permit requirements including obtaining a storm water construction permit if the project disturbs more than one acre of land. Appropriate BMPs would be followed, and all proposed project activities would be conducted in a manner to ensure that waste materials are contained, and the introduction of pollution materials to the receiving waters would be minimized.

Approximately 139 linear feet of ephemeral streams and 25 linear feet of intermittent streams may be impacted by access roads improvements and/or other land-disturbing activities associated the Paradise CT plant offsite TL upgrades. Streams within the offsite TL project areas associated with the Paradise CT plant are shown in Appendix A on Figure A-1 and Figures A-3 through A-5. TVA expects to utilize existing access roads and as such potential impacts to streams present will be minimized through avoidance (if practical) and the implementation of erosion and sediment BMPs identified in the BMP Plan developed for work in Kentucky and the site-specific SWPPP developed for construction work in Tennessee, to reduce potential sediment-laden runoff into adjacent or downgradient streams. However, temporary stream crossings may be required. Temporary stream crossings and other construction and maintenance activities would comply with appropriate state permit requirements and TVA requirements as described in *A Guide for Environmental Protection and Best Management Practices for Tennessee Valley Authority* (TVA 2017b).

Discharges into jurisdictional streams would not occur unless authorized by the USACE through the CWA Section 404 permitting process and/or TDEC Aquatic Resources Alteration Permit (ARAP) process or Kentucky Water Quality Certification Program, as applicable. Mitigation measures are not anticipated but will be incorporated into the final design of the project, if required through the permitting processes. As a result of implementing these measures, impacts to surface waters associated with the proposed offsite TL upgrades would be minor.

<u>Operational Impacts</u>

Storm Water

After construction, storm water BMPs would continue to be implemented so that surface water runoff from parking lots and industrially used areas of the site would be diverted to existing retention pond(s) with a controlled rate(s) of release. Runoff from areas with potential oil leaks, such as the two distillate-oil storage tanks, would be directed to an oil/water separator with subsequent discharge to the Paradise CC process pond. Oil collected in the oil/water separator would be periodically removed and trucked off site to an approved, waste oil recycling facility.

Sanitary Wastewater

During plant operations, there would be a small workforce at the site. If restroom facilities are to be part of this project's scope, they would be properly installed and permitted per local, state, and federal regulatory requirements.

Process Wastewater

The proposed Paradise CT plant would require up to about 100 gpm of water for inlet air evaporative cooling in summer ambient temperatures and demineralized water for CT compressor washing. Water is expected to be drawn through the current intake 103 from the Green River and treated prior to use. The current KPDES permit would need to be modified to include the discharges from the proposed Paradise CT plant. There would be a discharge in the summer from the cooling system; however, it would not be expected to impact thermal levels in the discharge. The Paradise CC plant already has ample means of demineralized water production that would be used for the CTs. Wash effluent would be collected in tanks and, after analysis, disposed of at an approved wastewater treatment facility offsite. Restroom facilities and other needs for potable water uses at the proposed Paradise CT plant would be obtained from an existing public water supply.

Additionally, impervious buildings and infrastructure prevent rain from percolating through the soil and result in additional runoff of water and pollutants into storm drains, ditches, and streams. Clearing of vegetation and ground cover, and the addition of impervious buildings and pavement could alter the current storm water flows. Construction of the CT plant and switchyard could increase the impervious cover on the project area, thus altering and possibly increasing the concentrated storm water runoff. This flow would be properly treated through implementation of the proper stormwater BMPs or by diverting the storm water discharges to the Paradise CC process water basin for co-treatment, and ultimately released through permitted Outfall 101 and 102 to the Green River. No direct or indirect negative impacts to the surface waters would be anticipated from the operation of this facility because any discharges would be required to meet KPDES limits and Kentucky Water Quality Standards that are developed to be protective of designated waters.

3.5.2.2.2 Colbert CT Plant Project Area, Offsite Natural Gas Loop Line, and Offsite TL Upgrades

Construction Impacts

Construction activities at Colbert where surface water could be impacted by stormwater include:

- Preparation of laydown and temporary use areas
- Construction of the CT plant and associated equipment and systems such as natural gas metering and handling systems, instrumentation, and control systems etc.
- Construction of three new 161-kV TLs to connect the existing switchyard to the new CT plant
- Construction of the natural gas pipeline.

During construction, TVA would comply with all applicable state and federal permit requirements. Alabama requires a stormwater construction permit be obtained if more than one acre is disturbed, including the development and implementation of a CBMPP. Additionally, any in-stream work may require a Section 404 permit from the USACE and a 401 Water Quality Certifications from ADEM for any stream crossing activities. The activities that are not covered under the construction storm water permit, such as hydrostatic testing, would be covered under the sites NPDES permit AL0003867 or other permitting would be required.

No jurisdictional streams would be impacted by construction activities within the Colbert CT plant site (Figure 3-2); therefore, no additional permitting or stream mitigation would be expected.

The natural gas pipeline would be constructed in a trench that would run parallel to the existing 10-inch-diameter natural gas pipeline lateral. The segment of the pipeline crossing Cane Creek would be installed using HDD to avoid impacts to aquatic resources. BMPs listed above would be used to minimize impacts associated with clearing and site preparation.

With proper implementation of these controls, only minor temporary impacts to surface water features within the Colbert CT Plant project area would be expected.

Approximately 135 linear feet of ephemeral streams and 447 linear feet of intermittent streams may be impacted by access road improvements and/or other land-disturbing activities associated the Colbert CT plant. Streams within the offsite TL project areas associated with the Colbert CT plant are shown in Appendix A on Figures A-7 through A-11, Figures A-14 through A-17, and Figure A-19. Construction impacts associated with the offsite TL upgrades required to support the Colbert CT plant would be the same as described for the offsite TL upgrades required to support the Paradise CT plant. TVA would comply with all appropriate state and federal permit requirements and appropriate BMPs would be followed, and all proposed project activities would be conducted in a manner to ensure that waste materials are contained, and the introduction of pollution materials to the receiving waters is minimized. As a result of implementing these measures, impacts to surface waters associated with the proposed offsite TL upgrades would be minor.

<u>Operational Impacts</u>

Storm Water

After construction, storm water BMPs would continue to be implemented so that surface water runoff from parking lots and previously developed industrial lands of the site would be diverted to existing retention pond(s) with a controlled rate(s) of release. Runoff from areas with potential oil leaks, such as the two distillate-oil storage tanks, would be directed to an oil/water separator with subsequent discharge to the Colbert CT process pond. Oil collected in the oil/water separator would be periodically removed and trucked off site to an approved, waste oil recycling facility.

Sanitary Wastewater

During plant operations, there would be a small workforce at the site. If restroom facilities are to be part of this project’s scope, they would be properly installed and permitted per local, state, and federal regulatory requirements.

Process Wastewater

The proposed Colbert CT plant would require up to about 100 gpm of water for inlet air evaporative cooling in summer ambient temperatures and demineralized water for CT compressor washing. Additionally, restroom facilities and safety showers and eye wash stations would require potable water. All water needs for this facility would be provided from an existing public water supply. The current NPDES permit would need to be modified to include the discharges from the proposed CTs. There would be no impacts from increased thermal loading from this waste stream. The Colbert plant has historically produced and stored limited amounts of demineralized water, and those facilities could be re-used/upgraded for the new CTs or demineralized water would be trucked to the site from offsite sources.

Additionally, impervious buildings and infrastructure prevent rain from percolating through the soil and result in additional runoff of water and pollutants into storm drains, ditches, and streams. Clearing of vegetation and ground cover, and the addition of impervious buildings and pavement could alter the current storm water flows. Construction of the CT plant and associated equipment systems could increase the impervious cover on the project area, thus altering and possibly increasing the concentrated storm water runoff. Any discharges would be sent to the current Colbert CT process water basin for co-treatment and ultimately released through permitted Outfall 0011 to Cane Creek. No direct adverse impacts to surface waters would be anticipated from the operation of this facility as any discharges would be required to meet NPDES limits and ADEM Water Quality Criteria that are developed to be protective of designated uses.

3.6 Floodplains

3.6.1 Affected Environment

A floodplain is the relatively level land area along a stream or river that is subject to periodic flooding. The area subject to a one-percent chance of flooding in any given year is normally called the 100-year floodplain. The area subject to a 0.2-percent chance of flooding in any given year is normally called the 500-year floodplain. It is necessary to evaluate development in the floodplain to ensure that the project is consistent with the requirements of EO 11988, Floodplain Management.

3.6.1.1 Paradise CT Plant Project Area, Offsite Natural Gas Upgrade, and Offsite TL Upgrades

The Paradise CT Plant project area is located on the Green River between RM 99.7 and RM 102.5, left descending bank, in Muhlenberg County, Kentucky. Flood elevations for the Green River are provided in Table 3-8.

Table 3-8. Green River Flood Elevations

Return Period (years)	Elevation at Green River Mile 99.7 (feet NAVD* 88)	Elevation at Green River Mile 102.5 (feet NAVD* 88)
10	397.0	397.8
50	400.2	401.0
100	401.8	402.2
500	404.2	405.0

*NAVD = North American Vertical Datum
Source: FEMA 2013

Portions of the proposed offsite TL upgrades needed to support the CT plant at Paradise would cross several floodplain areas in Sumner County, Tennessee; and Todd and Muhlenberg counties, Kentucky. Floodplains identified in the survey areas for the offsite TL upgrades associated with the Paradise CT plant are shown in Appendix A, Figures A-1 through A-6.

3.6.1.2 Colbert CT Plant Project Area, Offsite Natural Gas Loop Line, and Offsite TL Upgrades

The Colbert CT plant site is located along the Tennessee River between RM 244.7 and RM 245.5 and Cane Creek RM 2.5-3.8, left descending bank, in Colbert County, Alabama. Flood elevations for the Tennessee River are provided in Table 3-9. Cane Creek enters Pickwick Reservoir and the Tennessee River at Tennessee River Mile 244.0. The Cane Creek watershed is about 52 square miles, and the watershed of the Tennessee River at Cane Creek is about 31,000 square miles (TVA 1970). Because the watershed of the Tennessee River is so much larger, and thus contributes much more discharge in a storm event, the 100-year flood on the Tennessee River would be higher than the 100-year flood on Cane Creek; therefore, the 100-year flood on the Tennessee River is used in this analysis.

Table 3-9. Tennessee River Flood Elevations

Return Period (years)	Elevation at Tennessee River Mile 244.0 - Cane Creek mouth (feet NGVD 29)	Elevation at Tennessee River Mile 244.7 (feet NGVD 29)	Elevation at Tennessee River Mile 245.5 (feet NGVD 29)
10	420.8	421.1	421.4
50	422.2	422.5	422.8
100	422.6	422.8	423.2
500	423.6	423.9	424.4

Source: TVA 1992 (HEC-2 model)

Portions of the proposed offsite TL upgrades needed to support the CT plant at Colbert work would cross several floodplain areas in Hardin, Lawrence, Montgomery, Wayne, and Wilson counties, Tennessee; and Colbert, Lauderdale, and Morgan counties, Alabama. Floodplains with the TL corridors are shown on figures in Appendix A. Floodplains identified in the survey areas for the offsite TL upgrades associated with the Colbert CT plant are shown in Appendix A, Figures A-7 through A-20.

3.6.2 Environmental Consequences

As a federal agency, TVA adheres to the requirements of EO 11988, Floodplain Management. The objective of EO 11988 is “to avoid to the extent possible the long- and short-term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative” (EO 11988, Floodplain Management). The EO is not intended to prohibit floodplain development in all cases, but rather to create a consistent government policy against such development under most circumstances (U.S. Water Resources Council 1978). The EO requires that agencies avoid the 100-year floodplain unless there is no practicable alternative. For critical actions, the minimum floodplain of concern is the 500-year floodplain. A critical action is an action for which even a slight chance of flooding would be too great. Such facilities include, but are not limited to, hospitals, large generating facilities, and museums (U.S. Water Resources Council 1978).

3.6.2.1 Alternative A – No Action Alternative

Under the Alternative A, TVA would not construct or operate CT plants at Paradise and Colbert. Therefore, there would be no impacts to floodplains as there would be no physical changes to the current conditions found within the local floodplains.

3.6.2.2 Alternative B – Retirement of Allen CT Units 1-20 and Johnsonville CT Units 1-16 and Construction of CT Units at Paradise and Colbert

Floodplains within the Paradise CT plant project area are shown in Figure 3-1. The proposed CT plant would be located at elevation 418 feet mean sea level (msl), which would be at least 10 feet above the 500-year flood elevation. Therefore, construction of the CT units at this location would be consistent with EO 11988 for both regular and critical actions. The laydown and temporary use areas, the natural gas pipeline, and the 500-kV switchyard, would be located outside 100-year floodplains, which is also consistent with EO 11988.

Portions of the re-configured onsite 500-kV TL would be located within the 100-year floodplain of the Green River. Consistent with EO 11988, TLs and their support structures are considered to be repetitive actions in the 100-year floodplain that should result in minor impacts. The conducting wires of the TL would be located well above the 100-year flood elevation. The support structures for the TL would not be 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. Construction in the floodplain would be consistent with EO 11988 provided the TVA subclass review criteria for TL location in floodplains are followed (TVA 1981).

Muhlenberg County participates in the National Flood Insurance Program (NFIP), and any development must be consistent with its floodplain regulations. One structure on the re-configured 500-kV TL would be located in the Green River floodway. The Green River floodway is about 4,500 feet wide at this location, and the structure would be located at the edge of the floodway. The construction of one structure at the edge of the floodway would result in an imperceptible rise in flood elevations, and thus create no obstruction in the floodway. The placement of the structure would thus be consistent with Muhlenberg County floodplain regulations, and thereby be consistent with EO 11988.

The proposed offsite TL upgrades for the Paradise CT plant would be located high off the ground and well above the 100-year flood elevation, which would be consistent with EO 11988. Some existing access roads, including access roads to TL 5823 structures 87 and 94 and TL 6057 structures 7-10, 23, 195, and 219 are located in the 100-year floodplain. These areas are shown in Appendix A, Figures A-1, A-2, and A-6. Access roads are considered to be repetitive actions in the 100-year floodplain that should result in minor impacts. To minimize adverse impacts, any road improvements proposed in floodplains but not floodways would be constructed in such a manner that upstream flood elevations would not be increased by more than 1.0 foot.

A portion of the access road to TL 6057 structures 7-10 and 94 would also be located within the Green River and Bulls Creek floodways, respectively. To prevent an obstruction in the floodway: (1) any fill, gravel or other modifications in the floodway that extend above the pre-construction road grade would be removed after completion of the project; (2) this excess material would be spoiled outside of the published floodway; and (3) the area would be returned to its pre-construction condition.

The onsite and offsite upgrades to the natural gas supply for the Paradise CT plant would be located outside100-year floodplains, which would be consistent with EO 11988.

Floodplains within the Colbert CT plant project area and associated TL improvements are shown in Figure 3-2. The proposed CT units at Colbert would be located at or above elevation 459 feet msl, which would be over 30 feet above the 500-year flood elevation. Therefore, construction of the CT units at this location would be consistent with EO 11988 for both regular and critical actions. The control building and rail spur improvements would be located outside the 100-year floodplain, which would be consistent with EO 11988. Portions of the laydown and temporary use areas would be located in 100-year floodplains.

The pipeline company evaluated alternatives to locating the laydown areas in floodplains, and these alternatives would have increased impacts to environmental and cultural resources. Additionally, the pipeline is existing, and the laydown areas would need to be situated adjacent to the pipeline. The laydown area located approximately half-way along the roughly one-mile pipeline lateral route from the southern mainline tie-in point and the northern delivery station terminus would predominantly be used for staging or laydown of equipment and material. This staging location is expected to be used as a centralized location for equipment and material storage in order to minimize the aggregate impact area of the pipeline project along the route. This specific location (approximately halfway between the origin and terminus of the pipeline and immediately adjacent to the route) would result in construction efficiency and reduce third-party disturbance by minimizing traffic associated with mobilization and demobilization (initially, daily, and at completion).

Therefore, there is no practicable alternative to locating a portion of the laydown areas within the floodplain. To minimize adverse impacts, the natural gas provider reduced its original staging and laydown footprint in this area by increasing its expected temporary workspace at the north end of the project in a surface parking lot.

The pipeline company would also develop an evacuation plan prior to mobilization to relocate flood-damageable, loose, or valuable equipment out of the floodplain during a flood. Therefore, construction laydown areas within the floodplain would be consistent with EO 11988. Upon completion of the pipeline upgrades, the laydown and temporary use areas would be returned to existing conditions.

A portion of the new natural gas pipeline would be constructed within the 100-year floodplain. Consistent with EO 11988, utilities are considered to be repetitive actions in the 100-year floodplain that should result in minor impacts. To minimize adverse impacts, the portions of the pipeline trench that would be located within the floodplain would be backfilled such that the final settled ground elevation would be no higher than pre-construction elevation.

The proposed 161-kV TL onsite at Colbert would be located outside 100-year floodplains, which would be consistent with EO 11988.

The proposed offsite TL upgrades for the Colbert CT plant would be located high off the ground and well above the 100-year flood elevation, which would be consistent with EO 11988. Existing access roads to TL 5676 structures 503-505, TL 5617 structure 130, TL 5670 structures 125, 123, 121, 137, 139, 140, 153, and 154-158; and to TL 5989 structure 90; would be located in 100-year floodplains. These areas are shown in Appendix A, Figures A-8 through A-11, A-14 through A-16, and Figure A-18. Access roads are considered to be repetitive actions in the 100-year floodplain that should result in minor impacts. To minimize adverse impacts, any road improvements proposed in floodplains but not floodways would be done in such a manner that upstream flood elevations would not be increased by more than 1.0 foot.

A portion of the access roads to TL 5670 structures 137 and 140 would also be located within the Clark Spring Branch Tributary floodway. To prevent an obstruction in the floodway: (1) any fill, gravel or other modifications in the floodway that extend above the pre-construction road grade would be removed after completion of the project; (2) this excess material would be spoiled outside of the published floodway; and (3) the area would be returned to its pre-construction condition.

The offsite upgrades to the natural gas supply for the Colbert CT plants would consist of installing a new lateral tie into the main gas pipeline. The tie-in is located outside 100-year floodplains, which is consistent with EO 11988.

The proposed project would have no significant impact on floodplains and their natural and beneficial values provided the following mitigation measures are followed:

- New TL construction would adhere to the TVA subclass review criteria for TL location in floodplains.
- To prevent an obstruction in the floodway due to construction or modification of the access roads to TL 6057 Structures 7-10 in the Green River floodway; TL 5823 Structure 94 in the Bulls Creek floodway; and TL 5670 Structures 137 and 140 in the Clark Spring Branch Tributary floodway: (1) any fill, gravel or other modifications in the floodway that extend above the pre-construction road grade would be removed after completion of the project; (2) this excess material would be spoiled outside of the published floodway; and (3) the area would be returned to its pre-construction condition.
- At Colbert, the portions of the natural gas pipeline trench that would be located within the floodplain would be backfilled such that the final settled ground elevation would be no higher than the pre-construction ground elevation.
- Any road improvements proposed in floodplains but not floodways would be constructed in such a manner that upstream flood elevations would not be increased by more than one foot.
- The commercial natural gas provider at Colbert would develop an evacuation plan prior to mobilization to relocate flood-damageable, loose, or valuable equipment out of the floodplain during a flood.

3.7 Wetlands

3.7.1 Affected Environment

The USACE regulates the discharge of dredged or fill material into waters of the United States (WOUS), including wetlands, under the CWA Section 404 Permit [33 USC § 1344]. Additionally, EO 11990 – Protection of Wetlands – requires federal agencies to avoid possible long- and short-term impacts to wetlands and minimize their impact in order to preserve and enhance their natural and beneficial values.

As defined in Section 404 of the CWA, wetlands are those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support a prevalence of vegetation typically adapted for life in saturated soil conditions. Types of wetlands generally include swamps, marshes, bogs, and similar areas. Wetlands and wetland fringe areas can also be found along the edges of many watercourses and impounded waters (both natural and man-made). Wetland habitat provides valuable public benefits including flood storage, erosion control, water quality improvement, wildlife habitat, and recreation opportunities [33 CFR 328.39(b)].

3.7.1.1 Paradise CT Plant Project Area, Offsite Natural Gas Upgrade, and Offsite TL Upgrades

The Paradise CT plant project area is located along the left descending bank (west side) of the Green River between approximate RM 99 and 101. The site has undergone major land disturbances and natural drainage has been altered throughout the site. Past alterations within the site that directly affect the local hydrology include the construction of the facility, mining, disposal impoundments, roads within the site, and other previously conducted industrial activities. As a result, there are multiple manmade ponds, ditches, and swales throughout the site, some of which have developed wetland characteristics such as hydric soils and hydrophytic vegetation. As identified on the USGS topographic quadrangle map for the area, there are two streams (Jacobs Creek and an unnamed tributary to Jacobs Creek) located in the southeastern portion of the project area within the Green River floodplain, and they flow north to the Green River. The National Wetlands Inventory map identified forested wetlands and open water features along these streams.

Wetland delineation field surveys were conducted within all project areas in September and October 2020 in general accordance with the routine wetland determination method as published by the U.S. Army Corps of Engineers (USACE), 1987 edition (Technical Report Y-87-1; Environmental Laboratory 1987) and the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Eastern Mountains and Piedmont Region* [(Regional Supplement) (USACE 2012)].

As shown on Figure 3-1, 40 wetlands totaling 38.0 acres were identified within the Paradise CT Plant project area (Wood 2020a and HDR 2020). Relatively large, mostly emergent wetlands were identified within the existing TL corridor within the Green River floodplain in the southeastern portion of the project area; additional wetlands were identified throughout the site, mostly in previously disturbed areas, adjacent to ponds, and/or along constructed ditches and swales. The majority of the wetlands within the Paradise CT plant project area have either been previously impacted by land disturbance activities or were inadvertently created as a result of land disturbance activities. Most of the wetlands are at least partially dominated by common reed, an invasive species common throughout the project area (Wood 2020a and HDR 2020).

The Paradise CT plant offsite natural gas compressor will be located within a previously developed area that is paved. No wetlands occur within the project area of this proposed facility.

The Paradise CT plant offsite TL upgrades would occur along existing maintained ROW. Field delineations along the proposed upgrades and associated access roads were conducted in September and October 2020 (Wood 2020b; and Wood 2020c). Two wetlands were identified within the offsite TL project areas as detailed below and shown on figures in Appendix A:

- TL 5823 – One herbaceous wetland adjacent to Old Hickory Lake was identified near Structure 87 (Appendix A, Figure A-2). Less than 0.01 acre occurs within the project area.
- TL 6057 – One herbaceous wetland totaling 0.02 acre was identified along the proposed access road within the TL ROW near Structure 23 (Appendix A, Figure A-6).

3.7.1.2 Colbert CT Plant Project Area, Offsite Natural Gas Loop Line, and Offsite TL Upgrades

The Colbert CT plant project area is located along the left ascending bank (west side) of the Tennessee River between approximate RM 243 and 246. Water resources in the vicinity include the Tennessee River and adjacent wetlands north-northeast of the project area, as well as Cane Creek which flows north- northwestwardly through the area. The National Wetlands Inventory identified forested wetlands adjacent to Cane Creek and within a forested area south of US 72.

Based on the wetland delineation of the Colbert CT plant project area (Wood 2020d), two forested wetlands, totaling 0.9 acre, were identified within the project area (Figure 3-2). Tree species included cottonwood, sycamore, American elm, box elder, and sugarberry. One of the delineated wetlands was identified along the proposed natural gas pipeline upgrades that extend from within the Colbert CT plant project area to the south side of US 72 (offsite).

The Colbert CT plant offsite TL upgrades would occur along existing maintained TL ROW. Field delineations along the proposed upgrades and associated access roads were conducted in September and October 2020 (Wood 2020e-h). The wetlands along the offsite TL project areas and proposed access roads primarily included herbaceous or shrub wetlands associated with swales, wetlands adjacent to streams and lakes, or low elevation areas within floodplains.

Five wetlands were identified along the offsite TL project areas associated with the Colbert CT plant as detailed below and shown on figures in Appendix A:

- TL 5617 – One herbaceous wetland was identified between Structure 122 and Structure 123 (Appendix A, Figure A-7). Less than 0.01 acre occurs within the project area.
- TL 5670 – Three wetlands totaling 0.18 acre were identified within the existing ROW. Wetlands occur near Structures 123 (Appendix A, Figure A-1) and 153 (Appendix A, Figure A-18). There is also a wetland located along an access road between Structures 130 and Structure 131 (Appendix A, Figure A-13).
- TL 5989 – One herbaceous wetland totaling 0.03 acre was located along the proposed access road within the existing ROW (Appendix A, Figure A-20).

3.7.2 Environmental Consequences

3.7.2.1 Alternative A – No Action Alternative

Under Alternative A, there would be no project-related impacts to wetlands as TVA would not construct the CT plants at Paradise or Colbert and associated TL upgrades would not be required.

3.7.2.2 Alternative B – Retirement of Allen CT Units 1-20 and Johnsonville CT Units 1-16 and Construction of CT Units at Paradise and Colbert

Potential impacts to wetlands associated with the construction of CT units at Paradise and Colbert have mostly been avoided in conjunction with project planning. TVA has sited proposed project activities primarily within previously developed areas, and the potential to impact wetlands is low. Total estimated impacts to wetlands for all project areas is estimated to be approximately 0.29 acre.

A summary of potential impacts associated with the construction of the Paradise CT plant and offsite TL upgrades is included in Table 3-10. Wetlands within the Paradise CT plant project area have been avoided. However, re-configuration of the 500-kV line would require placement of two structures within an identified wetland resulting in an impact of 0.04 acre of forested wetland. In addition, approximately 0.03 acre of herbaceous wetland may be impacted by the potential improvements to existing access roads and/or other land-disturbing activities associated with the offsite TL upgrades. These impacts are anticipated to be temporary and limited to the construction phase.

Table 3-10. Summary of Wetland Impacts Associated with Paradise CT Plant

Feature Type	Paradise[1]	TL 5823[2]	TL 6057[2]
PEM (acres)	0.04	0.01	0.02
PSS (acres)	0	0	0
PFO (acres)	0	0	0
Total (acres)	**0.04**	**0.01**	**0.02**

PEM = Palustrine emergent wetlands
PSS = Palustrine scrub-shrub wetlands
PFO = Palustrine forested wetlands
[1] Includes area within Paradise CT plant project area identified on Figure 3-1.
[2] Includes areas within TL corridors and access roads identified on figures in Appendix A.
Source: Wood 2020

Proposed activities associated with the construction of the CT units within the Colbert CT plant site have been sited to avoid all wetland impacts. Therefore, no wetland impacts would occur within the Colbert CT plant project area. In addition, the offsite gas supply upgrades located south of US 72 would avoid impacts to the delineated wetland.

Approximately 0.09 acre of herbaceous wetlands and 0.13 acre of shrub wetland may be impacted by potential improvements to existing access roads and/or other land-disturbing activities associated the Colbert CT plant offsite TL upgrades. These impacts are anticipated to be temporary and limited to the construction phase. Table 3-11 summarizes potential wetland impacts associated with the Colbert CT plant project.

Table 3-11. Summary of Wetland Impacts Associated with Colbert CT Plant

Feature Type	Colbert[1]	Offsite Natural Gas Upgrade	TL 5617[2]	TL 5670[2]	TL 5989[2]	TL 5676[2]
PEM (acres)	0	0	<0.01	0.05	0.03	0
PSS (acres)	0	0	0	0.13	0	0
PFO (acres)	0	0	0	0	0	0
Total (acres)	**0**	**0**	**<0.01**	**0.18**	**0.03**	**0**

PEM = Palustrine emergent wetlands
PSS = Palustrine scrub-shrub wetlands
PFO = Palustrine forested wetlands
[1] Includes area within Colbert CT plant project area north of US 72 identified on Figure 3-2.
[2] Includes areas within TL corridors and access roads identified on figures in Appendix A.
Source: Wood 2020

During final design of the project, potential impacts to wetlands throughout all project areas will be minimized through further avoidance (if practical) and the implementation of erosion and sediment BMPs as well as a site-specific SWPPP to reduce potential sediment-laden runoff into adjacent or downgradient wetlands. BMPs will include those described in *A Guide for Environmental Protection and Best Management Practices for Tennessee Valley Authority Construction and Maintenance Activities, Revision 3* (TVA 2017b) and outlined in the site-specific SWPPP. As a result of implementing these measures, impacts to wetlands would be minor.

TVA will coordinate with the USACE and appropriate state agency to determine jurisdictional status of any wetlands that cannot be avoided. Unavoidable impacts to jurisdictional wetlands will not occur unless authorized by the USACE through the CWA Section 404 permitting process and/or TDEC ARAP process, Kentucky Water Quality Certification Program, or ADEM as applicable. Potentially required mitigation measures are not anticipated, but they will be incorporated into the final design of the project, if required.

3.8 Aquatic Ecology

3.8.1 Affected Environment

3.8.1.1 Paradise CT Plant Project Area, Offsite Natural Gas Upgrade, and Offsite TL Upgrades

The primary aquatic environment related to the Paradise CT plant project area is the Green River. Other stream features delineated within the project area include four ephemeral and three intermittent streams, as described in Section 3.5 (Surface Water). Historical and current alterations to the hydrology of these aquatic features have likely occurred from the operations of the Paradise Fossil Plant and the CC Plant.

Historically, TVA commissioned a biological survey in 1961 of the Green River in the vicinity of the Paradise Reservation for the purpose of obtaining information regarding the biological, chemical, and physical conditions of the Green River before fossil plant operations began. Results from the survey indicated that the river's primary production (i.e., algal growth) was not as great as found in similar size rivers. Plankton species richness was high, but diversity scores were low in the river near the Paradise Reservation. Invertebrates (other than protozoa and insects) collected indicated that all sample stations below the reservation (i.e., Stations 2-5) did not support a balanced invertebrate fauna.

Insect fauna was sparse and scattered, presumably due to unfavorable habitat conditions from barge traffic and dredging activities in the Green River. Fish sampling spaced over a 14-day period was regarded as insufficient for valid conclusions. Chemistry and bacteriology results indicated that all characteristics or qualities measured were favorable to support aquatic life (Academy of Natural Sciences 1962). A 1965 follow-up study determined that overall conditions at the sampling stations were somewhat lower quality than in 1961, which was believed to be the result of high water temperatures and low dissolved oxygen in the summer months combined with coal dust and heavy barge traffic (Academy of Natural Sciences 1966).

TVA collected 43 species of fish during impingement studies at the Paradise Reservation in 1974-1975. Threadfin shad comprised 52 percent and gizzard shad 44 percent of the total impinged fish assemblage. Channel catfish and white crappie were the next most abundant species in that assemblage. Recent (2006-2008) impingement studies at the reservation found gizzard shad was the dominate species, followed by threadfin shad and freshwater drum. All other species comprised one percent or less of the total fish assemblage impinged at the plant (TVA 2009). TVA also conducted a fish survey in the Green River near the Paradise Reservation (RM 98.4 to RM 105 in 2010 and 2011). The 2010 survey collected 596 individuals representing 36 species, with gizzard shad (56 percent), bluegill (5 percent), and spotted gar (4 percent) making up the three most abundant species. In 2011, 1,952 individuals representing 51 species were collected, with Mississippi silvery minnow (16 percent), bullhead minnow (13 percent), and bluegill (13 percent) dominating the assemblage collected.

In 1985, a barge-unloading facility was added to the Paradise Fossil Plant so that coal could be delivered by barge via the Green River. A 2008 mussel survey (TVA 2008) of the Green River near the Paradise coal unloading facility found very low densities of a small number of common mussel species.

The surface water resources in the offsite TL upgrade project areas include two ephemeral streams and one intermittent stream (Table 3-6 in Section 3.5). The use designations of these streams would be expected to be designated warm water aquatic habitat, primary contact recreation, secondary contact recreation, and domestic water supply (KDOW 2013). Watercourses that convey surface water only during storm events (such as ephemeral streams/wet weather conveyances [WWCs]) do not continuously support aquatic biota but can transfer surface water runoff to adjacent streams during precipitation events.

Intermittent streams are features that typically run dry during portions of the summer months. Water during this period usually is confined to large pools. Smaller intermittent streams can run completely dry for extended periods of time. Because of this fluctuation in water and available habitat, the aquatic community within intermittent streams tends to be temporary, relatively simple in composition and transient. Substrate observed within the intermittent streams documented during fall 2020 field surveys primarily consisted of cobble, sand, clay/ silt, and some boulders.

3.8.1.2 Colbert CT Plant Project Area, Offsite Natural Gas Loop Line, and Offsite TL Upgrades

The Colbert CT plant project area is located within the Tennessee River-Pickwick Lake watershed. A fall 2020 field survey of the proposed project area documented the main stem of the Tennessee River (Pickwick Reservoir) adjacent to the project boundary, a perennial stream (Cane Creek), and an unnamed intermittent stream within the project area. The

Colbert CT plant project area is located on the right descending bank of the Pickwick Reservoir at Tennessee RM 245. The reach of the Tennessee River adjacent to the project area has been altered from its former free-flowing character by the presence of Pickwick Dam, located approximately 38 river miles downstream of the Colbert CT plant project area, and Wilson Dam, located approximately 14 miles upstream. This reach of the Tennessee River near the CT plant project area historically supported and currently supports a rich diversity of aquatic species.

A total of seven streams (six perennial and one intermittent) and three WWCs/ephemeral streams were documented within the existing TL ROW and access roads where upgrade activities would occur (Table 3-7 in Section 3.5). Brewer Branch and Factory Creek were the only named streams documented and are located within TL 5617. All other stream features documented were small and provide minimal aquatic habitat.

3.8.2 Environmental Consequences

3.8.2.1 Alternative A – No Action Alternative

Under Alternative A, there would be no project-related impacts to aquatic resources as TVA would not construct the CT plants at Paradise or Colbert reservations, and associated TL upgrades would not be required. It is assumed that current operations would not create any additional impacts.

3.8.2.2 Alternative B – Retirement of Allen CT Units 1-20 and Johnsonville CT Units 1-16 and Construction of CT Units at Paradise and Colbert

One perennial stream, three intermittent streams and four ephemeral streams were identified within the Paradise CT project area. However, no direct impacts to surface water on the Paradise project site are anticipated and therefore there would be no direct impacts to aquatic ecological resources. Soil disturbances associated with construction activities could potentially result in indirect adverse water quality impacts. Soil erosion and sedimentation can clog small streams and threaten aquatic life. TVA would comply with all appropriate state and federal permit requirements. BMPs described in *A Guide for Environmental Protection and Best Management Practices for Tennessee Valley Authority Construction and Maintenance Activities*, Revision 3 (TVA 2017b) would be implemented to minimize erosion during clearing and site preparation. All proposed project activities would be conducted in a manner to ensure that waste materials are contained, and the introduction of pollution materials to the receiving waters would be minimized. The current KPDES permit would cover the site during construction and would require development of a project-specific BMP. This plan would identify site-specific BMPs to address construction-related activities that would be adopted to minimize storm water impacts. Indirect impacts to any of the aquatic features would be avoided with proper implementation of BMPs to prevent surface water run-off from carrying siltation into adjacent streams.

Streams identified within the offsite TL ROWs associated with the Paradise CT plant included two ephemeral and one intermittent stream. Ground disturbance near the delineated streams would be minimized, and all work would be completed in accordance with BMPs. These BMPs are designed in part to minimize erosion and subsequent sedimentation. TVA will utilize existing access roads for TL upgrades. However, if necessary, any new temporary stream crossings would include the placement of culverts or riprap in the stream to allow for equipment access. Mobile biota such as fish may be temporarily impacted but would be able to avoid areas impacted by construction. After construction is complete, the mobile biota would be able to inhabit these areas again. Less mobile organisms such as macroinvertebrates may be directly impacted since they cannot avoid construction activities, but they would be expected to quickly recolonize these areas once construction is complete. All materials would be removed, and the banks would be restored to pre-construction contours after construction is complete. Therefore, with proper implementation of BMPs, impacts to aquatic ecological resources would be minor.

One perennial stream and one intermittent stream were identified within the Colbert CT plant project area. However, no direct impacts to surface water on the Colbert project site are anticipated and therefore there would be no direct impacts to aquatic ecological resources. As described for the Paradise CT plant, indirect impacts to aquatic ecological resources would be avoided with proper implementation of BMPs to prevent surface water run-off from carrying siltation into adjacent streams. In addition, Alabama requires a stormwater construction permit be obtained, including the development and implementation of a CBMPP. With implementation of BMPs, no impacts to the Tennessee River, Cane Creek, or to the unnamed intermittent stream located within the Colbert CT plant project area are anticipated.

Six perennial, one intermittent, and three ephemeral streams were identified within the offsite TL ROW and access roads associated with the proposed Colbert CT plant. Ground disturbance near the streams would be minimized, and all work would be completed in accordance with BMPs. As described above, if necessary, temporary stream crossings may result in temporary impacts to aquatic biota. However, impacts associated with the use of temporary stream crossings would be minor with implementation of BMPs.

3.9 Vegetation

3.9.1 Affected Environment

The Paradise and Colbert CT plant project areas intersect nine Level IV ecoregions including the Caseyville Hills, Crawford-Mammoth Cave Uplands, Eastern Highland Rim, Green River Southern Wabash Lowlands, Inner Nashville Basin, Outer Nashville Basin, Southeastern Plains, Western Highland Rim, and Western Pennyroyal Karst Plain (Omernik 1987). These ecoregions support a diverse array of plant communities including deciduous, mixed evergreen-deciduous, and evergreen forest, as well as herbaceous vegetation. Many specific plant communities occur throughout these ecoregions, including bottomland hardwood, mixed mesophytic, upland oak-hickory, and swamp forests along with an array of herbaceous plant habitats.

Field surveys of the proposed Paradise and Colbert CT plant project areas were conducted by TVA in August of 2020 while offsite TL segments and the associated access roads were surveyed in September and October of the same year. Surveys focused on documenting plant communities, infestations of invasive plants, and possible threatened and endangered plant populations. Using the National Vegetation Classification System (Grossman et al. 1998), vegetation types observed during field surveys can be categorized as a combination of deciduous, evergreen, mixed evergreen-deciduous forest, and herbaceous vegetation. No forested areas in the proposed project area had structural characteristics indicative of old growth forest stands (Leverett 1996). All plant communities within proposed project areas are common and well represented across Alabama, Kentucky, and Tennessee.

Executive Order (EO) 13112 directed TVA and other federal agencies to prevent the introduction of invasive species (both plants and animals), control their populations, restore invaded ecosystems, and take other related actions. EO 13751 amends EO 13112 and directs federal agencies to continue coordinated federal prevention and control efforts related to invasive species. This Order incorporates considerations of human and environmental health, climate change, technological innovation, and other emerging priorities into federal efforts to address invasive species.

Some invasive plants have been introduced accidentally, but most were brought here as ornamentals or for livestock forage and have subsequently escaped from cultivation. Because these robust plants arrived without their natural predators (insects and diseases) their populations spread quickly across the landscape displacing native species and degrading ecological communities or ecosystem processes (Miller 2010). No federal-noxious weeds were observed within the project areas, but populations of many non-native species were observed during field surveys. Presence of invasive plants is ubiquitous across the project areas, which indicates a high level of previous disturbance throughout the project areas.

3.9.1.1 Paradise CT Plant Project Area, Offsite Natural Gas Upgrade, and Offsite TL Upgrades

Nearly all of the proposed Paradise CT plant project area has been heavily disturbed by the construction, operation, and maintenance of the generation and transmission infrastructure. In general, the most heavily disturbed and degraded habitats are currently covered with herbaceous vegetation and large, mostly unvegetated ponds. The vast majority of herbaceous vegetation on the Paradise CT plant project area is dominated by non-native plant species and possesses little conservation value. Common herbaceous species include American pokeweed, annual marsh elder, Canadian horseweed, common milkweed, common reed, field thistle, Fuller's teasel, Johnson grass, Queen Anne's lace, tall goldenrod, white sweet clover, and Chinese lespedeza. In herbaceous wetlands, vegetation is mostly common reed and annual marsh elder, while the woody species, autumn olive and sandbar willow, predominate in scrub/shrub wetlands.

Deciduous forest throughout the Paradise CT plant project area typically contains small diameter trees indicative of the previous disturbance onsite. Deciduous forest is defined as stands where deciduous trees account for more than 75 percent of total canopy cover. Canopy trees in these areas typically consist of American sycamore, black locust, box elder, eastern cottonwood, eastern red cedar, green ash, southern hackberry, and Osage orange with an understory of Carolina buckthorn, winged elm, and white mulberry. The woody vines, heartleaf peppervine, Japanese honeysuckle, poison ivy, and Virginia creeper, are also common. The herbaceous layer in these forest stands is depauperate; common reed, Japanese stiltgrass, and yellow wingstem dominate. Scrub/shrub old fields in the process of transitioning from herbaceous vegetation to deciduous forest are dominated by many of the tree species mentioned above as well as early successional plants including autumn olive, Chinese lespedeza, common reed, and sawtooth blackberry.

Relatively undisturbed mixed evergreen-deciduous forest stands, where evergreen and deciduous species contribute 25 to 75 percent of the total woody cover, occur in the northwest corner of the Paradise CT plant project area. These areas support the overstory trees American beech, American sycamore, black cherry, black gum, eastern cottonwood, mockernut and pignut hickories, as well as several oak species; the evergreens loblolly pine and Virginia pine are common in the overstory. Devil's walking stick, redbud, and winged sumac are common in the shrub layer. The herbaceous layer is depauperate with few species.

Disturbed evergreen forests in the Paradise CT plant project area, where evergreen trees account for more than 75 percent of total canopy cover, are dominated by loblolly pine and eastern red cedar. These stands occur only on two parallel ridges near the center of the Paradise CT plant project area.

Plant communities associated with offsite TL project areas associated with the proposed Paradise CT plant are entirely herbaceous and a mixture of early successional fields, cropland, pasture, mowed lawns, and other developed areas. Plants in these areas are weedy and typical of species found in highly disturbed habitats. The particular species present are dependent on the type of disturbance most prevalent at specific sites. In agricultural areas where row crops are grown, species like corn and soybeans were common, though fields had been harvested by the time of survey. Pastures and old fields located within the TL ROW and along access roads support more natural vegetation, but non-native species are still common. Common plants in these areas include beaked panicgrass, bearded beggarstick, broomsedge, browneyed Susan, flat-topped goldentop, frostweed, horsenettle, purple top grass, slender paspalum, and thoroughworts. Lawns and developed areas are more disturbed than areas of naturalized vegetation and contain species tolerant of frequent mowing including Bermuda grass, crabgrasses, Japanese clover, Japanese stiltgrass, lanceleaf plantain, and tall fescue.

Vegetation within the project areas associated with the Paradise CT plant and offsite TL upgrades do not contain high quality herbaceous plant communities; all areas were relatively disturbed.

3.9.1.2 Colbert CT Plant Project Area, Offsite Natural Gas Loop Line, and Offsite TL Upgrades

The majority of the Colbert CT plant project area is comprised of disturbed herbaceous vegetation, lawns, and sparsely vegetated developed areas. Much of this site has been heavily disturbed in the past by construction, operation, and maintenance activities on the Colbert Reservation and is incapable of supporting intact, native plant communities. Common plant species found in areas of naturalized herbaceous vegetation include blackberries, purple top grass, Johnson grass, passion flower, thistle, red maple seedlings, and smooth sumac.

Mixed evergreen-deciduous forest, where both evergreen and deciduous species account for more than 25 percent of canopy cover, covers approximately 86 acres of the Colbert CT plant project area. Prominent canopy species in these even-aged stands include loblolly pine, Virginia pine, southern red oak, and shagbark hickory. The sparse shrub layer includes Carolina buckthorn, flowering dogwood, sassafras, spicebush, and the non-native species Chinese privet.

The natural gas pipeline lateral tie-in is located in areas with existing pipeline ROW as well as mixed evergreen-deciduous forest. Common species in the open pipeline, which had been recently mowed at the time of survey, include bristle grass, broomsedge, Illinois bundleflower, and tall goldenrod. The forest in this area includes the evergreen species eastern red cedar and loblolly pine in the overstory, along with the deciduous species Osage orange, slippery elm, sugarberry, white ash, and willow oak. The shrub and herbaceous layers are species poor throughout and contain species such as Chinese privet and Cherokee sedge.

Plant communities associated with offsite TL segments requiring upgrades associated with the proposed Colbert CT plant are similar to those mentioned for the Paradise CT plant in Section 3.7.1.1. The species vary, but all the habitats are a comparable mixture of early successional fields, cropland, pasture, mowed lawns, and other developed areas that are dominated, in most locations, by non-native plants. These disturbed, open habitats are common and well represented throughout the region.

None of the project areas associated with the Colbert CT plant project area, offsite natural gas loop line, and offsite TL upgrades contain high quality plant communities. All areas are relatively disturbed and possess little standalone conservation value.

3.9.2 Environmental Consequences

3.9.2.1 Alternative A – No Action Alternative

Under Alternative A, there would be no project-related impacts to vegetation, as TVA would not construct the Paradise or Colbert CT plants. Changes to local plant communities resulting from natural ecological processes and human-related disturbance would continue to occur, but they would not result from the proposed project. The existing TL ROWs would continue to be managed per the TVA ROW Vegetation Management Plan.

3.9.2.2 Alternative B – Retirement of Allen CT Units 1-20 and Johnsonville CT Units 1-16 and Construction of CT Units at Paradise and Colbert

Under Alternative B, impacts resulting from conversion of some amount of forest land to herbaceous vegetation or to unvegetated, developed areas for the proposed CT plants and associated offsite upgrades would be long-term in duration, but minor. All herbaceous plant communities found throughout the project areas are heavily disturbed, early successional habitats. In areas of offsite TL and natural gas pipeline upgrades, project-related work would temporarily affect herbaceous plant communities, but these areas would likely recover to their pre-project conditions in less than one year. Small areas of low-quality herbaceous vegetation would be permanently converted to developed land to support proposed construction.

Construction of the Paradise CT plant would result in the removal of 9.5 acres of forest vegetation. The largest amount of tree clearing, 8.5 acres, would occur in association with construction of 500-kV TL (See Figure 3-3). In the offsite TL upgrade project areas associated with the Paradise CT plant, relatively small amounts of tree trimming may be required along a few existing access roads, but tree removal is not anticipated and if required would be a negligible amount. All of these forested areas contain substantial populations of non-native plant species and have been heavily disturbed in the past. All plant communities found within the Paradise CT plant site, onsite and offsite natural gas pipeline project areas, and TL upgrade project areas are common and well represented throughout the region. As of 2017, at least 126,000 acres of forest occurred in Muhlenberg County, Kentucky (U.S. Forest Service 2020). Therefore, project-related effects to forest resources would be negligible when compared to the total amount of forest land in the region.

Impacts to vegetation from the construction of the Colbert CT plant and associated offsite TL upgrades would be similar to those for the Paradise CT plant. Construction of the

Colbert CT plant would result in the removal of approximately 5 acres of forest vegetation. The largest amount of tree clearing would occur to support the new 161-kV TLs (Figure 3-4). Impacts to vegetation resulting from offsite TL upgrades associated with the Colbert CT plant would be similar to those described for the Paradise CT plant. All plant communities found within the Colbert CT plant site, onsite and offsite natural gas pipeline project areas, and TL upgrade project areas are common and well represented throughout the region. As of 2017, more than 193,000 acres of forest occurs in Colbert County, Alabama (U.S. Forest Service 2020). Therefore, project-related effects to forest resources would be negligible when compared to the total amount of forest land in the region.

Large parts of the project areas associated with both the Paradise and Colbert CT plants currently have substantial amounts of invasive terrestrial plants, and adoption of Alternative B would not significantly affect the extent or abundance of these species at the county, regional, or state level. The use of the TVA standard operating procedure of revegetating areas disturbed by construction, upgrades, and maintenance activities with noninvasive species (TVA 2017b) would serve to minimize the potential introduction and spread of invasive species on the Colbert and Paradise CT plant sites and along TVA TL and natural gas pipeline ROW. Following project activities, disturbed areas would be graded and vegetated with a noninvasive seed mix to prevent erosion and limit the invasion of non-native, weedy species. After construction, upgrades, and restoration are complete, the new and existing ROWs would continue to be managed per the TVA ROW Vegetation Management Plan.

Activities associated with Alternative B are expected to impact vegetation with limited conservation value that is common to the region. Therefore, overall impacts to vegetation from proposed project activities would be minor.

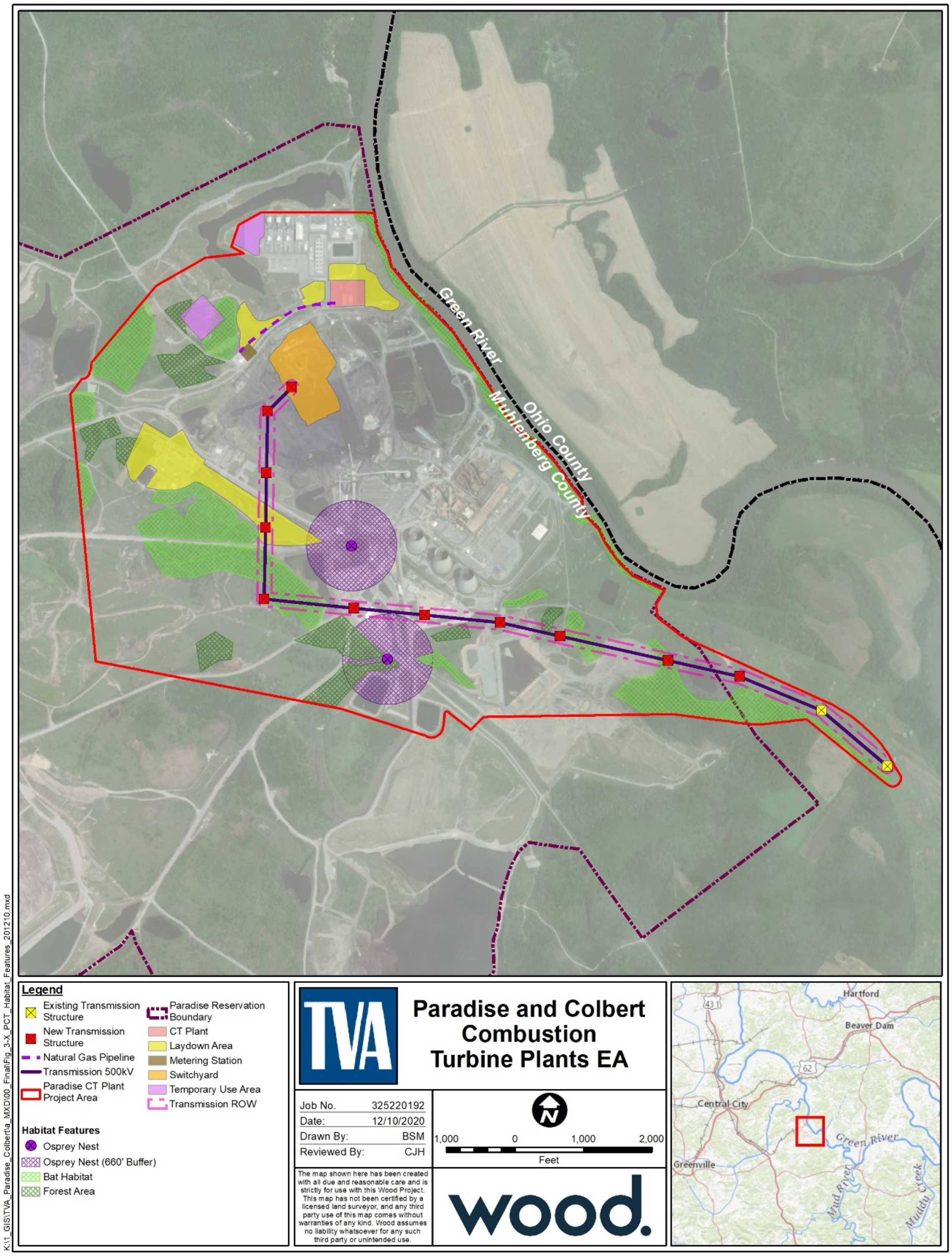

Figure 3-3. Habitat Features Within the Paradise CT Plant Project Area

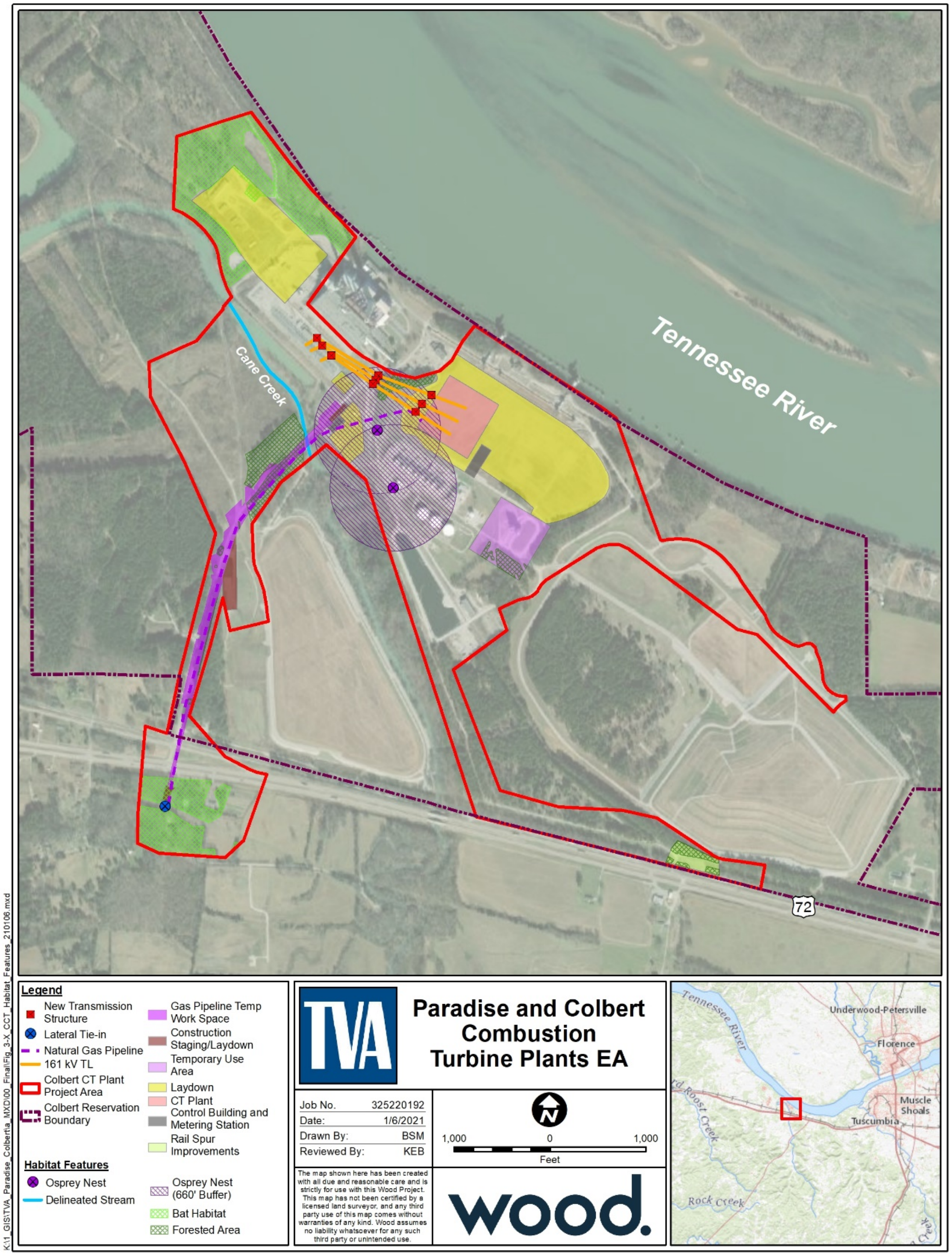

Figure 3-4. Habitat Features Within the Colbert CT Plant Project Area

3.10 Wildlife

3.10.1 Affected Environment

3.10.1.1 Paradise CT Plant Project Area, Offsite Natural Gas Upgrade, and Offsite TL Upgrades

Much of the Paradise CT plant project area is heavily disturbed including some areas that are already paved or graveled. In addition, other laydown areas, some temporary use areas, and some sections of proposed new onsite TL ROWs are located in herbaceous fields that have been heavily disturbed. These areas can be used by common species, but do not offer suitable habitat for rare wildlife species. The proposed Paradise CT plant project area includes some areas that are forested, and the proposed temporary use areas and TLs contain mixed deciduous-coniferous bottomland and upland forest. Small stands dominated by scrubby cedar or locust also exist near developed portions within the project areas. These stands have, on average, shorter canopies, and smaller diameter trees.

Birds typically found in forested habitats of this region include American robin, barred owl, blue jay, common yellowthroat, downy woodpecker, hairy woodpecker, eastern phoebe, eastern kingbird, eastern towhee, eastern wood-pewee, gray catbird, hooded warbler, indigo bunting, mourning dove, pileated woodpecker, prairie warbler, red-eyed vireo, red-tailed hawk, tufted titmouse, white-breasted nuthatch, white-eyed vireo, yellow-billed cuckoo, and yellow-rumped warbler (National Geographic 2002). Some sections of forest within the proposed Paradise CT plant project area also provide foraging and roosting habitat for several species of bat, particularly in areas where the forest understory is more open. Examples of common bat species likely found within this habitat include big brown, eastern red, and hoary. Eastern chipmunk, eastern woodrat, white-footed mouse, and woodland vole are other mammals that may be present within this habitat (Kays and Wilson 2002; Whittaker 1996). Eastern box turtle, eastern fence lizard, eastern garter snake, North American racer, rat snake, and ring-necked snake are common reptiles of these forests in the project region (Conant and Collins 1998; Gibbons and Dorcas 2005).

The addition of a natural gas-fired reciprocating engine at the existing compressor station would be constructed within the existing paved and graveled site which does not provide suitable habitat for rare wildlife species.

Existing offsite TL ROWs requiring upgrades are comprised of a variety of herbaceous habitats ranging from cultivated crops to pastures and early successional habitats. Birds that utilize these areas include chipping sparrow, field sparrow, killdeer, grasshopper sparrow, red-tailed hawk, red-winged blackbird, and white-throated sparrow (National Geographic 2002). Mammals that can be found in these areas are common mole, coyote, ground hog, least shrew, white-footed mouse, and white-tailed deer (Whitaker 1996). Reptiles that may use these habitats in this region include black racer, black rat snake, corn snake, eastern kingsnake, and eastern milksnake (Gibbons and Dorcas 2005). Emergent wetlands and saturated wet weather conveyances within field settings also provide habitat for common amphibians and reptiles. Amphibians likely present in riparian areas include American bullfrog, American toad, southern leopard frog, spring peeper, and upland chorus frog (Conant and Collins 1998). Reptiles with the potential to occur in riparian areas of the offsite TL ROWs include gray rat snake, northern watersnake, rough green snake, and black racer (Conant and Collins 1998; Gibbons and Dorcas 2005).

The TVA Natural Heritage database indicates that six caves are known within three miles of the proposed TL upgrades associated with the Paradise CT plant. No caves or cave-like habitats were observed within the project areas.

Two records of wading bird colonies occur within three miles of the proposed TL upgrades associated with the Paradise CT plant. The closest of these records is approximately 2.2 miles from project areas.

The U.S. Fish and Wildlife Service (USFWS) Information for Planning and Consultation (IPaC) website (https://ecos.fws.gov/ipac/) indicates several migratory bird species of concern have the potential to occur in the Paradise CT plant project area and offsite TL upgrade areas. These include bald eagle, eastern whip-poor-will, Henslow's sparrow, Kentucky warbler, lesser yellowlegs, prairie warbler, red-headed woodpecker, rusty blackbird, wood thrush. See Section 3.11 (Threatened and Endangered Species) for a discussion of impacts to bald eagle and Henslow’s sparrow. Early successional and edge habitats, primarily those in or adjacent to existing TL ROWs, could provide potentially suitable habitat for a few of these species including prairie warbler and red-headed woodpecker. Lesser yellowlegs and rusty blackbird could be found in wetlands within existing and proposed ROWs. Eastern whip-poor-will, Kentucky warbler, and wood thrush are not likely to occur in project areas as they require larger areas of mature forest not found in these areas.

3.10.1.2 Colbert CT Plant Project Area, Offsite Natural Gas Loop Line, and Offsite TL Upgrades

Much of the Colbert CT plant project area is heavily disturbed. Several areas are already paved or graveled, and some laydown areas are located above the former coal pile now covered with maintained fields. A few forested areas are located within the Colbert CT plant project area, within proposed natural gas pipeline areas, and along existing access roads associated with offsite TL upgrades. Herbaceous areas located within the CT plant project area are typically mowed fields that do not offer suitable habitat for rare wildlife species but can be used by common species. A variety of common wildlife species can utilize habitat in existing offsite TL and natural gas pipeline ROWs and along access roads associated with TL upgrades.

Existing TL and natural gas pipeline ROWs requiring upgrades are comprised of a variety of herbaceous habitats ranging from cultivated crops to pastures and early successional habitats. Birds that utilize these areas as well as herbaceous areas on the Colbert CT plant project area include chipping sparrow, field sparrow, house finch, killdeer, grasshopper sparrow, mourning dove, red-tailed hawk, red-winged blackbird, wild turkey, and white-throated sparrow (National Geographic 2002). Mammals that can be found in these areas are common mole, coyote, least shrew, white-footed mouse, and white-tailed deer (Whitaker 1996). Reptiles that may use these habitats in this region include black racer, gray rat snake, corn snake, eastern black kingsnake, and scarlet kingsnake (Gibbons and Dorcas 2005). Emergent wetlands and saturated wet weather conveyances within field settings provide habitat for common amphibians. Amphibians likely present include American bullfrog, American toad, southern leopard frog, spring peeper, as well as upland chorus frog (Powell et al. 2016).

Some areas of the proposed Colbert CT plant project area are forested. Proposed temporary use areas, railroad spur improvements, and associated natural gas pipeline ROW areas contain mixed evergreen-deciduous forest. Birds observed during August 2020 field investigations in these forested areas included American crow, American goldfinch, blue-gray gnatcatcher, Carolina wren, eastern phoebe, northern cardinal, northern mockingbird, worm-eating warbler, and yellow-billed cuckoo. Some sections of onsite forested areas also provide foraging and roosting habitat for several species of bat, particularly in areas where the forest understory is more open. Some examples of common bat species likely found within this habitat include big brown, eastern red, and hoary. Armadillo, eastern chipmunk, eastern woodrat, striped skunk, Virginia opossum, white-footed mouse, and white-tailed deer are other mammals that may be present or were observed within this habitat in the onsite project areas (Kays and Wilson 2002; Whittaker 1996; TVA 2020e). Reptile and amphibian species that may use these terrestrial forested communities include American toad, black racer, black rat snake, dusky salamander, eastern box turtle, eastern fence lizard, eastern garter snake, eastern hog-nosed snake, five-line skink, gray treefrog, green frog, leopard frog, ring-necked snake, rough green snake, slimy salamander, and spring peeper (Gibbons and Dorcas 2005; Powel et al. 2016).

The TVA Natural Heritage database indicates that 61 caves are known within three miles of the Colbert CT plant project area and offsite TL upgrades associated with the proposed Colbert CT plant. Two of these records occur within the Colbert Reservation, but are not within the proposed project area. Furthermore, neither of these caves currently exist as one is under the fossil plant and the other was not found during field surveys and was likely destroyed decades ago. Five extant caves are known from along the Tennessee River shoreline, directly adjacent to the northern edge of the onsite project area.

Two records of wading bird colonies occur within 3 miles of the TL upgrades associated with the proposed Colbert CT plant. Both records indicate that the colonies are greater than 660 feet from the TL upgrade action areas.

The USFWS IPaC website indicated the potential for several migratory bird species of concern to occur in the proposed Colbert CT plant project area and offsite project areas. These include bald eagle, blue-winged warbler, Cerulean warbler, eastern whip-poor-will, Kentucky warbler, lesser yellowlegs, prairie warbler, red-headed woodpecker, red-throated loon, rusty blackbird, semipalmated sandpiper, and wood thrush. A discussion of impacts to bald eagle and cerulean warbler is included in Section 3.11 (Threatened and Endangered Species). Prairie warbler was observed in forest/field edge habitat during field surveys of the proposed Colbert CT plant project area. Early successional and forest edge habitats could provide potentially suitable habitat for a few more of these species including blue-winged warbler and red-headed woodpecker. Lesser yellowlegs, semipalmated sandpiper, and rusty blackbird could be found in and around wetlands on the proposed Colbert CT plant project area or on existing offsite ROWs. Eastern whip-poor-will, Kentucky warbler, and wood thrush could occur in forested areas. Red-throated loon could use large bodies of water such as Pickwick, Wilson, and Wheeler Reservoirs.

3.10.2 Environmental Consequences

3.10.2.1 Alternative A – No Action Alternative

Under the Alternative A, TVA would not retire Units 1-20 of Frame CTs at Allen or Units 1-16 of Frame CTs at Johnsonville. Accordingly, soil and vegetation would remain in their current state, and current communities of terrestrial animals and their habitats would not be affected.

3.10.2.2 Alternative B – Retirement of Allen CT Units 1-20 and Johnsonville CT Units 1-16 and Construction of CT Units at Paradise and Colbert

Under Alternative B, habitat that could support common wildlife would be removed at both the proposed Paradise and Colbert CT plant project areas and in some areas along existing offsite ROW upgrades.

A relatively small amount of woody vegetation would be removed in association with the construction of the Paradise CT plant and onsite laydown areas (9.5 acres). The largest amount of habitat removal would occur in association with construction of the 500-kV TL ROW (8.5 acres) at Paradise. Some migratory birds of conservation concern identified by the USFWS may be impacted by the proposed action. Forest edge habitats would be impacted along smaller forest fragments where the 500-kV TL would be re-routed and at one onsite temporary use area near the proposed Paradise CT plant site.

A small amount of tree trimming may need to occur along existing access roads associated with proposed offsite TL upgrades at Paradise; however, no tree removal is anticipated as all access roads through forested areas are relatively well maintained. Forest edge habitats, primarily those in or adjacent to existing offsite TL ROWs, could provide suitable habitat for a few of these species including prairie warbler and red-headed woodpecker. Small areas of forested edge impacts could occur along the few offsite TL access roads requiring tree trimming. Lesser yellowlegs and rusty blackbird could be found in wetlands within existing offsite TL ROWs. Potential impacts to bald eagle and Henslow's sparrow are addressed in Section 3.11 (Threatened and Endangered Species).

Habitat removal would result in the displacement of any wildlife (primarily common, habituated species) currently using the project areas. Direct effects to some individuals may occur if those individuals are immobile during the time of habitat removal. This could be the case if activities took place during breeding/nesting seasons (e.g., eggs, babies, nestlings). Habitat removal likely would disperse mobile wildlife into surrounding areas in an attempt to find new food sources, shelter sources, and to reestablish territories. BMPs would be used to minimize impacts to streams and wetlands (TVA 2017b). Due to the heavily disturbed nature of habitat proposed for removal at the onsite Paradise CT plant project area, the small size and discrete locations of the areas of proposed impacts across Kentucky and Tennessee for the offsite TL upgrades, and the amount of similar, suitable habitat in areas immediately adjacent to or near proposed project areas, the impact to populations of common wildlife species would be minor.

Areas associated with construction of the Colbert CT plant are previously disturbed. The largest area of vegetative disturbance would occur on a former coal pile now covered in grass. Approximately 5 acres of fragmented forest may also be removed within the Colbert CT plant project area. The largest amount of forest to be removed would occur in association with construction of the north transmission line (approximately 1.4 acres). A small amount of tree trimming may need to occur along offsite access roads associated with proposed offsite TL upgrades; however, no tree removal is anticipated as all access roads through forested areas are relatively well maintained.

Some migratory birds of conservation concern identified by the USFWS may be impacted by the proposed action at Colbert. Forest edge habitat would be impacted at onsite forest fragments along the proposed new natural gas pipeline, a temporary use area, and a railroad spur. Small areas of forested edge impacts could occur along the few offsite TL access roads that would require tree trimming. Removal of this edge habitat could impact blue-winged warbler, prairie warbler and red-headed woodpecker. Impacts to forested areas within the CT plant project area would remove habitat for Eastern whip-poor-will, Kentucky warbler, and wood thrush. Lesser yellowlegs, semipalmated sandpiper, and rusty blackbird could be found in and around wetlands at the Colbert CT plant project area or within existing offsite TL ROWs that may be impacted. However, BMPs would be used in and around all wetlands, thereby minimizing impacts to the habitat. No impacts to red-throated loon or its habitat are anticipated due to the minimal amount of work occurring in these areas and the use of BMPs along all large bodies of water in the Colbert CT plant project area and at offsite TL upgrades. Potential impacts to bald eagle and cerulean warbler are addressed in Section 3.11 (Threatened and Endangered Species).

Wildlife displacement impacts at Colbert would be similar to those described for the Paradise CT plant. Due to the heavily disturbed nature of habitat proposed for removal at the proposed Colbert CT plant project area, the small size and discrete locations of the areas of proposed impacts across Alabama and Tennessee for the offsite TL upgrades, and the amount of similar, suitable habitat in areas immediately adjacent to or near proposed project areas, the impact to populations of common wildlife species would be minor.

3.11 Threatened and Endangered Species

3.11.1 Affected Environment

The ESA (16 USC §§ 1531-1543) was passed to conserve the ecosystems upon which endangered and threatened species depend, and to conserve and recover those species. An endangered species is defined by the ESA as any species in danger of extinction throughout all or a significant portion of its range, whereas a threatened species is likely to become endangered within the foreseeable future throughout all or a significant part of its range. Critical habitats, essential to the conservation of listed species, can also be designated under the ESA. The ESA establishes programs to conserve and recover endangered and threatened species and makes their conservation a priority for Federal agencies. Section 7 of the ESA requires federal agencies to consult with the USFWS when their proposed actions may affect endangered or threatened species or their critical habitats.

The States of Tennessee, Kentucky, and Alabama each provide protection for species considered threatened, endangered, or deemed in need of management within the state other than those federally listed under the ESA. The listings in Tennessee are managed by the Tennessee Wildlife Resources Agency (TWRA); additionally, the Tennessee Natural Heritage Program maintains a database of species that are considered threatened, endangered, in need of management, or tracked in Tennessee.

The species listings in Kentucky are managed by the state wildlife agency, Kentucky Department of Fish and Wildlife Resources (KDFWR). Additionally, the Kentucky State Nature Preserves Commission (KSNPC) maintains a database of aquatic and terrestrial animal species that are considered threatened, endangered, special concern, or are otherwise tracked in Kentucky because the species is rare and/or vulnerable within the state. Plant species are protected in Kentucky through the Kentucky Rare Plant Recognition Act of 1994.

The species listings in Alabama are managed by the Alabama Department of Conservation and Natural Resources (ADCNR); however, the Alabama Natural Heritage Program maintains a database of aquatic animal species that are considered threatened, endangered, special concern, or tracked in Alabama.

TVA also maintains a database of threatened and endangered plant and animal species in TVA's power service area, which includes all of Tennessee and parts of six surrounding states, including Kentucky and Alabama. The USFWS IPaC website and the TVA Natural Heritage database were queried in October 2020 for species of conservation concern, including federal and state-listed species. Records of terrestrial animal species that occur or have the potential to occur within the project areas are shown on Table 3-12. A discussion of these species and the potential for their habitats to occur within the project areas is included in the following sections.

The TVA Natural Heritage database indicated that there are 27 records of Tennessee, Kentucky, and Alabama state-listed terrestrial animal species, one federally protected terrestrial animal species (bald eagle) and one federally listed terrestrial animal species (gray bat) within 3 miles of the Paradise and Colbert CT plant project areas and associated offsite natural gas pipeline and TL upgrades. According to the USFWS IPaC website, three additional federally listed terrestrial animal species (Indiana bat, northern long-eared bat, and red-cockaded woodpecker) have also been reported from within one or more of the project counties (Table 3-12). No designated critical habitat for terrestrial species occurs within the proposed project areas.

Table 3-12. Terrestrial Species of Conservation Concern Known from Within Three Miles[1] of Paradise and Colbert CT Plant and Offsite Project Areas and Federally Listed and Candidate Species Listed in Project Counties[2]

Common Name	Scientific Name	Federal Status[3]	State Status[4]	State Rank[5]
	Alabama			
AMPHIBIANS				
Hellbender	*Cryptobranchus alleganiensis*	PS	SP	S2
BIRDS				
Bald Eagle	*Haliaeetus leucocephalus*	DM	S	S3B, S3S4N
Osprey	*Pandion haliaetus*		SP	S4
Red-cockaded Woodpecker[6]	*Picoides borealis*	LE	SP	S2
INVERTEBRATES				
A Beetle	*Batriasymmodes spelaeus*			S3
A Beetle	*Batrisodes jonesi*			S2S3
A Ground Beetle	*Rhadine caudata*			S2
MAMMALS				
Gray Bat	*Myotis grisescens*	LE	SP	S2
Indiana Bat[6]	*Myotis sodalis*	LE	SP	S2
Northern Long-eared Bat[6]	*Myotis septentrionalis*	LT	SP	S1
Rafinesque's Big-eared Bat	*Corynorhinus rafinesquii*		SP	S2
Tricolored Bat	*Perimyotis subflavus*			S3

Common Name	Scientific Name	Federal Status[3]	State Status[4]	State Rank[5]
REPTILES				
Alligator Snapping Turtle	*Macrochelys temminckii*		SP	S3
	Kentucky			
AMPHIBIANS				
Bird-Voiced Treefrog	*Hyla avivoca*		N	S3S4
Barking Treefrog	*Hyla gratiosa*		N	S3S4
BIRDS				
Bald Eagle	*Haliaeetus leucocephalus*	DM	S	S3B, S3S4N
Bank Swallow	*Riparia riparia*		S	S3B
Bell's Vireo	*Vireo bellii*		S	S2S3B
Common Gallinule	*Gallinula galeata*		T	S1S2B
Great Egret	*Ardea alba*		T	S2B
Henslow's Sparrow	*Ammodramus henslowii*		S	S3B
Hooded Merganser	*Lophodytes cucullatus*		T	S2B,S3S4N
Lark Sparrow	*Chondestes grammacus*		S	S2S3B
Least Bittern	*Ixobrychus exilis*		T	S1S2B
Northern Harrier	*Circus hudsonius*		T	S1S2B,S4N
Osprey	*Pandion haliaetus*		S	S3S4B
Sedge Wren	*Cistothorus platensis*		S	S3B
INVERTEBRATES				
Whitewashed Rabdotus	*Rabdotus dealbatus*		T	S1S2
MAMMALS				
Gray Bat	*Myotis grisescens*	LE	T	S2
Indiana Bat[6]	*Myotis sodalis*	LE	E	S1S2
Northern Long-eared Bat[6]	*Myotis septentrionalis*	LT	E	S1
REPTILES				
Eastern Slender Glass Lizard	*Ophisaurus attenuatus longicaudus*		T	S2
Common Ribbon Snake	*Thamnophis sauritus sauritus*		S	S3
	Tennessee			
AMPHIBIANS				
Hellbender	*Cryptobranchus alleganiensis*	PS	E	S3
Streamside Salamander	*Ambystoma barbouri*		E	S2
Barking Treefrog	*Hyla gratiosa*		N	S3S4
BIRDS				
Bald Eagle	*Haliaeetus leucocephalus*	DM	D	S3
Cerulean Warbler	*Setophaga cerulea*		D	S3B
Great Egret	*Ardea alba*			S2BS3N
Common Barn-owl	*Tyto alba*			S3

Common Name	Scientific Name	Federal Status[3]	State Status[4]	State Rank[5]
MAMMALS				
Gray Bat	*Myotis grisescens*	LE	E	S2
Indiana Bat[6]	*Myotis sodalis*	LE	E	S1
Northern Long-eared Bat[6]	*Myotis septentrionalis*	LT	T	S1S2
REPTILES				
Western Pigmy Rattlesnake	*Sistrurus miliarius streckeri*		T	S2S3
Alligator Snapping Turtle	*Macrochelys temminckii*		T	S2S3

[1] Source: TVA Natural Heritage Database, queried October 2020
[2] Includes Colbert, Lauderdale, and Morgan Counties, Alabama; Hardin, Lawrence, Montgomery, Sumner, Wayne, and Wilson Counties, Tennessee; and Muhlenberg and Todd Counties, Kentucky
[3] Federal Status Codes: DM = Delisted, Recovered, and Being Monitored; LE = Listed Endangered; LT = Listed Threatened; PS = Partial Status; – = Not Listed by USFWS
[4] State Status Codes: E = Listed Endangered; S = Listed Special Concern; T = Listed Threatened; SP = State Protected; D = Deemed in Need of Management; CE = Commercially Exploited; N = No Status
[5] State Ranks: S1 = Critically Imperiled; S2 = Imperiled; S3 = Vulnerable; S4 = Apparently Secure; S#S# = Denotes a range of ranks because the exact rarity of the element is uncertain (e.g., S1S2); S#B = Status of Breeding Population; S#N = Status of Non-Breeding Population.
[6] Federally listed or protected species known from the county, but not within three miles of the project footprint.

The TVA Regional Natural Heritage Project database and the USFWS IPaC website indicated that 15 federally listed endangered, two federally listed threatened, and 22 state-listed aquatic animals are currently known from or have the potential to occur within the 10-digit hydrologic unit code (HUC) watersheds encompassing the Paradise and Colbert CT plant project areas (Table 3-13). Another 23 species were also listed but are believed to be extirpated from this portion of their former ranges.

The TVA Regional Natural Heritage database and the USFWS IPaC website also indicated that 24 federally listed endangered, three federally listed threatened, and 23 state-listed aquatic animals are currently known from or have the potential to occur within the 10-digit HUC watersheds encompassing the offsite TL and natural gas pipeline project areas (Table 3-14).

Table 3-13. Aquatic Species of Conservation Concern Known from Within the Watersheds of Paradise and Colbert CT Plant Project Areas and Federally Listed and Candidate Species Listed in Onsite Project Counties[1]

Common Name	Scientific Name	Element Rank[2]	Federal Status[3]	State Rank[4]
FISH				
Alabama Cavefish	*Speoplatyrhinus poulsoni*	E	LE	SP (S1)
Chestnut Lamprey	*Ichthyomyzon castaneus*	E		S (S2)
Snail Darter	*Percina tanasi*	AB	LT	SP (S1)
Southern Cavefish	*Typhlichthys subterraneus*	E		SP (S3)
MACROINVERTEBRATES				
Alabama Blind Cave Shrimp	*Palaemonias alabamae*	E	LE	SP (S1)
MUSSELS				
Birdwing Pearlymussel	*Lemiox rimosus*	E	LE	SP (S1)

Common Name	Scientific Name	Element Rank[2]	Federal Status[3]	State Rank[4]
Black Sandshell	*Ligumia recta*	E		PSM (S2)
Butterfly	*Ellipsaria lineolata*	E		PSM (S4)
Cracking Pearlymussel	*Hemistena lata*	H	LE	SP, P1 (S1)
Cumberland Moccasinshell	*Medionidus conradicus*	H		SP (S1)
Cumberlandian Combshell	*Epioblasma brevidens*	H	LE	SP (S1)
Deertoe	*Truncilla truncata*	E		PSM (S1)
Fanshell	*Cyprogenia stegaria*	E	LE	SP (S1)
Fine-rayed Pigtoe	*Fusconaia cuneolus*	H	LE	SP (S1)
Kidneyshell	*Ptychobranchus fasciolaris*	E		PSM (S2)
Longsolid	*Fusconaia subrotunda*	H		PSM (S1)
Monkeyface	*Quadrula metanevra*	E		PSM (S3)
Mountain Creekshell	*Villosa vanuxemensis*	H?		PSM (S3)
Ohio Pigtoe	*Pleurobema cordatum*	E		PSM (S2)
Painted Creekshell	*Villosa taeniata*	H		PSM (S2)
Pink Mucket	*Lampsilis abrupta*	E	LE	SP (S1)
Pocketbook	*Lampsilis ovata*	E		PSM (S2)
Purple Lilliput	*Toxolasma lividus*	E		PSM (S2)
Pyramid Pigtoe	*Pleurobema rubrum*	E		SP (S1)
Rock Pocketbook	*Arcidens confragosus*	E		PSM (S3)
Rough Pigtoe	*Pleurobema plenum*	E	LE	SP (S1)
Round Hickorynut	*Obovaria subrotunda*	H		PSM (S2)
Round Pigtoe	*Pleurobema sintoxia*	E		SP (S1)
Sheepnose	*Plethobasus cyphyus*	E	LE	SP (S1)
Slabside Pearlymussel	*Pleuronaia dolabelloides*	H	LE	SP (S1)
Smooth Rabbitsfoot	*Quadrula cylindrica cylindrica*	H	LT	SP (S1)
Snuffbox	*Epioblasma triquetra*	H	LE	PSM (S1)
Spectaclecase	*Cumberlandia monodonta*	E	LE	SP (S1)
Spike	*Elliptio dilatata*	E		PSM (S1)
Tennessee Clubshell	*Pleurobema oviforme*	H		PSM (S1)
Tennessee Pigtoe	*Pleuronaia barnesiana*	H		PSM (S1)
Wavy-rayed Lampmussel	*Lampsilis fasciola*	H		PSM (S2)
White Wartyback	*Plethobasus cicatricosus*	E	LE	SP (S1)
SNAILS				
Anthony's River Snail	*Athearnia anthonyi*	E	LE	SP (S1)

[1] Source: TVA Natural Heritage Database, queried on 10/9/2020. Records are from the Tennessee River-Pickwick Lake (0603000508) and Lewis Creel-Green River (0511000305) 10-digit HUC watersheds

[2] Heritage Element Occurrence Rank; E = extant record ≤25 years old; H=historical record ≥ 25 years old; H? = possibly historical; AB = Good estimated viability

[3] Status Codes: LE = Listed Endangered; LT = Listed Threatened; SP = Special Protection; PSM = Partial Status Mussel

[4] State Ranks: S1 = Critically Imperiled; S2 = Imperiled; S3 = Vulnerable; S4 = Apparently Secure

Table 3-14. Aquatic Species of Conservation Concern Known from Within the Watersheds of Proposed Offsite TL Project Areas and Federally Listed and Candidate Species Listed in Offsite Project Counties[1]

Common Name	Scientific Name	Element Rank[2]	Federal Status[3]	State Status[3]	State Rank[4]
CRUSTACEANS					
Alabama Blind Cave Shrimp	*Palaemonias alabamae*	E	LE	SP	S1
Alabama Crayfish	*Orconectes alabamensis*	E		D	S2
Hardin Crayfish	*Orconectes wrighti*	E		LE	S2
Tennessee Bottlebrush Crayfish	*Barbicambarus simmonsi*	E		LT	S2?
FISH					
Alabama Cavefish	*Speoplatyrhinus poulsoni*	E	LE	SP	S1
Ashy Darter	*Etheostoma cinereum*	E		LE	S2S3
Blackfin Sucker	*Thoburnia atripinnis*	H?		D	S2
Blotchside Logperch	*Percina burtoni*	H?		D	S2
Blue Sucker	*Cycleptus elongatus*	H?		LT	S2
Boulder Darter	*Etheostoma wapiti*	E	LE	LE	S1
Coppercheek Darter	*Etheostoma aquali*	E		LT	S2S3
Crown Darter	*Etheostoma corona*	E		LE	S1S2
Egg-mimic Darter	*Etheostoma pseudovulatum*	E		LE	S1
Lake Sturgeon	*Acipenser fulvescens*	AC		LE	S1
Lollipop Darter	*Etheostoma neopterum*	E		D	S1S2
Longhead Darter	*Percina macrocephala*	H?		LT	S2
Flame Chub	*Hemitremia flammea*	E		D	S3
Highfin Carpsucker	*Carpiodes velifer*	E		D	S2S3
Redband Darter	*Etheostoma luteovinctum*	H?		D	S4
Saddled Madtom	*Noturus fasciatus*	E		LT	S2
Scaly Sand Darter	*Ammocrypta vivax*	H?		D	S2
Slackwater Darter	*Etheostoma boschungi*	E	LT	SP	S1
Slenderhead Darter	*Percina phoxocephala*	H?		D	S3
Smallscale Darter	*Etheostoma microlepidum*	H?		D	S2
Sooty Darter	*Etheostoma olivaceum*	H?		D	S3
Southern Cavefish	*Typhlichthys subterraneus*	E		SP	S3
Spotfin Chub	*Erimonax monachus*	E	LT	LT	S2
Stonecat	*Noturus flavus*	AC		CNGF	S1
Tennessee logperch	*Percina apina*	E		D	S2
MUSSELS					
Appalachian Monkeyface	*Quadrula sparsa*	H	LE	LE	S1
Birdwing Pearlymussel	*Lemiox rimosus*	E	LE	SP	S1
Black Sandshell	*Ligumia recta*	E		PSM	S2
Clubshell	*Pleurobema clava*	H	LE	LE	SH

Common Name	Scientific Name	Element Rank[2]	Federal Status[3]	State Status[3]	State Rank[4]
Cracking Pearlymussel	*Hemistena lata*	H	LE	LE	S1
Cumberland Moccasinshell	*Medionidus conradicus*	H		SP	S1
Cumberlandian Combshell	*Epioblasma brevidens*	H	LE	SP	S1
Deertoe	*Truncilla truncata*	E		PSM	S1
Dromedary Pearlymussel	*Dromus dromas*	E	LE	LE	S1
Elktoe	*Alasmidonta marginata*	H		PSM	S1
Fanshell	*Cyprogenia stegaria*	H	LE	LE	S1
Fine-rayed Pigtoe	*Fusconaia cuneolus*	H	LE	SP	S1
Kidneyshell	*Ptychobranchus fasciolaris*	E		PSM	S2
Longsolid	*Fusconaia subrotunda*	H	PT	PSM	S1
Monkeyface	*Quadrula metanevra*	E		PSM	S3
Mountain Creekshell	*Villosa vanuxemensis*	H?		PSM	S3
Ohio Pigtoe	*Pleurobema cordatum*	E		PSM	S2
Orange-foot Pimpleback	*Plethobasus cooperianus*	E	LE	LE	S1
Oyster Mussel	*Epioblasma capsaeformis*	E	LE	SP	SX
Painted Creekshell	*Villosa taeniata*	E		PSM	S2
Pink Mucket	*Lampsilis abrupta*	E	LE	LE	S2
Pocketbook	*Lampsilis ovata*	E		PSM	S2
Purple Catspaw	*Epioblasma obliquata obliquata*	H?	LE	LE	S1
Purple Lilliput	*Toxolasma lividus*	E		PSM	S2
Pyramid Pigtoe	*Pleurobema rubrum*	E		SP	S1
Ring Pink	*Obovaria retusa*	E	LE	LE	S1
Rock Pocketbook	*Arcidens confragosus*	E		PSM	S3
Rough Pigtoe	*Pleurobema plenum*	E	LE	SP	S1
Round Hickorynut	*Obovaria subrotunda*	H	PT	PSM	S2
Round Pigtoe	*Pleurobema sintoxia*	E		SP	S1
Scaleshell	*Leptodea leptodon*	H	LE	SP	SX
Sheepnose	*Plethobasus cyphyus*	E	LE	LE	S2S3
Slabside Pearlymussel	*Pleuronaia dolabelloides*	H	LE	SP	S1
Smooth Rabbitsfoot	*Quadrula cylindrica cylindrica*	H	LT	SP	S1
Snuffbox	*Epioblasma triquetra*	H	LE	PSM	S1
Spectaclecase	*Cumberlandia monodonta*	E	LE	SP	S1
Spike	*Elliptio dilatata*	E		PSM	S1
Sugarspoon	*Epioblasma arcaeformis*	H		PSM	SX
Tennessee Clubshell	*Pleurobema oviforme*	H		PSM	S1
Tennessee Pigtoe	*Pleuronaia barnesiana*	H		PSM	S1
Wavy-rayed Lampmussel	*Lampsilis fasciola*	H		PSM	S2
White Wartyback	*Plethobasus cicatricosus*	E	LE	LE	S1

Common Name	Scientific Name	Element Rank[2]	Federal Status[3]	State Status[3]	State Rank[4]
SNAILS					
Anthony's River Snail	*Athearnia anthonyi*	E	LE	SP	S1

[1] Source: TVA Natural Heritage Database, queried on 10/29/2020. Records are from the Cumberland River (0513020103 & 0513020106), Station Camp Creek (0513020105), Stone River (051302030), Factory Creek (0603000504), Shoal Creek (0603000505), Wilson Lake – Shoal Creek (0603000505), Tennessee River- Cypress Creek (0603000506), Tennessee River – Pickwick Lake (0603000508), Tennessee River (0604000105), and Buffalo River – Upper (0604000401) ten-digit HUC watersheds.
[2] Heritage Element Occurrence Rank; E = extant record ≤25 years old; H=historical record ≥ 25 years old; H? = possibly historical; AB = Good estimated viability
[3] Status Codes: LE = Listed Endangered; LT = Listed Threatened; PT = Proposed Threatened; CNGF = Commercial or Nongame Fish (Alabama); D = Deemed in Need of Management; SP = Special Protection; PSM = Partial Status Mussel
[4] State Ranks: S1 = Critically Imperiled; S2 = Imperiled; S3 = Vulnerable; S4 = Apparently Secure, SX = Presumed extirpated.

The TVA Natural Heritage database indicates 36 plant species tracked by the states of Alabama, Kentucky, and Tennessee have been previously reported from within a five-mile vicinity of the of the Colbert and Paradise CT plant project areas and associated offsite infrastructure upgrades. No federally listed plant species have been previously reported from within a five-mile vicinity of the project areas, but eight federally listed plants have been documented from the counties where work would occur (Table 3-15). No designated critical habitat for plants occurs within the project areas.

All species listed in Table 3-15 have specific habitat requirements that are not common in states where those species are listed and tracked. These specialized habitats are varied and include rocky grasslands, rich cove forests, sandstone rock shelters, limestone glades over bedrock, calcareous seeps, and forested wetlands. No populations of species listed in Table 3-15 were observed during comprehensive surveys of all CT plant and offsite TL and natural gas pipeline project areas. Field surveys indicate that all plant communities within the project areas are disturbed and do not contain habitat capable of supporting protected plant species.

Table 3-15. Plant Species of Conservation Concern Known from Within Five Miles[1] of Proposed Paradise and Colbert CT Plant and Offsite Project Areas and Federally Listed and Candidate Species Listed in Project Counties[2]

Common Name	Scientific Name	Federal Status[3]	State Status[3]	State Rank[4]
	Alabama			
Price's potato-bean[5]	*Apios priceana*	LT		S2
Wall-rue Spleenwort	*Asplenium ruta-muraria*			S1
American Hart's Tongue Fern[5]	*Aspleniun scolopendrium* var. *americanum*	LT		S1
River Bulrush	*Bolboschoenus fluviatilis*			S1
Blue-eyed Mary	*Collinsia verna*			S1
Leafy prairie-clover[5]	*Dalea foliosa*	LE		S1
Dutchman's Breeches	*Dicentra cucullaria*			S2
False Rue-anemone	*Enemion biternatum*			S2

Common Name	Scientific Name	Federal Status[3]	State Status[3]	State Rank[4]
Alabama Gladecress	*Leavenworthia alabamica*			S2
Fleshy-fruit Gladecress[5]	*Leavenworthia crassa*	LE		S2
White fringeless orchid[5]	*Platanthera integrilabia*	T		S2
Prairie-dock	*Silphium pinnatifidum*			S2
Tennessee Yellow-eyed Grass[5]	*Xyris tennesseensis*	LE		S1
	Kentucky			
Fly Poison	*Amianthium muscitoxicum*		LE	S1
Blue Wild-indigo	*Baptisia australis* var. *minor*		S	S2S3
Yellow Wild-indigo	*Baptisia tinctoria*		LT	S1S2
Broadwing Sedge	*Carex alata*		LT	S1S2
Carolina Larkspur	*Delphinium carolinianum*		LT	S1S2
Water-purslane	*Didiplis diandra*		LE	S1S2
French's Shootingstar	*Dodecatheon frenchii*		S	S3
Downy Gentian	*Gentiana puberulenta*		LE	S1
Floating Pennywort	*Hydrocotyle ranunculoides*		LE	S1S2
Necklace Glade-cress	*Leavenworthia torulosa*		LT	S2
Perideridia	*Perideridia americana*		LT	S2
Nodding Rattlesnake-root	*Prenanthes crepidinea*		S	S3
Hair-like Mock Bishop-weed	*Ptilimnium capillaceum*		LT	S1S2
Prairie-dock	*Silphium pinnatifidum*		S	S3
Ozark Bunchflower	*Veratrum woodii*		LT	S2
	Tennessee			
Western Hairy Rock-cress	*Arabis hirsuta*		LT	S1
Price's Potato-bean[5]	*Apios priceana*	LT	LE	S3
Braun's Rockcress[5]	*Arabis perstellata*	LE	LE	S1
Purple Milkweed	*Asclepias purpurascens*		S	S1
Tennessee Milk-vetch	*Astragalus tennesseensis*		S	S3
Sedge	*Carex hirtifolia*		S	S1S2
Blue-eyed Mary	*Collinsia verna*		LE	S1
Leafy prairie-clover[5]	*Dalea foliosa*	LE	LE	S2S3
Beak Grass	*Diarrhena obovata*		S	S1
Yellow Trout-lily	*Erythronium rostratum*		S	S2
Spring Creek Bladderpod[5]	*Lesquerella perforata*	LE	LE	S1
Fraser Loosestrife	*Lysimachia fraseri*		LE	S2
Short's Bladderpod[5]	*Physaria globosa*	LE	LE	S2
Barbed Rattlesnake-root	*Prenanthes barbata*		S	S2

Common Name	Scientific Name	Federal Status[3]	State Status[3]	State Rank[4]
White Water Buttercup	*Ranunculus aquatilis* var. *diffusus*		LE	S1
Blue Sage	*Salvia azurea* var. *grandiflora*		S	S3
Ovate Catchfly	*Silene ovata*		LE	S2
Southern Morning-glory	*Stylisma humistrata*		LT	S1
Horsesugar	*Symplocos tinctoria*		S	S2

[1] Source: TVA Natural Heritage Database, queried October 2020
[2] Includes Colbert, Lauderdale, and Morgan Counties, Alabama; Hardin, Lawrence, Montgomery, Sumner, Wayne, and Wilson Counties, Tennessee; and Muhlenberg and Todd Counties, Kentucky
[3] Status Codes: LE = Listed Endangered; S = Listed Special Concern; LT = Listed Threatened
[4] State Ranks: S1 = Critically Imperiled; S2 = Imperiled; S3 = Vulnerable; S#S# = Denotes a range of ranks because the exact rarity of the element is uncertain (e.g., S1S2)
[5] Federally listed species occurring within the county where work would occur, but not within 5 miles of the project area

3.11.1.1 Paradise CT Plant Project Area, Offsite Natural Gas Upgrade, and Offsite TL Upgrades

The TVA Natural Heritage database indicated that there are eighteen records of Tennessee and Kentucky state-listed terrestrial animal species, one federally protected terrestrial animal species (bald eagle), and one federally listed terrestrial animal species (gray bat) within 3 miles of the Paradise CT plant project area and associated TL upgrades. Two additional federally listed terrestrial animal species (Indiana bat and northern long-eared bat) have also been reported from Sumner, Wilson, and Montgomery counties, Tennessee, and Muhlenberg and Todd counties, Kentucky (Table 3-12).

A brief description of species potentially occurring within the Paradise CT plant onsite area and the offsite project areas can be found below.

3.11.1.1.1 Amphibians

Bird-voiced treefrogs primarily inhabit swampy areas including large floodplain ponds, manmade ponds, and lakes that are near rivers or streams and in close proximity to forest (Powell et al. 2016; NatureServe 2020). The closest record of bird-voiced treefrog is approximately 870 feet from the Paradise Reservation. Suitable habitat for this species occurs at ponds and wetlands adjacent to the Paradise Reservation including those within Peabody Wildlife Management Area (WMA) and along existing onsite and offsite TLs. Some appropriate habitats may occur along the edge of the Green River.

Barking treefrogs are found in lowland wet woods and swampy areas (Powell et al. 2016). The closest record of this species is 1.6 miles from the proposed offsite fiber optic groundwire installation. Suitable habitat for this species does not occur in the Paradise CT plant project area but could occur on the forested edges of existing offsite TL ROWs within wetlands.

Streamside salamanders are found in the Inner Nashville Basin in low gradient streams that flow over exposed bedrock, many of which are ephemeral (Niemiller et al. 2006). This species has been documented in two streams immediately upstream of a ROW that may be used for vehicle access between two proposed offsite TL structure upgrades along

TL 5823. Despite heavy residential development in the area, it is likely that individuals of this species have been washed downstream during large rain events and could occur within offsite TL upgrade project areas.

3.11.1.1.2 Birds

Bank swallows nest in colonies where the birds burrow into steep sand and gravel banks creating cavity nests during the breeding season. The species utilizes open and partially open areas near flowing bodies of water (NatureServe 2020). A colony exceeding 100 nest burrows existed for multiple years in a coal refuse pile in the southeast portion of the Paradise Reservation, which is outside of the Paradise CT plant project area. However, this coal pile is no longer present, and the area has been reseeded and left to forest regeneration. Suitable nesting habitat occurs along the banks of the Green River.

Bell’s vireo requires shrub/scrub, dense brush, willow thickets, or narrow early successional wooded areas with dense understories, such as those often found along small stream corridors (NatureServe 2020). Bell’s vireos tend to prefer the above-mentioned habitats if they are scattered within more open grassland or agricultural landscapes versus forest dominated areas. Small blocks of grassland/shrub habitats surrounded by mature forests may be avoided by this species. This species has been recorded within the Paradise Reservation, and a small amount of suitable habitat for the Bell’s vireo may still occur in that area. However, this area of potential Bell’s vireo habitat is outside of the Paradise CT plant project area.

Common barn-owls hunt for small mammals in open areas, including agricultural fields, grasslands, and marshes (Nicholson 1997). They nest in hollow trees and in buildings where there is little human activity. The closest record of this species is approximately 2.12 miles away from proposed offsite TL upgrades. This species could inhabit forested areas in the Paradise CT plant project area and along existing onsite and offsite ROWs.

Common gallinules reside in wetland or riparian habitats including both freshwater and brackish marshes as well as the edges of lakes or ponds. They typically require areas with a mix of aquatic vegetation, including submerged, floating, and emergent (Cornell Lab of Ornithology 2019). Common gallinules have been recorded approximately 420 feet away from the Paradise Reservation within the Peabody WMA. There is no habitat for this species within the CT plant project area or in offsite TL project areas.

Great egrets often nest in heronries comprised of a mix of species. Heronries are located in trees around wetlands, reservoirs, and along rivers (Palmer-Ball Jr 1996). The closest record of this species is approximately 2.3 miles away from proposed project areas near the Cumberland River. Suitable nesting habitat for this species occurs along large rivers and wetlands within the CT plant project area and offsite TL project areas.

Henslow’s sparrow utilizes pastures and native grasslands, with a preference for areas with tall grass species that have a residual layer of dead vegetation (Reinking et al. 2000). This bird species is a locally distributed summer resident across Kentucky and is known to occupy the Peabody WMA. Records of this species occur approximately 0.52 miles away from the Paradise CT plant project area. Suitable habitat for this species may occur within existing onsite and offsite TL project areas associated with the proposed Paradise CT plant.

The hooded merganser is a waterfowl species that utilizes both deep and shallow water habitats such as streams, rivers, and lakes. Tree cavities or nest boxes are required for nesting and are often in close proximity to water (Cornell Lab of Ornithology 2019; NatureServe 2020). The closest known record of this species is approximately 1.6 miles away from the Paradise Reservation. Suitable nesting habitat for this species does not occur within the reservation; however, ample habitat is available along the Green River in Kentucky, within the waterfowl refuge portion of the Peabody WMA, and on Old Hickory Lake in Tennessee.

Least bittern is found in marshy habitats with herbaceous vegetation like rushes, sedges, and cattails. They nest along marshes, ponds, reservoirs, and waterfowl management areas (Palmer-Ball Jr 1996). Suitable nesting habitat likely occurs along offsite TL project areas associated with the Paradise CT plant.

Lark sparrows are found in open and semi-open habitats with sparse ground cover. They are more often found in altered habitats in recent decades, such as rural farmland (Palmer-Ball Jr 1996). The closest record of this species is 0.7 miles away from the proposed offsite compressor engine. Suitable nesting habitat likely occurs along existing onsite and offsite TL project areas associated with the Paradise CT plant.

Ospreys occupy riparian habitats alongside bodies of water such as rivers, lakes, and reservoirs. They build nests of sticks on a variety of man-made structures (e.g., TL structures, lighting towers) near water (NatureServe 2020). Two active osprey nests were documented within the Paradise CT plant project area during field review in August 2020, as shown in Figure 3-3. Both are within 660 feet of proposed construction activities. No additional nests were observed during field surveys of proposed offsite TL upgrades or during drone flyovers of the TL proposed for fiber optic groundwire installation (TL 6057).

Northern harriers are associated with large tracts of fallow fields and grasslands. Nesting of this species in Kentucky has only been reported in recent decades where they nested in thick grasslands (Palmer-Ball Jr 1996). The closest record of this species is 2.2 miles away from the proposed offsite compressor engine. Suitable foraging habitat for this species occurs over herbaceous habitats found on all of the onsite and offsite project areas. Suitable nesting habitat likely occurs along existing offsite TLs within the proposed upgrade project areas.

Sedge wrens nest throughout Kentucky and reside in wet grasslands and savanna, as well as moist areas where scattered bushes and shrubs are present. This species is highly sensitive to habitat conditions and will leave a potential breeding site if the site is too dry, wet, or overgrown (NatureServe 2020). The closest record of this species is approximately 0.24 miles away on the Peabody WMA. Due to their sensitivity, habitat for the sedge wren is not likely to occur in the highly disturbed areas of the Paradise CT plant project area. Additional habitat could occur along existing offsite TL ROW proposed upgrade project areas.

Bald eagles are protected under the Bald and Golden Eagle Protection Act (USFWS 2013). This species is associated with larger mature trees capable of supporting its massive nests. These are usually found near larger waterways where the eagles forage (USFWS 2007). Records document the occurrence of four bald eagle nests across Muhlenberg and Todd counties, Kentucky and Montgomery, Wilson, and Sumner counties, Tennessee. The closest of these is approximately 0.84 miles away from the Paradise Reservation. No bald eagle nests were observed during field reviews across the Paradise CT plant project area, during TL upgrade surveys, or during drone flyovers of TL proposed for fiber optic groundwire installation (TL 6057).

3.11.1.1.3 Invertebrates

Whitewashed rabdotus is a terrestrial snail that occurs in meadows and open glades. It is most often observed on the ground or on low vegetation during damp weather (NatureServe 2020). The closest record of this species is approximately 1.3 miles away from the TL proposed for fiber optic groundwire installation (TL 6057). Suitable habitat for this species exists along existing onsite and offsite ROWs associated with the Paradise CT plant.

3.11.1.1.4 Mammals

Gray bats roost in caves year-round and migrate between summer and winter roosts during spring and fall (Brady et al. 1982; Tuttle 1976a). Bats disperse over bodies of water at dusk where they forage for insects emerging from the surface of the water (Tuttle 1976b). Although they prefer caves, gray bats have been documented roosting in large numbers in buildings (Gunier and Elder 1971). Gray bats have been reported from a cave approximately 2.2 miles away from proposed upgrades along the TL proposed for fiber optic groundwire installation (TL 6057).

Indiana bats hibernate in caves in winter and use areas around them for swarming (mating) in the fall and staging in the spring, prior to migration back to summer habitat. During the summer, Indiana bats roost under the exfoliating bark of dead snags and living trees in mature forests with an open understory and a nearby source of water (Pruitt and TeWinkel 2007; Kurta et al. 2002). Although less common, Indiana bats have also been documented roosting in buildings (Butchkoski and Hassinger 2002). Indiana bats are known to change roost trees frequently throughout the season, while still maintaining site fidelity, returning to the same summer roosting areas in subsequent years (Pruitt and TeWinkel 2007). One acoustic recording presumably from an Indiana bat was documented approximately 3.3 miles from the Paradise CT plant project area in Muhlenberg County. Indiana bat hibernacula are known from Montgomery County, Tennessee, and Indiana bat summer maternity colonies are known from Wilson County, Tennessee. All hibernacula and maternity areas are greater than 10 miles away from project areas.

Northern long-eared bats predominantly overwinter in large hibernacula such as caves, abandoned mines, and cave-like structures. During the fall and spring, they utilize entrances of caves and the surrounding forested areas for swarming and staging. In the summer, northern long-eared bats roost individually or in colonies beneath exfoliating bark or in crevices of both live and dead trees (typically greater than 3 inches in diameter). Roost selection by northern long-eared bat is similar to that of Indiana bat; however, northern long-eared bats are thought to be more opportunistic in roost site selection. This species also roosts in abandoned buildings and under bridges. Northern long-eared bats emerge at dusk to forage below the canopy of mature forests on hillsides and roads, and occasionally over forest clearings and along riparian areas (USFWS 2014). The closest records of northern long-eared bats are from a cave approximately 4.2 miles away from the proposed offsite TL upgrades in Montgomery County, Tennessee. Other hibernacula are known from Sumner County, Tennessee. Summer roost trees for northern long-eared bats are known from Wilson County, Tennessee, and mist net surveys documented this species in Muhlenberg County, Kentucky. All of these other records are greater than 5 miles away from proposed project areas.

Six caves are known within 3 miles of the proposed TL upgrades associated with the Paradise CT plant. No caves or cave-like habitats were observed within the Paradise CT plant project area. Suitable foraging habitat for all three bat species occurs over and along forested areas and bodies of water across the proposed project areas. Field surveys in August 2020, which followed the 2020 USFWS Indiana Bat Summer Survey Guidelines (USFWS 2020a), determined that suitable summer roosting habitat for Indiana bat and northern long-eared bat occurs in some forested areas across the Paradise CT plant project area, though habitat quality ranges from low to high based on presence of suitable roosting exfoliating bark, cavities, and crevices; density/clutter of forest, and proximity to water (Figure 3-3). No suitable summer roosting habitat for Indiana bat or northern long-eared bat was observed during September and October 2020 field surveys along TL access roads that would require tree trimming to facilitate road improvements.

3.11.1.1.5 Reptiles

Common ribbon snakes are found along the edges of aquatic areas like swamps, ponds, marshes, rivers, and streams, where they frequently climb into low bushes that overhang water (Gibbons and Dorcas 2005). Suitable habitat for this species exists along the Green River and along water bodies in the existing onsite and offsite ROWs within the Paradise CT plant project area.

Eastern slender glass lizards are found in dry grasslands and open woodlands (Powell et al. 2016). The closest record of this species is approximately 1.1 miles away from the TL proposed for the fiber optic groundwire installation (TL 6057). Suitable habitat for this species exists along existing onsite and offsite ROWs within the Paradise CT plant project area.

3.11.1.1.6 Fish

The blackfin sucker occurs in medium rivers/ creeks with pool-riffle complexes over moderate gradients. Spawning occurs in shallow swift water (NatureServe 2020).

The blotchside logperch is known to inhabit large creeks and small to medium rivers with low turbidity. This species is typically found in areas of large gravel and small cobble substrates with moderate current (Etnier and Starnes 1993).

The blue sucker is currently state listed as threatened in Tennessee. This species occurs in larger rivers of the Gulf Coastal drainages from the Mobile Basin to the Rio Grande. It is found in larger streams of the Yazoo, Big Black, and the lower Mississippi South drainages in the Mississippi River Basin (Ross 2001). The blue sucker inhabits deep pools of large, free-flowing rivers with swift currents of up to 260 cm/s. Once common throughout its range, populations of blue suckers have drastically declined due to impoundments and increasing siltation of big rivers (Etnier and Starnes 1993).

The boulder darter inhabits fast rocky riffles of small to medium rivers. Adults are often associated with areas of boulder/ rubble substrate. Spawning occurs among boulders in flowing water (NatureServe 2020).

Chestnut lamprey adults live in medium and large rivers; larvae burrow in bottom of smaller tributaries in areas of moderate current and later move into more densely vegetated areas with a softer bottom. Adults also occur in large reservoirs. Eggs are laid in a nest in the river bottom; adults may cover eggs with stones (NatureServe 2020).

The coppercheek darter prefers medium rivers/creeks with clear, fast, rocky riffles. The species primarily occupies deep riffles, runs, and flowing pools in the main channel of streams with a mixture of gravel and cobble substrate. Threats to the species appear to be loss of habitat due to impoundment (NatureServe 2020).

The crown darter is often associated with submersed aquatic vegetation over gravel or rock substrates in sluggish medium/ small streams. Threats to the species appear to be poor agricultural and forestry practices (NatureServe 2020).

The egg-mimic darter typically occurs under overhanging banks in areas of low gradient. Preferred habitats have dense mats of exposed tree roots (NatureServe 2020).

The flame chub is an inhabitant of springs/spring runs. Spawning occurs from late January through May. Populations have declined with the continued alteration of spring habitats (Etnier and Starnes 1993).

The highfin carpsucker is the smallest of the carpsuckers, and it is the species that has been most adversely affected by environmental change. It prefers habitat consisting of areas of gravel substrate in clear medium to large rivers and is more susceptible to change by siltation and impoundment (Etnier and Starnes 1993).

The lake sturgeon prefers large lakes and rivers and spawns over rocky reefs. TWRA has released approximately 81,500 lake sturgeon into the French Broad, Holston, and Tennessee rivers downstream of Douglas and Cherokee reservoirs since 2000 as part of their reintroduction program (NatureServe 2020).

The longhead darter occurs sporadically in the upper Green and Barren river systems. This darter is most often found in swift flowing runs and riffles of clean upland streams and rivers over cobble substrates and is often associated with flow refuges created by boulders. Neither of the perennial streams crossed by the proposed delivery point contain suitable habitat within or adjacent to the proposed ROW, so it is unlikely that the longhead darter would occur within the project area. The major threat to the species is habitat degradation due to pollution, siltation, and stream alteration projects (NatureServe 2020).

The lollipop darter typically occurs under overhanging banks in areas of low gradient; preferred habitats have dense mats of exposed tree roots (NatureServe 2020).

The redband darter is listed as “In Need of Management” by TWRA. Though Etnier and Starnes (1993) describe the redband darter as occurring only in the Duck River system, the Caney Fork River system, and Stones Creek, the TWRA has recently collected specimens from headwaters of the Mill Creek drainage. This darter prefers pools and sluggish runs in spring fed streams of moderate gradient over limestone bedrock, gravel, and cobble substrates.

The saddled madtom prefers medium rivers/creeks with rocky riffles, runs, and flowing pools with clear water. Threats to this species appear to be habitat loss due to impoundments, channelization, removal of riparian vegetation, bridge construction, runoff from agricultural land, and range fragmentation (NatureServe 2020).

The scaly sand darter is listed as “In Need of Management” by TWRA. In Tennessee it was once common in western tributaries of the Lower Tennessee River prior to creation of the

Kentucky Reservoir, and it may also have occurred in the Forked Deer and Obion River systems. Currently it is known to occur only in the Hatchie River system, primarily in the mainstems of the Hatchie River and Spring Creek. This species prefers a shifting sand substrate with moderate current in medium to large streams (Etnier and Starnes 1993).

The slackwater darter prefers streams with gravel-bottomed pools in sluggish areas of creeks and small rivers. It has also been associated with dense filamentous algae in the upper Buffalo River. Spawning occurs in very shallow seepage water in fields and open woods (NatureServe 2020).

The slenderhead darter is commonly found in gravel shoal areas of medium to large rivers with moderate to swift current. The most likely threats to the species are siltation, impoundment, and channelization (Etnier and Starnes 1993).

The smallscale darter prefers medium rivers/creeks with high gradients, gravel, and coarse rubble (NatureServe 2020).

Snail darter can occur in gravel and sand runs of medium-sized rivers. Adults and spawning individuals inhabit sand and gravel shoals of moderately flowing, vegetated, large creeks and river. It is also found in deeper portions of rivers and reservoirs where current is present. Young occur in slackwater habitats, including the deeper portions of rivers and reservoirs (Etnier and Starnes 1993).

The sooty darter, formally known as dirty darter, is restricted to the Nashville Basin tributaries to the Cumberland River and lower Caney Fork River. It inhabits small, low gradient streams with limestone bedrock substrates. Adults prefer slabrock pools but are not confined to this habitat. Spawning occurs from April to May. Juveniles feed on midge larvae and microcrustaceans while adults feed on the same but utilize other aquatic insect immatures, isopods, and amphipods (Etnier and Starnes 1993).

Southern cavefish species is known only from cool (10-14° C), clear waters of cave streams, underground lakes, wells, and outlets of springs, over mixed gravel, sand, and mud substrates (NatureServe 2020).

The spotfin chub inhabits clear upland rivers in swift currents over boulder substrates. Spawning occurs May through August (Etnier and Starnes 1993).

The stonecat occurs under rocks in riffles, runs, and rapids in warm medium creeks to small rivers (Etnier and Starnes 1993).

The Tennessee logperch prefers streams with predominate gravel and cobble substrates (NatureServe 2020).

3.11.1.1.7 Macroinvertebrates

The Alabama crayfish prefers medium sized rivers/creeks and can be found under rocks. Little is currently known about its life history (NatureServe 2020).

The Hardin crayfish prefers streams with substrate dominated by deposits of alluvia gravel. Threats to this species are mostly unknown, but they are likely sedimentation and agricultural runoff (NatureServe 2020).

3.11.1.1.8 Mussels

Birdwing pearlymussel is almost always found in riffle areas with stable, sand and gravel substrates in moderate to fast currents in small to medium-sized rivers (Parmalee and Bogan 1998).

Black sandshell is typically found in medium-sized to large rivers in locations with strong current and substrates of coarse sand and gravel with cobbles. Water depths for this species range from several inches to six feet or more. It can be found in sand, gravel, or silt (NatureServe 2020).

The butterfly mussel reaches its greatest abundance in large rivers in stretches with pronounced current and a substrate of coarse sand and gravel. It appears to have been successful in adapting to impoundment conditions in the Cumberland and Tennessee rivers, where it is locally common and can be found at depths of up to 20 feet (NatureServe 2020).

The clubshell can be found in the lower Tennessee River and the Cumberland River. It once occurred in the Clinch and Sequatchie rivers. In Tennessee, adults reach an average length of 65 mm. It inhabits medium-sized and large rivers with firm substrate of sand and gravel. Although once numerous, the clubshell has been nearly extirpated from most of the state due to loss of desirable habitat from impoundments. The host fish for the glochidia is unknown (Bogan and Parmalee 1983).

Cracking pearlymussel is abundant in sand, gravel, and cobble substrates in swift currents or in mud and sand in slower currents (NatureServe 2020).

Cumberland moccasinshell inhabits small streams, preferably in headwaters, in sand and gravel substrates. It is often found in cracks or under rocks (Parmalee and Bogan 1998).

Cumberlandian combshell is restricted to the Tennessee and Cumberland rivers. It inhabits headwater streams, including the Powell, Clinch, Holston, and Nolichucky. Adults average 50 mm but can reach over 80 mm in length. It prefers clear streams with rocky bottoms but has been found in sand and gravel bottoms of the Clinch River. The mussel is bradytictic with several darter species being identified as host fish (Bogan and Parmalee 1983).

The deertoe mussel is a generalist in substrate choice and river size. It is more common in medium-sized rivers. Adults commonly reach sizes from 40-50 mm in length. It is bradytictic, with sauger and freshwater drum being identified as the glochidia host (Parmalee and Bogan 1998).

The dromedary pearlymussel is known to occur in shoals and riffles. It is believed to be bradytictic with no identified fish host (Parmalee and Bogan 1998).

The elktoe prefers small, shallow rivers with moderately fast current in a mixture of fine gravel and sand. However, it can occur in larger rivers with sand/gravel substrate (NatureServe 2020).

The fanshell occurs in the Ohio, Cumberland, and Tennessee River systems. Adults reach a maximum length of 70 mm. All viable populations are restricted to unimpounded stretches of the Clinch River on substrate of coarse sand and gravel in strong flowing waters. It is bradytictic with the glochidia host unknown. However, goldfish have served as host under laboratory conditions (Parmalee and Bogan 1998).

Fine-rayed pigtoe occurs in the Tennessee River drainage from the Clinch and Powell rivers in southwestern Virginia to Muscle Shoals, Alabama. Large adults can reach 80 mm in length. It usually inhabits ford and shoal areas of rivers with moderate gradient. The fine-rayed pigtoe is tachytictic with several fish being shown under laboratory conditions to act as the glochidia host (Parmalee and Bogan 1998).

Kidneyshell is most commonly found in small (6-16 m wide) to medium-sized (15-20 m wide) rivers, and it is rarely found in large rivers (>30-50 m wide). The species is tolerant of a variety of habitat conditions, although rivers with moderately strong current and a substrate of coarse gravel and sand provide the most suitable habitat. It may be found at depths of less than three feet up to those as great as 18 to 24 feet on large rivers (reservoirs) such as the Tennessee and Cumberland rivers (NatureServe 2020).

Longsolid is found in medium to large rivers with strong current and gravel substrate (NatureServe 2020).

The mountain creekshell is found in gravel and sand substrates in riffles and edges of *Justicia* beds (NatureServe 2020).

Ohio pigtoe occurs in the Upper Mississippi River drainage to the St. Lawrence River drainage. Adults can average 80-90 mm in length, but very old specimens can reach 120 mm. It reaches greatest abundance and size in large rivers with solid substrate consisting of sand and gravel with strong current. Although it can be found at depths of 18-24 feet, it has not adapted well to impoundments. The species is trachytictic with bluegill, and rosefin shiners have been identified as the glochidia host (Parmalee and Bogan 1998).

The orangefoot pimpleback can be found primarily in big rivers. Individuals have been found at depths of 12 to 18 feet in sand and coarse gravel substrate. It is considered to be tachytictic, but host fish for glochidia is currently unknown (Parmalee and Bogan 1998).

The oyster mussel is found throughout the Tennessee and Cumberland river systems, and it prefers shallow riffles in fast current. Adults can reach 70 mm in length. The oyster mussel is bradytictic with several darters, and the banded sculpin has been identified as the glochidia host (Parmalee and Bogan 1998).

Painted creekshell is restricted to the Tennessee and Cumberland river drainages. Adults rarely exceed 80 mm in length. It prefers substrate of mixed sand and gravel in good current at depths of 3 feet or less. It is presumed to be bradytictic like other species in the same genius. The rock bass has been identified as the glochidia host for this species (Parmalee and Bogan 1998).

Pocketbook is much generalized in habitat preference, adapting well to both impoundment situations as well as free-flowing, shallow rivers. It may be found in big rivers (reservoirs) at depths of 15 to 20 feet and in small streams in less than two feet of water. Although usually found in moderate to strong current, it can survive in standing water. The most suitable substrate consists of a mixture of gravel and coarse sand mixed with some silt or mud (Parmalee and Bogan 1998).

The purple catspaw inhabits large river systems with sand and gravel substrates in runs and riffles (NatureServe 2020).

Purple lilliput has a wide distribution. It prefers mud, sand, and gravel substrate of small to medium-sized rivers. However, it can be found on shallow, rocky gravel points or sandbars in impoundments. Adults seldom exceed 35 mm in length. Females become gravid in May or June. The green sunfish and the longear sunfish have been identified as glochidia hosts (Parmalee and Bogan 1998).

Pyramid pigtoe prefers rivers with strong current and substrate composed of firm sand and gravel. It is believed to be tachytictic and the glochidia host is unknown (NatureServe 2020).

The ring pink is typically found in large rivers with gravel bars. The glochidia host is unknown (NatureServe 2020).

Rock pocketbook is found in mud and sand bottom pools in medium to large rivers in standing or slow flowing water. It is a species typical of large lowland streams with little or no flow and a substrate of mud or a mixture of mud and fine sand (NatureServe 2020).

Rough pigtoe can be found in medium to large rivers over substrate composed of firmly packed gravel and sand. The fish host is unknown (NatureServe 2020).

The round hickorynut occurs in the Tennessee, Cumberland, and Ohio river systems. Adults seldom exceed 60 mm in length. The species is bradytictic with glochidia present in June. It prefers medium to large rivers with sand and gravel substrate and moderate flow. Typically, it is found at depths less than 3 feet. The glochidia host fish is unknown (NatureServe 2020).

Round pigtoe is found in medium to large rivers in mixed mud, sand, and gravel. Parmalee and Bogan (1998) reported Tennessee occurrences most abundantly, and almost exclusively, in medium-sized and large rivers and in current on a firm substrate of coarse gravel and sand at depths of less than three feet to more than 20 feet.

The scaleshell prefers medium to large rivers with low to moderate gradients in a variety of stream habitats. Currently, it is more restricted to rivers with relatively good water quality (NatureServe 2020).

Sheepnose can be found in the Ohio, Cumberland, and Tennessee river systems and the upper Mississippi River north to Minnesota. Adults can reach up to 110-120 mm in length. The species prefers substrate of mixed coarse sand and gravel. It is tachytictic with most reproductive activity occurring in the summer. The glochidia host fish has been identified as sauger (Parmalee and Bogan 1998).

Slabside pearlymussel occurs in moderate to high gradient riffles in creeks to large rivers. It is generally found at depths <1 m, moderate to swift current velocities, and substrates from coarse sand to heterogenous assemblages of larger sized particles. The slabside pearlymussel is primarily a large stream to moderately sized river species, inhabiting sand, fine gravel, and cobble substrates in relatively shallow riffles and shoals with moderate current. This species requires flowing, well-oxygenated waters to thrive (NatureServe 2020).

The typical habitat for smooth rabbitsfoot is small to medium rivers with moderate to swift currents, and in smaller streams it inhabits gravel bars or gravel and cobble close to the fast current. Found in medium to large rivers in sand and gravel. It has been found in depths up to 3 meters (NatureServe 2020).

Snuffbox is found in riffles of small and medium creeks, in large rivers, and in shoals and wave-washed shores of lakes. They are suspension feeders, typically feeding on algae, bacteria, detritus, microscopic animals, and dissolved organic material (NatureServe 2020).

Spectaclecase has been documented in various types of substrate, including gravel, sand, and mud, in medium-sized to large rivers. Glochidia host are undetermined (NatureServe 2020).

Spike has a wide distribution range. Adults in impoundments can attain lengths of 120 mm. It is a generalist in regards to river size and depth. Most suitable habitat seems to be firm substrate of coarse sand and gravel in moderately strong current. The species is tachytictic. Reproductive activity occurs from mid-May to August. Several fish species have been identified as glochidia hosts (Parmalee and Bogan 1998).

Tennessee clubshell occurs in the Tennessee and Cumberland river drainages. Adults reach lengths of 70 mm, but old adults can reach 90 mm. It prefers substrate of coarse gravel and sand in small shallow creeks and rivers with good current. It is thought to be tachytictic. Several fish species have been shown to serve as glochidia hosts.

Tennessee pigtoe occurs in the Cumberland and Tennessee river systems. Adults may reach 90-95 mm in length. It is believed to be tachytictic. The host fish for the glochidia is unknown. Several sub-species range from headwater to big river habitat (Parmalee and Bogan 1998).

Wavy-rayed lampmussel occurs in the Great Lakes and Ohio-Mississippi drainages south to the Tennessee River system. Adults can reach up to 90-100 mm in length and are typically found in small to medium-sized rivers. It inhabits depths of 3 feet or less and is tolerant of habitat conditions unfavorable to many similar species. It prefers substrate of mud, sand, and gravel in moderate current and can become abundant locally. Its reproductive period is unknown. The believed glochidia host is smallmouth and largemouth bass (Parmalee and Bogan 1998).

3.11.1.2 Colbert CT Plant Project Area, Offsite Natural Gas Loop Line, and Offsite TL Upgrades

The TVA Natural Heritage database indicated there are ten records of Alabama and Tennessee state-listed terrestrial animal species, one federally protected terrestrial animal species (bald eagle), and one federally listed terrestrial animal species (gray bat) within 3 miles of the Colbert CT plant site and associated TL upgrades. Three additional federally listed terrestrial animal species (Indiana bat, northern long-eared bat, and red-cockaded woodpecker) have also been reported from Lawrence, Wayne, and Hardin counties, Tennessee; and Morgan, Colbert, and Lauderdale counties, Alabama (Table 3-12).

3.11.1.2.1 Amphibians

Hellbenders are found in larger, fast-flowing streams and rivers with large shelter rocks. Eggs are laid in depressions created beneath large rocks or submerged logs (Petranka

1998). The nearest known hellbender record occurs approximately 1.6 miles from the Colbert CT plant site and is possibly a historical record due to the age of the record. Pickwick, Wilson, and Wheeler reservoirs are all located on the Tennessee River, which is immediately adjacent to the Colbert CT plant project area. Records for hellbenders are known from these reservoirs. Cane Creek on the Colbert Reservation (See Figure 3-2) and other larger streams along existing ROWs with proposed upgrades may also offer suitable habitat for this species.

3.11.1.2.2 Birds

Bald eagles are protected under the Bald and Golden Eagle Protection Act (USFWS 2013). This species is associated with larger mature trees capable of supporting its massive nests. These are usually found near larger waterways where the eagles forage (USFWS 2007). Records document the occurrence of 11 bald eagle nests across Lawrence, Wayne, and Hardin counties, Tennessee and Morgan, Colbert, and Lauderdale counties, Alabama. The closest of these is approximately 0.45 mile away from the proposed TL upgrades. No bald eagle nests were observed during field reviews across the Colbert CT plant project area or during surveys of offsite TL project areas.

Cerulean warblers prefer large tracts of deciduous forest with numerous well-spaced, large trees. These areas are typically within mature, old-growth deciduous communities, particularly in mesic areas or floodplains (Nicholson 1997). The closest records of these species are approximately 1.2 miles away. Suitable habitat for these species does not occur within project areas.

Ospreys occupy riparian habitats alongside bodies of water such as rivers, lakes, and reservoirs. They build nests of sticks on a variety of man-made structures (e.g., TL structures, lighting towers) near water (NatureServe 2020). Two active osprey nests were documented within the Colbert CT plant project area during field review in August 2020, as shown in Figure 3-4. Both are within 660 feet of proposed construction activities. One additional nest was observed on a proposed TL upgrade structure on TL 5676.

Red-cockaded woodpeckers typically inhabit open, mature pine forests with dense groundcover consisting of a variety of grass, forb, and shrub species (Turcotte and Watts 1999 and USFWS 2003). These woodpeckers are thought to be extirpated from most of their habitat and the one record that exists from Colbert County, Alabama is historic and over 15 miles away (USFWS 2016). No known managed populations of this species occur within the project areas. While field reviews in August 2020 determined that suitable nesting trees occur on the Colbert CT plant project area, this species does not occur there.

3.11.1.2.3 Invertebrates

Batriasymmodes spelaeus (a beetle), *Batrisodes jonesi* (a beetle), and *Rhadine caudata* (a ground beetle) are all cave obligate invertebrates tracked by the state of Alabama (NatureServe 2020). The nearest caves known to support these species are located over 0.5 miles from all project areas. Sixty-one caves are known within three miles of the project areas. The closest extant caves are known from along the Tennessee River shoreline, approximately 550 feet from the Colbert Reservation; however, no records of these species are known from these closest caves.

3.11.1.2.4 Mammals

Rafinesque's big-eared bats roost in hollow trees, abandoned buildings, under bridges, or in culverts, in or near wooded areas in summer. In winter, this species has been found in caves. This species is believed to be non-migratory, moving short distances between summer and winter roosting sites. Different parts of chosen roosts are often used all year. Rafinesque's big-eared bats emerge late in the evening to forage in mature forest in both upland and lowland areas along permanent water bodies, especially rivers (Harvey 1992; NatureServe 2020). Suitable summer roosting habitat occurs within the Colbert CT plant project area and offsite natural gas pipeline area. Suitable foraging habitat occurs over forested areas and bodies of water across the onsite and offsite project areas associated with the Colbert CT plant.

Tricolored bats hibernate in caves, mines, and rock crevices. In summer they roost in dead or live vegetation in live trees. They are associated with forested landscapes where they forage near trees and along waterways, especially riparian areas (Harvey 1992). A study showed that summer roosting trees selected in the Great Smoky Mountains National Park were often oak and yellow poplar (Carpenter et al. 2019). In middle Tennessee, tricolored bats were observed roosting within clumps of dead foliage hanging from branches of live trees. The dead foliage was typically comprised of hickory or oak leaves (D. Thames, TWRA, personal communication). The closest record of this species is from a cave along the Tennessee River immediately adjacent to the Colbert Reservation, at least 1,500 feet from the proposed CT plant project area. Suitable summer roosting habitat for this species occurs in forested areas throughout the onsite and offsite project areas associated with the Colbert CT plant. Suitable foraging habitat for this species occurs over bodies of water throughout the proposed project areas.

Gray bats roost in caves year-round and migrate between summer and winter roosts during spring and fall (Brady et al. 1982; Tuttle 1976a). Bats disperse over bodies of water at dusk where they forage for insects emerging from the surface of the water (Tuttle 1976b). Although they to prefer caves, gray bats have been documented roosting in large numbers in buildings (Gunier and Elder 1971). Gray bats have been reported from mist net captures approximately 1.2 miles away from the Colbert CT plant project area. Summer emergence surveys performed at the caves along the Tennessee River did not document gray bat use. Winter surveys of presumably the two largest of these caves did not report any gray bats. The closest known gray bat hibernaculum is approximately 0.3 miles away from proposed TL upgrades along TL 5617. Suitable foraging habitat for this species occurs over bodies of water throughout the project areas.

Indiana bats hibernate in caves in winter and use areas around them for swarming (mating) in the fall and staging in the spring, prior to migration back to summer habitat. During the summer, Indiana bats roost under the exfoliating bark of dead snags and living trees in mature forests with an open understory and a nearby source of water (Pruitt and TeWinkel 2007; Kurta et al. 2002). Although less common, Indiana bats have also been documented roosting in buildings (Butchkoski and Hassinger 2002). Indiana bats are known to change roost trees frequently throughout the season, while still maintaining site fidelity, returning to the same summer roosting areas in subsequent years (Pruitt and TeWinkel 2007). The closest known record of this species is a maternity colony from McNairy County, Tennessee approximately 9.7 miles from proposed offsite TL upgrades associated with the Colbert CT plant.

The northern long-eared bat predominantly overwinters in large hibernacula such as caves, abandoned mines, and cave-like structures. During the fall and spring, they utilize entrances of caves and the surrounding forested areas for swarming and staging. In the summer, northern long-eared bats roost individually or in colonies beneath exfoliating bark or in crevices of both live and dead trees (typically greater than 3 inches in diameter). Roost selection by northern long-eared bat is similar to that of Indiana bat, however northern long-eared bats are thought to be more opportunistic in roost site selection. This species also roosts in abandoned buildings and under bridges. Northern long-eared bats emerge at dusk to forage below the canopy of mature forests on hillsides and roads, and occasionally over forest clearings and along riparian areas (USFWS 2014). The closet record of northern long-eared bat is from a mist net survey approximately 7.5 miles away from the Colbert CT plant project area in Colbert County, Alabama.

Sixty-one caves are known within three miles of the Colbert Reservation, TLs proposed for improvement, and the new natural gas pipeline associated with the Colbert CT plant. None of these are known to be used by Indiana bats or northern long-eared bats. Suitable foraging habitat for both Indiana bat and northern long-eared bat species occurs over and along forested areas and bodies of water across the Colbert CT plant onsite and offsite project areas. Field surveys conducted in August 2020, which followed the 2020 USFWS Indiana Bat Summer Survey Guidelines (USFWS 2020a), determined that suitable summer roosting habitat for Indiana bat and northern long-eared bat occurs in some forested areas across the Colbert CT plant project area, including offsite areas associated with the natural gas pipeline upgrades. Habitat quality ranges from low to moderate based on presence of suitable exfoliating bark, cavities, and crevices; density/clutter of forest, and proximity to water. Bat habitat surveys were not performed for the offsite natural gas pipeline project areas south of CR 20. Therefore, to be conservative, it is assumed that the forested habitat there is suitable for summer roosting Indiana bat and northern long-eared bat. No suitable summer roosting habitat for Indiana bat or northern long-eared bat was observed during field surveys conducted in October 2020 along access roads that would require tree trimming to facilitate road improvements. In total, 13.0 acres of potentially suitable summer roosting habitat for Indiana bat and northern long-eared bat exists in the onsite and offsite project areas associated with the Colbert CT plant.

3.11.1.2.5 Reptiles

Alligator snapping turtles are almost entirely aquatic turtles. Only nesting females are known to leave the water. Alligator snapping turtles use large, deep bodies of water such as lakes, rivers, and deep sloughs. They are often found among submerged logs and root snags in areas with muddy substrate (Behler and King 1979; Buhlmann et al 2008). The closest record of alligator snapping turtle is approximately 1.8 miles away from TL upgrades associated with the Colbert CT. Pickwick, Wilson, and Wheeler reservoirs are all located on the Tennessee River, which is immediately adjacent to the Colbert CT plant project area. Cane Creek on the Colbert Reservation (Figure 3-2) and other larger streams along existing ROWs with proposed upgrades may also offer suitable habitat for this species.

Western pygmy rattlesnake occurs in a variety of habitats, but it is generally found where water is nearby, such as in river floodplains, swamps, marshes, and wet prairies. The species is less common in rocky upland habitats in pine forests. Diet consists of amphibians, reptiles, and small mammals (Powell et al. 2016). The closest record is approximately 1.6 miles from TL upgrades associated with the Colbert CT. Suitable habitat for western pygmy rattlesnake was found throughout the onsite and offsite proposed project areas near wetlands and floodplains.

3.11.2 Environmental Consequences

3.11.2.1 Alternative A – No Action Alternative

Under the Alternative A, changes to local plant communities and habitats resulting from natural ecological processes and human-related disturbance would continue to occur. These changes may benefit or negatively affect species present in the project areas, but the changes would be unrelated to the proposed project. Current communities of threatened or endangered animals and their habitats would not be affected.

3.11.2.2 Alternative B – Retirement of Allen CT Units 1-20 and Johnsonville CT Units 1-16 and Construction of CT Units at Paradise and Colbert

Under Alternative B, habitat that could support threatened and endangered terrestrial animal species would be removed at both onsite CT plant project areas and in some offsite project areas along existing ROW. No impacts to threatened or endangered plants or aquatic species are anticipated because habitat for these species is not present.

3.11.2.2.1 Paradise CT Plant Project Area, Offsite Natural Gas Upgrade, and Offsite TL Upgrades

Twenty-two terrestrial animal species of conservation concern were addressed in this review based on records within 3 miles of the Paradise CT plant project area, existing offsite compressor station where a new internal combustion engine would be added, and associated offsite TL upgrades. All of the species have the potential to occur within portions of the project areas. However, the offsite compressor station is located on a previously developed paved and graveled site, and habitat for threatened and endangered species does not exist at this location.

Several species of reviewed birds use larger bodies of water for foraging and may select nesting sites along these water features, including bald eagle, great egret, osprey, hooded merganser, and bank swallow. Foraging habitat for each of these species occurs over large bodies of water such as the Green River near the Paradise CT plant project area and other large rivers crossed by offsite TL proposed for upgrades. BMPs would be used to avoid or minimize impacts (e.g., sedimentation) to these bodies of water. No forested habitat is proposed for removal along the edge of these larger bodies of water. While helicopters used to install the fiber optic line would likely disturb nesting birds in the immediate vicinity, the disturbance would be temporary and no known nesting sites for bald eagle, great egret, hooded merganser, or bank swallow occur within the project areas. In addition, proposed actions adhere to the National Bald Eagle Management Guidelines. Therefore, these species would not be significantly impacted by proposed actions. Two active osprey nests were documented on the Paradise CT plant project area during field review in August 2020. Both are within 660 feet of construction activities. If the timing of proposed actions within 660 feet of these nests cannot be modified to avoid nesting seasons, coordination with the USDA Wildlife Services would be required to ensure compliance under the EO 13186 [Responsibilities of Federal Agencies to Protect Migratory Birds].

Bird-voiced treefrog, barking treefrog, least bittern, and common gallinule are all found in wetland and riparian habitats. Similarly, common ribbon snakes are found in vegetation alongside these water features. Impacts to wetland habitats include 0.04 acres within the

Paradise CT plant project area and 0.03 acres within the offsite TL project areas. BMPs would be used in and around all other wetlands, thereby minimizing the impacts of these temporary TL upgrade activities. Breeding habitat for these species may occur along TLs in the project area where activities would be short in duration, isolated across the landscape, and BMPs would be used. Direct impacts to treefrog tadpoles could occur if mats are placed directly on top of egg clusters in a wetland. Direct impacts to ribbon snakes could occur if heavy machinery traversed over their underground or underwater burrows. While common gallinules also nest in wetlands, they are rare breeders in this area. Therefore, impacts to young of this species are less likely to occur. Similarly, least bittern nests in vegetation on the ground in wetlands. Eggs and nestlings are in the nest for only 35 days of the year. While the opportunity for impact is present, the likelihood of impacting nests of this species is low given the short duration and localized effects of the proposed actions. Adult birds of all of these species would flush if disturbed by construction activities. Due to the relatively small amount of habitat being permanently impacted and the use of BMPs across the remaining project areas, proposed actions would not impact the bird-voiced treefrog, barking treefrog, least bittern, common gallinule, and common ribbon snake.

Habitat for Bell’s vireo and sedge wren exists throughout the proposed offsite TL project areas along the existing ROWs. Additionally, open grassland areas of the TL ROWs offer potential habitat for eastern slender glass lizard, hunting and nesting habitats for northern harrier, and hunting grounds for common-barn owl. Similarly, open meadows and grasslands also offer habitat for Henslow’s sparrow, lark sparrow, and whitewashed rabdotus. Direct impacts could occur to nesting birds, eastern slender glass lizards hiding under debris, and whitewashed rabdotus that occur in the path of machinery or in areas where TL structures need to be placed or guy wires need to be installed. Nesting habitat for barn owl could occur in forested areas within the Paradise CT plant project area, including temporary use areas, laydown, and proposed warehouse areas, and along existing offsite TL ROWs. Only 9.5 acres of forested habitat is proposed for removal at the Paradise CT plant project area. Actions along existing offsite TL ROWs associated with the Paradise CT plant are limited to temporary disturbance by helicopter installation of fiber optic ground wire, and activities at eight structures and existing access roads along the 64.8 miles of TL to be upgraded. Overall, herbaceous habitat removal would be minimal and would occur in discrete locations across the landscape. Access to existing offsite TL structures would occur along existing access roads. Activities would occur over a short duration at each structure. There is a low likelihood that nests would be built on existing access roads. And while it is possible that new TL structure installation would directly impact nests, burrows, or slow-moving snails, these actions would only occur at small, discrete locations across the entire project area. Adults and fast-moving adults would flush if disturbed. Therefore, populations of Bell’s vireo, sedge wren, eastern slender glass lizard, northern harrier, common-barn owl, Henslow’s sparrow, lark sparrow, and whitewashed rabdotus would not be impacted.

Streamside salamanders are known from two ephemeral/intermittent streams along TL 5823. Records of this species have been documented upstream of project areas and could occur between structures 76 and 77 and adjacent to structure 79. However, neither stream would be impacted by the proposed actions. Access roads to each of these structures are a sufficient distance away from streams such that streams would not be crossed or receive sediment inputs. Actions occurring at each of the structures would be limited (i.e., tower extension, conductor cut and slide). No ground disturbance is likely to occur except for the movement of vehicles at structures 77 and 79. The same would be true at structure 76 unless the slope gradient is too high, in which case a pad would be graded for the cranes to park on during installation of the tower extension. If this occurs, BMPs would be used to ensure there would be no sediment inputs into the stream (the stream is 775 feet away from this structure).

No hibernacula for gray bat would be impacted by the proposed actions, and no winter hibernacula for Indiana bat or northern long-eared bat would be impacted by the proposed actions. Foraging habitat for all three species exists along rivers ponds, streams, and wetlands within the onsite and offsite project areas. Additional foraging habitat for Indiana bat and northern long-eared bat exists in and along forested areas in proposed project areas. Suitable summer roosting habitat for Indiana bat and northern long-eared bat was observed during August 2020 field surveys throughout the Paradise CT plant project area in forests. Habitat ranged from low to high suitability based on presence of trees with suitable roosting characteristics (exfoliating bark, cracks, crevices; See Figure 3-3). Up to 9.5 acres of forest could be removed in association with the proposed actions at the Paradise CT plant project area. Within those forested areas, up to 8.7 acres of potentially suitable summer roosting habitat for Indiana bat and northern long-eared bat could be removed.

A number of activities associated with the proposed project were addressed in TVA's programmatic consultation with the USFWS on routine actions and federally listed bats in accordance with ESA Section 7(a)(2) and completed in April 2018. For those activities with potential to affect bats, TVA committed to implementing specific conservation measures. These activities and associated conservation measures are identified on pages 5-7 of the TVA Bat Strategy Project Screening Form (Appendix B) and need to be reviewed/implemented as part of the proposed project. Due to the use of BMPs and application of identified conservation measures, TVA has determined that proposed actions are not likely to impact gray bat, Indiana bat, or northern long-eared bat.

Alternative B would not impact federally listed plants, designated critical habitat, or state-listed plants species because no suitable habitat for protected plant species occurs within the proposed project areas. All habitats within the Paradise CT plant onsite and offsite project areas were surveyed in August-October 2020 and none were found to support state or federally listed plant species. Overall, plant communities have been too disturbed by current and past land use to support protected plant species.

The Green River adjacent to the Paradise Reservation provides suitable habitat for federal and state-listed aquatic species. Construction activities associated with the Paradise CT plant would not occur within or immediately adjacent to the Green River, and construction activities would not directly impact the river or its species. Appropriate BMPs would be followed (TVA 2017b), and all proposed project activities would be conducted in a manner to ensure that waste materials are contained, and the introduction of pollution materials to the receiving waters would be minimized. Jacob's Creek (perennial) and the three intermittent streams identified within the Paradise CT plant project area (see Figure 3-1) do not provide suitable habitat for aquatic threatened and endangered species. Therefore, with implementation of BMPs, no direct or indirect impacts to threatened or endangered aquatic species are anticipated with construction of the Paradise CT plant.

Additionally, no suitable habitat for threatened or endangered aquatic species occurs within the one intermittent stream identified within the offsite TL project areas associated with the Paradise CT plant. BMPs would be used to avoid or minimize impacts (e.g., sedimentation) to rivers crossed by the existing ROW and access roads. Therefore, no impacts are anticipated to occur to aquatic species of conservation concern.

3.11.2.2.2 Colbert CT Plant Project Area, Offsite Natural Gas Loop Line, and Offsite TL Upgrades

Fifteen terrestrial animal species were addressed in this review based on records within 3 miles of the Colbert CT plant project area and associated offsite TL upgrades. Only some of these species have the potential to occur within portions of the project areas.

Remaining red-cockaded woodpecker populations only occur in managed areas with regular prescribed burns and trees with abundant nesting cavities. This species does not occur in proposed project areas and would not be impacted by proposed actions.

Caves immediately adjacent to the Colbert CT plant project area and near proposed offsite TL upgrades offer potentially suitable habitat for cave obligate beetles. However, no records of these species are known from those caves, and proposed actions would not impact the integrity of the caves. No impacts are anticipated to *Batriasymmodes spelaeus*, *Batrisodes jonesi*, and *Rhadine caudata*.

No direct impacts would occur to large rivers, oxbows, and fast flowing, larger streams, which provide habitat for hellbenders and alligator snapping turtles. With the use of BMPs, potential indirect impacts to streams and rivers would be minimized such that impacts to hellbender, alligator snapping turtles, and aquatic fish and mussel species and their habitats would be negligible.

Suitable habitat for western pygmy rattlesnake occurs across the project areas in woodlands and near wetland and floodplain habitats. Due to the heavily disturbed habitats and frequent activity at the Colbert CT plant project area, this species is more likely to occur along existing offsite TL ROWs. Direct impacts to western pygmy rattlesnake could occur if heavy machinery passed over their burrows or nests. Access to existing structures would occur along existing access roads, and activities would occur over a short duration at each structure. It is not likely that this species would build nests or burrows on existing access roads. While it is possible that new structure installation would directly impact nests or burrows, these actions would only occur at small, discreet locations across the entire project area. BMPs would be used in and around wetlands, thereby minimizing the impacts in these areas. Due to the relatively small amount of habitat being permanently impacted across the landscape, the short duration of the actions at the TLs, and the use of BMPs, proposed actions would not impact western pygmy rattlesnake.

Bald eagles and osprey use larger bodies of water for foraging and may select nesting sites along these water features. Foraging habitat for these species occurs over the Tennessee River and other large rivers crossed by offsite TLs with proposed upgrades. BMPs would be used to avoid or minimize impacts (e.g., sedimentation) to these bodies of water. No forested habitat along the edge of these larger bodies of water is proposed for removal. All known bald eagle nests are a sufficient distance from proposed actions such that they would not be impacted by proposed actions. Proposed actions adhere to the National Bald Eagle Management Guidelines. Two active osprey nests were documented on the Colbert CT plant project area during field review in August 2020 (Figure 3-4), and one additional nest was observed on an offsite TL structure with proposed upgrades on TL 5676 during field reviews in September 2020. All observed osprey nests were within 660 feet of proposed construction activities. If the timing of proposed actions within 660 feet of these nests cannot be modified to avoid nesting seasons, coordination with USDA-Wildlife Services would be required to ensure compliance under the EO 13186 [Responsibilities of Federal Agencies to Protect Migratory Birds].

No hibernacula for gray bat would be impacted by the proposed actions. No winter hibernacula for Indiana bat, northern long-eared bat, Rafinesque's big-eared bat, or tricolored bat would be impacted by the proposed actions. Foraging habitat for all of these species exists along rivers ponds, streams, and wetlands within the project areas. Additional foraging habitat for Indiana bat, northern long-eared bat, Rafinesque's big-eared bat, and tricolored bat exists in and along forested areas in the project area. Suitable summer roosting habitat for Indiana bat, northern long-eared bat, Rafinesque's big-eared bat, and tricolored bat was observed during August 2020 field surveys in the Colbert CT plant project area. Habitat ranged from low to moderate suitability based on presence of trees with suitable roosting characteristics (exfoliating bark, cracks, crevices; see Figure 3-4). Up to 5 acres of forest could be removed in association with the proposed actions at the Colbert CT plant project area. Of those forested areas, up to 0.5 acres of potentially suitable summer roosting habitat for Indiana bat and northern long-eared bat could be removed. Given the amount of forest present across the landscape, this proposed tree removal is relatively small (see Section 3.9 Vegetation). While removal of this small amount of potential roosting habitat does have the potential to directly impact a small number of summer roosting bats should tree removal occur during times of occupancy, is not expected to impact populations of Rafinesque's big-eared bat and tricolored bat.

A number of activities associated with the proposed project were addressed in TVA's programmatic consultation with the USFWS on routine actions and federally listed bats in accordance with ESA Section 7(a)(2) and completed in April 2018. For those activities with potential to affect bats, TVA committed to implementing specific conservation measures. These activities and associated conservation measures are identified on pages 5-7 of the TVA Bat Strategy Project Screening Form (Appendix B) and need to be reviewed/implemented as part of the proposed project. Due to the use of BMPs and application of identified conservation measures, TVA has determined that proposed actions are not likely to impact gray bat, Indiana bat, or northern long-eared bat.

Alternative B would not impact federally listed plants, designated critical habitat, or state-listed plants species because no suitable habitat for protected plant species occurs within the proposed project areas. All habitats within the Colbert CT plant onsite and offsite project areas were surveyed in August-October 2020 and none were found to support state or federally listed plant species. Overall, plant communities have been too disturbed by current and past land use to support protected plant species.

The Tennessee River adjacent to the Colbert Reservation provides suitable habitat for several aquatic threatened and endangered species. Construction of the Colbert CT plant and onsite components would not occur within or immediately adjacent to the Tennessee River, and construction activities would not directly impact the river or its species. Appropriate BMPs would be followed (TVA 2017b), and all proposed project activities would be conducted in a manner to ensure that waste materials are contained, and the introduction of pollution materials to the receiving waters would be minimized. Therefore, direct or indirect impacts to threatened or endangered aquatic species from construction of the Colbert CT plant and onsite components would be negligible under Alternative B.

A total of six perennial, one intermittent, and three ephemeral streams were identified within the offsite TL ROW project areas associated with the Colbert CT plant. Of these identified streams, only Brewer Branch and Factory Creek have the potential to provide suitable habitat for species listed in Tables 3-13 and 3-14. However, no activities are anticipated to occur within these streams. Furthermore, ground disturbance would be minimized, and all work would be completed in accordance with BMPs. With proper implementation of BMPs, no direct or indirect impacts to aquatic threatened and endangered species is anticipated to occur.

3.12 Visual Resources

3.12.1 Affected Environment

This assessment provides a review and classification of the visual attributes of existing scenery, along with the anticipated attributes resulting from the proposed action. The classification criteria used in this analysis are adapted from a scenic management system developed by the U.S. Forest Service (USFS) and integrated with planning methods used by TVA (USFS 1995). Potential visual impacts to cultural and historic resources are not included in this analysis as they are assessed separately in Section 3.13.

The visual landscape of an area is formed by physical, biological, and man-made features that combine to influence both landscape identifiability and uniqueness. The scenic value of a particular landscape is evaluated based on several factors that include scenic attractiveness, scenic integrity, and visibility. Scenic attractiveness is a measure of scenic quality based on human perceptions of intrinsic beauty as expressed in the forms, colors, textures, and visual composition of each landscape. Scenic attractiveness is expressed as one of the following three categories: distinctive, common, or minimal. Scenic integrity is a measure of scenic importance based on the degree of visual unity and wholeness of the natural landscape character. The scenic integrity of a site is classified as high, moderate, low, or very low. The subjective perceptions of a landscape's aesthetic quality and sense of place are dependent on where and how it is viewed.

Views of the landscape are described in terms of what is seen in the foreground, middleground, and background distances. In the foreground, an area within 0.5 mile of the observer, details of objects are easily distinguished. In the middleground, from 0.5 mile to 4 miles from the observer, objects may be distinguishable, but their details are weak and tend to merge into larger patterns. In the distant part of the landscape, the background, details and colors of objects are not normally discernible unless they are especially large, standing alone, or have a substantial color contrast. In this assessment, the background is measured as 4 to 10 miles from the observer. Visual and aesthetic impacts associated with an action may occur as a result of the introduction of a feature that is not consistent with the existing viewshed. Consequently, the visual character of an existing site is an important factor in evaluating potential visual impacts.

For this analysis, the affected environment includes the areas within the Paradise and Colbert reservations that encompass both permanent and temporary impact areas and the proposed offsite improvements associated with construction of the plants at each site.

3.12.1.1 Paradise CT Plant Project Area, Offsite Natural Gas Upgrade, and Offsite TL Upgrades

The Paradise Reservation is located on the west side of the Green River, southeast of Central City and northeast of Drakesboro, in western Kentucky. Portions of the reservation are devoid of vegetation and much of it has been heavily disturbed by previous industrial activities. Mining operations have substantially altered the topography and appearance of much of the reservation. This, in combination with the large-scale industrial development associated with the existing CC plant and the retired coal-fired plant, provides a sharp visual contrast to the surrounding rural and natural landscape. Currently, the most dominant visual components of the Paradise Reservation include two 600-foot-high stacks, one 800-foot-high stack, and three cooling towers over 435 feet high. Other major visual components of the site include the powerhouse buildings, the emission control buildings and ducts, the coal pile and coal handling facilities, the CC plant and mechanical draft cooling tower, and an extensive network of connecting high-voltage TLs. As the coal-fired units at Paradise have been retired, TVA is currently considering options to manage the disposition of the buildings and physical structures that are no longer needed. Options currently being considered include deconstruction and demolition of buildings that previously supported operation of the coal-fired plant. The results of this independent evaluation will be provided in a separate environmental review.

Based on the above characteristics, the scenic attractiveness of the affected environment at the Paradise Reservation is considered to be common to minimal, whereas the scenic integrity is considered to be low. The rating for scenic attractiveness is based on the ordinary or common visual quality of the landscape, which is often reduced to low in the foreground due to the absence of natural features in the industrial setting. The forms, colors, and textures in the affected environment are not considered to have distinctive visual quality. In the foreground and middleground, the scenic integrity has been lowered by the industrial nature of the reservation. However, in the background these alterations are not substantive enough to dominate the view of the landscape. The scenic class of a landscape is determined by combining the levels of scenic attractiveness, scenic integrity, and visibility and can be excellent, good, fair, or poor. Based on the criteria used for this analysis, the overall scenic class for the affected environment at Paradise is considered to be fair.

In a visual impact assessment, sensitive receptors generally include any scenic vistas, scenic highways, residential viewers, and public facilities such as churches, cemeteries, schools, parks, and recreational areas that are located in the project's viewshed. Viewers in the foreground of the proposed Paradise CT plant project area would generally be limited to employees and visitors to the Paradise Reservation, recreational boaters on the Green River, and users of the Paradise Boat Ramp located approximately 775 feet north of the project boundary. There are no residences or other sensitive visual receptors located in the foreground.

The new offsite natural gas compressor would be constructed at an existing compressor station approximately 18 miles west of the Paradise Reservation. The existing station is located in an area with an industrial character and minimal vegetation. The built environment, including storage tanks, warehouse buildings and associated structures, dominate the landscape. There are no sensitive visual receptors in the foreground of the compressor station, and views are restricted to transient motorists on SR 175, which passes to the southwest.

Two existing TLs would be upgraded to support development of the CT plant at Paradise. One is located in western Kentucky and the other is located in north central Tennessee. The TLs cross a variety of terrains ranging from relatively flat to steep, wooded ridges. The TL corridors combine natural elements, such as rolling fields and forested areas, with human development, including commercial and industrial properties, urban and suburban development, and cleared utility corridors, creating a somewhat disjointed visual landscape.

3.12.1.2 Colbert CT Plant Project Area, Offsite Natural Gas Loop Line, and Offsite TL Upgrades

The Colbert Reservation is located near the town of Tuscumbia in northwestern Alabama, along an impounded section of the Tennessee River. Land use in the vicinity is predominantly rural, with undeveloped forested areas and open fields of pasture or crops. However, this relatively natural landscape is fragmented and sharply contrasted by large scale industrial uses including the existing CT plant and the retired coal-fired plant on the Colbert Reservation, as well as the Barton Riverfront Industrial Park approximately 2 miles to the west and a large rock quarry approximately two miles to the east. Predominant focal points in the foreground of the project area are the six stacks and buildings associated with the retired coal-fired plant; however, these are currently in the process of being decommissioned and demolished. Other major visual components of the site that will remain following the demolition include the eight existing CT units and associated storage buildings, the 161-kV switchyard, and a network of high-voltage TLs (TVA 2016c). Like Paradise, the scenic attractiveness of the affected environment at the Colbert Reservation is considered to be common to minimal, based on the common visual quality and lack of natural features, while the scenic integrity is considered to be low due to industrial development. Based on the criteria used for this analysis, the overall scenic class for the affected environment at Colbert is considered to be fair.

Viewers in the foreground of the Colbert CT plant project area would predominantly consist of employees of and visitors to the Colbert Reservation and boaters on the Tennessee River. Visitors to portions of the Seven Mile Island State WMA, which encompasses the riverbank opposite the reservation as well as islands within the river, would also fall within the foreground of the CT plant project area. No residences or other sensitive visual receptors are located in the foreground.

The offsite natural gas lateral tie-in would be constructed south of the Colbert Reservation, crossing under a railroad, Old Lee Highway (CR 20), and US 72 before terminating at an existing above-ground piping/valve setting located in a wooded area south of the highway. The existing piping/valve setting is currently visible from one nearby residence and may also be briefly visible to passing motorists on the highway.

Four existing TLs would be upgraded to support development of the CT plant at Colbert. Two are located in south central Tennessee, while the other two are located in northern Alabama. Much like the TLs associated with the Paradise CT plant, these existing TL corridors cross a variety of terrains, combining natural elements with human development, resulting in a somewhat disjointed visual landscape.

3.12.2 Environmental Consequences

The potential impacts to the visual environment from a given action are assessed by evaluating the potential for changes in the scenic value class ratings based upon landscape scenic attractiveness, integrity, and visibility. Sensitivity of viewing points available to the general public, their viewing distances, and visibility of the proposed action are also considered during the analysis. These measures help identify changes in visual character based on commonly held perceptions of landscape beauty and the aesthetic sense of place. The extent and magnitude of visual changes that could result from the proposed alternatives were evaluated based on the process and criteria outlined in the scenic management system as part of the environmental review required under NEPA.

3.12.2.1 Alternative A – No Action Alternative

Under Alternative A, TVA would not construct the CT plants at the Paradise or Colbert reservations, and landscape character and integrity would remain in its current state. Therefore, there would be no impact to visual resources.

3.12.2.2 Alternative B – Retirement of Allen CT Units 1-20 and Johnsonville CT Units 1-16 and Construction of CT Units at Paradise and Colbert

Implementation of Alternative B would result in short-term visual impacts associated with construction activities in all project areas impacted by the proposed onsite and offsite actions. During the approximately two-year construction period, there would be increased visual discord from existing conditions due to an increase in personnel and equipment coupled with disturbances of laydown and staging areas. However, this would be contained within the immediate vicinity of the construction activities and would only last until all project activities have been completed and the disturbed areas have been seeded and restored through the use of TVA's standard BMPs (TVA 2017b). Because of their temporary nature, construction-related impacts to local visual resources are expected to be minor.

Long-term impacts resulting from the construction of the Paradise CT plant would include visible alterations to the existing landscape associated with the three new Paradise CT units (with stack heights of 131 feet), as well as the proposed 500-kV switchyard and the new transmission structures and overhead wires associated with the new re-configured 500-kV TL. While these features would add elements to the viewshed that are discordantly contrasting with the natural environment, these elements would be visually similar to other industrial structures seen in the current landscape, including the three CC units, mechanical draft cooling tower, and numerous high-voltage TLs. These elements contribute to the landscape's ability to absorb negative visual change and would minimize the visual impact of the proposed action. Furthermore, the Paradise CT plant facilities would have minimal public visibility, with unobstructed views generally limited to employees and visitors to the Paradise Reservation. The proposed facilities may also be visible in the foreground to boaters on the Green River and users of the Paradise Boat Ramp. However, forested buffers along the riverbank would somewhat obstruct the view from both recreational areas. Visitors to the adjacent Peabody WMA may also have views of these facilities, but at middleground distances, changes in the viewshed would be less perceptible and would merge with the existing plant infrastructure, becoming visually subordinate to the overall landscape character. The nearest residences and other visual receptors such as churches are located at distances of 1.5 miles or more and would not have views of the Paradise CT plant project area due to topography and intervening vegetation.

The new offsite natural gas compressor needed to provide the additional natural gas supply to the CTs at Paradise would be constructed at an existing compressor station approximately 18 miles west of the Paradise Reservation. As the compressor would be visually similar to other components of the existing facility and there are no sensitive visual receptors in close proximity to the compressor station, visual impacts associated with the construction and operation of the offsite natural gas compressor would be negligible.

Proposed TL upgrades associated with the Paradise CT plant would entail minor modifications to existing TLs and would not alter the existing aesthetic or visibility. Therefore, following completion of construction activities and vegetation restoration, there would be no notable impacts to visual resources in association with TL upgrades.

Onsite components and specifications for the proposed Colbert CT plant would be the same as described for Paradise, with the exception of the 500-kV switchyard, which would not be constructed at Colbert. Similar to Paradise, the addition of CT plant equipment at Colbert would be visually compatible with the industrial structures seen in the current landscape, even with the planned demolition of the retired coal-fired plant features. Existing structures including the eight CT units, the switchyard, and numerous high-voltage TLs would remain and continue to contribute visual discord with the natural landscape, minimizing the visual impact of the new CT units and associated onsite components. As at Paradise, the Colbert CT plant facilities would be minimally visible to the public, with unobstructed views generally limited to employees and visitors to the Colbert Reservation, and to boaters on the Tennessee River. The proposed facilities may also be visible in the foreground to visitors of the Seven Mile Island State WMA, though vegetation on the riverbank and on the islands could provide a visual buffer. Residences on Pride Estates Road east of the reservation, and the Cane Creek Boat Ramp (see Figure 3-10 in Section 3.15) west of the reservation, are located in the middleground. However, it is unlikely that the Colbert CT plant facilities would be visible from either of these locations due to topography and the presence of dense vegetation.

Short-term visual impacts of a new natural gas lateral tie-in to supply the Colbert CT plant would occur through the stockpiling of pipe, trenching and directional drilling, and the assembly of the pipeline. These visual impacts would be localized and temporary until construction activities are complete and the ROW revegetated. In the long-term, the character of parts of the ROW corridor may be permanently altered through the clearing of trees from wooded areas. However, as the majority of the proposed pipeline runs adjacent to an existing cleared corridor associated with a roadway and driveway, little forested area would require clearing and visual impacts would be minor.

Visual impacts associated with offsite TL upgrades to support the Colbert CT plant would be the same as those described in association with the Paradise Reservation. There would be no notable long-term impacts to visual resources in association with TL upgrades.

The industrial elements and utility structures already in place within the project areas currently contribute visual discord with the landscape, contributing to the landscape's ability to absorb negative visual change. Therefore, while the forms, colors, and textures of the landscape that make up the scenic attractiveness would be somewhat affected by the construction of the CT plants and associated components, it would still remain common to minimal. Scenic integrity would remain low as visually disruptive elements and human alterations would continue to dominate the landscape. Based on the criteria used for this analysis, the scenic value class for the affected environment after the proposed modifications would remain fair. While the construction of the CT plants would contribute to minor differences in the visual environment, it would not change the overall scenic value class as the industrial character of the reservations would remain consistent. Therefore, overall visual impacts resulting from the implementation of the Alternative B would be minor.

3.13 Cultural and Historic Resources

3.13.1 Affected Environment

3.13.1.1 Regulatory Framework for Cultural Resources

Cultural resources or historic properties include prehistoric and historic archaeological sites, districts, buildings, structures, and objects as well as locations of important historic events. Federal agencies, including TVA, are required by the NHPA (54 USC 300101 et seq.) and by NEPA to consider the possible effects of their undertakings on historic properties. "Undertaking" means any project, activity, or program, and any of its elements, which has the potential to have an effect on a historic property and is under the direct or indirect jurisdiction of a federal agency or is licensed or assisted by a federal agency. An agency may fulfill its statutory obligations under NEPA by following the process outlined in the regulations implementing Section 106 of NHPA at 36 CFR Part 800. Additional cultural resource laws that protect historic resources include the Archaeological and Historic Preservation Act (54 USC 300101 et seq.), Archaeological Resources Protection Act (16 USC 470aa-470mm), and the Native American Graves Protection and Repatriation Act (25 USC 3001-3013).

Section 106 of the NHPA requires that federal agencies consider the potential effects of their actions on historic properties and to allow the Advisory Council on Historic Preservation an opportunity to comment on the action. Section 106 involves four steps: (1) initiate the process, (2) identify historic properties, (3) assess adverse effects, and (4) resolve adverse effects. This process is carried out in consultation with the State Historic Preservation Officer (SHPO) and other interested consulting parties, including federally recognized Indian tribes with an interest in the project area.

Cultural resources are considered historic properties if they are listed or eligible for listing in the National Register of Historic Places (NRHP). The NRHP eligibility of a resource is based on the Secretary of the Interior's criteria for evaluation (36 CFR 60.4), which state that significant cultural resources possess integrity of location, design, setting, materials, workmanship, feeling, association, and:

a. Are associated with events that have made a significant contribution to the broad patterns of our history; or

b. Are associated with the lives of persons significant in our past; or

c. Embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic value; or

d. Have yielded, or may yield, information (data) important in prehistory or history.

A project may have effects on a historic property that are not adverse, if those effects do not diminish the qualities of the property that identify it as eligible for listing on the NRHP. However, if the agency determines (in consultation) that the undertaking's effect on a historic property within the area of potential effect (APE) would diminish any of the qualities that make the property eligible for the NRHP (based on the criteria for evaluation at 36 CFR Part 60.4 above), the effect is said to be adverse. Examples of adverse effects would be ground disturbing activity in an archaeological site or erecting structures within the viewshed of a historic building in such a way as to diminish the structure's integrity of feeling or setting.

Agencies are required to consult with SHPOs, Indian tribes, and others throughout the Section 106 process and take their comments into consideration before deciding to initiate a project, and to document adverse effects to historic properties resulting from agency undertakings.

3.13.1.2 Area of Potential Effect (APE)

The APE is the geographic area or areas within which an undertaking may directly or indirectly cause changes in the character or use of historic properties if such properties exist. When determining the APE for the proposed action, TVA took into consideration the types of activities proposed in various parts of the affected area. Five major types of activities would be carried out as part of the project: installation of new frame CT units at the Paradise and Colbert reservations; reconductoring approximately 14.4 miles of TL in Alabama; uprating three TLs in Tennessee; installing new fiber optic line along approximately 51 miles of the Paradise-Montgomery 500-kV TL (48 miles in Kentucky and 3 miles in Tennessee); and installing and/or upgrading a natural gas pipeline near the Colbert Reservation.

3.13.1.2.1 Installation of New Frame CT Units

The installation of new frame CTs at the Paradise and Colbert reservations would take place within previously disturbed areas. Besides the units, the proposed CT facilities also would include natural gas metering and handling systems; instrumentation and control systems; transformers; and administration and warehouse/maintenance buildings. At Colbert, a new gas line feed would be constructed from an existing main gas line to the new units. At Paradise, a retired 69-kV TL would be removed, and TVA would build a new switching station. At both plants, TVA would construct new transformer yards, build new TL feeds for the new units, and use two or more construction laydown areas. These construction activities have potential for ground disturbance. The installation of new units would also result in the introduction of new visual elements, which have the potential for visual effects on any historic architectural properties that may be in view of the new units within one-half mile. For new structures less than 200 feet in height, TVA considers visual effects beyond one-half mile to be non-significant. TVA included all parts of the affected areas at the Colbert CT and Paradise CT plant sites in the APE.

3.13.1.2.2 TL Reconductoring

TL reconductoring work would consist of reconductors of two TL segments totaling approximately 4.2 miles in the vicinity of Florence, Alabama, and one TL segment totaling 10.2 miles in the vicinity of Decatur, Alabama. Reconductoring involves removing the old conductor (high-voltage cables that carry the electricity) and pulling new conductor into place. One 72-foot-tall tower structure on TL 5670, near Florence, would receive a 10-foot extension. Designated pull points along the TL corridor would be used to set up cable reels of conductor for installation. The pull points would require use of a trailer-mounted cable reel. Therefore, TVA included the access routes for each of the potential pull points (total of 49 non-contiguous access routes) in the APE. These access routes consist of existing roads surfaced in dirt, gravel, or pavement. TVA would make no modifications to any of the roads and would keep vehicles on those roads during travel to and from the work locations. The TL reconductoring would not include any new visual elements and therefore does not have potential for visual effects on any above-ground properties that may be in the viewshed.

3.13.1.2.3 TL Uprates

TL uprates associated with the proposed Paradise and Colbert CT plants would include replacing and/or modifying existing structures (poles or towers), conductor cuts and slides (to shorten the conductor between structures so that it sags less), and adding tower extensions. TVA would uprate three TLs in Tennessee (TL 5617, TL 5989, and TL 5823). Some uprate activities could be accomplished using light-duty equipment (such as pickup trucks or two-axle bucket trucks with no outriggers) positioned on existing access roads. TVA considers such activities to have very low potential for ground disturbance and did not include areas where such activities would occur in the APE. Other activities would require some ground disturbance—installation of new pole or tower structures and installation of tower extensions, which requires use of cranes. TVA included all work areas for new structure installations and tower extensions in the APE. As any equipment needed for the work would be moved to work areas along existing access routes, any access routes outside the TL ROW that are not surfaced in concrete, asphalt, or gravel were included in the APE. In order to account for the entire area that could be affected by ground disturbance, TVA included a fifty-foot radius surrounding each work area affected by structure installations or tower extensions in the APE. One work activity, the addition of a 16-foot extension to a 120-foot tower structure, has potential for visual effects on any historic architectural properties that may be present in the viewshed.

3.13.1.2.4 Fiber Optic Line Installation

TVA would install new fiber optic line on TL L6057. This TL extends from the Paradise Fossil Plant in Muhlenberg County, Kentucky, south to the Montgomery Substation near Clarksville in Montgomery County, Tennessee, for a distance of approximately 51 miles. This work would affect only a small number of structures or spans in each TL. The new fiber optic line may be installed by helicopter. Designated pull points along the TL corridor would be used to set up reels of fiber optic cable for installation. The pull points would require use of a trailer-mounted cable reel.

3.13.1.2.5 Natural Gas Pipeline Construction and/or Upgrades

TVA would construct a new compressor within an existing compressor station to support the Paradise CT. This action is consistent with item B1 in Appendix A of TVA's 2020 Programmatic Agreement (*Programmatic Agreement Among the Tennessee Valley Authority, the Advisory Council On Historic Preservation, and the State Historic Preservation Officers of Alabama Georgia, Kentucky, Mississippi, North Carolina, Tennessee, and Virginia and Federally Recognized Indian Tribes, Regarding Undertakings Subject to Section 106 of the National Historic Preservation Act of 1966*). Item B1 in Appendix A excludes "Except for construction of new additions, all renovation, maintenance, or internal changes to an existing facility less than 50 years old and not meeting Criteria Consideration G, or properties greater than 50 years old and which have been previously determined (in consultation within the last 10 years) to be ineligible for the National Register or non-contributing buildings within a district or property listed in or eligible for the National Register." As such, the addition of the new compressor is exempt from full Section 106 review and consultation.

In order to provide the additional natural gas supply to the new CT units at Colbert, a new lateral tie into the main distribution pipeline would be constructed just south of the intersection of Steam Plant Road and US 72. Easements with landowners south of US 72 and with TVA for land on the reservation would be amended to reflect the proposed pipeline installation. The proposed pipeline and station upgrades would be constructed and operated by a commercial supplier. Gas to fuel the new CT units would be provided by a new 20-inch underground pipeline. This pipeline would run parallel to an existing 10-inch lateral natural gas pipeline on the Colbert Reservation. The new pipeline facilities would also require upgrades to the existing onsite natural gas delivery station to include replacement of metering and pressure/flow regulating equipment as well as additional piping and valves.

3.13.1.2.6 Total Geographic Extent of the APE

TVA has determined that the APE should include the following areas:

- All areas at Colbert CT and Paradise CT plant project areas where ground disturbance related to the undertaking would take place;
- The total linear extent of the ROWs of all TLs affected by reconductoring;
- All areas within the ROW of the TLs affected by uprates where ground disturbing activities would take place (a 50-foot radius surrounding the work structure, plus equipment access to the work structure);
- The 150-foot-wide ROW of the Paradise-Montgomery 500-kV TL;
- Any off-ROW access routes for the TL reconductoring, uprates, and fiber optic installation that are not surfaced in asphalt, concrete, or gravel;
- All areas within the proposed natural gas pipeline corridor south of, and within, the Colbert Reservation; and
- The viewsheds within a 0.5-mile radius of any proposed activities that have potential for visual effects on above-ground historic properties.

In the discussion below, the APE is divided into three broad units: the portion in and around the Paradise CT plant project area; the portion in and around the Colbert CT plant project area (including the natural gas pipeline area); and the portion that consists of the TL ROWs and associated off-ROW access routes.

3.13.1.3 Paradise CT Plant Project Area, Offsite Natural Gas Upgrade, and Offsite TL Upgrades

3.13.1.3.1 Affected Resources in the Paradise CT Plant Project Area Portion of the APE

TVA has conducted six reviews under Section 106 of the NHPA within parts of the APE at the Paradise CT plant project area, in connection with various prior undertakings between 2013 and 2017 (Figure 3-5). TVA carried out these reviews in connection with several proposed actions, including: construction of a baghouse; construction of the Paradise CC; a TL feed to the new Paradise CC; barge roll-off area improvements; demolition of the coal wash facility; and CCR management (a complex project that included construction and operation of new dewatering facilities for CCR, construction and operation of a new CCR landfill, and closure of wet ash impoundments, as described in TVA's Paradise CCR Management Operations EA [TVA 2017a]). All of these reviews began with a desktop review that included examination of historic and current topographic maps, current and historic satellite imagery, reports of previous investigations, TVA's technical reports on the Paradise Steam Plant Project (TVA 1964 and 1979), and historic photographs taken at ground level or from the air. Three of the reviews included an archaeological survey, and one included a survey of historic architectural properties. The archaeological surveys involved systematic shovel testing and visual examinations of exposed ground surfaces. Approximately 246 acres, or 52 percent, of the APE was included within these previous reviews.

No archaeological sites were recorded at the Paradise Reservation as a result of these investigations. In archaeological surveys, shovel testing provided evidence of past ground disturbance that has altered or removed the original soils and sediments. Such ground disturbance results in low (or no) probability for intact archaeological sites.

During each of these past reviews, TVA consulted with the Kentucky SHPO and federally recognized Indian tribes pursuant to 36 CFR Part 800. In each case, the SHPO concurred with TVA's finding of no effect, and none of the consulted tribes objected or identified resources of concern.

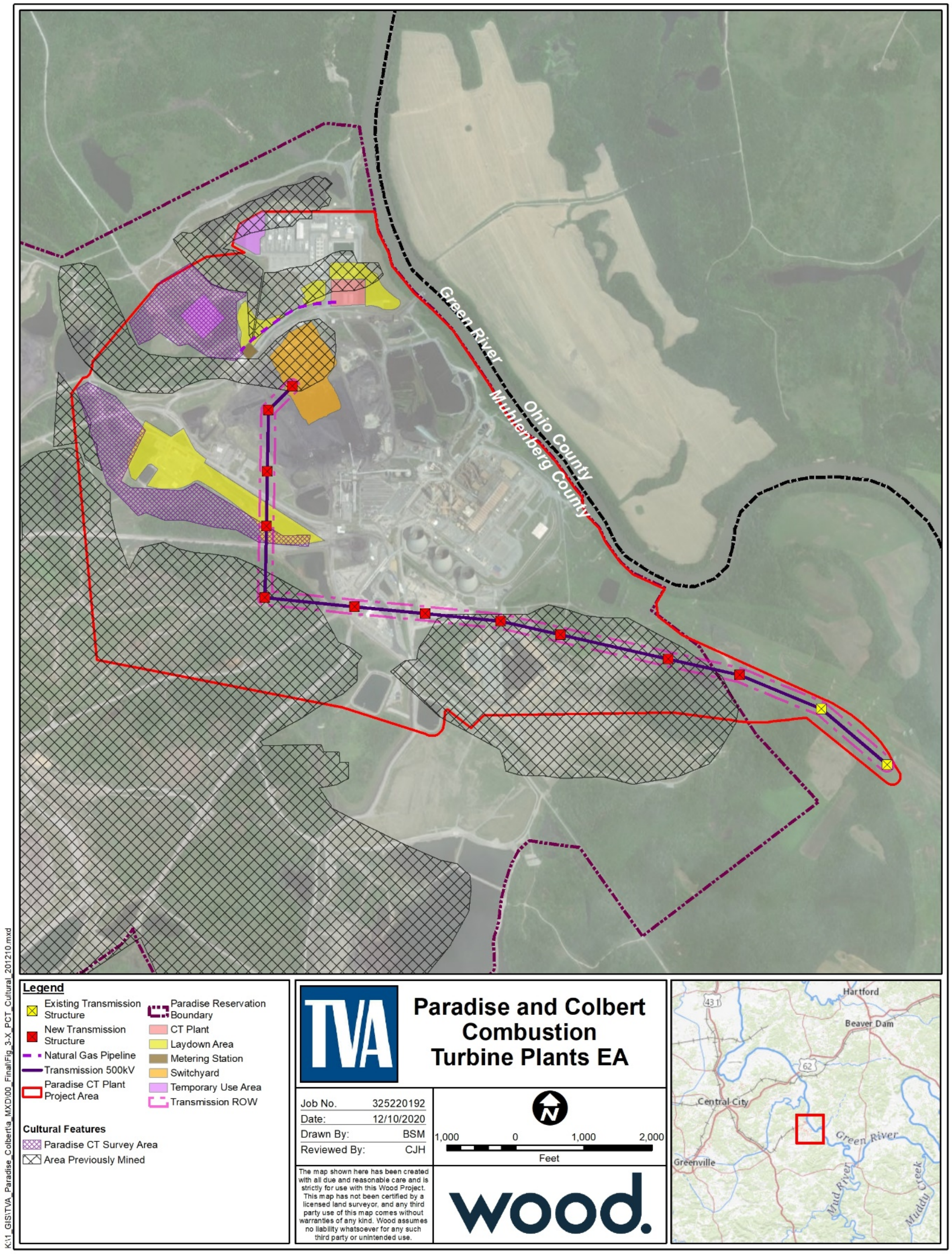

Figure 3-5. Cultural Resource Features Within the Paradise CT Plant Project Area

3.13.1.3.2 Areas in the Paradise CT Plant APE not Included in Previous Archaeological Investigations

More than half of the Paradise CT plant project area was not included within previous archaeological investigations. A large portion of this area lacks potential for undisturbed archaeological deposits due to ground disturbance from past coal mining. According to TVA (1964:19), the presence of coal was a major factor in the selection of this site for the Paradise steam plant:

> "As soon as the location of the steam plant at Paradise had been settled, a contract for furnishing coal to the plant was executed with the Peabody Coal Company of St. Louis, Missouri. The contract calls for an unprecedented 65 million tons of coal to be delivered to the tractor hopper over a period of approximately 17 years…. All of the coal was to come from strip mines within a short distance of Paradise…. Sinclair Mine was opened adjacent to the project to supply coal directly from the strip pits…"

Figure 3-5 shows areas that were surface mined and sub-surface (auger) mined by the Peabody Coal Company, as well as historical surface mines, both within and outside the APE. With the exception of the Paradise Fossil Plant footprint, a very extensive portion of the Paradise Reservation has been affected by surface mining. Such mining removed all surficial sediments, and if any archaeological sites had been present in those sediments, the sites were destroyed.

Nearly all areas within the Paradise CT plant project area portion of the APE that have not been surveyed for archaeology, and were not affected by coal mining, have been affected in obvious ways by the construction of the fossil plant and ancillary facilities, including the powerhouse, the office building, the cooling water intake, ash storage areas, impoundments, coal storage, conveyors, various other structures, drives, and parking areas. Construction of these features is documented to some extent by engineering drawings and historic photographs, and by current satellite images of the APE (Figure 3-5). Construction of these facilities would have included excavation and grading, resulting in the destruction of any archaeological sites that may have been present prior to TVA's acquisition of the land in the APE.

A comparatively small portion of the area within the Paradise CT plant project area portion of the APE has not been included in previous archaeological surveys and is not obviously affected by past construction or mining. This portion consists of two tracts totaling approximately 73.5 acres – a 33.5-acre tract east of Paradise CC plant and a 40-acre tract east of the former coal wash plant. TVA carried out an archaeological survey of these two tracts in order to identify archaeological sites that could be affected by the Paradise CT/Colbert CT project. The survey, which consisted of pedestrian survey and systematic shovel testing, identified no archaeological sites. The survey also identified a historic cemetery, the McDougal Cemetery, at the Paradise Reservation. TVA is consulting with the Kentucky SHPO and federally recognized Indian tribes regarding the results of this survey and TVA's finding that there are no NRHP-listed or -eligible archaeological sites in this part of the APE (Appendix C). The Kentucky SHPO's comments to date indicate agreement that there are no archaeological sites in the Paradise CT plant portion of the APE.

Therefore, as all areas within the APE that have been examined with archaeological surveys contained no archaeological sites, and all the remaining areas in the APE were disturbed by major earth-moving activities, TVA finds that the Paradise CT plant project area portion of the APE contains no archaeological sites.

3.13.1.3.3 Historic Architectural Assessments in the Paradise CT Plant Project Area Portion of the APE

TVA carried out two historic architectural reviews at the Paradise Reservation in 2013. The first was completed as part of TVA's obligations under NHPA Section 106 for a then-proposed installation of a baghouse (a baghouse is an emissions control structure that removes fly ash from a coal burning generating plant's exhaust stack). The APE for the baghouse project included a half-mile radius surrounding the powerhouse, an area that includes much (but not all) of the viewshed of the Paradise CT plant project area portion of the APE. TVA consulted the GIS database of architectural resources at the Kentucky Heritage Council (KHC) in Frankfort, and this indicated that there are no previously unrecorded historic architectural properties within that project's APE. The architectural survey resulted in the identification of one previously unrecorded architectural resource, Paradise Fossil Plant (MG-146). Based on the results of that survey, TVA determined that the Paradise Fossil Plant was ineligible for listing on the NRHP due to its lack of architectural distinction and to a loss of integrity of design, materials, and feeling resulting from a large number of modifications that TVA completed after the plant began operations in the 1960s. TVA consulted with the Kentucky SHPO, who concurred with TVA's eligibility determination. However, Kentucky SHPO also recommended that TVA re-assess the potential NRHP eligibility of the Paradise Fossil Plant in 2020, as structures added to the plant in ca. 1970 could have gained historic significance by that date.

Also, in 2013, TVA conducted a desktop review of historic architectural resources within a half-mile radius surrounding the proposed CC/CT plant. The review area covers a large part of the current Paradise CT plant project area portion of the APE. Based on the preliminary site check at the KHC, no historic architectural resources had been recorded within the APE. TVA identified no extant structures that would be 50 years old or older, other than Paradise Fossil Plant. Therefore, TVA found that no historic architectural resources listed in or eligible for listing in the NRHP were located within the half-mile viewshed of the then-proposed CC/CT plant.

TVA also conducted an architectural assessment of Paradise Fossil Plant in 2020, as part of TVA's identification efforts under Section 106 of the NHPA in connection with the proposed decommissioning and deconstruction of the plant. Based on this more recent assessment, TVA found again that the plant is ineligible for the NRHP. TVA consulted with the Kentucky SHPO regarding this finding and the SHPO agreed.

Based on these various assessments, there are no historic architectural properties listed in, or eligible for listing in, the NRHP within the Paradise CT plant project area portion of the APE.

3.13.1.4 Colbert CT Plant Project Area, Offsite Natural Gas Loop Line, and Offsite TL Upgrades

3.13.1.4.1 Affected Resources in the Colbert CT Plant Project Area Portion of the APE

Approximately 365 acres of the total affected area of 390 acres at the Colbert CT plant project area portion of the APE have been included in prior NHPA Section 106 reviews (Figure 3-6). TVA carried out these reviews in connection with several proposed actions, including: the Colbert Steam Plant Scrubber Project; construction of a microwave tower; seismic remediation of the bottom ash impoundment; installation of ammonia removal equipment; upgrades to the Colbert-Stateline TL; closure of the coal yard; Colbert Fossil Plant decommissioning; and a geotechnical investigation of the Cane Creek area. The reviews included examination of historic and current topographic maps, current and historic satellite imagery, reports of previous investigations, TVA's technical report on the Colbert Steam Plant Project (TVA 1963), and historic photographs taken at ground level or from the air. Some of these reviews also included archaeological surveys, the most comprehensive of which was a survey TVA performed in 2016 in connection with the proposed Colbert Fossil Plant decommissioning project. That survey included nearly all accessible areas within the fossil plant that were not clearly disturbed by construction or fossil plant operations. None of the archaeological surveys at the Colbert Reservation have identified archaeological sites in areas where the Colbert CT/Paradise CT project would involve ground disturbing actions.

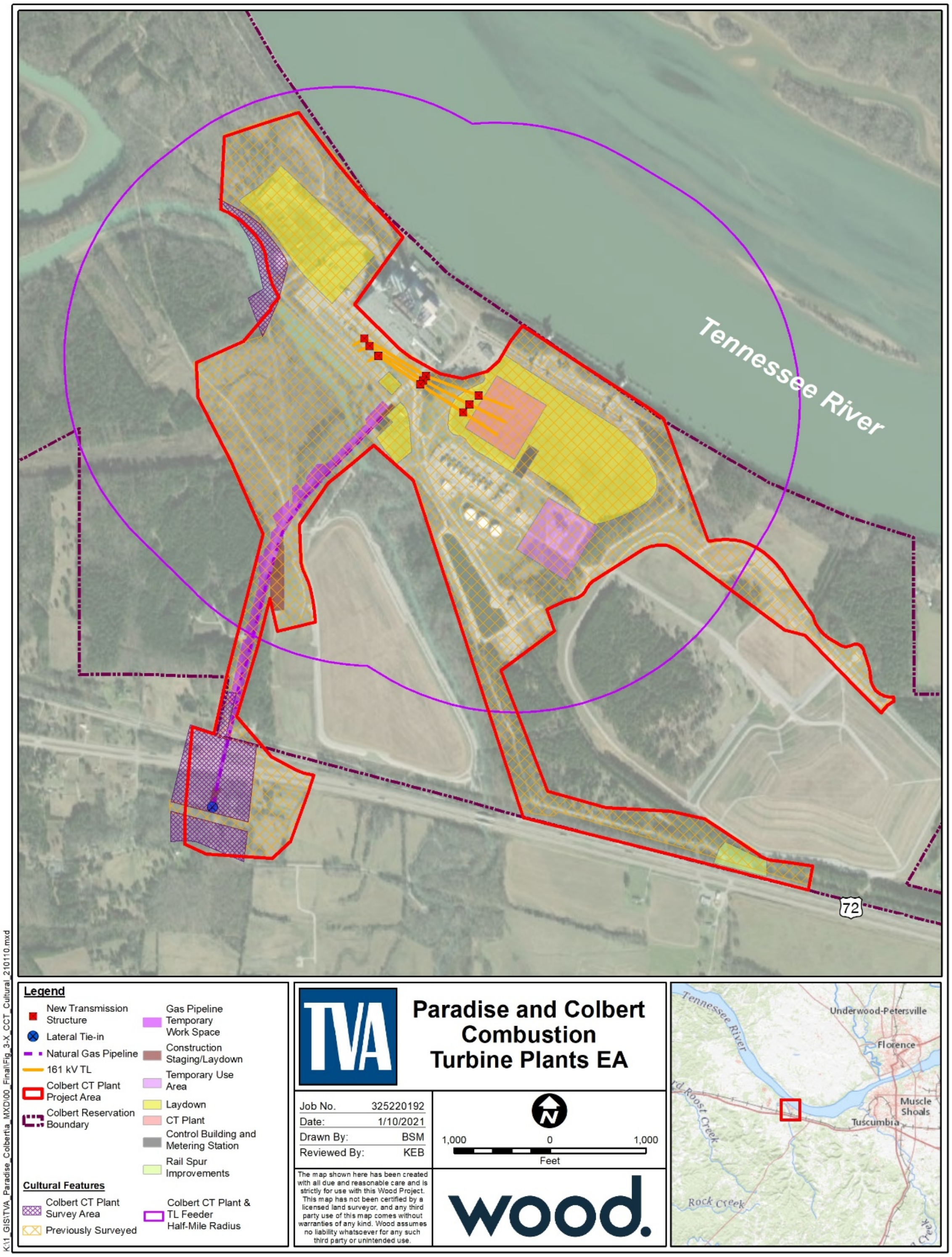

Figure 3-6. Cultural Resource Features at the Colbert CT Plant Project Area

3.13.1.4.2 Archaeological Investigations in the Colbert CT Plant Project Area Portion of the APE

TVA estimates that a minimum of 138 acres within the 390-acre review area at the Colbert CT plant project area has been affected by earth-moving activity, including construction of plant facilities, impoundments, and US 72, as well as the construction and use of the coal storage area. All such areas lack potential for intact archaeological sites due to the disturbance. Some of the previous archaeological reviews included areas that were affected by construction.

Background research revealed that 15 previously recorded archaeological sites are located within the CT Footprint (1CT16, 1CT20, 1CT21, 1CT22, 1CT75, 1CT77, 1CT78, 1CT113, 1CT116, 1CT437, 1CT625, 1CT626, 1CT630, 1CT631, 1CT632), and six previously recorded sites are located in parts of the TL corridors that would be affected by potentially ground-disturbing work (1MG778, 1MG1038, 1LU639, 1CT332, 1CT333, and 1CT334). Based on previous investigations two of these sites (1CT16 and 1CT77) are non-extant, having been destroyed by construction; two (1MG1038 and 1CT626) are ineligible for the NRHP; one (1MG778) is eligible; and 16 are considered either potentially eligible or of undetermined NRHP status. Of the 11 previously recorded archaeological sites within the Colbert Reservation portion of the APE, only one (1CT437) is located in an area where the project would involve any ground-disturbing work.

A comparatively small amount of area within the Colbert CT plant project area portion of the APE (approximately 28 acres) has not been included in previous Section 106 reviews and does not appear to have been significantly affected by past ground disturbing activities. This area consists of a ca. 7-acre area on both sides of Cane Creek northwest of the switchyard and southwest of the warehouse area that lies just north of the powerhouse; and approximately 15 acres surrounding and south of the intersection of Colbert Steam Plant Road and US 72. Some of this 15-acre area lies south of US 72 on private land, where changes to the existing natural gas pipeline would be required. TVA carried out an archaeological survey of these 28 acres. The survey consisted of a pedestrian survey and systematic shovel testing and also included a revisit of one previously recorded archaeological site, 40CT437, a twentieth-century historic site with structural remains. Based on the site’s lack of research potential, TVA finds that 40CT437 is ineligible for inclusion in the NRHP. Of the remaining 10 previously recorded sites in the Colbert Reservation that are extant and considered either potentially eligible for the NRHP or of undetermined NRHP status, none is located in an area where TVA plans ground-disturbing work. No additional archaeological sites were identified by the survey in the Colbert CT plant project area portion of the APE. TVA is consulting with the Alabama SHPO and federally recognized Indian tribes regarding the results of this survey and TVA’s finding that there are no NRHP-listed or NRHP-eligible archaeological sites in this part of the APE (Appendix C).

3.13.1.4.3 Historic Architectural Assessments in the Colbert CT Plant Project Area Portion of the APE

In 2016 TVA completed an architectural assessment of the Colbert Fossil Plant in connection with the proposed decommissioning of the plant. Based on the assessment, TVA determined that the Colbert Fossil Plant is ineligible for inclusion in the NRHP due to a lack of historic integrity. TVA consulted with the Alabama SHPO, who concurred with TVA’s determination.

When assessing the potential for visual effects on historic architectural properties resulting from the proposed installation of new CT units, TVA created a half-mile buffer surrounding the proposed new Colbert CT power block (where the new units would be installed) and TL feeder line. This half-mile buffer does not extend outside of the Colbert Reservation boundary except where it extends over the Tennessee River. TVA considers visual effects from the construction of facilities lower than 200 feet to be minimal beyond one-half mile. Thus, significant visual effects would be limited to the Colbert Fossil Plant and the existing CT plant. Colbert Fossil Plant is ineligible for the NRHP due to a lack of historic integrity, and the CT plant is ineligible as it does not meet the minimum age threshold of 50 years. Therefore, there are no NRHP-listed or NRHP-eligible historic architectural properties within the Colbert CT plant project area portion of the APE.

3.13.1.5 Offsite TL Upgrades

3.13.1.5.1 Affected Resources in the Offsite TL Upgrade Portion of the APE

A few areas in the TL upgrade portion of the APE (for TLs that are considered in this EA) have been included in previous archaeological surveys. These surveys have identified eight archaeological sites that are located in the project areas (Table 3-16). Three of the sites are listed as undetermined or as potentially eligible for the NRHP, and five are ineligible.

Table 3-16. Areas Within the TL Upgrade Portion of the APE that were Included in Previous Archaeological Surveys, and Findings

Affected TL (CT Plant)	Portion Previously Surveyed	Survey Year	Findings
TL 6057 (Paradise)	50-foot radius surrounding nine work structures (footprint) and viewshed within half-mile radius; 7.3 miles of associated off-ROW access roads, all as part of Paradise-Montgomery uprate project	2018	No archaeological sites and no above-ground properties in APE.
TL 5617 (Colbert)	5.4-mile Colbert-Mt. Pleasant Tap to Loretto segment	1997	Six archaeological sites, of which two recommended potentially eligible for NRHP.
TL 5989 (Colbert)	100-foot radius surrounding three towers as part of a tower lighting project	2018	One archaeological site that is potentially eligible for the NRHP.
TL 5676 (Colbert)	Large survey of the Muscle Shoals Reservation that included approximately 1.6 miles of Tap Str 6-Florence TL ROW	1993	One archaeological site in ROW. Site is disturbed and likely ineligible for the NRHP.
TL 5670 (Colbert)	0.34-mile section included in a survey of the Calpine-Solutia TL	2002	None.

3.13.1.5.2 Areas in the TL Upgrade Portion of the APE not Included in Previous Archaeological Investigations

TVA carried out an archaeological survey of all areas in the TL upgrade portion of the APE that were not included in previous archaeological surveys, in order to identify archaeological sites that could be impacted by the proposed CT project. The survey included the entire length of each TL where reconductor work would be carried out, as well as associated off-ROW access routes. For TLs where upgrade work is planned, TVA included a 50-foot radius surrounding each of the work structures where ground-disturbing work (such as installation of new poles and work requiring cranes) would occur, and the associated access routes. This survey included revisits of the locations of all six previously recorded archaeological sites located in this part of the APE (1MG778, 1MG1038, 1LU639, 1CT332, 1CT333, and 1CT334). None of these sites was relocated, and it appears that the portions of these sites within the APE are no longer extant. The survey identified five archaeological sites, as shown in Table 3-17. TVA has determined that four of these sites lack research potential and are ineligible for inclusion in the NRHP. One site, located in the ROW of TL 5617 in Tennessee, is potentially eligible for inclusion in the NRHP.

Table 3-17. Archaeological Survey Results of TL Segments not Included in Previous Archaeological Surveys

TL (CT Plant)	State	Identified Archaeological Sites
TL 5670 (Colbert)	Alabama	None
TL 5676 (Colbert)	Alabama	None
TL 5617 (Colbert)	Tennessee	Four ineligible sites, one potentially eligible site
TL 5823 (Paradise)	Tennessee	None
TL 5989 (Colbert)	Tennessee	None
TL 6057 (Paradise)	Tennessee and Kentucky	One ineligible site

3.13.1.5.3 Historic Architectural Properties in the TL Upgrade Portion of the APE

In Alabama, the only proposed modification to any TL structure is addition of a 10-foot extension to one structure (Structure 134 of TL 5676). This represents a less than 10 percent increase in height, which falls below TVA's threshold for visual effects, as stipulated by Appendix B (Section D, item 2) of TVA's Section 106 Programmatic Agreement executed in January 2020. TL 5676 consists of seven structures, of which five date to 1924 and are associated with Wilson Hydroelectric Project (listed in the NRHP). No modifications would be made to any of those structures. Therefore, none of the proposed TL upgrades in Alabama has potential for visual effects.

None of the proposed modifications to the Paradise-Montgomery 500-kV TL would result in increases in height beyond the height of existing TL structures, or in the addition of new structures. Therefore, none of the TL work in Kentucky has potential for visual effects.

In Tennessee, the only action related to this undertaking that has potential for visual effects on above-ground properties would be the addition of a 16-foot extension to Structure 76 on the on TL 5823. The tower is 74 feet tall, and the extension would result in a 22 percent increase in height. TVA carried out a desktop review of the half-mile radius surrounding this structure in order to identify any historic architectural properties. The review included the following sources: the Tennessee Historical Commission Online viewer; the NRHP; the 1956 and 2010 editions of the USGS Laguardo, TN 7.5-minute topographic quadrangle; current satellite imagery provided by Bing; Google Street View; and TVA's Integrated Cultural Database.

There are no NRHP listings within one-half mile of Structure 76. Six houses and eight barns are shown within the half-mile radius on the 1956 topographic quadrangle. Only two of the houses, and three of the barns, appear to be extant based on recent satellite imagery. The THC Online Viewer lists two structures in this review area, and these correspond with the two extant houses: SU-24 (900 Lock 4 Road), and SU-1001 (1033 Lock 4 Road). Based on current satellite imagery, SU-24 appears to be extensively modified and is located in a small lot in a modern subdivision. Maps, satellite images, and Google Street View all indicate that views to Structure 76 from this property are blocked by vegetation and other structures. SU-1001 is located approximately 0.21 miles west/northwest of Structure 76, at the southern edge of a modern subdivision. The TL tower does appear to be in view from SU-1001 currently, although the views are partially blocked by a line of trees. Google Street View indicates SU-1001 has been modified, and the THC Online Viewer lists the construction date as 1880 and describes it as "ext. altered dwelling w/ original entrance." The three extant barns are in proximity and are potentially associated with the house. The setting of this property has been extensively altered by the construction of a modern subdivision. The property is surrounded on three sides by modern homes and streets. TVA has not assessed the NRHP eligibility of this property. However, given that its integrity of setting has been altered, TVA finds that the tower extension would not further diminish its integrity, and therefore, that the undertaking would not result in an adverse effect, were this property to be found eligible for the NRHP.

Potentially Historic TLs

TVA staff consulted TVA's Transmission Line index for information regarding the construction dates, structure types, and number of replacement structures for each of the affected TLs, in order to determine whether any would meet criteria of historic significance. Two of the TLs that would be reconductored in Alabama meet the minimum age criterion for consideration as potential historic properties: TL 5670, constructed in 1936, and TL 5676, constructed in 1924. TL 5676 was built in 2001. Thirty-four (62 percent) of the original structures in TL 5670 are extant; the remainder were replaced with a modern type of structure between 1952 and 1970. TVA considers the replacement of 20 percent or more of the original structures in a historic TL as compromising the integrity of design, materials, and feeling of the historic TL. Based on this threshold, TL 5676 is ineligible for the NRHP. As mentioned above, the only proposed modification to any of the structures is the addition of a 10-foot extension to one structure (Structure 134, which is one of the original A-frame structures). TL 5676 consists of seven structures, of which five date to 1924 and are associated with Wilson Hydroelectric Project (listed in the NRHP). No modifications would be made to any of those structures.

All of the affected TLs in Tennessee and Kentucky were built by TVA between 1948 and 1968 using steel lattice-type towers, as shown in Table 3-18. The oldest of these (TL 5823) lacks historic integrity, as nearly all of the original structures have been replaced. All of the structures in these lines are of types that TVA still uses today. TVA does not consider these structures to have historic significance because these types of structures are ubiquitous throughout the US and are still being made today. Therefore, TVA does not consider any of the affected TLs to be eligible for inclusion in the NRHP.

Table 3-18. Age and Composition of Affected TLs in Tennessee and Kentucky

TL	Affected section	Construction Date	Structure type	Original structures remaining
TL 5617	Structures 117-152A	1954	Steel towers	94%
TL 5989	Structures 9A, 9B, 9C, 9D, and A-D	1960	Steel towers (6) and steel poles (2)	75%
TL 5823	Structures 72-97 and A-F	1948	Steel towers	6%
TL 6057*	Structures 1-237 (in Kentucky) and 238-248 (in Tennessee)	1968	Steel towers	100%

*Including the entire ca. 51-mile TL extending from Paradise CT plant to the Montgomery, TN Substation

3.13.2 Environmental Consequences

3.13.2.1 Alternative A – No Action Alternative

As Alternative A would result neither in ground-disturbing actions nor in construction of new features with visual effects, TVA has found that this alternative does not have potential for effects on historic properties.

3.13.2.2 Alternative B – Retirement of Allen CT Units 1-20 and Johnsonville CT Units 1-16 and Construction of CT Units at Paradise and Colbert

The project footprint in Kentucky contains no NRHP-listed or –eligible archaeological sites and the undertaking's APE contains no NRHP-listed or –eligible historic architectural properties. Therefore, TVA finds that the Paradise and Colbert CT plants project would result in no effects on historic properties in Kentucky. Although the McDougal Cemetery is located within the Paradise Reservation portion of the APE, TVA has no plans for any ground disturbing activities within or adjacent to this cemetery. Therefore, the proposed undertaking will not result in physical or visual effects on the cemetery.

In Tennessee, one inventoried above-ground property is located within view of a proposed 16-foot tower extension. TVA finds that adding the extension would not result in an adverse effect on this property, were the property to be found eligible for inclusion in the NRHP. TVA finds that all four of the affected TLs are ineligible for inclusion in the NRHP.

The project footprint in Tennessee contains five archaeological sites. TVA finds that four of these sites (40MT1152, 40LR212, 40LR213, and 40LR214) are ineligible, and one (40WY231) is potentially eligible, for inclusion in the NRHP. TVA proposed to avoid project effects on 40WY231 by creating a buffer and using wetland mats in the access route where the site is located. TVA finds that with this condition on the undertaking, the Paradise and Colbert CT Plants project would result in no effects on historic properties in Tennessee.

The project footprint in Alabama contains 10 archaeological sites that are potentially eligible for inclusion in the NRHP, or of undetermined/unassessed eligibility. All of these sites are located in areas where TVA plans no project-related activities. The archaeological survey identified one site, 1CT437, which previously had an undetermined eligibility status. Based on the current survey, TVA has determined this site is not eligible for the NRHP. No NRHP-listed or –eligible above-ground properties are located in the viewshed of activities that could have visual effects. While the undertaking would result in a physical change (tower extension) to one transmission structure in TL L5670 (built 1936), TVA recommends that this TL, while meeting the minimum age threshold for eligibility, lacks integrity and is not eligible for the NRHP. Therefore, TVA finds that the Paradise and Colbert CT plants project would result in no effects on historic properties in Alabama.

TVA is consulting with the Alabama, Kentucky, and Tennessee SHPOs and with federally recognized Indian tribes within whose areas of interest the APE falls (Appendix C). Pending completion of consultation with SHPOs and the tribes under Section 106 of the NHPA, TVA finds that the undertaking will result in no effects on historic properties.

3.14 Transportation

3.14.1 Affected Environment

3.14.1.1 Paradise CT Plant Site Project Area, Offsite Natural Gas Upgrade, and Offsite TL Upgrades

The transportation network surrounding the Paradise Reservation contains federal, state, and county roads and bridges, rail, and barge facilities on the Green River. As shown in Figure 3-7, nearby, major highways include the Wendell H. Ford Western Kentucky Parkway (WKP) and US 62 (to the north); US 431 (to the west); and the William H. Natcher Parkway (to the east). The WKP is a four-lane divided highway approximately 5.5 miles north of Paradise. The reservation is served by one CSX rail line to the west of the site. Rail access originates from the CSX Transportation mainline at Central City located approximately 8 miles northeast of the reservation.

Traffic generated by current operations at Paradise is composed of a mix of cars and light duty trucks (two-axle delivery trucks), medium duty trucks (larger two-axle and three-axle trucks) and heavy-duty trucks (three- to five-axle trucks and tractor trailers). Public road access is available to the Paradise Reservation via State Road (SR) 176, CR 1008, and Riverside Road. SR 176, a two-lane highway that extends from US 431 in Drakesboro approximately six miles east to CR 1008, is the primary roadway to the Paradise Reservation. SR 70 (Rochester Road), a two-lane paved road, is located approximately 4.5 miles south of Paradise and intersects with Riverside Road, which accesses the reservation from the south. The Rockport Paradise Road (CR 1011) runs north along the Green River from its connection point with SR 176 northwest of the Paradise Reservation to the WKP. Roadways in the vicinity of the Paradise CT plant project area are shown on Figure 3-7. The Annual Average Daily Traffic (AADT) on the roadways near the Paradise Reservation are shown in Table 3-19. As indicated by recent traffic counts, US 431 north of SR 176 is the most heavily traveled highway in the area. AADTs for 2016 through 2017 include traffic resulting from operation of units 1 and 2 at the Paradise Fossil Plant, which were retired in 2017. Current traffic for roads in the vicinity of the reservation would be lower following retirement of the fossil plant unit 3 in February 2020. The greatest decreases in traffic would be on SR 176 and CR 1011.

Table 3-19. Annual Average Daily Traffic on Roads in the Vicinity of the Paradise CT Plant Site

Roadway	Year	AADT
US 431 north of SR 176 (Station 256)	2019	5,440
US 431 south of SR 176 (Station 252)	2018	4,471
SR 176 east of U.S. Highway 431 (Station 253)	2019	1,345
SR 176 east of Goose Lake (Station 043)	2017	1,605
SR 176 west of U.S. Highway 431 (Station 258)	2018	1,724
SR 70 east of U.S. Highway 431 (Station 251)	2019	1,446
Rockport Paradise Road south of WKP Station (036)	2016	290

Source: Kentucky Transportation Cabinet 2020

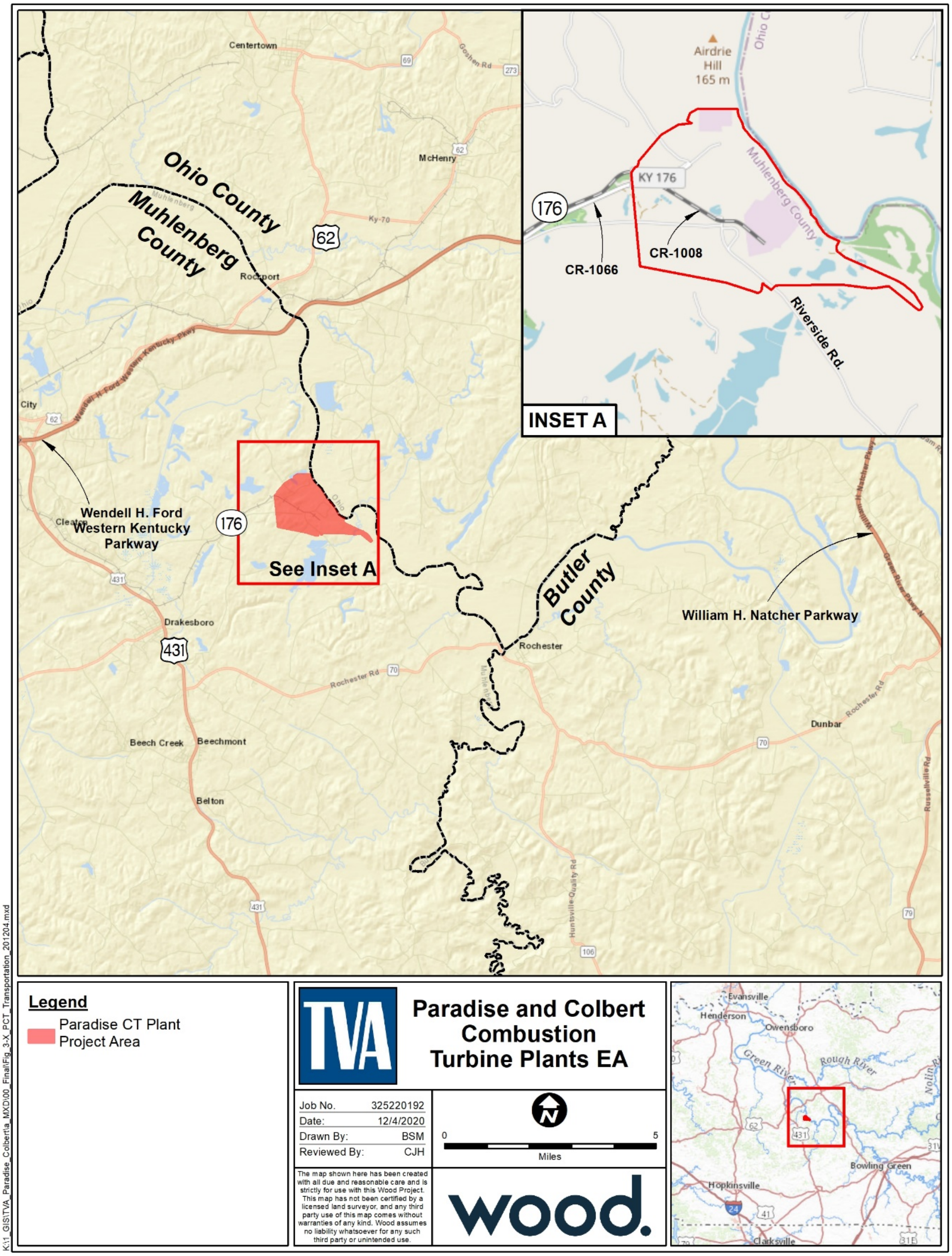

Figure 3-7. Roadways in the Vicinity of the Paradise Reservation

In order to provide natural gas pipeline service to the Paradise CT plant, upgrades to an existing compressor station are required. The compressor station is located approximately 18 miles west of the Paradise CT plant project area just southeast of SR 70 and SR 175. The station is located in a rural area with access via SR 70.

Upgrades to two offsite TLs are also included as part of the Paradise CT plant project – TL 6057 and TL 5823. TL 6057 is primarily located in Kentucky and extends 52 miles south from the Paradise Reservation, terminating in Northwest Tennessee. The portion of TL 5823 being uprated extends approximately 13 miles west and south of TVA’s Gallatin Reservation in Tennessee. Roadway access to these TLs consists of a combination of state and county roads, with direct access provided by existing access roads from public roadways.

3.14.1.2 Colbert CT Plant Site Project Area, Offsite Natural Gas Loop Line, and Offsite TL Upgrades

The Colbert Reservation is located about 9 miles west of Tuscumbia, Alabama. The existing transportation infrastructure near the reservation includes federal, state, and county roads as well as railway for land access and river access via barge through the system of locks along the Tennessee River.

As shown in Figure 3-8, the nearest major highway to the Colbert Reservation is US 72 which provides regional east/west access and connects Decatur, Alabama and Memphis, Tennessee. US 72 is a four-lane divided highway that passes approximately 0.8 miles south of the Colbert Reservation. SR 247 is a two-lane highway that provides a north/south connection to Red Bay, Alabama from US 72. CR 20 (Old Lee Highway) is a two-lane highway that runs parallel with US 72 to the north for approximately 8 miles and provides access to local facilities along the river. Direct access from and to the Colbert Reservation is from Colbert Steam Plant Road, which connects with CR 20 and US 72. The two-lane Colbert Steam Plant Road has an at grade railroad crossing near CR 20 that is not signalized but has crossing gates. The intersection of CR 20 and Colbert Steam Plant Road has stop signs at each approach. Eastbound and westbound turn lanes to US 72 are provided from Colbert Steam Plant Road. In addition, a 350-foot left turning lane is provided on eastbound US 72 to Colbert Steam Plant Road. The project area for the proposed offsite natural gas upgrade associated with the Colbert CT plant is located on private property directly across US 72 from the intersection with Colbert Steam Plant Road. Access to this site would be provided from US 72.

Recent AADTs on roadways near the Colbert Reservation are shown in Table 3-20. As indicated by these counts, US 72 is the most heavily traveled highway in the area. The low traffic counts for CR 20 (Old Lee Highway) and Colbert Steam Plant Road indicate that both roadways serve local traffic, particularly traffic to the Colbert Reservation.

Table 3-20. Annual Average Daily Traffic on Roads in the Vicinity of the Colbert CT Plant Site

Roadway	Year	AADT
US 72 east of Colbert Steam Plant Road (Station 804)	2019	12,057
US 72 West of Garner Lane (Station 627)	2019	10,334
Colbert Steam Plant Road at US 72 (Station 1322)	2019	370
CR 20 at Colbert Steam Plant Road (Station 3804)	2019	300

Source: Alabama Department of Transportation 2020

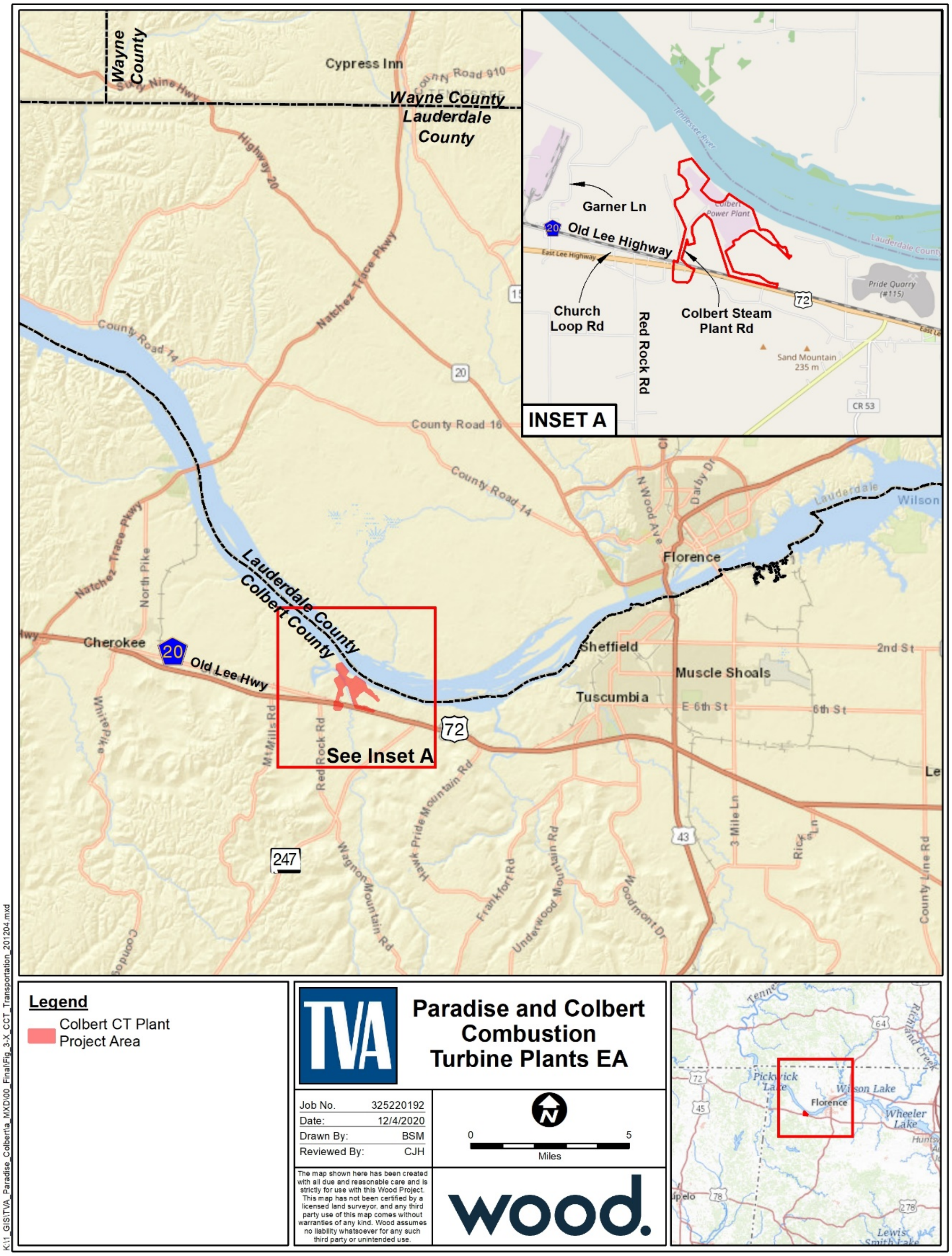

Figure 3-8. Roadways in the Vicinity of the Colbert Reservation

Upgrades to four offsite TLs are also included as part of the Colbert CT plant project – TL 5989, TL 5617, TL 5676, and TL 5670. TL 5989 and TL 5617, approximately 2 miles and 13 miles in length, respectively, are both located in Tennessee near the Alabama and Mississippi state lines. TL 5676 and TL 5670, approximately 3 miles and 10 miles in length, respectively, are located in northwestern Alabama. Roadway access to all of these TLs consists of a combination of state and county roads, with direct access provided by existing access roads from public roadways.

3.14.2 Environmental Consequences

3.14.2.1 Alternative A – No Action Alternative

Under Alternative A, there would be no impact to transportation as there would be no changes or plant additions at the Paradise and Colbert Reservations. Highway traffic levels would remain similar to current levels.

3.14.2.2 Alternative B – Retirement of Allen CT Units 1-20 and Johnsonville CT Units 1-16 and Construction of CT Units at Paradise and Colbert

<u>Construction</u>

Under Alternative B, onsite construction activities for the proposed CT plant at the Paradise Reservation would result in increased traffic on local and state roadways in the vicinity of the site due to commuting of construction workers and delivery of materials and equipment for the project. Construction activities would last approximately two years, with work occurring during daytime hours, typically on weekdays but potentially up to seven days a week. Construction employment is expected to ramp up from a low of approximately 25 workers to approximately 180 workers during peak construction in month 16 of the project. Transportation impacts associated with construction are based on the peak construction workforce.

During peak construction at the Paradise CT plant site there would be measurable traffic increases on roadways in the vicinity of the Paradise Reservation, primarily in traffic traveling along US 431, SR 176, and CR 1011, with most north/south traffic traveling on US 431. Traffic increases would likely be more noticeable on the county roads accessing the reservation including CR 1011 and Riverside Road and at the intersection of US 431 and SR 176. Based on the estimated peak construction workforce of 180 workers and assuming one worker per vehicle, construction worker traffic could potentially result in an increase of up to 13.6 percent over the current AADT on SR 176 east of US 431. Construction traffic could also result in a potential increase of 4.1 percent on US 431 south of SR 176 and 3.4 percent on US 431 north of SR 176 during both morning and evening commutes. As construction workers are likely to come from different origins north and south of the intersection of US 431 and SR 176, these increases would be lower as traffic would be dispersed between the two directions. These increases would occur during a three- to six-month peak construction period and represent a relatively small increase in AADT on public roadways within the vicinity of the Paradise Reservation, which currently experiences low traffic volumes. Due to the temporary nature of construction activities on low volume roadways, transportation impacts from construction activities on area roadways would be minor. Traffic on public roadways would return to preconstruction levels after construction is complete.

Additional truck traffic would also occur in the area during construction due to material and equipment deliveries to the site. However, as this increase would primarily occur during the mobilization and demobilization phases, impacts to the surrounding transportation network are not anticipated. It is anticipated that most project components would be delivered by truck; however, larger project equipment would be delivered to the site by rail. Minor rail modifications would be made onsite if necessary.

Proposed upgrades to the existing compressor station are relatively minor. As such, construction traffic would be minimal and short term and would not impact traffic on roadways surrounding the facility.

The offsite TL upgrades associated with the Paradise CT plant would not impact regional or local transportation networks as the upgrade work involves temporary short-term construction with small crews of workers at specific sites along each TL corridor. The construction schedule and workforce anticipated at the Colbert CT plant site would be similar to that described for the Paradise CT plant. Based on the estimated peak construction workforce and assuming one worker per vehicle, construction worker traffic could potentially result in a minimal traffic increase on US 72 of up to 2% over the current AADT near the Colbert Reservation. As construction workers are likely to come from both the east and west on US 72, these increases would be lower and not noticeable. However, construction workforce traffic could also result in an increase of up to 49% on Colbert Steam Plant Road over the current AADT. As construction activities peak at the Colbert CT plant site, noticeable increases in traffic traveling through the intersections of Colbert Steam Plant Road with US 72 and CR 20 are likely to occur during morning and evening commutes. Due to these increases in traffic, drivers may experience delays or congestion during peak hour traffic periods, especially on southbound Colbert Steam Plant Road during the evening commute for traffic making left turns to eastbound US 72. Additional congestion could occur at this intersection due to delays from rail traffic at the Norfolk Southern rail crossing of Colbert Steam Plant Road. TVA would work with local and state officials, as appropriate, to manage and alleviate such impacts, including the possible use of staggered work shifts and encouragement of carpooling to minimize traffic delay at these local intersections. Due to the temporary nature of construction activities for the proposed Colbert CT plant and the offsite natural gas pipeline upgrade, and implementation of appropriate traffic controls if necessary, the impacts on traffic traveling on US 72 in the vicinity of the Colbert Reservation and Colbert Steam Plant Road would be minor. Traffic on these roadways would return to preconstruction levels after construction is complete.

Additional truck traffic would also occur in the area during construction due to material and equipment deliveries to the site. Most project components would be delivered by truck; however, larger components would be delivered by rail. Minor rail modifications would be made onsite if necessary.

The offsite TL upgrades associated with the Colbert CT plant would not impact regional or local transportation networks as the upgrade work involves temporary short-term construction with small crews of workers at specific sites along each TL corridor.

Operation

Operation of the proposed CT plants at Paradise and Colbert are expected to require four to six workers at each site resulting in a negligible increase in workforce traffic and no impacts to roadways in the project area.

3.15 Natural Areas, Parks and Recreation

3.15.1 Affected Environment

Natural areas include ecologically significant sites, national or state forests, wilderness areas, scenic areas, WMAs, greenways, trails, NRI streams, and wild and scenic rivers. Managed areas include lands held in public ownership that are managed by an entity (e.g., TVA, USDA, USFS, State of Tennessee) to protect and maintain certain ecological and/or recreational features. Ecologically significant sites are either tracts of privately-owned land that are recognized by resource biologists as having significant environmental resources or identified tracts on TVA lands that are ecologically significant but not specifically managed by TVA's Natural Areas program. NRI streams are free-flowing segments of rivers recognized by the National Park Service (NPS) as possessing remarkable natural or cultural values. Parks and developed recreation facilities include open areas, boat ramps, community centers, swimming pools, and other public recreation areas.

This section addresses natural areas and parks and recreation facilities that are on, in the immediate vicinity (within a 0.5-mile radius) of, or within the region (within a 5-mile radius) of the Paradise and Colbert CT plant project areas, as well as those that are in the immediate vicinity of associated offsite actions including TL upgrades.

3.15.1.1 Paradise CT Plant Project Area and Offsite Natural Gas Upgrade

Natural areas, parks, and developed recreation areas within the region of the Paradise CT plant project area are listed in Table 3-21 and illustrated on Figure 3-9.

Table 3-21. Natural Areas, Parks and Recreation Facilities in a 5-mile Radius of the Paradise CT Plant Project Area

Natural Area or Park	Managing Entity	Use
Peabody WMA	KDFWR	Wildlife habitat, small & large game hunting
Paradise Boat Ramp	TVA	Public boat ramp
Rochester Boat Ramp	KDFWR	Public boat ramp
Rockport Boat Ramp	KDFWR	Public boat ramp

Source: TVA 2020e; KDFWR 2020a

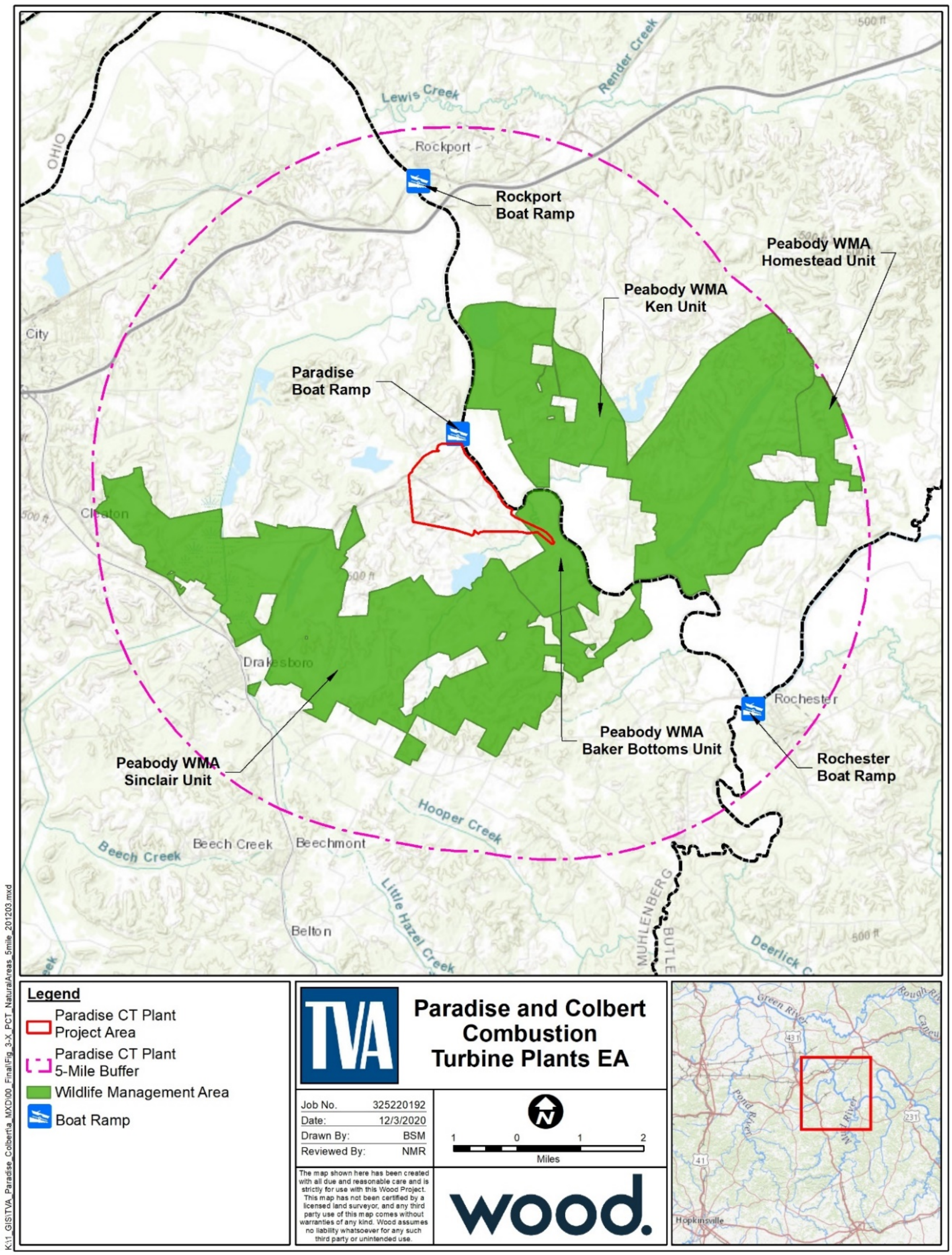

Figure 3-9. Natural Areas, Parks and Recreation Facilities in a 5-mile Radius of the Paradise CT Plant Project Area

A review of data from the TVA Natural Heritage database and the KDFWR indicates that the easternmost portion of the Paradise CT plant project area, which extends past the TVA reservation, is located on the Baker Bottoms Unit of the Peabody WMA. The WMA is broken up into eight individual units – three of which are adjacent to the Paradise Reservation. The Baker Bottoms Unit of the WMA is located southeast adjacent to the reservation and contains large ROW corridors for existing TLs originating from the Paradise facilities. The Sinclair Unit of the Peabody WMA abuts the reservation to the south and west, and the main access road to the plant (SR 176) passes through the Sinclair Unit. The Ken Unit is located on the opposite side of the Green River, east of the Paradise Reservation. The Homestead Unit of the WMA is also located within a 5-mile radius, approximately 4.5 miles northeast of proposed Paradise CT plant project area. The Peabody WMA has rough terrain primarily comprised of reclaimed coal-mined land with swampland, numerous excavated ridges, and water-filled strip mine pits. Lands within the WMA are owned by both private landowners and the KDFWR. Private lands within the WMA are managed by KDFWR under lease agreements with the private landowners. The main public uses are fishing and hunting for deer, turkey, waterfowl, and small game; however, the WMA is also utilized for bird watching and other passive recreation (KDFWR 2020b).

The Paradise Boat Ramp, which provides public access to the Green River, is located near the northern boundary of the Paradise Reservation, approximately 775 feet north of the proposed CT site boundary. This boat ramp is accessible from State Route 176 on the Paradise Reservation and from Rockport-Paradise Road to the north. Two additional Green River access points are also located within a five-mile radius of the CT plant project area – the Rochester Boat Ramp located approximately four miles southeast of the project boundary and the Rockport Boat Ramp located approximately 4.2 miles north-northwest of the project boundary.

Apart from these designated natural and recreational areas, water-based recreation activities on the Green River adjacent to the Paradise Reservation include general pleasure boating, boat fishing, and water sports activities such as water skiing.

The new engine needed to provide the additional natural gas supply to the CTs at Paradise would be constructed at an existing compressor station approximately 18 miles west of the Paradise Reservation. The Vogue Unit of the Peabody WMA, another of the eight individual WMA units, is located southeast adjacent to this existing facility on the opposite side of KY-175. There are no other natural areas, parks, or developed recreation facilities within a 0.5-mile radius of the existing facility.

3.15.1.2 Colbert CT Plant Project Area and Offsite Natural Gas Loop Line

Natural areas, parks, and developed recreation areas within a five-mile radius of the Colbert CT plant project area, which encompasses the location of the offsite gas tie-in, are listed in Table 3-22 and illustrated on Figure 3-10.

Table 3-22. Natural Areas, Parks and Recreation Facilities in a 5-mile Radius of the Colbert CT Plant Project Area

Natural Area or Park	Managing Entity	Use
Alabama Cavefish Critical Habitat	USFWS	Endangered species habitat
Cane Creek Recreation Area and Boat Ramp	Colbert County, AL	Public boat ramp and bank fishing, camping
Coffee Bluff TVA Habitat Protection Area	TVA	Habitat protection
Freedom Hills WMA	ADCNR	Wildlife habitat, small & large game hunting
Key Cave Aquifer Hazard Area	N/A	Aquifer protection/recharge
Key Cave National Wildlife Refuge	USFWS	Endangered species habitat, waterfowl and small game hunting
Pride Landing Boat Ramp	ADCNR	Public boat ramp
Seven Mile Island WMA	ADCNR	Wildlife habitat, small & large game hunting
Tennessee River/Wilson Dam Non-Essential Experimental Population Area	USFWS	Reintroduction of protected species populations

Source: TVA 2020e

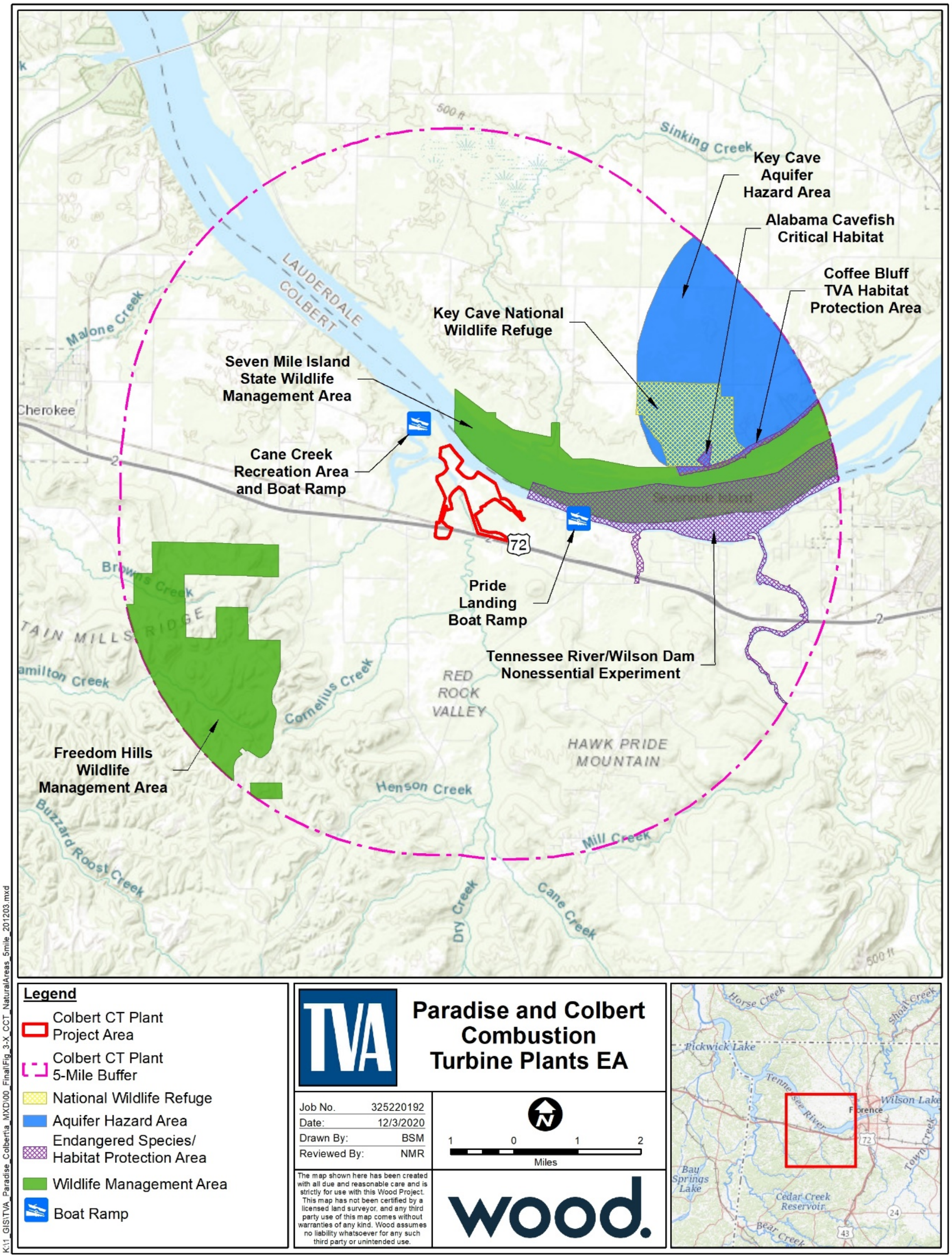

Figure 3-10. Natural Areas, Parks and Recreation Facilities in 5-mile Radius of the Colbert CT Plant Project Area

There are no parks or recreation areas located within the footprint of the Colbert CT plant project area. The Seven Mile Island WMA is located adjacent to the Colbert Reservation, encompassing islands within the Tennessee River and the shoreline opposite the reservation. Comprised of 4,685 acres, the Seven Mile Island WMA is managed by the ADCNR for waterfowl and small game hunting.

The Tennessee River/Wilson Dam Non-Essential Experimental Population Area, located just upstream of the Colbert Reservation, was designated by the USFWS in 2001 for the reintroduction of 16 federally listed mussel species and one aquatic snail species. The designated area consists of the Tennessee River between Wilson Dam and the backwaters of Pickwick Reservoir, and it also extends 5 miles upstream of all tributaries that enter Wilson Dam tailwaters.

The Key Cave Aquifer Hazard Area, located approximately 2.3 miles northeast of the Colbert CT plant project area, consists of approximately 2,300 acres of hardwood forests, croplands, and sinkholes surrounding Key Cave that acts as an aquifer recharge area. The area's sinkholes are an integral component of groundwater recharge to the caves. Within this large area is Key Cave National Wildlife Refuge, managed by USFWS in cooperation with TVA. This refuge consists of 1,047 acres of land and contains designated critical habitat for the federally listed Alabama cavefish. Recreational opportunities on these lands include wildlife observation, hiking, photography, and hunting. Entry into caves for research is by permit only.

Along the southern boundary of the Key Cave Aquifer Hazard Area, and approximately 2.6 miles from the CT plant project area, the Coffee Bluff TVA Habitat Protection Area consists of approximately 250 acres of land along Pickwick Reservoir featuring bluffs, waterfalls, caves, ravines, scenic views, and a variety of plant life and wildlife.

The Freedom Hills WMA is located approximately 2.6 miles southwest of the Colbert CT plant project area and consists of approximately 34,500 acres, managed by the ADCNR for small and large game hunting. The WMA also offers a public shooting and archery range, as well as primitive camping.

In addition to these parks and natural areas, two developed recreation sites are located near the CT plant project area. Cane Creek Recreation Area is situated on the Colbert Reservation property and is located approximately 2,610 feet northwest of the Colbert CT plant project area. This recreation area, developed by TVA and currently managed by Colbert County, includes a boat launching ramp, paved parking lot, and lighting. In addition to boat launching and bank fishing, some dispersed recreational activity such as informal camping occurs on adjacent reservation property. Cane Creek Road provides access to this area. The second recreation facility is Pride Landing Boat Ramp located approximately 0.9 miles upstream CT plant project area. This area includes a paved ramp and is managed by the ADCNR.

Local residents also fish from the bank in the outfall area south of the Colbert switchyard, which is within the boundaries of the Colbert CT plant project area. This area is accessible to the general public, though not advertised as a public recreation area. It is estimated that approximately six to 12 people fish from this bank on average per day and that several of these are repeat visitors (TVA 2016a). In addition, water-based recreation activities on the Tennessee River adjacent to the Colbert Reservation include general pleasure boating, fishing and water sports activities.

3.15.1.3 Offsite TL Upgrades

Upgrades to existing TL segments are proposed in association with the development of both the Paradise and Colbert CT plant project areas. Natural areas, parks, and developed recreation areas intersected by or immediately adjacent to (within 0.5 mile) these existing TL corridors are listed in Table 3-23.

Table 3-23. Natural Areas, Parks and Recreation Facilities in 0.5-mile Radius of Offsite TL Corridors to be Upgraded

Natural Area or Park	Managing Entity	Use	TL Segment	Associated CT Plant
Old Hickory Reservoir Reservation	USACE	Recreation on lake and shoreline property	TL 5823	Paradise
Old Hickory State WMA	TWRA	Wildlife habitat, small and large game hunting	TL 5823	Paradise
Peabody WMA	KDFWR	Wildlife habitat, small & large game hunting	TL 6057	Paradise
Holly Creek Cave Preserve	Southeastern Cave Conservancy	Cave and habitat protection	TL 5617	Colbert
Muscle Shoals National Recreation Trail	TVA	Pedestrian/bike trail	TL 5676	Colbert
Muscle Shoals Reservation	TVA	Recreation, navigation and flood protection	TL 5676	Colbert
Pickwick Landing State Park	TDEC	Recreation on lake and shoreline property	TL 5989	Colbert
River Heritage Park	City of Florence, AL	City park	TL 5676	Colbert
Shoal Creek Nonessential Experimental Population	USFWS	Reintroduction of protected species populations	TL 5617	Colbert
Veterans Park	City of Florence, AL	City park with sports complex	TL 5676	Colbert
Wheeler National Wildlife Refuge	USFWS	Endangered species habitat, hiking, wildlife observation, and hunting	TL 5670	Colbert
Wheeler Reservoir Reservation	TVA	Recreation, navigation and flood protection	TL 5670	Colbert
Wilson Dam Tailwater Restricted Mussel Harvest Area	ADCNR	Freshwater mussel protection	TL 5676	Colbert

Source: TVA 2020e; City of Florence, AL 2020

3.15.2 Environmental Consequences

3.15.2.1 Alternative A – No Action Alternative

Under Alternative A, TVA would not construct the proposed CT plants at the Paradise or Colbert reservations. Therefore, there would be no impacts to natural areas, parks, or recreational resources associated with this alternative.

3.15.2.2 Alternative B – Retirement of Allen CT Units 1-20 and Johnsonville CT Units 1-16 and Construction of CT Units at Paradise and Colbert

Under Alternative B, some of the proposed TL upgrades within the Paradise CT plant project area, including new transmission structures within the proposed re-configured 500-kV TL, would occur within the Baker Bottoms Unit of the Peabody WMA. While construction activities would occur primarily within the existing TL ROW, portions of the WMA closest to construction activities and equipment would experience temporary increases in noise, air emissions, and fugitive dust. However, these impacts would be minimized through the use of standard BMPs, and construction schedules in this area would be coordinated with the KDFWR site manager contact to minimize impacts to hunting activities. In addition, in order to meet buffer requirements along the modified 500-kV TL to the proposed Paradise CT plant, approximately 0.01 acre of additional ROW easement within the WMA is anticipated to be acquired from KDFWR. This easement, which is adjacent to the existing TL ROW corridor within the WMA, would be purchased by TVA, giving them the right to clear the ROW and to construct, operate, and maintain the TL. The fee simple ownership of the land within the ROW would remain with KDFWR, and many activities and land uses, such as wildlife management and hunting, could continue to occur on the property. Due to the short-term nature of construction activities and the minimal amount of new ROW acquisition which would not affect current uses of the property, impacts to the Baker Bottoms Unit of the Peabody WMA would be minor.

Additionally, users of the Paradise Boat Ramp and recreationists on the Green River adjacent to the Paradise CT plant project area may experience increased noise during the approximately 2-year construction period. Increased construction workforce traffic may also have an indirect effect on users of the Sinclair Unit of the Peabody WMA and the Paradise Boat Ramp, both of which are accessed from SR 176. However, these construction impacts would be short term and unlikely to interfere with use or enjoyment of these facilities. As such, impacts would be minor.

The Vogue Unit of the Peabody WMA is located adjacent to the existing offsite compressor station, approximately 500 feet from the proposed location of the new compressor. As construction will be contained within the existing developed station footprint, construction impacts would be limited to temporary increases in noise in the vicinity of the existing compressor station, which may result in a temporary disruption of nearby hunting activities within the WMA. However, as construction impacts would be short-term and localized, and operational noise would be within the current operation of the compressor station, impacts to users of the Peabody WMA would be minor.

Proposed offsite TL upgrades associated with the Paradise CT plant could result in increased noise, fugitive dust, and increased erosion and sedimentation at parks and natural areas crossed by and immediately adjacent to the existing TL ROW corridors (listed in Table 3-23) during the construction period. However, these impacts would be minimized through the implementation of BMPs designed to minimize fugitive dust and manage storm water runoff. Additionally, because of the sequence of construction activities, construction impacts at a given point along the TL would be short term. For these reasons, impacts to natural areas and parks associated with the TL modifications would be temporary and minor.

While there are opportunities for recreational bank fishing in an outfall area located within the Colbert CT plant project area, access to this location would not be hindered during either construction or operation of the CT plant. Users of this site, as well as the nearby Cane Creek Recreation Area and Boat Ramp, the Seven Mile Island WMA, and recreationists on the Tennessee River, may be impacted by increased noise during the construction period. However, these construction impacts would be minor, as they would be short-term and unlikely to interfere with use or enjoyment of these facilities. There are no natural areas, parks, or recreation facilities within a mile of the proposed natural gas lateral tie-in south of the Colbert Reservation, and there would be no impacts at the remaining parks and natural areas in the region due to distance.

Impacts to natural areas, parks, and recreation associated with offsite TL upgrades to support the Colbert CT plant would be the same as those described in association with the Paradise CT plant, and thus would be temporary and minor.

3.16 Noise

3.16.1 Affected Environment

Noise is unwanted or unwelcome sound usually caused by human activity and added to the natural acoustic setting of a locale. It is further defined as sound that disrupts normal activities or diminishes the quality of the environment. Community response to noise is dependent on the intensity of the sound source, its duration, the proximity of noise-sensitive land uses, and the time of day the noise occurs. For instance, higher sensitivities to noise would be expected during the quieter overnight periods at noise sensitive receptors such as residences. Other sensitive receptors include developed sites where frequent human use occurs, such as churches and schools.

Sound is measured in logarithmic units called decibels (dB). Given that the human ear cannot perceive all pitches or frequencies of sound, noise measurements are typically weighted to correspond to the limits of human hearing. This adjusted unit of measure is known as the A-weighted decibel (dBA) which filters out sound in frequencies above and below human hearing. A noise level change of 3 dBA or less is barely perceptible to average human hearing. However, a 5 dBA change in noise level is clearly noticeable. The noise level associated with a 10 dBA change is perceived as being twice as loud; whereas the noise level associated with a 20 dBA change is considered to be four times as loud and would therefore represent a “dramatic change” in loudness.

To account for sound fluctuations, environmental noise is commonly described in terms of the equivalent sound level. The equivalent sound level is the constant noise level that conveys the same noise energy as the actual varying instantaneous sounds over a given period. Fluctuating levels of continuous, background, and/or intermittent noise heard over a specific period are averaged as if they had been a steady sound. The day-night sound level (L_{dn}), expressed in dBA, is the 24-hour average noise level with a 10-dBA correction penalty for the hours between 10 p.m. and 7 a.m. to account for the increased sensitivity of people to noises that occur at night. Typical background day-night noise levels for rural areas are anticipated to range between an L_{dn} of 35 and 50 dB, whereas higher-density residential and urban areas background noise levels range from 43 dB to 72 dB (EPA 1974). Common indoor and outdoor noise levels are listed in Table 3-24.

The perceived loudness or intensity between a noise source and a receptor may change because of distance, topography, vegetation, water bodies, and structures. The closer a receptor is to a noise source the louder the noise seems; for every doubling of distance from a source the intensity drops by about 6 dBA over land and about 5 dBA over water.

Topography, vegetation, and structures can change noise intensity through reflection, absorption, or deflection. Reflection tends to increase the intensity, while absorption and deflection tend to decrease the intensity.

There are no federal, state, or locally established quantitative noise-level regulations specifying environmental noise limits for either the Paradise or Colbert CT project areas or the surrounding areas. However, the EPA noise guideline recommends outdoor noise levels not exceed an L_{dn} of 55 dBA, which is sufficient to protect the public from the effect of broadband environmental noise in typical outdoor and residential areas. These levels are not regulatory goals but are “intentionally conservative to protect the most sensitive portion of the American population” with “an additional margin of safety” (EPA 1974). The U.S. Department of Housing and Urban Development (HUD) considers an L_{dn} of 65 dBA or less to be compatible with residential areas (HUD 1985).

Table 3-24. Common Indoor and Outdoor Noise Levels

Common Outdoor Noises	Sound Pressure Levels (dB)	Common Indoor Noises
	110	Rock Band at 5 m (16.4 ft)
Jet Flyover at 300 m (984.3 ft)		
	100	
		Inside Subway Train (New York)
Gas Lawn Mower at 1 m (3.3 ft)		
	90	
		Food Blender at 1 m (3.3 ft)
Diesel Truck at 15 m (49.2 ft)		Garbage Disposal at 1 m (3.3 ft)
	80	
		Shouting at 1 m (3.3 ft)
Gas Lawn Mower at 30 m (98.4 ft)	70	Vacuum Cleaner at 3 m (9.8 ft)
Commercial Area		Normal Speech at 1 m (3.3 ft)
	60	
		Large Business Office
	50	Dishwasher Next Room
Quiet Urban Daytime		
	40	Small Theater, Large Conference Room
Quiet Urban Nighttime		Library
Quiet Suburban Nighttime		
	30	
		Bedroom at Night
Quiet Rural Nighttime		Concert Hall (Background)
	20	
		Broadcast and Recording Studio
	10	
		Threshold of Hearing
	0	

Source: Arizona DOT 2008

3.16.1.1 Sources of Noise

Primary sources of noise at both the Paradise and Colbert CT project areas are related to the operations of the components of the natural gas plants already in place at these facilities. The existing three-unit CC plant at Paradise and the eight-unit CT plant at Colbert generate localized noise through operation of gas and/or steam turbines, generators, mechanical draft cooling towers, and other ancillary equipment. Historically, coal unloading and operation of the coal-fired fossil plant units were dominant noise-generating activities at both sites. However, both coal-fired fossil plants have been retired and noise emissions have reduced accordingly.

The offsite TL upgrades associated with the proposed CT plants at the Paradise and Colbert reservations traverse a variety of land uses including industrial, commercial, urban, suburban, and rural areas. In general, noise levels are high around airports, industrial facilities, construction areas, and major transportation corridors such as highways and railways. Typical background day/night noise levels for rural areas range between 35 and 50 dB whereas background noise levels for higher-density residential and urban areas range from 43 dB to 72 dB (EPA 1974).

3.16.1.2 Noise Receptors

Sensitive noise receptors include residences or other developed sites where frequent human use occurs, such as churches, parks, and schools. The Paradise CT plant project area is located more than 3 miles from the nearest populated area, the town of Drakesboro, and the closest residences are located more than 1.5 miles from the Paradise CT plant project area. Users of nearby recreational areas, including the Peabody WMA which abuts the reservation to the east and contains the easternmost portion of the Paradise CT plant project area, and the Paradise Boat Ramp, located approximately 775 feet north of the Paradise CT plant project area, are the only sensitive noise receptors located within a one-mile radius.

The area surrounding the Colbert CT plant project area consists predominantly of undeveloped rural properties; however, there are residences to the south, along Old Lee Highway and US 72, as well as to the east of the reservation, along the Tennessee River. Dense forested areas and topography separate these residential areas from the existing CT plant site and the retired fossil plant, blocking the line of site and helping to attenuate noise. Other sensitive noise receptors include users of the Cane Creek Recreation Area and Boat Ramp, located 2,610 feet northwest of the Colbert CT plant site, and the Seven Mile Island State WMA which encompasses the shoreline on the opposite bank of the Tennessee River.

3.16.2 Environmental Consequences

3.16.2.1 Alternative A – No Action Alternative

Under Alternative A, TVA would not construct the proposed CT plants at the Paradise or Colbert reservations. Therefore, there would be no impacts to noise receptors resulting from the proposed action under this alternative and ambient noise levels would remain similar to current conditions.

3.16.2.2 Alternative B – Retirement of Allen CT Units 1-20 and Johnsonville CT Units 1-16 and Construction of CT Units at Paradise and Colbert

Under Alternative B, onsite construction activities for the proposed CT plant at Paradise would result in increased noise levels adjacent to the construction site due to operation of construction equipment onsite and along roadways used by construction-related vehicles. Construction activities would last approximately two years, with work occurring during daytime hours, typically on weekdays but up to seven days a week, or during evening hours, should the schedule need to be accelerated. During the construction phase, noise would be generated by a variety of construction equipment including trucks, truck-mounted augers and drills, excavators, tracked cranes, and bulldozers. Typical noise levels from this construction equipment are expected to be 85 dBA or less at a distance of 50 feet from the construction site (FHWA 2016).

A portion of the proposed re-configured 500-kV TL within the Paradise CT plant project area, would occur within the Peabody WMA. Therefore, users of the WMA could experience noise levels approaching 85 dBA in the immediate vicinity of construction activities. However, construction associated with the TL upgrade would be short-term, and the noise would dissipate at locations within the WMA that are removed from the construction activities. The only other sensitive noise receptor near the Paradise CT plant project area is the Paradise Boat Ramp public access point located approximately 775 feet to the north. Based on straight line noise attenuation, it is estimated that maximum noise levels from construction equipment would attenuate to 61.2 dBA at this recreational site. While this is somewhat higher than the recommended EPA outdoor noise guideline of 55 dBA, construction noise would be temporary and unlikely to interfere with use or enjoyment of this facility. Additionally, noise levels would likely be lower in the field as objects and topography would cause further noise attenuation. Construction noise would be negligible at any residences or other sensitive noise receptors as they are located at distances of more than 1.5 miles.

There is also a potential for indirect noise impacts associated with an increase in traffic related to workforce vehicle traffic. Roadway traffic noise is not usually a serious problem for people who live more than 500 feet from heavily traveled freeways or more than 100 to 200 feet from lightly traveled roads (FHWA 2011). Due to the nature of the decibel scale and the attenuating effects of noise with distance, a doubling of traffic volume would result in an approximately 3 dBA increase in noise level, which would not normally be a perceptible noise increase (FHWA 2011). TVA estimates that the peak workforce needed during the estimated two-year construction period at Paradise would consist of approximately 185 personnel per day. Assuming one person per commuting vehicle, there would be a maximum daily morning inbound traffic volume of approximately 185 vehicles and a daily outbound traffic volume of approximately 185 vehicles each working day. As workforce traffic noise would only occur twice per day as workers are entering and leaving the project site and would result from a relatively low number of personal vehicles dispersed among the surrounding roadways (not near doubling existing traffic volumes), noise impacts from construction workforce traffic at Paradise would be minor.

During operation of the proposed Paradise CT plant, noise levels for each piece of equipment would not exceed 85 dBA at a distance of 3 feet. Based on straight line noise attenuation, it is estimated that noise levels from the CT plant would attenuate to 29.6 dBA at the Paradise Boat Ramp and 17.1 dBA at the Peabody WMA, well under the recommended EPA noise guideline of 55 dBA. As with construction noise, operational noise from the Paradise CT plant would be imperceptible at residences or any other sensitive receptors due to distance.

The new offsite natural gas compressor needed to provide the additional natural gas supply to the CTs at Paradise would be constructed at an existing compressor station approximately 18 miles west of the Paradise Reservation. The results of an acoustical analysis by the commercial supplier indicate that the potential increase in noise levels due to the proposed modifications at the station would be less than 1 dBA greater than existing levels at the nearest sensitive noise receptors, which are located more than a mile from the existing facility. Additionally, the estimated cumulative noise attributable to the station would remain below 55 dBA at these same receptors (Texas Gas Transmission, LLC 2020). Therefore, as operational noise would be not be discernably different than existing levels at the facility, and there are no sensitive noise receptors within a mile of the existing compressor station, noise impacts associated with the construction and operation of the additional offsite natural gas compressor would be negligible.

Proposed TL upgrades associated with the Paradise CT plant would require the use of standard TL maintenance equipment including bulldozers, bucket trucks, boom trucks, forklifts, and helicopters. Use of this equipment may result in a considerable increase over existing background noise levels, especially for those residents and other sensitive receptors located immediately adjacent to the existing ROW. However, construction activities would be limited to daylight hours and would utilize equipment consistent with existing maintenance practices (i.e., line inspection and vegetation maintenance by helicopter). Additionally, because of the sequence of construction activities, construction noise at a given point along the TL would be short term. For these reasons, noise-related impacts of TL modifications would be temporary and minor.

The construction schedule and equipment utilized for the proposed Colbert CT plant would be the same as described for the CTs at Paradise. The closest sensitive noise receptor that could be impacted by onsite construction within the Colbert plant site is a residence located approximately 525 feet south of the boundary, near the potential rail spur improvement area. Based on straight line noise attenuation, it is estimated that noise levels from construction equipment would attenuate to 64.6 dBA or less at this residence, and 61.0 dBA or less at residences located east of the reservation, along the Tennessee River. These maximum noise levels are higher than the recommended EPA noise guideline of 55 dBA, but lower than the HUD recommended guideline of 65 dBA for residential properties. Maximum construction noise levels at nearby recreational sites would range from 50.7 dBA at the Cane Creek Recreation Area and Boat Ramp to 60.7 dBA at the Seven Mile Island WMA. Additionally, like Paradise, noise impacts from construction workforce traffic at Colbert, peaking at approximately 180 personnel, would be minor. Overall, noise impacts from CT plant construction would be temporary and minor.

Like the Paradise CTs, operational noise levels for each piece of equipment at the Colbert CT plant would not exceed 85 dBA at a distance of 3 feet. Based on straight line noise attenuation, it is estimated that maximum noise levels from the CT plant would attenuate to 21.9 dBA at the nearest residence and 31.4 dBA or lower at nearby recreational facilities. As these noise levels are well under the recommended EPA noise guideline of 55 dBA, operational noise impacts would be minor.

The construction of a new natural gas lateral tie into the main distribution pipeline to supply the Colbert CT plant may result in notable but temporary noise increases for nearby receptors during the construction period. There are four residences located within 600 feet of the proposed construction area south of US 72 that would likely experience the greatest impacts. However, these noise impacts would be limited to daylight hours and would be short term in nature. Noise impacts associated with offsite TL upgrades to support the Colbert CT plant would be the same as those described in association with the Paradise CT plant. Therefore, all offsite noise impacts associated with the Colbert CT plant would be temporary and minor.

3.17 Solid and Hazardous Waste

3.17.1 Affected Environment

In general, hazardous materials include substances that, because of their quantity, concentration, or physical, chemical, or infectious characteristics, may present substantial danger to public health or the environment when released into the environment. Hazardous materials are regulated under a variety of federal laws including Occupational Safety and Health Administration (OSHA) standards, Emergency Planning and Community Right to Know Act (EPCRA), the Resource Conservation and Recovery Act (RCRA), the Comprehensive Environmental Response, Compensation and Liability Act of 1980 and the Toxic Substances Control Act.

RCRA regulations define what constitutes a hazardous waste and establishes a “cradle to grave” system for management and disposal of hazardous wastes. Subtitle C of RCRA includes separate, less stringent regulations for certain potentially hazardous wastes. Used oil, for example, is regulated as hazardous waste if it is disposed of, but it is separately regulated if it is recycled. Specific requirements are provided under RCRA for generators, transporters, processors, and burners of used oil that are recycled. Universal wastes are a subset of hazardous wastes that are widely generated. Universal wastes include batteries, lamps and high intensity lights, and mercury thermostats. Universal wastes may be managed in accordance with the RCRA requirements for hazardous wastes or by special, less stringent provisions.

Solid waste consists of a broad range of materials that include refuse, sanitary wastes, contaminated environmental media, scrap metals, nonhazardous wastewater treatment plant sludge, nonhazardous air pollution control wastes, various nonhazardous industrial waste, and other materials (solid, liquid, or contained gaseous substances). Solid waste is regulated by the EPA and RCRA Subtitle D. Each state is required to ensure the federal regulations for solid waste are met and may implement more stringent requirements.

Special waste is a solid waste, other than a hazardous waste, that requires special handling and management to protect public health or the environment. In some states, special wastes may include sludges, bulky wastes, pesticide wastes, industrial wastes, combustion wastes, friable asbestos and certain hazardous wastes exempted from RCRA Subtitle C requirements. Any of these wastes, if generated, would be disposed as required by state and federal regulations.

The most recent Biennial Report available on the EPA RCRA Information website identifies the Paradise Fossil Plant/Combined Cycle Plant as a Large Quantity Generator of hazardous waste and the Colbert Fossil Plant as a Small Quantity Generator of hazardous wastes (EPA 2020b and 2020c). Large quantity generators generate more than 1,000 kilograms of hazardous waste per month, or more than 1 kilogram per month of toxic or acutely toxic hazardous waste. In contrast small quantity generators generate between 100 kilograms and 1,000 kilograms per month of hazardous waste (EPA 2020d). It is anticipated that the designation for the Paradise Fossil Plant will change due to the recent shutdown of Paradise coal-fired Unit 3.

Historically, CCRs were the primary solid waste produced at the coal-fired units at the Paradise and Colbert reservations. However, as these units have been retired, the amount of solid waste generated at the reservations has decreased. The unique solid waste concerns for gas- and oil-fired plants are the byproducts from emission controls. The solid waste produced from these controls is dependent upon the specific control technology implemented and is not anticipated to be considerable (Brown et al. 2017). Other hazardous wastes currently generated at these sites include waste paint, waste paint solvents, paper insulated lead cable, debris from sandblasting and scraping paint chips, solvent rags used to clean equipment, and liquid-filled fuses (TVA 2019b).

Maintenance of the existing TL ROWs and natural gas pipeline ROWs may generate solid waste such as vegetative wastes (limbs, tree trunks, and resulting mulch) and domestic solid waste (trash, refuse). Small amounts of hazardous waste generated during the maintenance of the equipment including waste oils, coolant/anti-freeze, chemical waste from cleaning operations, parts washer liquids, and other waste petroleum products. Use of herbicides would result in waste containers, unused herbicide products, outdated herbicides, and other vegetation control chemicals requiring proper disposal (TVA 2019d).

3.17.2 Environmental Consequences

3.17.2.1 Alternative A – No Action Alternative

Under the Alternative A, TVA would continue to generate solid and hazardous wastes from its current operations. These wastes would be managed in accordance with current TVA procedures and state and federal regulations. Therefore, no impacts to solid waste and hazardous waste generation are anticipated.

3.17.2.2 Alternative B – Retirement of Allen CT Units 1-20 and Johnsonville CT Units 1-16 and Construction of CT Units at Paradise and Colbert

Construction of the CT plant at Paradise would generate non-hazardous solid waste, including concrete, land clearing and stabilizing debris, metals, plastic, wood, packing materials, scrap metals, and non-hazardous used oil and lubricants. All non-hazardous waste from construction activities would be disposed of in accordance with applicable regulations and TVA's procedures, which include recycling where possible.

Construction activities would result in a potential increase in generation of hazardous waste. Various hazardous wastes, such as waste paints, coating and adhesive wastes, and spent solvents, could be produced during construction. These wastes would be temporarily stored in properly managed hazardous waste storage areas onsite. Appropriate spill prevention, containment, and disposal requirements for hazardous wastes would be implemented to protect construction and plant workers, the public, and the environment. A permitted hazardous waste disposal facility would be used for ultimate disposal of the wastes.

Installation of the new combustion engine at the offsite compressor station would occur on a previously developed paved and graveled site. Minor quantities of solid and hazardous waste associated with installation would be handled in accordance with established federal and state regulations. Similarly, given the limited magnitude of the proposed offsite TL upgrades associated with the Paradise CT plant, only minor amounts of solid and hazardous waste would be produced during upgrade activities. Onsite and offsite construction activities associated with the construction of the CT plant at the Colbert Reservation and the offsite TL upgrades would be similar to those described for construction of the CT plant at the Paradise Reservation. Because CT plants produce very small quantities of solid waste during normal operation, the generation of solid and hazardous waste during operations would be similar to the current waste generation rates. Operation of the new engine at the offsite compressor station to support the CT plant at Paradise would require installation of two new aboveground storage tanks for lubricating oil. The commercial gas company and its contractors will implement measures identified in their established Spill Prevention and Response Procedures Plan to prevent and contain accidental spills of any material, and to ensure that inadvertent spills of fuels, lubricants, coolants, or solvents are contained, cleaned up, and disposed of in an appropriate manner. Therefore, operation of the offsite compressor station would not result in releases of hazardous and solid waste. Solid and hazardous wastes generated during construction and operation of the CT plants at Paradise and Colbert would be managed in accordance with established procedures and applicable regulations. Therefore, no significant impacts are anticipated as a result of the solid waste and hazardous waste generation from the Paradise and Colbert CT plant project.

3.18 Socioeconomics and Environmental Justice

3.18.1 Affected Environment

The study areas for socioeconomic and environmental justice analysis are defined as any census block group that falls within a 5-mile radius of the proposed Paradise or Colbert CT plant project areas. The Paradise CT plant study area includes portions of Muhlenberg, Ohio, and Butler counties in western Kentucky. The offsite natural gas compressor would also be located in Muhlenberg County, but outside the designated 5-mile radius. Therefore, demographic data for the single block group encompassing the compressor station is also included in the following analysis. The Colbert CT plant study area, which encompasses the offsite natural gas lateral tie-in south of the reservation, includes portions of Colbert and Lauderdale counties in northwestern Alabama. Comparisons at multiple spatial scales provide a more detailed characterization of populations that may be affected by the proposed actions, including any environmental justice populations (e.g., minority and low-income). Demographic and economic characteristics of populations within the study areas were assessed using the 2014-2018 American Community Survey 5-year estimates provided by the U.S. Census Bureau (USCB) (USCB 2020a).

Two existing TLs would be upgraded to support development of the CT plant at Paradise, while four existing TLs would be upgraded to support CT plant development at Colbert. These six TL segments span Muhlenberg and Todd counties in Kentucky; Montgomery, Sumner, Wilson, Hardin, Wayne, and Lawrence counties in Tennessee; and Lauderdale, Colbert, and Morgan counties in Alabama. Due to the nature of the proposed upgrades, which would be limited to existing TL ROW, demographic data was not assessed along each TL segment at the block group level. However, the presence of minority and low-income populations along the TL segments was assessed using the EPA's EJSCREEN tool, as detailed in Section 3.18.1.3.

3.18.1.1 Demographic and Economic Conditions

Demographic and economic characteristics of the Paradise and Colbert CT plant study areas and of the secondary reference geographies are summarized in Table 3-25.

The block groups that make up the Paradise CT plant study area have a combined resident population of 9,283, which accounts for just 0.2 percent of the total population of the state of Kentucky. The study area is very rural and population centers are limited to the small towns of Drakesboro, Rochester, and Rockport. Since 2010, the study area has experienced a slightly higher growth rate (with a population increase of 3.1 percent) than the overall population changes experienced at the county and state levels. Almost 96 percent of the Paradise study area population is white; correspondingly, minority populations are relatively small. Minority percentages in the study area are generally comparable to those of the surrounding counties and are somewhat lower than those of the state of Kentucky (Table 3-25).

The average median household income in the block groups that make up the Paradise CT plant study area is $42,409, which is in line with the median household income reported for the surrounding counties (ranging from $40,061 to $43,110) but lower than that of the state of Kentucky ($48,392) (Table 3-25). The percentage of the study area population falling below the poverty level (19.1 percent) is also relatively consistent with the comparison geographies, where 17.4 to 20.5 percent of the population lives below the poverty level. The total civilian labor force within the block groups that make up the Paradise CT plant study area is 4,285, with the unemployment rate at 11.1 percent. This unemployment rate is noted to be higher relative to the unemployment rates of Muhlenberg, Ohio, and Butler counties (ranging from 6.0 to 9.1 percent), and the state of Kentucky (6.1 percent) (Table 3-25).

Table 3-25. Demographic and Socioeconomic Characteristics of CT Plant Study Areas and Reference Geographies

	Paradise CT Plant Study Area (Block Groups within 5-Mile Radius)	Muhlenberg County, Kentucky	Ohio County, Kentucky	Butler County, Kentucky	State of Kentucky	Colbert CT Plant Study Area (Block Groups within 5-Mile Radius)	Colbert County, Alabama	Lauderdale County, Alabama	State of Alabama
Population[1,2]									
Population, 2018 estimate	9,283	31,081	24,071	12,745	4,440,204	12,768	54,495	92,585	4,864,680
Population, 2010	9,001	31,499	23,842	12,690	4,339,367	12,647	54,428	92,709	4,779,736
Percent Change 2010-2018	3.1%	-1.3%	1.0%	0.4%	2.3%	1.0%	0.1%	-0.1%	1.8%
Persons under 18 years, 2018	21.7%	20.5%	24.5%	22.3%	22.8%	22.2%	21.3%	20.0%	22.6%
Persons 65 years and over, 2018	16.5%	18.2%	17.7%	17.7%	15.6%	20.2%	19.3%	19.3%	16.1%
Racial Characteristics[1]									
Not Hispanic or Latino									
White alone, 2018 (a)	95.8%	92.1%	94.4%	94.9%	84.8%	85.5%	78.7%	84.8%	65.7%
Black or African American, 2018 (a)	2.2%	4.6%	0.9%	0.3%	7.9%	8.1%	15.7%	9.9%	26.4%
American Indian and Alaska Native, 2018 (a)	0.4%	0.2%	0.0%	0.2%	0.2%	0.2%	0.7%	0.5%	0.5%
Asian, 2018 (a)	0.1%	0.6%	0.3%	0.2%	1.4%	0.6%	0.4%	0.7%	1.3%
Native Hawaiian and Other Pacific Islander, 2018 (a)	0.0%	0.0%	0.0%	0.0%	0.1%	0.2%	0.1%	0.1%	0.0%
Some Other Race alone, 2018 (a)	0.2%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.1%	0.2%
Two or More Races, 2018	1.1%	0.9%	1.0%	1.2%	2.0%	1.6%	1.9%	1.4%	1.7%
Hispanic or Latino, 2018	0.2%	1.5%	3.4%	3.2%	3.6%	3.8%	2.5%	2.6%	4.2%
Income and Employment[1]									
Median household income, 2018	$ 42,409	$ 43,110	$ 42,826	$ 40,061	$ 48,392	$ 49,415	$ 47,558	$ 46,265	$ 48,486
Persons below poverty level, 2018	19.1%	17.4%	20.5%	19.4%	17.9%	15.1%	16.3%	15.2%	17.5%
Persons below low-income threshold, 2018 (b)	45.6%	41.6%	44.1%	45.4%	37.7%	38.0%	36.8%	37.3%	37.8%
Civilian Labor Force, 2018	4,285	12,921	10,594	5,404	2,087,800	5,272	23,833	42,397	2,224,606
Percent Employed, 2018	88.9%	91.1%	90.9%	94.0%	93.9%	90.8%	94.1%	94.7%	93.4%
Percent Unemployed, 2018	11.1%	8.9%	9.1%	6.0%	6.1%	9.2%	5.9%	5.3%	6.6%

(a) Includes persons reporting only one race.

(b) Low-income threshold is defined as two times the poverty level

Sources: [1]USCB 2020a; [2]USCB 2011

The offsite existing compressor station where a compressor would be constructed to provide additional natural gas supply to the CTs at Paradise is located in a rural area of Muhlenberg County, outside the 5-mile study area radius. The block group that encompasses the compressor station has a resident population of 752, though there are no residences within one mile of the compressor station. There is no minority population in this block group, as 100 percent of the population identifies as white. The median household income in the block group is $48,542, which is higher than that of Muhlenberg County and comparable to the state of Kentucky. Only 10.6 percent of the population of the compressor station block group falls below the poverty level, and the unemployment rate (5.6 percent) is somewhat lower than in the county and the state.

The block groups that make up the Colbert CT plant study area are also predominantly rural and have a combined resident population of 12,768, accounting for approximately 0.3 percent of the total population of the state of Alabama. Most residential development is located toward the eastern end of the study area, near the city of Tuscumbia, or along US 72 which runs south of the Colbert Reservation. Since 2010, the study area has experienced a population increase of approximately 1.0 percent, slightly lower than the growth rate of Alabama as a whole (1.8 percent), but greater than that of Colbert and Lauderdale counties, which essentially stayed the same. Approximately 86 percent of the Colbert study area population is white, with Black or African American comprising the largest minority population, followed by Hispanic or Latino. Minority percentages in the study area are generally slightly lower than those of the surrounding counties and the state of Alabama (Table 3-25).

The average median household income in the block groups that make up the Colbert CT plant study area is $49,415, which is slightly higher than the median household income reported for the surrounding counties and the state (ranging from $46,265 to $48,486) (Table 3-25). Correspondingly, the percentage of the study area population falling below the poverty level (15.1 percent) is on the low end of the spectrum when compared to the larger geographies, where 15.2 to 17.5 percent of the population lives below the poverty level. The total civilian labor force within the block groups that make up the Colbert CT plant study area is 5,272, with the unemployment rate at 9.2 percent. This unemployment rate is noted to be higher relative to the unemployment rates of Colbert and Lauderdale counties (5.9 and 5.3 percent, respectively), and the state of Alabama (6.6 percent) (Table 3-25).

3.18.1.2 Community Facilities and Services

Community facilities and services include public or publicly funded facilities such as police protection and other emergency services (ambulance/fire protection), schools, hospitals and other health care facilities, libraries, day care centers, churches, and community centers. To identify facilities and emergency services that could be potentially impacted by proposed project activities, the study area is identified as the service area of various providers, where applicable, or the area within a 5-mile radius of each project boundary.

Based on a review of aerial imagery and online information including the U.S. Geological Survey (USGS) Geographic Names Information System database (USGS 2020a), community facilities and services available within a 5-mile radius of the Paradise CT plant project area include nine churches, 11 cemeteries, two post offices, and an elementary school. The project area is also served by the Drakesboro Fire Department and the Rochester Volunteer Fire Department. No community facilities are located in close proximity (within 0.5 mile) of the Paradise Reservation.

Community facilities and services available within a 5-mile radius of the Colbert CT plant project area include 12 churches and 20 cemeteries. Two of these churches and one cemetery are located within 0.5 mile of the Colbert Reservation. Additional services, including schools, health care facilities, and emergency services, are located at distances slightly greater than 5 miles, in the cities of Cherokee to the west and Tuscumbia to the east.

3.18.1.3 Environmental Justice

On February 11, 1994, President Clinton signed EO 12898 Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations. EO 12898 mandates some federal-executive agencies to consider environmental justice as part of the NEPA. Environmental justice has been defined as the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income (EPA 2018) and ensures that minority and low-income populations do not bear disproportionately high and adverse human health or environmental effects from federal programs, policies, and activities. Although TVA is not one of the agencies subject to this order, TVA routinely considers environmental justice impacts as part of the project decision-making process.

Guidance for addressing environmental justice is provided by the CEQ Environmental Justice Guidance under NEPA (CEQ 1997). The CEQ defines minority as any race and ethnicity, as classified by the USCB, that is: Black or African American; American Indian or Alaska Native; Asian; Native Hawaiian and Other Pacific Islander; some other race (not mentioned above); two or more races; or a race whose ethnicity is Hispanic or Latino (CEQ 1997).

Identification of minority populations requires analysis of individual race and ethnicity classifications as well as comparisons of all minority populations in the region. Minority populations exist if either of the following conditions is met:

- The minority population of the impacted area exceeds 50 percent of the total population.
- The ratio of minority population is meaningfully greater (i.e., greater than or equal to 20 percent) than the minority population percentage in the general population or other appropriate unit of geographic analysis (CEQ 1997).

The nationwide poverty level is determined annually by the USCB and varies by the size of family and number of related children under 18 years of age. The 2019 USCB Poverty Threshold for an individual is an annual income of $13,300, and for a family of four it is an annual household income of $26,370 (USCB 2020b). For the purposes of this assessment, low-income individuals are those whose annual household income is less than two times the poverty level. More encompassing than the base poverty level, this low-income threshold, also used by the EPA in their delineation of low-income populations, is an appropriate measure for environmental justice consideration because current poverty thresholds are often too low to adequately capture the populations adversely affected by low-income levels, especially in high-cost areas (EPA 2017). According to EPA, the effects of income on baseline health and other aspects of susceptibility are not limited to those below the poverty thresholds. For example, populations having an income level from one to two times the poverty level also have worse health overall than those with higher incomes

(Centers for Disease Control and Prevention 2011). A low-income environmental justice population exists if either of the following two conditions is met:

- The low-income population exceeds 50 percent of the total population.
- The ratio of low-income population significantly exceeds (i.e., by greater than or equal to 20 percent) that of the general population or other appropriate geographic areas of analysis.

Based on a preliminary review of the EPA's EJSCREEN tool, the proposed CT plant project areas are not located in areas with high concentrations of environmental justice populations; in particular, minority populations make up relatively small percentages of the total population in each study area. A more detailed evaluation was completed using the 2014-2018 American Community Survey data to identify whether any specific block groups within the vicinity of the proposed CT plant project areas exceed environmental justice thresholds. Figure 3-11 identifies the block groups within the Paradise and Colbert CT plant study areas that meet the specified criteria as environmental justice minority populations or low-income populations.

Total minority populations (i.e., all non-white and Hispanic or Latino racial groups combined) comprise approximately 15 percent of the population of Kentucky and approximately 5 to 8 percent of the population in the three counties encompassing the Paradise CT plant study area. The study area as a whole has a total minority percentage of 4.2 percent, with percentages for individual block groups ranging from 0 to 13.2 percent of the population. Thus, none of the block groups within the Paradise CT plant study area have minority populations that either exceed 50 percent of the total population or significantly exceed the minority percentage of any of the reference geographies. Therefore, they do not meet the criterion for consideration as minority population groups subject to environmental justice considerations.

The percentage of the population of Kentucky living below the low-income threshold is approximately 38 percent, while Muhlenberg, Ohio, and Butler County percentages are slightly higher, ranging from 41.6 to 45.4 percent. Approximately 46 percent of people living within the Paradise CT plant study area are considered low-income, with percentages for individual block groups ranging from 14.7 to 56.9 percent of the population. Three of the Paradise CT plant study area block groups have low-income populations that either exceed 50 percent of the total population or significantly exceed the low-income percentage of one or more of the reference geographies. Figure 3-11 identifies these block groups determined to meet the criterion for consideration as low-income population groups subject to environmental justice considerations.

There are no minority populations in the block group that encompasses the offsite compressor station associated with the Paradise CT plant development, as 100 percent of the population identifies as white. Approximately 25 percent of people living within the block group are considered low income. As this percentage does not exceed 50 percent of the total population and is lower than the low-income percentages of the reference geographies, the compressor station block group does not meet the criterion for consideration as either a minority or low-income population group subject to environmental justice considerations.

Total minority populations comprise approximately 34 percent of the population of Alabama, 21 percent of the population in Colbert County, and 15 percent of the population in

Lauderdale County. The Colbert CT plant study area as a whole has a total minority percentage of 14.5 percent, with percentages for individual block groups ranging from 3.5 to 28.9 percent of the population. As none of the block groups within the Colbert CT plant study area have minority populations that either exceed 50 percent of the total population or significantly exceed the minority percentage of any of the reference geographies, they do not meet the criterion for consideration as minority population groups.

The percentage of the population of Alabama living below the low-income threshold is approximately 38 percent, while both Colbert and Lauderdale counties have low-income percentages of approximately 37 percent. In line with these reference geographies, 48 percent of people living within the Colbert CT plant study area are considered low income, with percentages for individual block groups ranging from 9.4 to 55.7 percent of the population. Just one of the Colbert CT plant study area block groups has a low-income population that either exceeds 50 percent of the total population or significantly exceeds the low-income percentage of one or more of the reference geographies. Figure 3-11 identifies the block group determined to meet the criterion for consideration as a low-income population group.

Based on a review of the EJSCREEN tool, communities encompassing the six offsite TL segments that would be upgraded in association with the Paradise and Colbert CT plants are a mixture of block groups that meet the criteria for consideration as minority and/or low-income populations and those that do not. The TL corridors span both rural and urban/suburban areas. Minority populations tend to be highest in larger cities and population centers, while low-income populations are more evenly dispersed, found in both rural and urban areas.

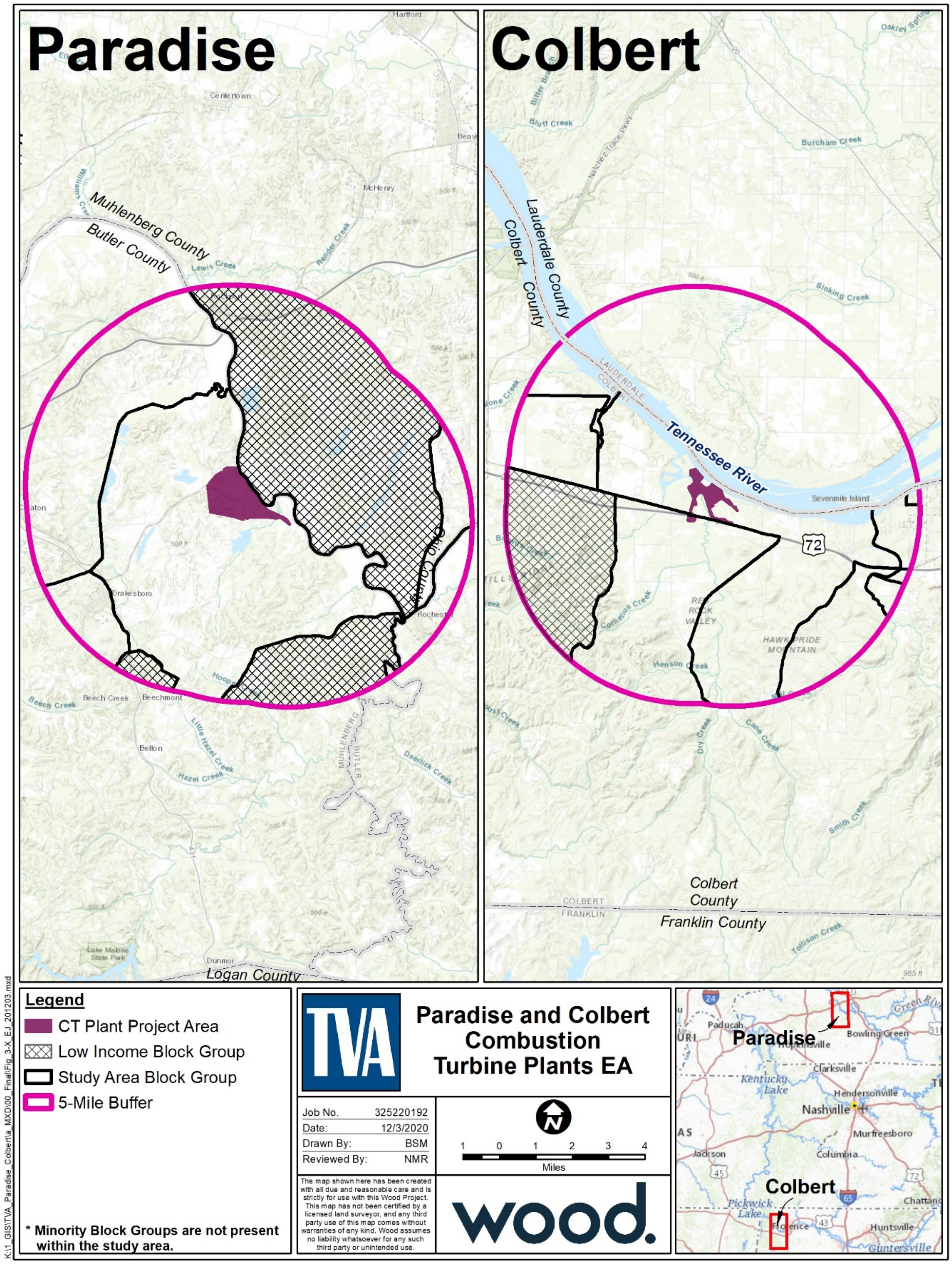

Figure 3-11. Environmental Justice Populations Within the Paradise and Colbert CT Plant Study Areas

3.18.2 Environmental Consequences

3.18.2.1 Alternative A – No Action Alternative

Under Alternative A, TVA would not construct the proposed CT plants at the Paradise or Colbert reservations. Therefore, there would be no change in local demographics, economic conditions, or community services, and there would be no impacts to environmental justice populations associated with the proposed actions.

3.18.2.2 Alternative B – Retirement of Allen CT Units 1-20 and Johnsonville CT Units 1-16 and Construction of CT Units at Paradise and Colbert

3.18.2.2.1 Demographic and Economic Impacts

As described in Chapter 2, construction of the CT plant at Paradise would take approximately two years and would require a temporary workforce of approximately 185 people at the peak of construction. Workers could be drawn from the labor force that currently resides within the surrounding counties and specialty workers and laborers not available within the area would be expected to temporarily relocate or commute to the project area for the duration of the construction period. However, given that the maximum number of workers needed for construction at Paradise would equate to just 7.6 percent of the unemployed civilian workforce in Muhlenberg, Ohio, and Butler counties, it is likely that most of the workers could be drawn from the existing labor force. This, in combination with the short construction timeframe, indicates that construction activities would not result in any permanent population increase in the region.

Construction activities associated with the Paradise CT plant would entail a temporary increase in employment and associated payrolls which would result in a minor short-term direct positive impact to employment in the region. Indirect impacts related to the purchases of materials and supplies, and the multiplier effect of increased spending in the local economy would be beneficial, but minor, given the short construction period.

The proposed upgrades to the offsite compressor station would be minor and would be completed by the existing workforce of the commercial supplier. Therefore, there would be no impacts to local demographics and employment.

Following construction, permanent staffing associated with the operation of the CT plant at Paradise is expected to require four to six personnel. Due to the small number of new staff that would be integrated into the existing workforce, long-term impacts to employment would be minimal.

Onsite construction activities associated with the proposed Colbert CT plant would be similar to those at Paradise, requiring a peak workforce of approximately 180 personnel over the approximately two-year construction period. As the maximum number of workers needed at Colbert would equate to 4.9 percent of the unemployed civilian workforce in Colbert and Lauderdale counties, it is expected that most workers could be drawn from the labor force that currently resides within the surrounding counties. Therefore, impacts to local demographics and employment associated with construction activities would be beneficial and minor. Following construction, operation of the CT plant at Colbert would also require approximately four to six additional personnel, resulting in minimal long-term employment impacts. Temporary economic benefits associated with construction would be the same as those noted for Paradise, as capital costs are estimated to be similar.

In addition, construction of a new offsite natural gas lateral tie into the main distribution pipeline south of the Colbert CT plant site would require the acquisition or amendment of ROW easements from owners of two parcels impacted by the proposed pipeline installation. A commercial supplier would purchase an easement from the landowner, giving the supplier the right to construct, operate, and maintain the pipeline across the property owner's land. Current landowners would be compensated for the value of such rights. Given the relatively minor acquisitions, the direct and indirect local economic effect from the purchase easements would be minor relative to the total regional economy.

Offsite TL modifications, associated with the proposed Paradise CT plant, would entail the use of small mobile crews comprised of contractors and/or full-time TVA staff. Due to the linear nature of the TLs, the construction workforce would be transient as work progresses along the TL segments. There would be no notable effects on local demographics or employment due to the relatively small workforce needed for offsite TL modifications and the short-term presence of work crews in any given location.

3.18.2.2.2 Community Facilities and Services

Direct impacts to community facilities occur when a community facility is displaced or access to the facility is altered. Construction of the proposed CT plants and supporting onsite components at Paradise and Colbert would not result in the displacement of any community facilities nor impede access to the facilities. The natural gas compressor needed to support the CT plant at Paradise would be constructed at an existing compressor station. The offsite natural gas pipeline and lateral tie-in for Colbert would not involve the displacement or alteration of access for any community facilities. Similarly, offsite TL modifications associated with both of the proposed CT plants would take place within the existing ROW corridor and, therefore, there would be no direct impacts to community facilities or services under Alternative B.

Indirect impacts occur when a proposed action or project results in a population increase that would generate greater demands for services and/or affect the delivery of such services. In the event of an emergency at either the Paradise or Colbert CT plant sites, local law enforcement, fire, and/or EMS response would likely be required. However, given the relative magnitude of the proposed CT plants and TVA's adherence to stringent workplace health and safety regulations, implementation of the Alternative B would not result in appreciable increases in emergency incidents and thus would not have a notable impact on the demand for emergency services in the area. As neither the offsite natural gas upgrades associated with each of the proposed plants, nor the TL modifications and maintenance would result in notable impacts to local demographics, increased demands for services such as schools, churches, and healthcare facilities are not anticipated.

3.18.2.2.3 Environmental Justice

As indicated in Figure 3-11, three block groups within the Paradise CT plant study area meet the criteria for consideration as low-income populations under EO 12898, the closest of which is located across the Green River to the northeast. However, onsite actions would be limited to specific activities located within the boundary of the proposed CT plant project area, at distances of 1.5 miles or more from the closest residences. Due to distance, there would be no direct impacts to the surrounding communities or environmental justice populations associated with the construction of the CT plant. Environmental justice communities may experience impacts from noise and dust associated with increased workforce traffic on local roads during the construction period, but this would be temporary and minor as the workforce would disperse at distances further from the reservation. In addition, this impact would not be disproportionate as impacts would be consistent across all communities (i.e., environmental justice and non-environmental justice) along the local roadways.

As described in Section 3.1 (Air Quality), overall air emissions associated with the operation of the CT plant at Paradise would be reduced through the shutdown of Paradise coal-fired Unit 3. thereby enhancing environmental quality for all populations in the vicinity of the proposed CT plant. Air emissions associated with the operation of the CT plant at Colbert would be in compliance with PSD requirements, which ensures there is no significant impact to or deterioration of air quality due to the proposed project. Therefore, operation of the plant would not represent an adverse impact to environmental justice populations.

The new offsite natural gas compressor needed to provide the additional natural gas supply to the CTs at Paradise would be constructed at an existing compressor station approximately 18 miles west of the Paradise Reservation. As operation of the new compressor would be consistent with operation of the existing facility, and there is no residential land use within one mile of the existing compressor station, there would be no impact to local communities or environmental justice populations.

Based on a review of EJSCREEN, communities encompassing the proposed TL upgrades associated with the Paradise CT plant are a mixture of those that meet the criteria for consideration as minority and/or low-income populations, and those that do not. Impacts to communities adjacent to the existing TL ROW may experience temporary impacts such as noise and fugitive dust while modifications are being completed. However, these impacts would be temporary and minor and would not be disproportionate as impacts would be consistent across all communities (i.e., environmental justice and non-environmental justice) along the TL segments.

One block group within the Colbert CT plant study area, identified in Figure 3-11, meets the criteria for consideration as a low-income population. As this block group is located approximately 2 miles east of the CT plant project area, there would be no direct impacts due to distance. Impacts to the low-income population would be limited to minor indirect impacts such as increased workforce traffic on local roads and the potential for employment opportunities, as described above for the Paradise CT plant. Air emissions from operation of the proposed CT plant at Colbert would also be monitored and controlled and are not expected to impact air quality. As such, there would be no disproportionate or adverse environmental hazards to environmental justice populations in the vicinity of the CT plant project area.

The construction of a new natural gas lateral tie-in to the main distribution pipeline, just south of the Colbert Reservation, may also result in localized impacts to nearby residences during the construction period from increased workforce traffic on local roads and noise and dust generated during the construction period. However, this impact would be temporary, minor, and limited to a small number of residences outside the identified low-income block groups.

As a review of EJSCREEN indicated that the communities encompassing the proposed TL upgrades associated with the Colbert CT plant consist of both environmental justice and non-environmental justice populations, impacts associated with offsite TL upgrades would be the same as those described in association with the Paradise CT plant. Therefore, offsite impacts associated with the Colbert CT plant would have no disproportionate adverse impacts on environmental justice populations.

3.19 Public Health and Safety

3.19.1 Affected Environment

Workplace health and safety regulations are designed to eliminate personal injuries and illnesses from occurring in the workplace. These laws may comprise both federal and state statutes. The Occupational Safety and Health Act of 1970 (OSHA) (Title 29 CFR Part 1910) (29 CFR 1910) is the main statute protecting the health and safety of workers in the workplaces. A related statute, 29 CFR 1926, contains health and safety regulations specific to the construction industry. The Kentucky-specific regulations adopted by the Kentucky Occupational Safety and Health (OSH) Standards Board or the Kentucky Labor Cabinet supersede federal OSHA standards. The Kentucky OSH Program, under the statutory authority of KRS Chapter 338 (338.011 to 338.991) and through a state plan approved by the U.S. Department of Labor, OSHA, maintains authority for enforcement, standards promulgation, onsite consultation, and training services related to job safety and health. The official regulations (803 KAR 2:015 through 2:505 (containing both general industry and construction industry) are maintained by the Legislative Research Commission. The state of Alabama does not have a state OSHA plan; however, workers are protected under the federal OSHA. Additionally, the Pipeline Inspection, Protection, Enforcement, and Safety Act of 2006 contains health and safety regulations to confirm the commitment to the Integrity Management Program (IMP) and other programs enacted in the 2002 legislation (Pipeline Safety Improvement Act of 2002) for natural gas pipelines.

TVA has a robust safety conscious culture that is focused on awareness and understanding of workplace hazards, prevention, intervention, and active integration of BMPs to avoid and minimize hazards. General guidelines for workplace safety that are communicated to work crews include the following:

- Pre-Job Brief – allows the worker to think through a job and use that knowledge to make the job as safe as possible
- Two-Minute Rule (situational awareness) – take time before starting a job to familiarize yourself with the work environment and to identify conditions that were not identified during the pre-job brief
- Stop When Unsure – when confronted with a situation that creates a question and what to do is uncertain, stop and get help
- Self-Check – use of “STAR” acronym to promote self-check awareness: Stop and focus, Think what will happen with right or wrong action, Act correctly, Review that the results are as expected
- Procedure Use and Adherence – allows for proper application of procedures and work packages based on expected activities
- Flagging and Operational Barriers – key to ensure control of the work zones and avoidance of exposure to work hazards by public
- Three-Way Communication – essential for all job tasks to ensure they are completed safely and productively.

The routine operations and maintenance activities at the Paradise and Colbert Plants reflect a safety conscious culture and are performed consistent with OSHA and applicable state standards and requirements and specific TVA guidance. TVA's Safety Standard Programs and Processes would be strictly adhered to during the proposed actions. The safety programs and processes are designed to identify actions required for the control of hazards in all activities, operations, and programs. It also establishes responsibilities for implementing OSHA and state requirements.

It is TVA's policy that contractors have a site-specific health and safety plan in place prior to conducting construction activities at TVA properties. The contractor site-specific health and safety plans address the hazards and controls as well as contractor coordination for various construction tasks. A health and safety plan would also be required for workers responsible for operations after construction is complete.

Health hazards are also associated with emissions and discharges from the facility as well as accidental spills/releases at the plant and/or along the pipelines. An emergency response plan developed to address these potential discharges is discussed with local emergency management agencies. These programs are audited by TVA no less than once every three years and by EPA periodically. These mitigative measures are used to ensure protection of human health which includes the workplace, public, and the environment.

Additionally, wastes generated by operations at Paradise and Colbert can pose a health hazard. Wastes including solid wastes, hazardous waste, liquid wastes, discharges, and air emissions are managed in accordance with applicable federal, state, and local laws and regulations and all applicable permit requirements. Furthermore, waste reduction practices are employed including recycling and waste minimization. TVA is committed to complying with all applicable regulations, permitting, and monitoring requirements.

TLs, like all other types of electrical wiring, generate both electric and magnetic fields (EMFs). The voltage on the conductors of a TL generates an electric field that occupies the space between the conductors and other conducting objects such as the ground, TL structures, or vegetation. A magnetic field is generated by the current (i.e., the movement of electrons) in the conductors. The strength of the magnetic field depends on the current, the design of the line, and the distance from the line. Most of this energy is dissipated on the ROW, and the residual very low amount is reduced to background levels near the ROW or energized equipment.

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

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

3.19.2 Environmental Consequences

3.19.2.1 Alternative A – No Action Alternative

Under Alternative A, TVA would continue to apply the safety-conscious culture and activities currently performed in accordance with applicable standards or specific TVA guidance. TVA would continue to address and manage reduction or elimination of occupational hazards through implementation of safety practices, training, and control measures. Through its safety programs, TVA fosters a culture of safety-minded employees, extending to activities which are conducted offsite and, as such, impacts would be minimal.

3.19.2.2 Alternative B – Retirement of Allen CT Units 1-20 and Johnsonville CT Units 1-16 and Construction of CT Units at Paradise and Colbert

Construction and operation of the CT units at the Paradise and Colbert reservations, natural gas supply upgrades, offsite natural gas compressor engine associated with the Paradise CT unit, and TL upgrades would be performed consistent with standards as established by OSHA and state requirements as well as BMPs and TVA safety plans and procedures. During construction, customary industrial safety standards as well as the establishment of appropriate BMPs and job site safety plans would describe how job safety would be maintained during the project. These BMPs and site safety plans address the implementation of procedures to ensure that equipment guards, housekeeping, and personal protective equipment are in place; the establishment of programs and procedures for right-to-know, hearing conservation, equipment operations, excavations, grading, and other activities; the performance of employee safety orientations and regular safety inspections; and the development of a plan of action for the correction of any identified hazards. Construction debris and wastes would be managed in accordance with federal, state, and local requirements.

A commercial gas supplier would be constructing the 20-inch diameter underground natural gas pipeline at Colbert. A portion of the pipeline would be constructed using HDD. Contractors will continuously monitor operations during HDD activities at Colbert. The contractor would have readily available and strategically placed containment equipment to contain inadvertent releases of drilling fluid to waterbodies Further, the inspector(s) would ensure that each individual involved in drilling operations is familiar with the locations of all spill containment equipment and the specific procedures for handling potential drilling fluid releases. Implementation of these measures would ensure that no unusual site safety risks would be expected from construction activities.

The operation of the proposed CT units at both the Paradise and Colbert reservations would adhere to TVA guidance and be consistent with standards established by OSHA and applicable state requirements. TVA would implement health and safety practices that would address and manage the reduction or elimination of occupational and public health hazards. Through its safety programs, TVA fosters a culture of safety-minded employees, extending to activities which are conducted offsite and, as such, impacts would be minimal.

The natural gas pipeline facilities would be designed, constructed, operated, and maintained in accordance with the U.S. Department of Transportation Minimum Federal Safety Standards (49 CFR Part 192). These regulations are intended to ensure adequate protection of the public from natural gas pipeline failures by specifying material selection and qualification, minimum design requirements, and protection from internal, external, and atmospheric corrosion. In addition, these regulations prescribe the minimum standards for operating and maintaining natural gas pipeline facilities. Long-term impacts resulting from a pipeline release during future operations are unlikely, but they would be minimized by adherence to these standards.

Under Alternative B, EMFs would continue to be produced along the length of the offsite TLs. The strength of the fields within and near the ROW varies with the electric load on the line and with the terrain. Nevertheless, EMF strength attenuates rapidly with distance from the line and is usually equal to local ambient levels at the edge of the ROW. Thus, public exposure to EMFs would be minimal and would not change from existing conditions. TVA would also work with property owners to move features located in the TL ROWs, such as sheds or storage buildings, that may interfere with the ability to operate the TL safely. Therefore, worker and public health and safety during project operation would be maintained and impacts would be minimal.

3.20 Cumulative Impacts

The CEQ regulations (40 CFR §§ 1500-1508) implementing the procedural provisions of the NEPA of 1969, as amended (42 USC § 4321 et seq.), define cumulative impact as:

"…the impact on the environment which results from the incremental impact of the action when added to other past, present and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions" (40 CFR § 1508.7)."

This definition of "cumulative impacts" was incorporated in TVA's amended NEPA regulations that became effective on April 27, 2020. A cumulative impact analysis must consider the potential impact on the environment that may result from the incremental impact of a project when added to other past, present, and reasonably foreseeable future actions (40 CFR § 1508.7). Baseline conditions reflect the impacts of past and present actions. The impact analyses summarized in preceding sections are based on baseline conditions and, therefore, incorporate the cumulative impacts of past and present actions.

3.20.1 Geographic Area of Analysis

The appropriate geographic area over which past, present, and future actions could reasonably contribute to cumulative effects is variable and dependent on the resource evaluated. The cumulative impact analysis is based on the resources of potential concern and the geographic area in which potential adverse effects from site-specific activities have the potential to alter (degrade) the quality of the regional environmental resources.

The offsite proposed actions, including TL upgrades and construction of a natural gas compressor, involve temporary short-term construction with small crews of workers at specific sites along each TL corridor and at the existing compressor station. As impacts from these offsite actions are relatively minor, associated cumulative effects would be localized and negligible. Therefore, the appropriate geographic area of analysis is limited to the immediate Paradise and Colbert CT plant project areas and the respective vicinities (5-mile radius for many resources) surrounding them. The proposed CT plants, onsite components, and adjacent gas pipeline upgrades are within Muhlenberg County, Kentucky and Colbert County, Alabama. Therefore, these counties were used to define the geographic area of analysis for cumulative effects on air quality.

3.20.2 Identification of "Other Actions"

Past, present, and reasonably foreseeable future actions that are appropriate for consideration in this cumulative analysis are listed in Table 3-26 for the vicinity of the Paradise CT plant project area and in Table 3-27 for the vicinity of the Colbert CT plant project area. These actions were identified within the geographic areas of analysis as having the potential to, in aggregate, result in larger and potentially adverse impacts to the resources of concern.

Table 3-26. Summary of Past, Present, and Reasonably Foreseeable Future Actions in the Vicinity of the Paradise CT Plant Project Area

Action	Description	Timing and Reasonable Foreseeability
Closure of Units 1 and 2 at Paradise Fossil Plant	TVA closed Units 1 and 2 in April 2017.	Past
Construction and operation of the Paradise CC Plant	CC plant located on the Paradise Reservation that became operational in April 2017 with a generating capacity of 1,100 MW.	Past and Present
Closure of Unit 3 at Paradise Fossil Plant	TVA closed Unit 3 in February 2020.	Past
Closure of Ash Disposal Areas	Described in Paradise Fossil Plant CCR Management Operations EA (TVA 2017a).	Present
Deconstruction of the Paradise Fossil Plant (TVA 2020c)	Demolition and deconstruction of the Paradise Fossil Plant.	Present
Wendell H. Ford Western Kentucky Parkway (WKP) Pavement Work	Pavement improvements to approximately 22 miles of WKP (6 miles within geographic area of analysis) from Rockport to Neafus in Ohio County, Kentucky, scheduled for fiscal year 2021 (Kentucky Transportation Cabinet 2020a).	Reasonably Foreseeable

Table 3-27. Summary of Past, Present, and Reasonably Foreseeable Future Actions in the Vicinity of the Colbert CT Plant Project Area

Action	Description	Timing and Reasonable Foreseeability
Closure of Colbert Fossil Plant	Unit 5 was idled in 2013. Colbert units 1 through 4 were retired in March of 2016, effectively closing the plant.	Past
Ash Impoundment Closure (TVA 2016c)	The 52-acre Ash Impoundment #4 at the Colbert Fossil Plant, which held 3.2 million cubic yards of CCR in the form of Fly Ash and Bottom Ash was closed in March 2018.	Past
Deconstruction of the Colbert Fossil Plant	Demolition and deconstruction of the Colbert Fossil Plant.	Past and Present

Action	Description	Timing and Reasonable Foreseeability
TL Upgrades associated with Colbert CT Plant	TVA has identified additional TL segments that may require uprates or reconductor work as part of the Colbert CT plant project. The specific nature, timing, and location of the work is yet to be determined and will be considered in a future environmental review.	Reasonably Foreseeable
Expansion of Cherokee Industrial Landfill (ADEM 2020)	The Solid Waste Disposal Authority plans to expand the Cherokee Industrial Landfill (located one mile west of Colbert CT plant project area) from 56.35 to 64.44 acres.	Reasonably Foreseeable
Construction of solar farm in Cherokee, Alabama (Business Alabama 2020)	Development of 2,500-acre solar farm approximately three miles from the Colbert CT plant project area in Cherokee, Alabama in 2021.	Reasonably Foreseeable

Actions that are listed as having a timing that is “past” or “present” inherently have environmental impacts that are integrated into the base condition for each of the resources analyzed in this chapter. However, these actions are included in this discussion to provide for a more complete description of their characteristics. Actions that are not reasonably foreseeable are those that are based on mere speculation or conjecture, or those that have only been discussed on a conceptual basis.

3.20.2.1 Past and Present Actions

3.20.2.1.1 Construction and Operation of the Paradise CC Plant

TVA constructed and is operating the Paradise CC plant located on the Paradise Reservation just north of the coal units. The CC facility became operational in April 2017 and is comprised of three combustion turbines, three triple-pressure heat recovery steam generators with supplemental duct-firing, and a steam turbine (TVA 2020b). The plant has a generating capacity of 1,100 MW. Construction of this facility also included construction of a new gas pipeline lateral connecting the plant to an existing gas interstate pipeline that has adequate transportation capacity to supply the plant (TVA 2013).

3.20.2.1.2 Retirement of Paradise Fossil Plant

TVA retired Units 1 and 2 in April 2017 and replaced their generation with the Paradise CC plant mentioned above. Unit 3 ceased operation in February 2020. Virtually all coal unit operational measures were discontinued, and the coal plant is currently subject to basic care and maintenance measures. Primary operational measures that were discontinued include daily coal barge operations, coal pile management, pumping and use of water from the Green River for condenser cooling, and thermal discharges to the Green River. The plant has discontinued the discharge of fly ash and bottom ash to designated wet impoundment areas. Routine plant deliveries have also been discontinued. Employment at the plant has been reduced.

3.20.2.1.3 Retirement of Colbert Fossil Plant

Colbert Fossil Plant originally had five coal-fired generators onsite, Units 1-5. Unit 5 was retired in 2013, and TVA retired the remaining units on March 23, 2016. As a result, virtually all coal unit operational measures were discontinued, and the plant is currently subject to basic care and maintenance measures. TVA has continued operations of the eight frame CT units located at the facility.

3.20.2.1.4 Ash Impoundment Closures at Paradise and Colbert Fossil Plants

The closure of the ash impoundments at the Paradise Fossil Plant, which is currently ongoing, is described in the *Paradise Fossil Plant CCR Management Operations EA* (TVA 2017a) and the *Paradise CCR Management and Process Water Basins Supplemental E*A (TVA 2018). The closure of the impoundment portion of the Colbert Fossil Plant was completed in 2018 and is addressed in TVA's *Ash Impoundment Closure EIS, Part II – Site Specific NEPA Review* (TVA 2016c).

3.20.2.1.5 Colbert Fossil Plant Deconstruction and Demolition

Coal-fired power generation ceased at the Colbert Fossil Plant in March 2016. Decommissioning of the plant is currently ongoing, and the target brownfield restoration is anticipated to be complete by 2023. The environmental impacts of activities associated with decommissioning have been assessed in the *Colbert Fossil Plant Decontamination and Deconstruction EA* (TVA 2016a), which included a detailed cumulative effects assessment as part of the evaluation of alternatives.

3.20.2.1.6 Paradise Fossil Plant Deconstruction and Demolition

Decommissioning of the Paradise Fossil Plant is anticipated to start in March of 2021 and be complete by 2030. Therefore, decomissioning activities would be concurrent with the construction activities associated with the Paradise CT plant analyzed in this EA. The demolition of the barge loop is scheduled to be complete by July 2021, which would allow for site preparation work for the 500-kV TL switchyard associated with the Paradise CT plant to begin shortly after. The environmental impacts of activities associated with decommissioning of the Paradise Fossil Plant are being assessed in an ongoing environmental review that includes a detailed cumulative effects assessment as part of the evaluation of alternatives, including the effects of this project.

3.20.2.2 Reasonably Foreseeable Future Actions

3.20.2.2.1 TVA TL Upgrades Required Subsequent to CT Plant Construction

TVA has identified additional TLs (or TL segments) for future uprates or reconductor work to facilitate the Colbert CT plant project. Upgrades would be performed to increase the electrical capacity of the existing TLs and may include the following: moving features that interfere with clearance, replacing and/or modifying existing structures, installing intermediate structures, modifying, or replacing some of the existing conductor in order to increase ground clearance, adding fill rock or dirt (surcharge) around the base of existing structures, and working with the local power companies to modify their lines. The specific nature, timing, and location of the work is yet to be determined and will be considered in a future environmental review, which will include an evaluation of cumulative impacts associated with these actions; however, these upgrades would occur in existing ROW and involve minimal impact to natural resources or surrounding uses.

3.20.2.2.2 Wendell H. Ford WKP Pavement Improvements

Pavement improvements to approximately 22 miles of WKP in both directions from Rockport to Neafus in Ohio County, Kentucky (milepoint 65.68 to milepoint 83.3). Approximately 6 miles of the WKP improvements project that is near Rockport northwest of the Paradise CT plant project area would fall within a 5-mile radius of the project. The improvements are scheduled to begin in fiscal year 2021 (Kentucky Transportation Cabinet 2020a). This project is expected to be completely within previously disturbed areas and would not result in any notable resource impacts.

3.20.2.2.3 Expansion of Cherokee Industrial Landfill

The Solid Waste Disposal Authority of the cities of Muscle Shoals, Sheffield, and Tuscumbia, Alabama purchased the Cherokee Industrial Landfill and adjoining acreage in Barton, Alabama, located near the Barton Riverfront Industrial Park on Cane Creek Road approximately one mile west of the Colbert CT plant project area, and provisions are in place to allow for future expansion of the landfill. The Solid Waste Disposal Authority will issue approximately $14 million in revenue bonds and $4 million in taxable bonds to finance the purchase, and future development of additional cells. The Authority submitted to the ADEM an application to renew and modify the industrial waste landfill permit for the landfill. The proposed permit modification expands the waste disposal area from 56.35 to 64.44 acres (ADEM 2020). The permit indicates the project would not impact wetlands, threatened and endangered species, or cultural resources.

3.20.2.2.4 Construction of Solar Farm in Cherokee, Alabama

TVA partnered with Longroad Energy to build the largest solar farm in Alabama. Construction is currently underway and should be complete by mid-2021 (Allen Media Broadcasting 2020). Longroad Energy is the developer of the project and Orsted is the current owner. The solar farm would be located approximately three miles northwest of the Colbert CT plant project area on almost 2,500 acres of land off of Mulberry Lane in Cherokee, Alabama. TVA agreed to build associated TL updates and a switching substation that would be constructed and operated by TVA. Construction workforce may include 300 people and is expected to bring $1 million in sales tax revenue for Colbert County (Business Alabama 2020). TVA prepared an environmental assessment for this project which resulted in a FONSI.

3.20.3 Analysis of Cumulative Effects

To address cumulative impacts, the existing affected environment surrounding the project area was considered in conjunction with the environmental impacts presented in Chapter 3 and the potential resource impacts from the past, present, and reasonably foreseeable future actions. These combined impacts are defined by the CEQ as “cumulative” in 40 CFR Section 1508.7 and may include individually minor, but collectively significant actions taking place over a period of time.

TVA evaluated a full range of environmental resource issues associated with Alternative B for inclusion in the cumulative impacts analysis. The proposed actions identified under Alternative B would occur mostly on land that was previously disturbed and is used for industrial purposes. The landscapes surrounding the existing Paradise and Colbert reservations are already subject to environmental stressors associated with industrial operations and previous disturbances of the sites. Consequently, as has been described in prior subsections of this EA, the existing quality of environmental resources potentially directly or indirectly affected by project activities is generally low.

The cumulative impact analysis must consider the potential impact on the environment that may result from the incremental impact of a project when added to other past, present, and reasonably foreseeable future actions. This cumulative impact analysis is limited to those resource issues potentially adversely affected by project activities. Accordingly, land use and prime farmland; air quality; climate change; geology and soils; groundwater; floodplains; wildlife; vegetation; natural areas, parks, and recreation; visual resources; cultural resources; socioeconomics; environmental justice communities, noise; hazardous materials and solid and hazardous waste; and public health and safety are not included in this analysis as these resources are either not adversely affected, or the effects are considered to be temporary, negligible or beneficial. In addition, the analyses summarized in preceding sections showed that the proposed action would result in only minor adverse impacts to undisturbed or sensitive resources including surface water; aquatic ecology; wetlands; and threatened and endangered species. Therefore, impacts from the Paradise and Colbert CT project in combination with the “other actions” described above would not result in incrementally greater cumulative effects to these resources.

Overall, cumulative impacts associated with Alternative B would be negligible. Cumulative transportation impacts are discussed further below and would be localized and short term.

3.20.3.1 Transportation

The potential for cumulative effects to transportation from the proposed action and other identified actions would be related to the construction phase of these actions. Traffic generated by these actions would consist of construction workforce and goods and equipment transport to construction sites. The reasonably foreseeable future actions at and near Paradise including demolition and deconstruction of the Paradise Fossil Plant combined with the CT plant construction would contribute to additional traffic volumes on area roads in the vicinity of the Paradise Reservation including SR 176, CR 1008, and Riverside Road. Additional traffic may cause some traffic delays. In addition, workers commuting to the sites from outside the project area may experience delays due to the WKP pavement improvement project.

The reasonably foreseeable future actions near Colbert including the demolition and deconstruction of the Colbert Fossil Plant, expansion of the Cherokee Industrial Landfill, and construction of a large solar farm near the Colbert Reservation, as well as additional TL upgrades for the CT plant, would contribute to additional traffic volumes on the US 72 and Steam Plant Road, which could lead to congestion or delays at intersections near Colbert.

TVA would mitigate congestion or delays near the project sites by implementing appropriate traffic controls, as needed by staging of trucks, spacing logistics, staggering work shifts, or timing truck traffic to occur during lighter traffic hours. With implementation of these mitigation measures, cumulative impacts of the proposed actions to transportation are expected to be minor.

3.21 Unavoidable Adverse Impacts

Unavoidable adverse impacts are the effects of the proposed action on natural and human resources that would remain after mitigation measures or BMPs have been applied. Mitigation measures and BMPs are typically implemented to reduce a potential impact to a level that would be below the threshold of significance as defined by the CEQ and the courts. Impacts associated with the construction and operation of the proposed CT plants at Paradise and Colbert and the associated offsite natural gas and TL upgrades have the potential to cause unavoidable adverse effects to several natural and human environmental resources. TVA has reduced the potential for adverse effects during the planning process. In addition, TVA would implement mitigation measures (Section 2.7) to further reduce potential adverse effects to certain environmental resources.

Construction of the proposed CT plants and associated offsite natural gas and TL upgrades would require the permanent conversion of approximately 9.5 acres of forest vegetation for the Paradise CT plant and approximately 5 acres of forest vegetation for the Colbert CT plant to herbaceous vegetation or to unvegetated, developed areas. Additionally, some low-quality herbaceous vegetation would be permanently converted to developed land. These habitat alterations would result in impacts to localized species composition and wildlife habitat for the lands immediately affected. However, due to the abundant habitat of similar quality within the vicinity of the project sites, the overall impact to vegetation and wildlife is considered minor.

Approximately 8.7 acres of potentially suitable summer roosting habitat for Indiana bat and northern long-eared bat could be removed at Paradise and approximately 0.5 acres of potentially suitable summer roosting habitat for Indiana bat and northern long-eared bat could be removed at Colbert. These activities were addressed in TVA's programmatic consultation with the USFWS on routine actions and federally listed bats in accordance with ESA Section 7(a)(2) and completed in April 2018. For those activities with potential to affect bats, TVA committed to implementing specific conservation measures. Due to the application of identified conservation measures, TVA has determined that proposed actions are not likely to significantly impact the Indiana bat, or northern long-eared bat.

Two active osprey nests were documented on the Paradise CT plant project area, two active osprey nests were documented on the Colbert CT plant project area, and one additional nest was observed on an offsite TL structure with proposed upgrades on TL 5676 during field reviews in August and September 2020. All observed osprey nests were within 660 feet of construction activities. If the timing of proposed actions within 660 feet of these nests cannot be modified to avoid nesting seasons, coordination with the USDA Wildlife Services would be required to ensure compliance under the EO 13186.

The construction of the proposed CT plants and associated offsite natural gas and TL upgrades would also result in potential minor effects to surface water and wetland resources. These impacts would be mitigated through adherence to permit requirements and the provision of appropriate compensatory mitigative measures, if needed. Temporary impacts to water quality from runoff during construction, as well as ongoing vegetation maintenance along the TLs, could impact nearby receiving water bodies but would be reduced with application of appropriate BMPs.

Although the Paradise CT will not require a PSD evaluation it must meet the requirements and limits provided in KDAQ and federal regulations. The Paradise plant site currently operates under a Title V operating permit, which will require a significant modification for the proposed project. For the Colbert CT plant, TVA has begun the process of complying with PSD requirements with the submission of Class I and Class II modeling protocols to ADEM in August 2020. If the results from the PSD analysis are accepted, ADEM will issue a construction permit, which allows initial unit operations for approximately one year. The terms of the construction permit will be rolled into the existing Colbert Title V operating permit via a Title V permit modification. As both plants would operate within the parameters of the respective Title V permits, the overall unavoidable emissions adverse impacts to air quality would be minor. Unavoidable localized increases in air and noise emissions would also occur during construction activities. Activities associated with the use of construction equipment may result in varying amounts of dust, air emissions, and noise that may potentially impact onsite workers, users of adjacent recreational lands and water bodies, and residents located near the offsite TL segments and natural gas tie-in. Potential noise impacts also include traffic noise associated with the construction workforce traveling to and from the site. Emissions from construction activities and equipment are minimized through implementation of BMPs including proper maintenance of construction equipment and vehicles.

Additionally, there would be unavoidable adverse impacts to floodplains in association with the installation of buried natural gas pipeline at the Colbert CT plant. However, these impacts would be minor and limited to the duration of construction activities.

In the context of the availability of regional resources that are similar to those unavoidably adversely affected by the project, coupled with the application of appropriate BMPs and adherence to permit requirements, unavoidable adverse effects would be minor.

3.22 Relationship of Short-Term Uses to Long-Term Productivity

NEPA requires a discussion of the relationship between short-term uses of the environment and the maintenance and enhancement of long-term productivity. This EA focuses on the analyses of environmental impacts associated with the construction and operation of the proposed CT plants at Paradise and Colbert, as well as associated offsite natural gas and TL upgrades. These activities are considered short-term uses of the environment for the purposes of this section. In contrast, the long-term productivity is considered to be that which occurs beyond the conclusion of decommissioning the CT plants and associated infrastructure. This section includes an evaluation of the extent that the short-term uses preclude any options for future long-term use of the project sites.

Construction of the CT plants and associated offsite natural gas and TL upgrades would cause a minor, short-term deterioration in existing air quality during construction. These impacts would be mitigated through implementation of mitigative measures to reduce emissions from construction phase equipment and minimize emissions of fugitive dust. Operational impacts to air quality would be minor because appropriate emission controls are included within the CT plant infrastructure to allow the plants to operate under their respective Title V permit conditions. Similarly, operational impacts to climate change would be minor and would not affect regional or national GHG emissions. Therefore, there would be no effect on the enhancement of long-term productivity related to air quality or climate change following decommissioning.

The acreage disturbed during construction of the CT plants is larger than that required for the actual permanent structures and other ancillary facilities necessary once the site is operational because of the need for laydown, warehouse, and temporary use areas. Preparation of these onsite areas coupled with noise from construction activities may displace some wildlife and alter existing vegetation. Once the new facilities are completed, the areas not needed for operations would be expected to be returned to pre-existing conditions. Likewise, areas within the existing TL corridors disturbed by construction would return to existing conditions following the completion of upgrade activities. Additionally, following decommissioning of CT plants, TLs and supporting infrastructure, lands would be available for redevelopment thereby maintaining long term productivity of the site.

The principal change in short-term use of the project area would be the loss of vegetation within the areas impacted by operation of the CT plant facilities. The Paradise and Colbert plant sites have been developed for heavy industrial use; they are not currently used for agriculture and only support fragmented areas of woody vegetation. Therefore, there would be no losses to agricultural activities or large-scale timber production. Additionally, because the vicinity of the project area includes similar vegetation and habitat types, the short-term disturbance to support CT plant operations is not expected to significantly alter long-term productivity of wildlife, agriculture, or other natural resources.

Construction of the Paradise and Colbert CT plants, including the offsite upgrades to natural gas and TL infrastructure, would reduce the long-term productivity of the land for other purposes while these facilities are in operation. However, after decommissioning, the lands could be reused and made available for other uses.

3.23 Irreversible and Irretrievable Commitments of Resources

The term “irreversible commitments of resources” describes environmental resources that are potentially changed by the construction or operation of the proposed projects that could not be restored to their prior state by practical means at some later time. Irreversible commitments generally occur to nonrenewable resources such as minerals or cultural resources and to those resources that are renewable only over long timespans, such as soil productivity. A resource commitment is considered irretrievable when the use or consumption is neither renewable nor recoverable for use until reclamation is successfully applied. Irretrievable commitments generally apply to the loss of production, harvest, or other natural resources and are not necessarily irreversible. For example, the construction of a road through a forest would be an irretrievable commitment of the productivity of timber within the road ROW as long as the road remains. Mining of ore is an irreversible commitment of a resource; once the ore is removed and used, it cannot be restored.

The land used for the proposed CT plants and associated infrastructure is not irreversibly committed because once the plants cease operations and the facilities are decommissioned, the land supporting the facilities could be returned to other industrial or nonindustrial uses. The ROW used for the natural gas pipeline and TLs would constitute an irretrievable commitment of onsite resources, such as wildlife habitat and forest resources, for the length of time the pipeline and TLs are in place. However, the approximate previous land use and land cover could be returned upon retirement of these facilities. In the interim, compatible uses of the ROW could continue.

Resources required by construction activities, including labor, fossil fuels and construction materials, would be irretrievably lost through the use of gasoline and diesel-powered equipment during construction. In addition, operation of the CT plants would result in the irretrievable loss of natural gas which would be used to fuel the CTs. In addition, the materials used for the construction of the proposed site would be committed for the life of the facilities. However, these fossil fuels and building materials are not in short supply and their use would not have an adverse effect upon continued availability of these resources.

CHAPTER 4 – LIST OF PREPARERS

4.1 NEPA Project Management

Name:	**Ashley Pilakowski**
Education:	B.S., Environmental Management
Project Role:	TVA Project Manager, TVA NEPA Coordinator, NEPA Compliance
Experience:	9 years in environmental planning and policy and NEPA compliance

Name:	**Emily Willard**
Education:	B.S., Environmental Science
Project Role:	Project Coordination
Experience:	15 years in Environmental Compliance; Preparation of Environmental Review Documents

Name:	**Bill Elzinga**
Education:	M.S. and B.S., Biology
Project Role:	Technical Resource Manager
Experience:	35 years of experience managing and performing NEPA analyses for electric utility industry, and state/federal agencies; ESA compliance; CWA evaluations

Name:	**Karen Boulware**
Education:	M.S., Resource Planning and B.S., Geology
Project Role:	Wood Project Manager. Chapters 1 and 2; Geology and Soils; Groundwater; Solid and Hazardous Waste
Experience	26 years of professional experience in NEPA.

4.2 Other Contributors

TENNESSEE VALLEY AUTHORITY

Name:	**Steve Cole**
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Project Role:	Cultural Resources
Experience:	32 years in Archaeology and Cultural Resources Management

Name:	**Adam Dattilo**
Education:	M.S., Forestry
Project Role:	Vegetation; Threatened and Endangered Plants
Experience:	10 years botany, restoration ecology, threatened and endangered plant monitoring/surveys, invasive species control, as well as NEPA and ESA compliance

Name:	**Elizabeth B. Hamrick**
Education:	M.S., Wildlife and Fisheries Science and B.A. Biology

Project Role:	Terrestrial Ecology (Animals), Terrestrial Threatened and Endangered Species
Experience:	17 years conducting field biology, 12 years technical writing, 8 years compliance with NEPA and ESA
Name:	**Kim Pesenko**
Education:	B.S., Civil Engineering
Project Role:	Air Quality and Climate Change
Experience:	28 years of professional experience in environmental compliance and air quality
Name:	**Craig Phillips**
Education:	M.S. and B.S., Wildlife and Fisheries Science
Project Role:	Aquatic Ecology and Threatened and Endangered Species
Experience:	7 years sampling and hydrologic determination for streams and wet-weather conveyances; 5 years in environmental reviews.
Name:	**Connie Heitz**
Education:	M.P.A. Environmental and Natural Resource Management, B.S. Public Affairs
Project Role:	Wood Deputy Project Manager, Technical Review, Transportation; Solid and Hazardous Waste, Public Health and Safety
Experience:	27 years in environmental and land use planning
Name:	**Matt Basler**
Education:	M.S., Fisheries Science/Management and B.S., Wildlife and Fisheries
Project Role:	Aquatic Resources; Threatened and Endangered Species and Wildlife Resources Review
Experience:	Expertise in fisheries and wildlife science (population studies/surveys, habitat measurements and improvement, stream and wetland delineation, fisheries management, lake renovation, aquatic vegetation sampling and identification).
Name:	**Richard Bennett, PE, PTOE**
Education:	B.S., Civil Engineering
Project Role:	Transportation
Experience:	31 years of experience in transportation and traffic engineering
Name:	**Mary Motte Fikri**
Education:	M.S., Forest Resources and B.S., Natural Resources
Project Role:	Wetlands and Waters of the U.S.
Experience:	22 years of experience in wetlands and natural resources
Name:	**Forrest Scott Glover**
Education:	B.S., Plant and Soil Science and M.S., Biosystems Engineering Technology
Project Role:	Waters of the U.S. Delineations and Reports

Experience:	16 years of experience in wetland delineation and stream determination
Name:	**Natalie Kleikamp**
Education:	B.A., Biology
Project Role:	Natural Areas, Parks and Recreation; Socioeconomics and Environmental Justice; Noise; and Visual Resources
Experience:	6 years of experience in NEPA analysis and documentation
Name:	**Chris Mausert-Mooney**
Education:	B.S., Biology (M.S. in progress)
Project Role:	Vegetation
Experience:	9 years of experience in ecological and botanical investigations
Name:	**Stephanie Miller**
Education:	M.S., Biology and B.S., Marine Biology
Project Role:	Surface Waters; Wetlands; Threatened and Endangered Species; Aquatic Ecology; and Wildlife reviews
Experience:	9 years of experience in aquatic and terrestrial ecology
Name:	**Rebecca Porath**
Education:	M.S. and B.S., Wildlife and Fisheries Sciences
Project Role:	Cumulative Effects; Threatened and Endangered Species; Aquatic Ecology; and Wildlife reviews; technical editing and document management
Experience:	22 years of experience in NEPA analysis and documentation, ecological studies, and preparation of technical documents
Name:	**Stan Rudzinski**
Education:	B.S., Wildlife Management, M.S. biology
Project Role:	Wetland delineation and habitat surveys
Experience:	27 years of experience in wetland and biological investigations
Name:	**A. Chevales Williams**
Education:	B.S. Environmental Chemical Engineering
Project Role:	Surface Waters
Experience:	16 years of experience in water quality monitoring and compliance; 13 years in NEPA planning and environmental services
Name:	**Carrie Williamson, P.E., CFM**
Education:	B.S. and M.S., Civil Engineering
Project Role:	Floodplains
Experience:	7 years Floodplains, 3 years River Forecasting, 2 years NEPA Specialist, 7 years compliance monitoring.

CHAPTER 5 – ENVIRONMENTAL ASSESSMENT RECIPIENTS

5.1 Federal Agencies

U.S. Army Corps of Engineers
U.S. Fish and Wildlife Service

5.2 Federally Recognized Tribes

Absentee Shawnee Tribe of Oklahoma
Alabama-Coushatta Tribe of Texas
Alabama-Quassarte Tribal Town
Cherokee Nation
The Chickasaw Nation
Eastern Band of Cherokee Indians
Eastern Shawnee Tribe of Oklahoma
Kialegee Tribal Town
Muscogee (Creek) Nation
Poarch Band of Creek Indians
Seminole Tribe of Florida
Seminole Nation of Oklahoma
Shawnee Tribe
Thlopthlocco Tribal Town
United Keetoowah Band of Cherokee Indians in Oklahoma

5.3 State Agencies

Alabama Department of Agriculture and Industries
Alabama Department of Conservation and Natural Resources
Alabama Department of Economic and Community Affairs
Alabama Department of Environmental Management
Alabama Department of Transportation
Alabama Forestry Commission
Alabama Historical Commission
Alabama State Historic Preservation Officer
Kentucky State Clearinghouse
Kentucky State Historic Preservation Officer
Tennessee Department of Agriculture
Tennessee Department of Environment and Conservation
Tennessee State Historic Preservation Officer
Tennessee Wildlife Resources Agency

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_____. 2020f. Waters of the US Delineation Report (draft), Tennessee Valley Authority TL 5670, issued by Wood Environment & Infrastructure Solutions, Inc., October 2020.

_____. 2020g. Waters of the US Delineation Report (draft), Tennessee Valley Authority TL 5989, issued by Wood Environment & Infrastructure Solutions, Inc., October 2020.

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Appendix A – Figures A-1 to A-20: Water Resources Within Offsite Transmission Line Upgrade Areas

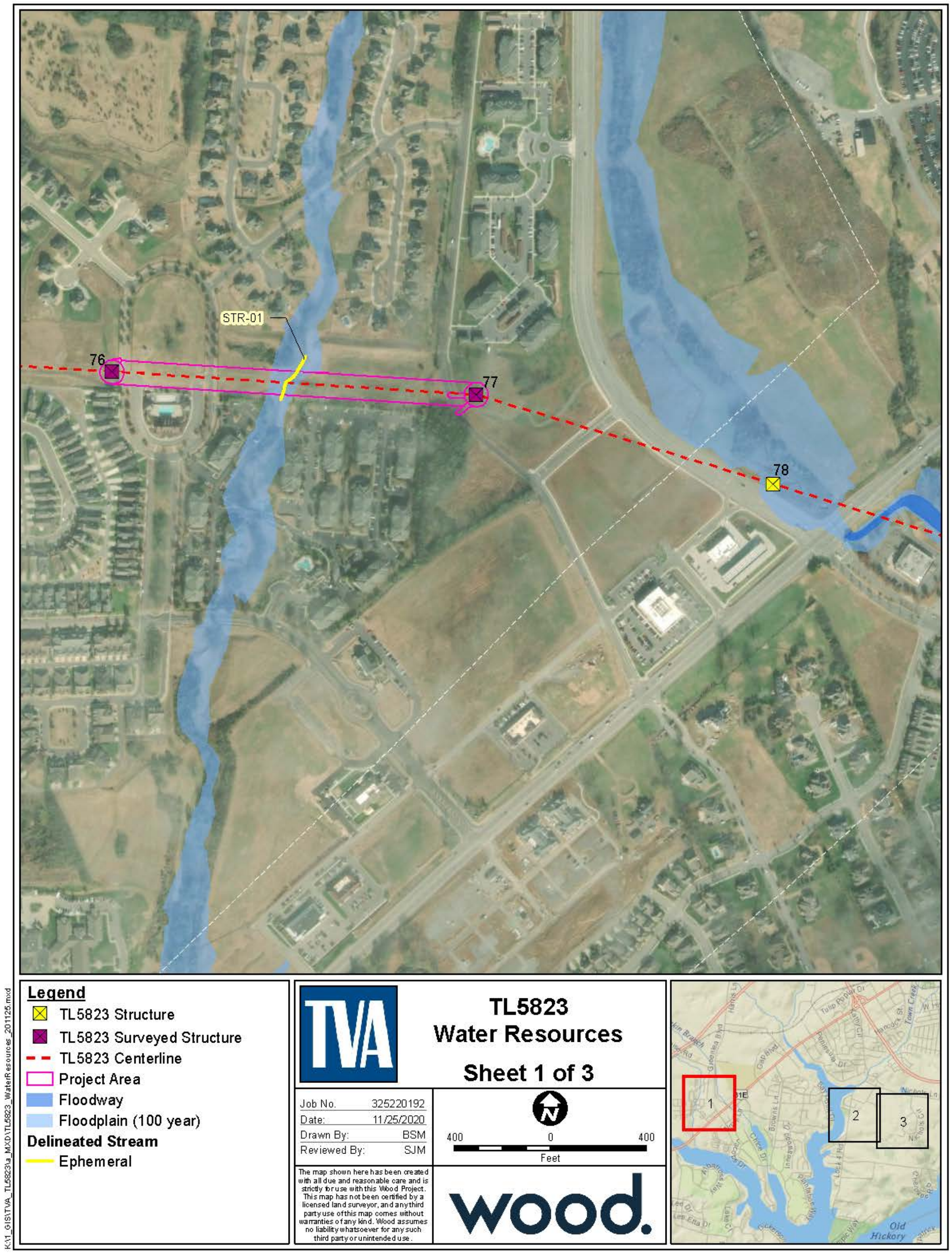

Figure A-1. Water Resources within TL5823

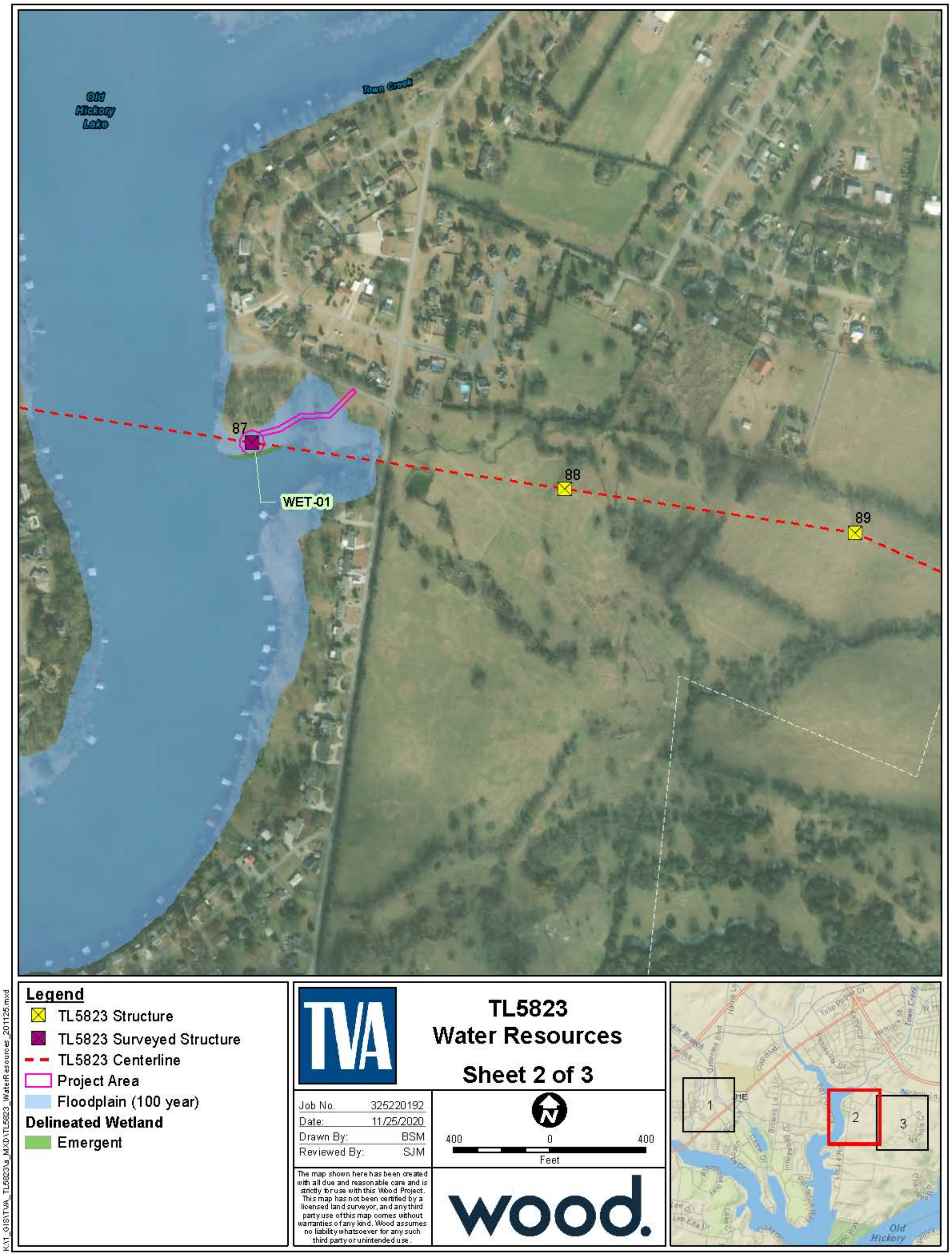

Figure A-2. Water Resources within TL5823

Legend

- TL5823 Structure
- TL5823 Surveyed Structure
- TL5823 Centerline
- Project Area

Delineated Stream

- Intermittent

TVA

TL5823
Water Resources

Sheet 3 of 3

Job No.	325220192
Date:	11/25/2020
Drawn By:	BSM
Reviewed By:	SJM

400 0 400
Feet

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wood.

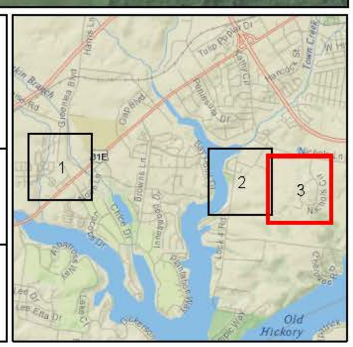

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Figure A-3. Water Resources within TL5823

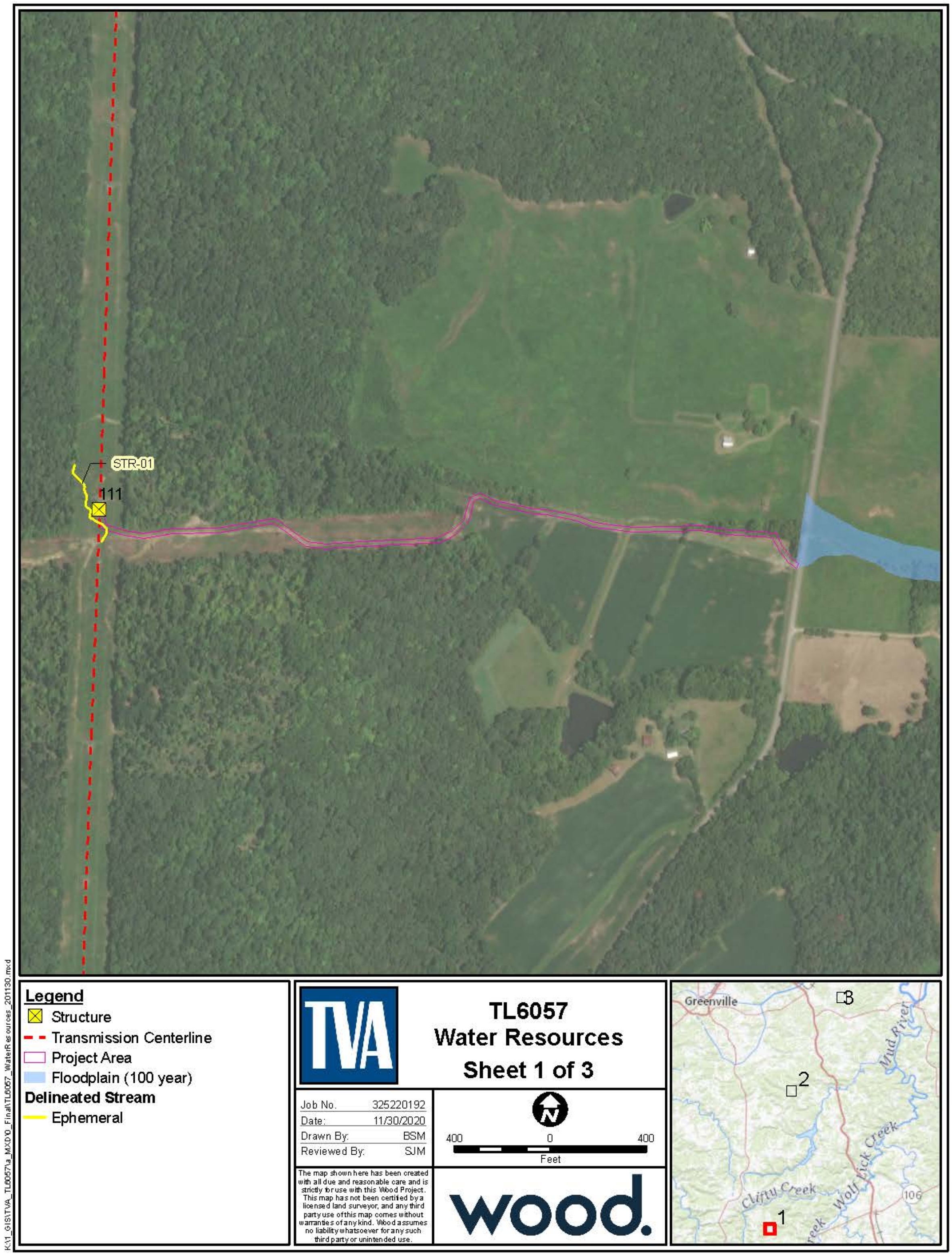

Figure A-4. Water Resources within TL6057

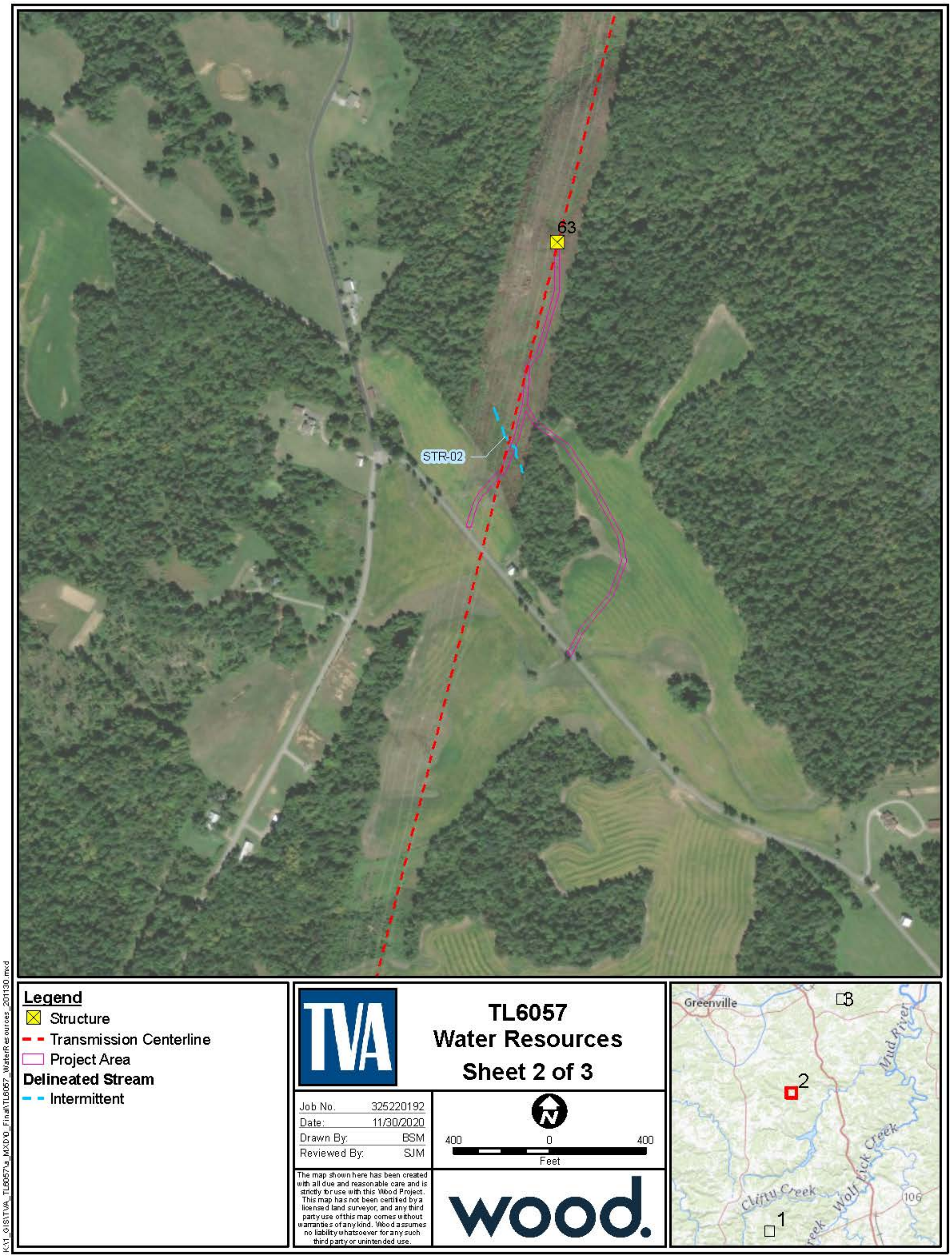

Figure A-5. Water Resources within TL6057

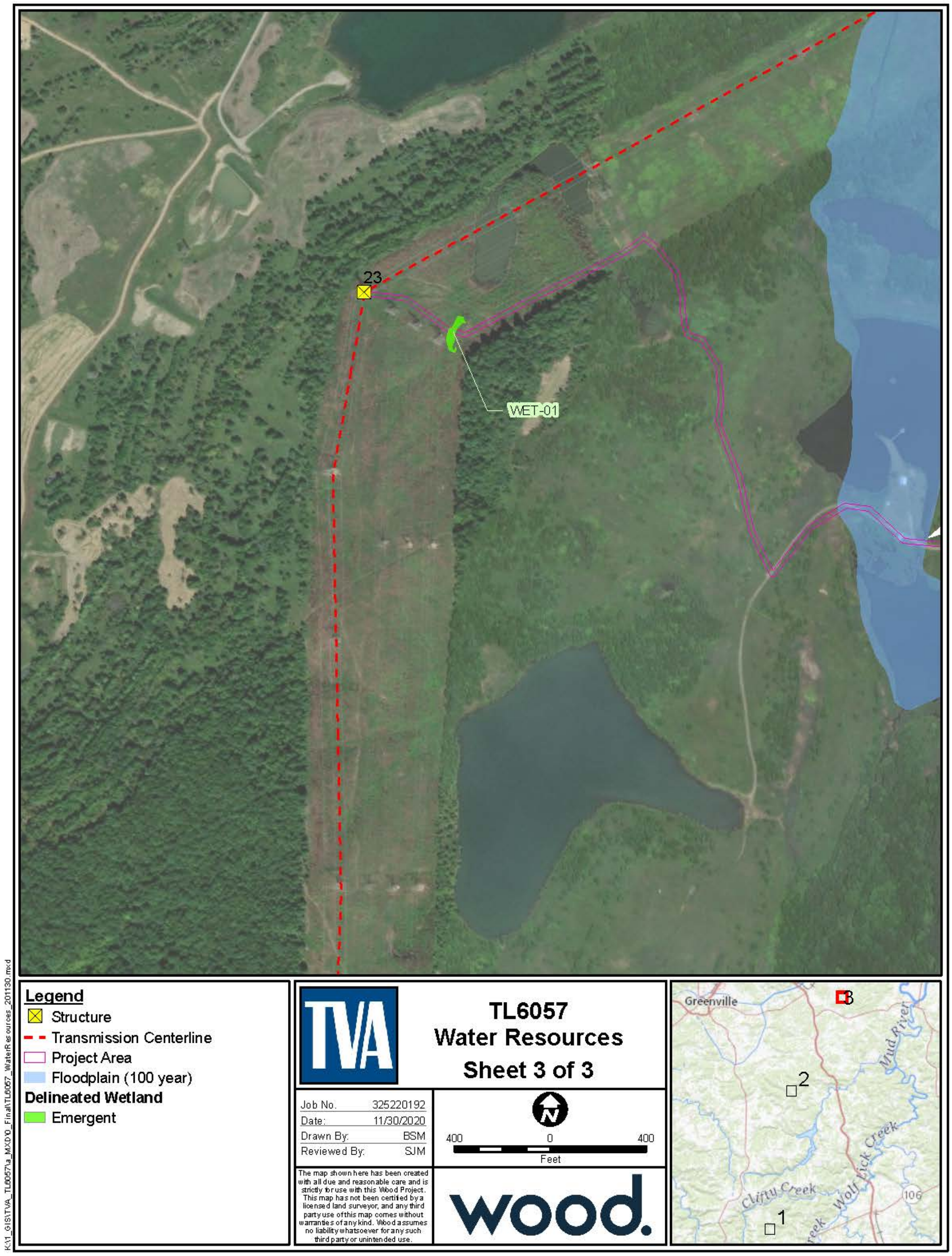

Figure A-6. Water Resources within TL6057

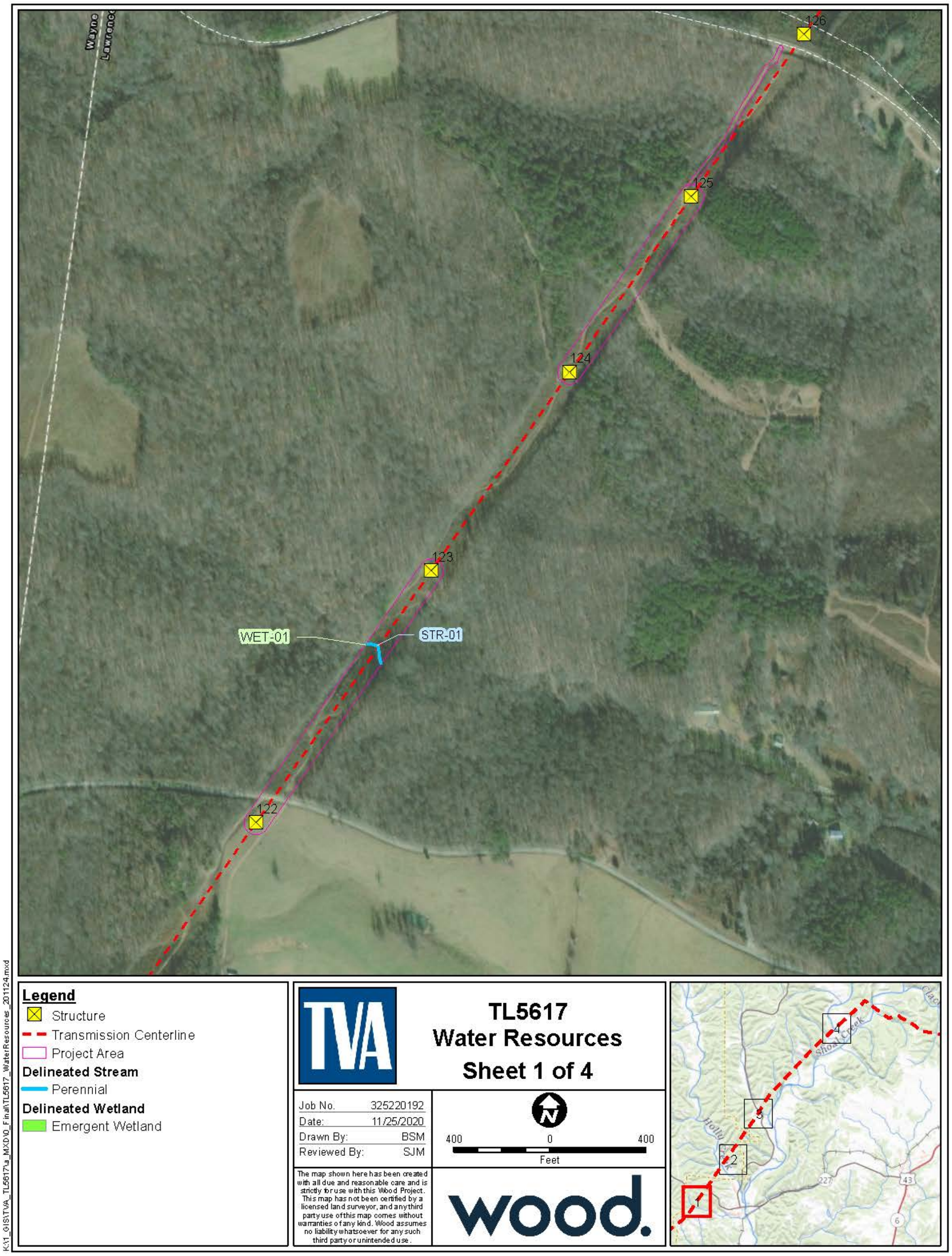

Figure A-7. Water Resources within TL5617

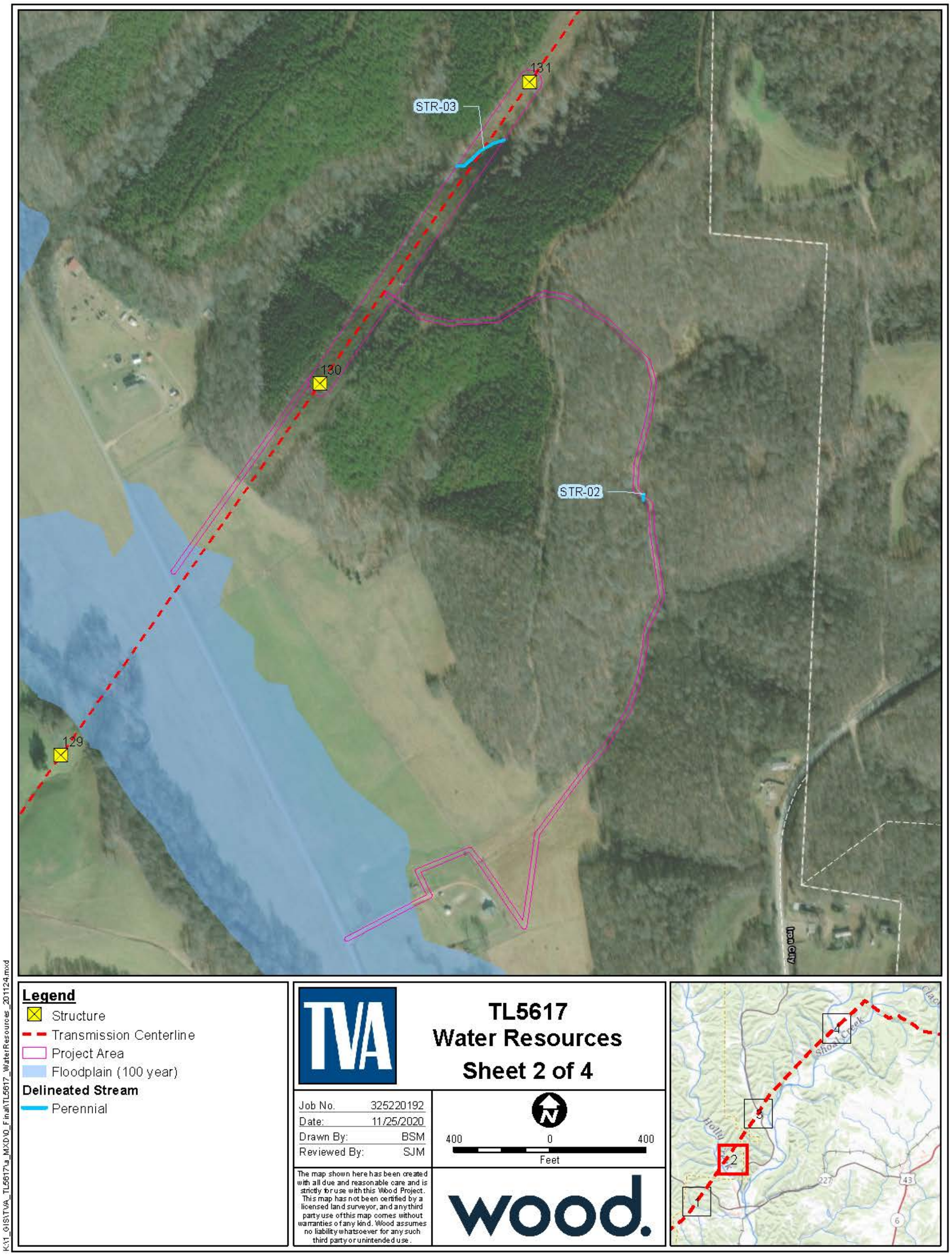

Figure A-8. Water Resources within TL5617

Legend

- Structure
- Transmission Centerline
- Project Area
- Floodplain (100 year)

Delineated Stream

- Perennial

TVA

TL5617
Water Resources
Sheet 3 of 4

Job No.	325220192
Date:	11/25/2020
Drawn By:	BSM
Reviewed By:	SJM

400 0 400
Feet

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wood.

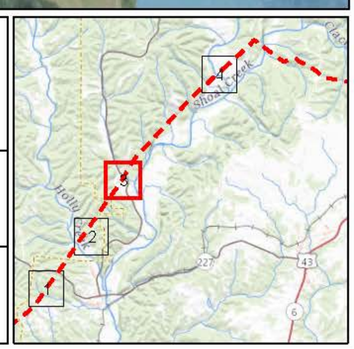

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Figure A-9. Water Resources within TL5617

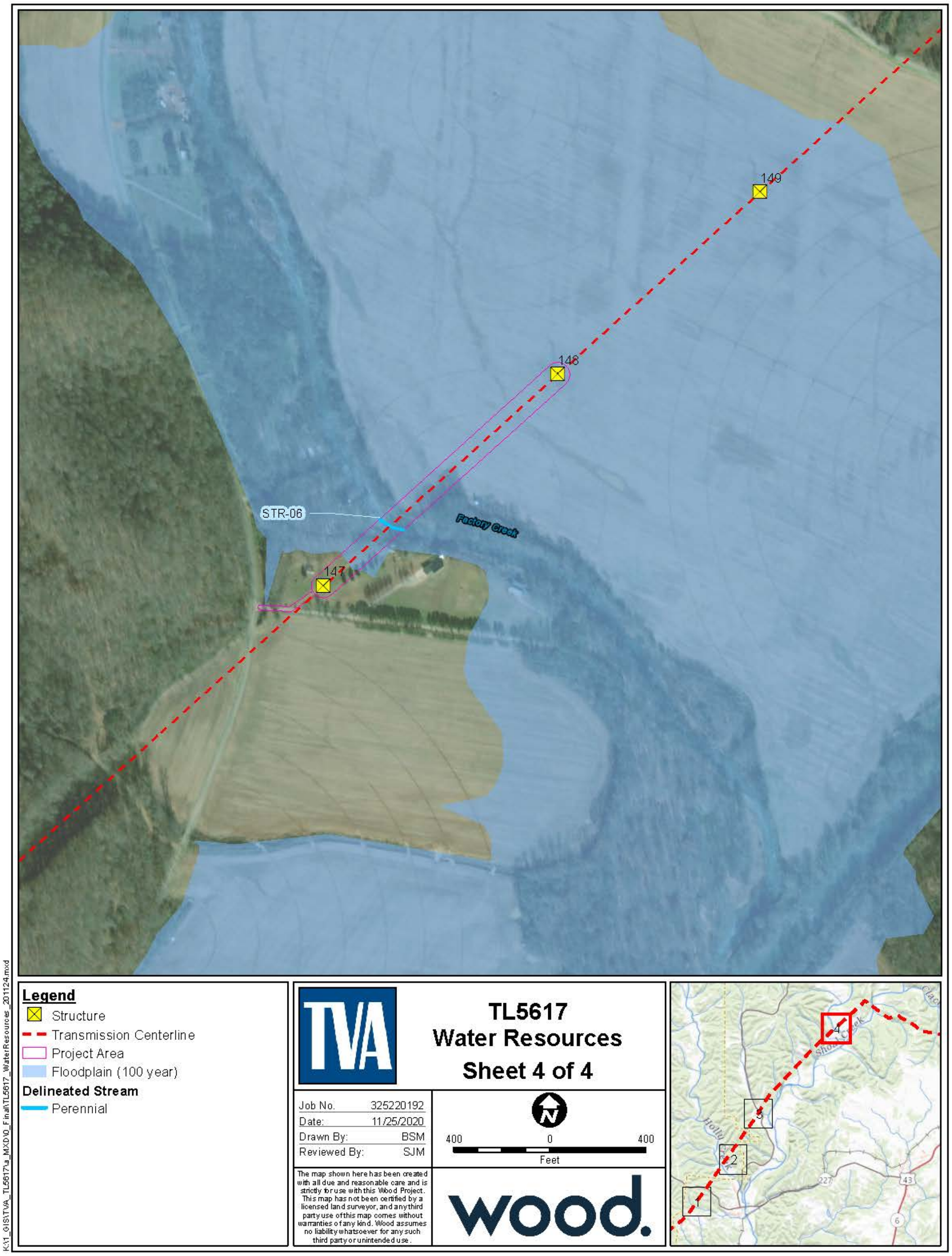

Figure A-10. Water Resources within TL5617

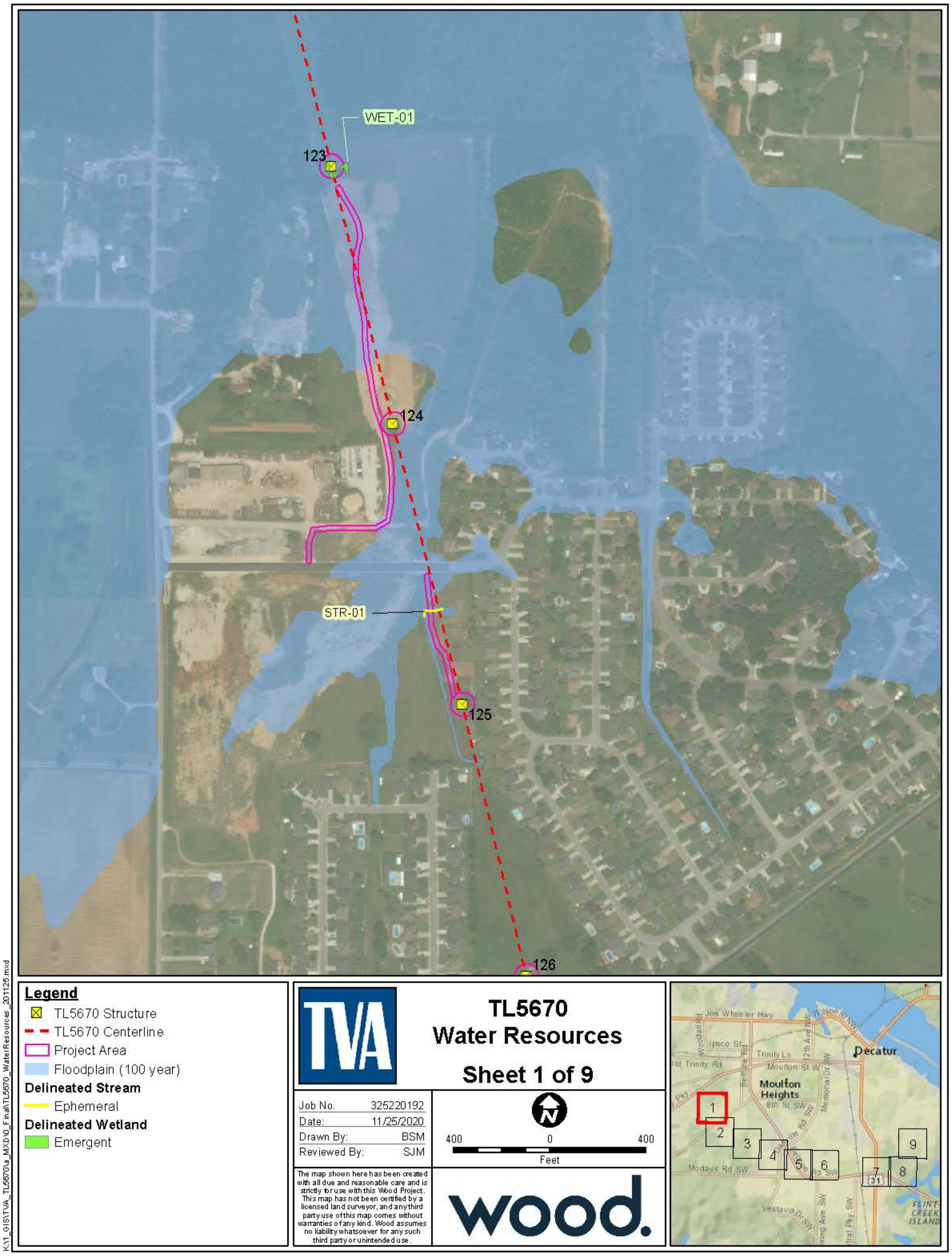

Figure A-11. Water Resources within TL5670

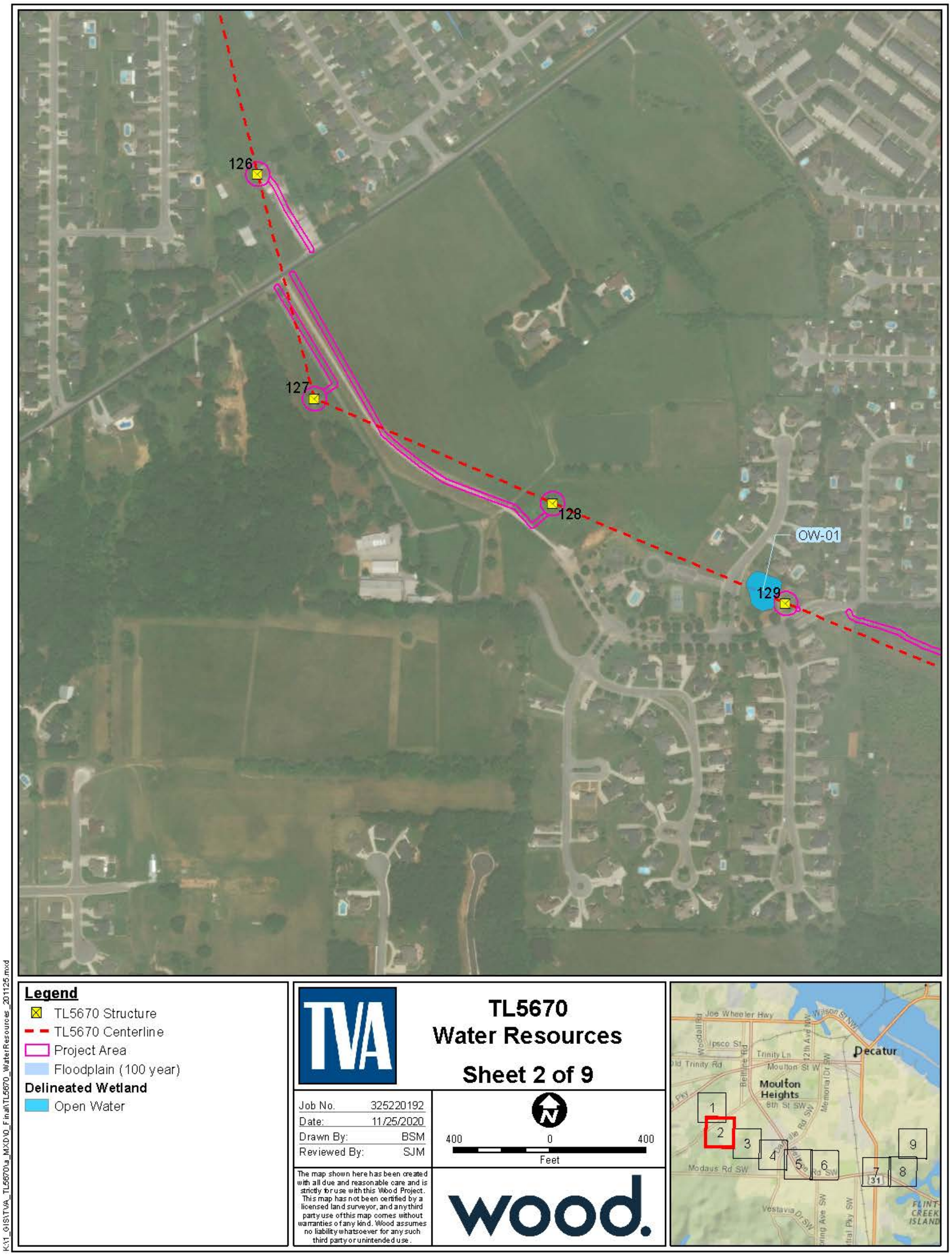

Figure A-12. Water Resources within TL5670

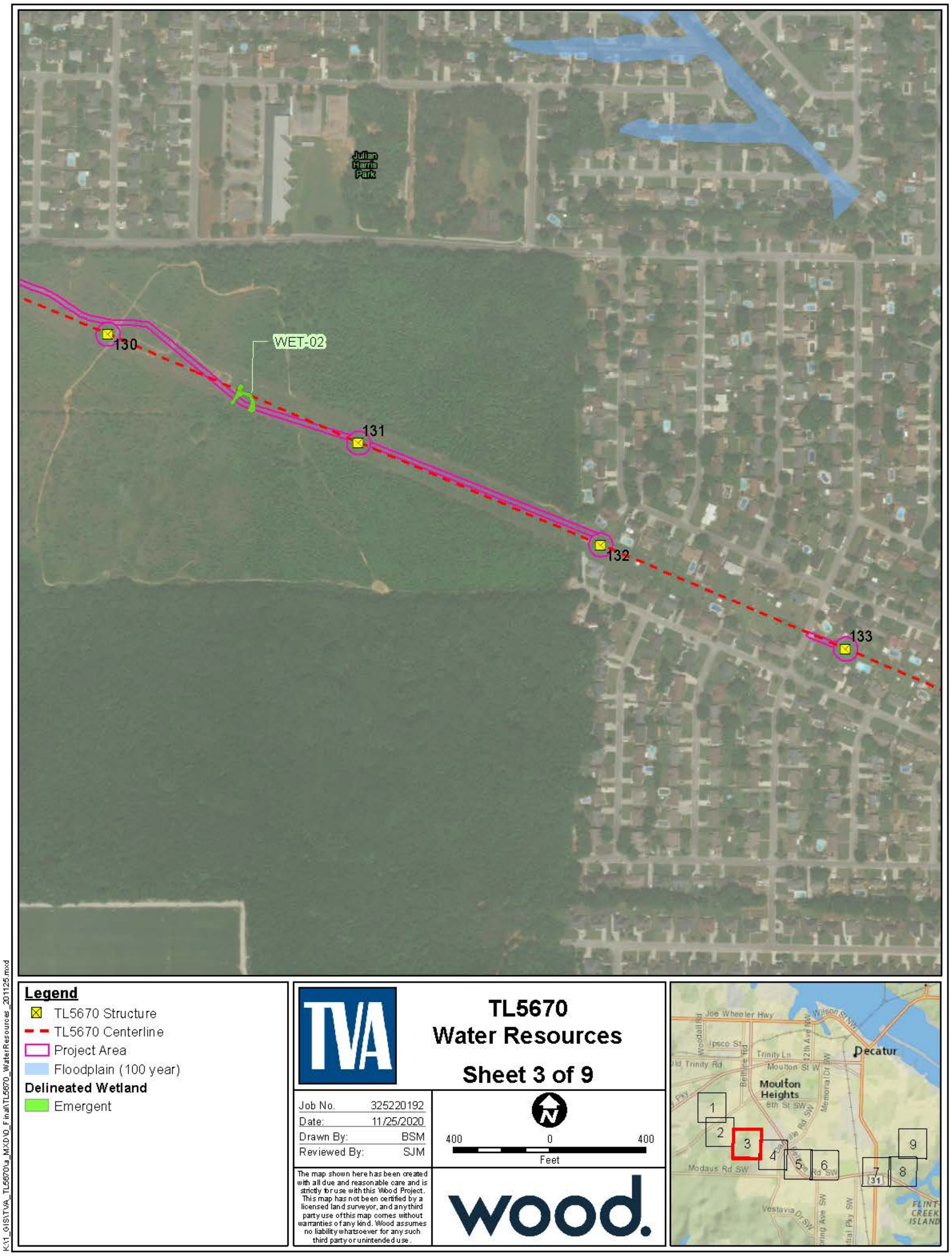

Figure A-13. Water Resources within TL5670

Figure A-14. Water Resources within TL5670

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Legend

- TL5670 Structure
- TL5670 Centerline
- Project Area
- Floodplain (100 year)

Delineated Stream

- Intermittent

TL5670
Water Resources

Sheet 5 of 9

Job No.	325220192
Date:	11/25/2020
Drawn By:	BSM
Reviewed By:	SJM

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Feet

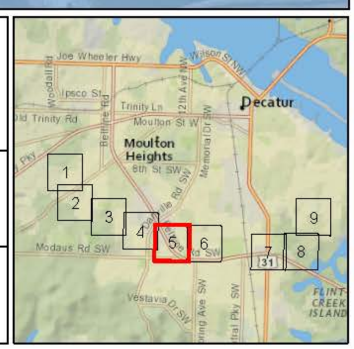

Figure A-15. Water Resources within TL5670

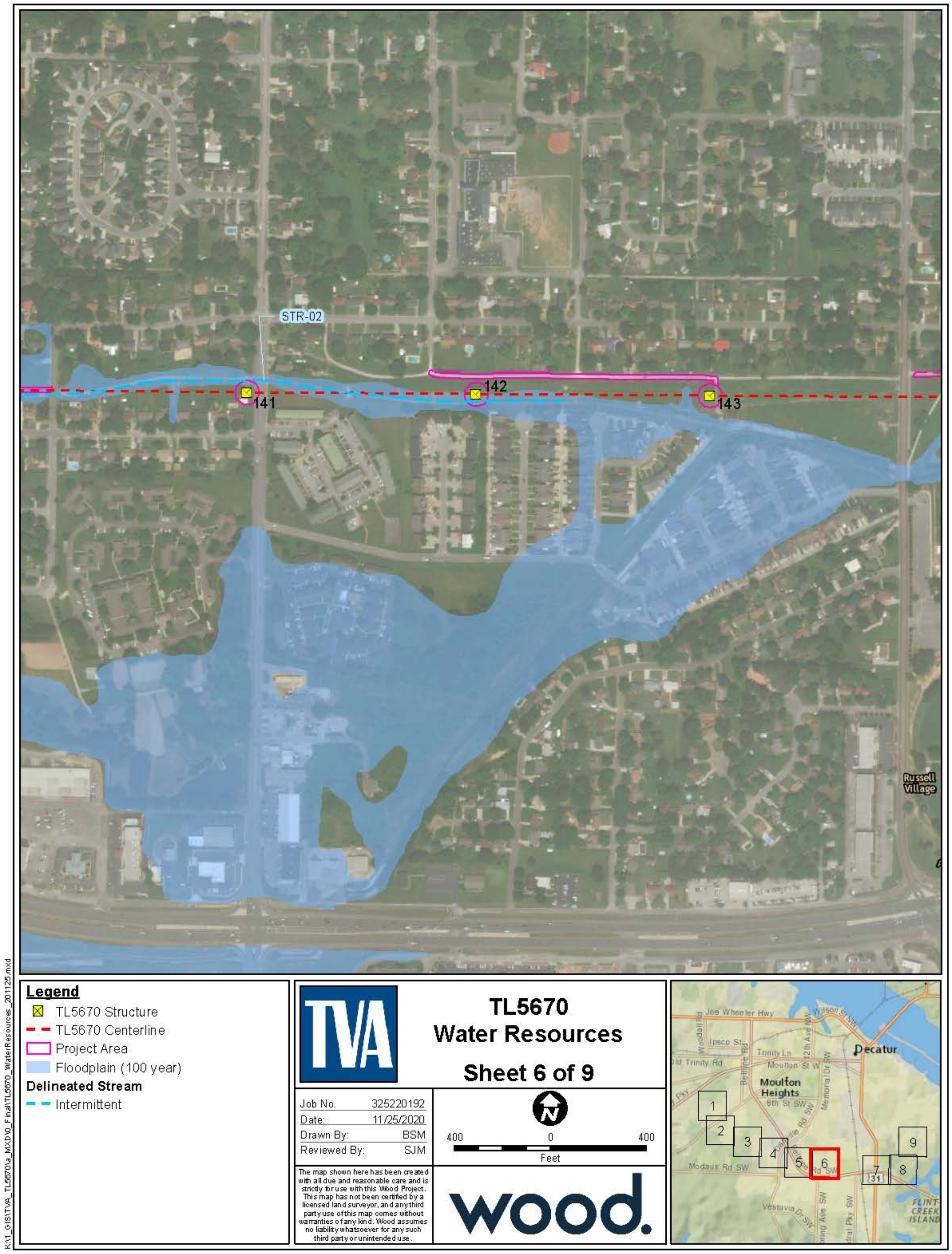

Figure A-16. Water Resources within TL5670

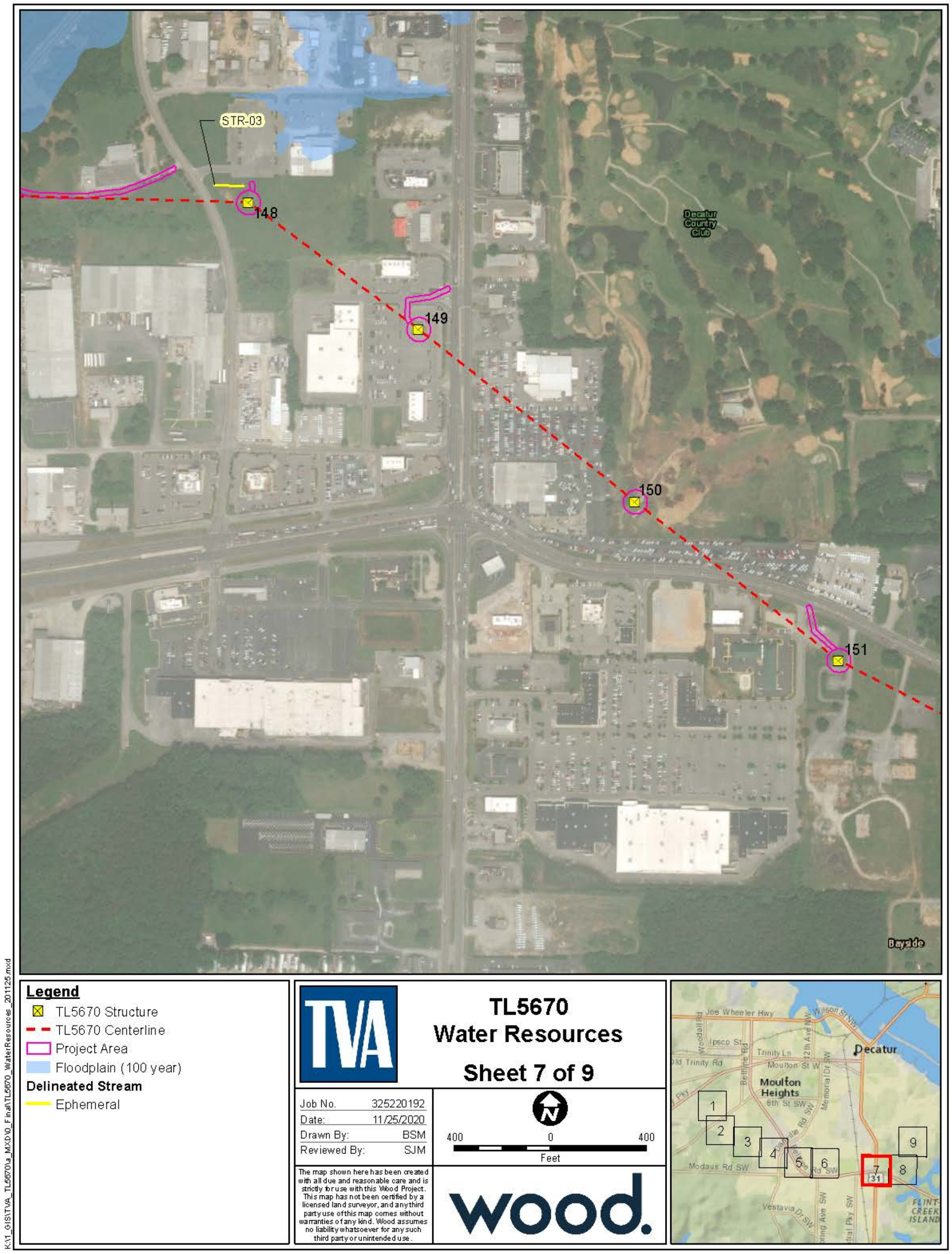

Figure A-17. Water Resources within TL5670

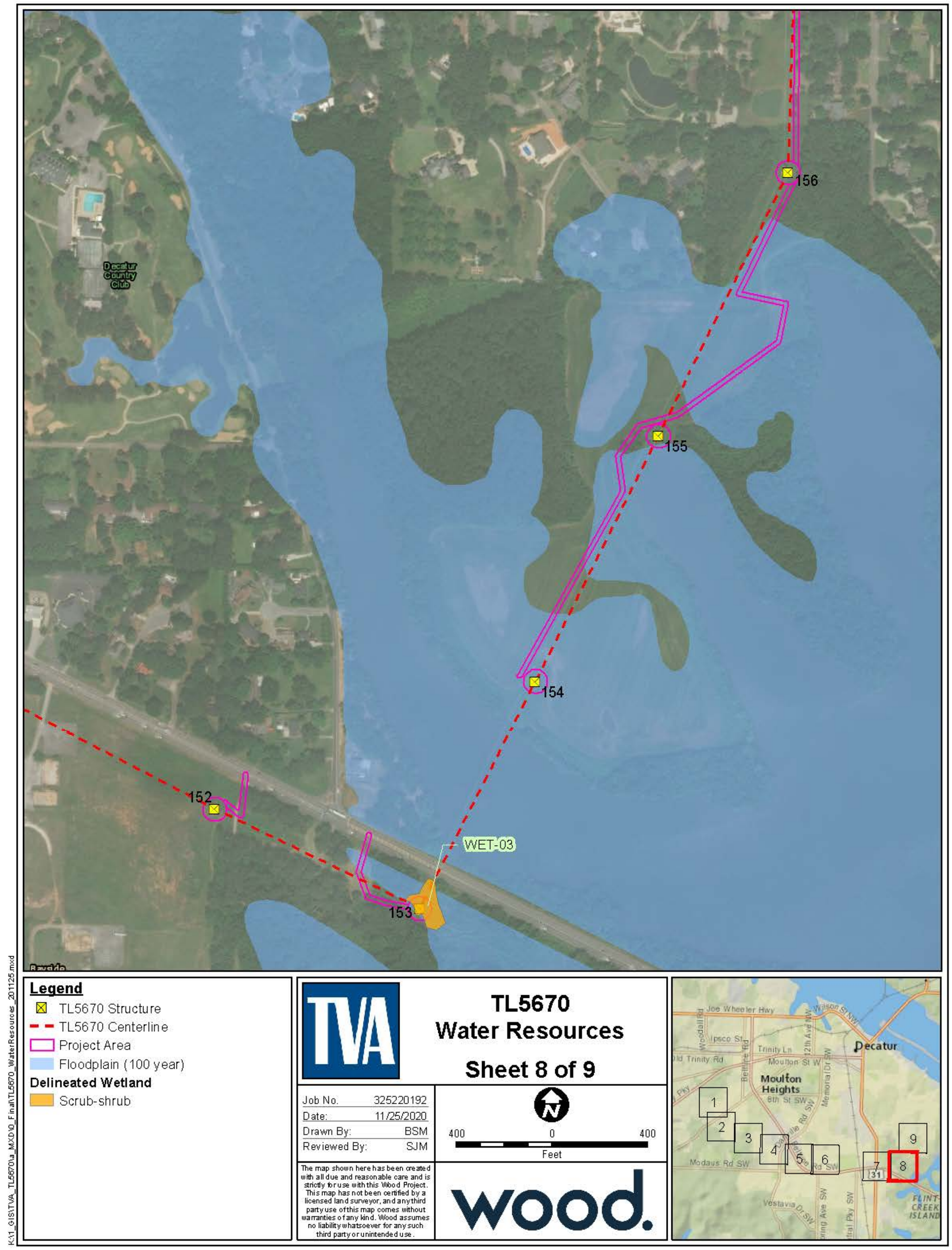

Figure A-18. Water Resources within TL5670

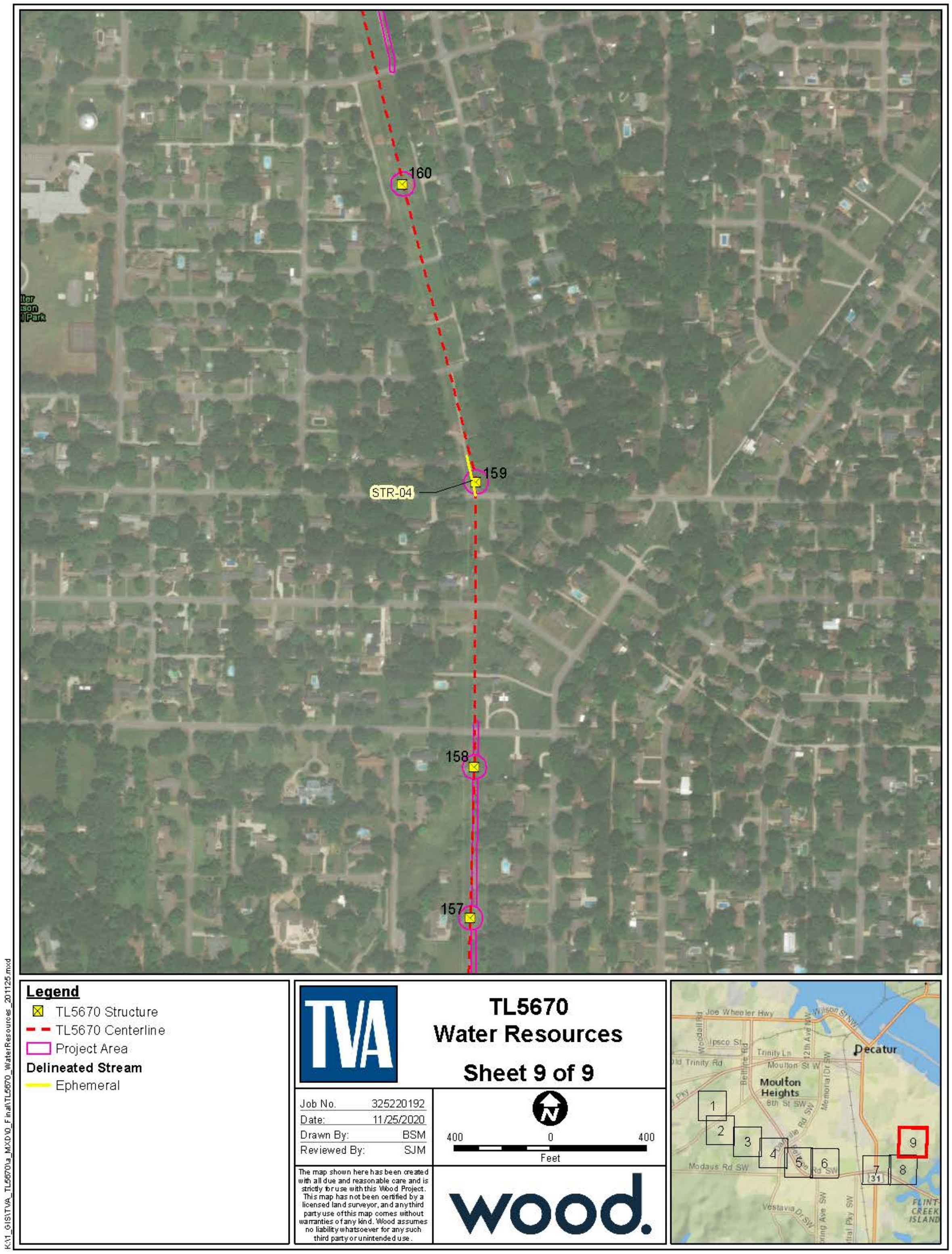

Figure A-19. Water Resources within TL5670

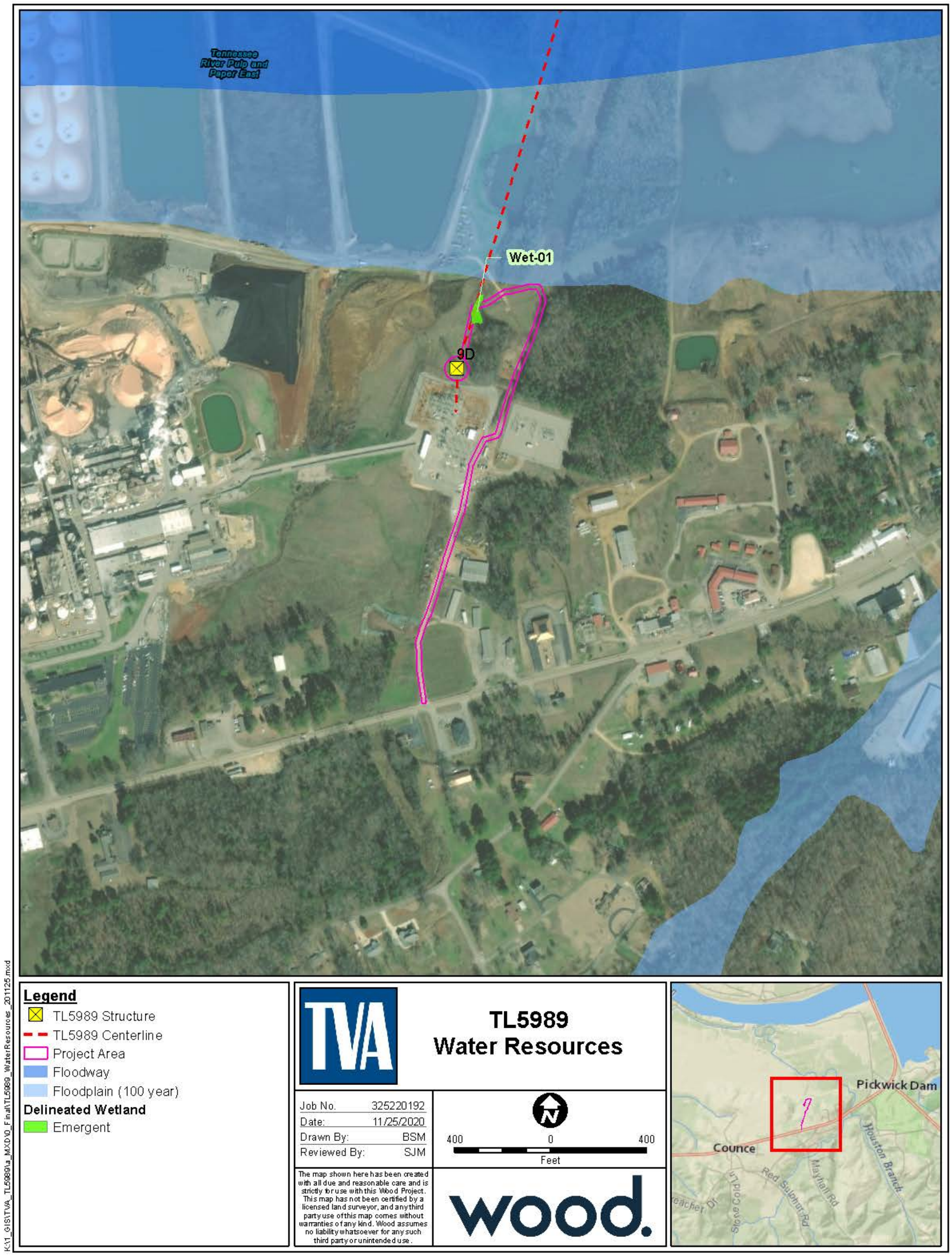

Figure A-20. Water Resources within TL5989

Appendix B – Bat Strategy Project Assessment

Project Review Form - TVA Bat Strategy *(06/2019)*

*This form should **only** be completed if project includes activities in Tables 2 or 3 (STEP 2 below). This form is not required if project activities are limited to Table 1 (STEP 2) or otherwise determined to have no effect on federally listed bats. If so, include the following statement in your environmental compliance document (e.g., add as a comment in the project CEC): "Project activities limited to Bat Strategy Table 1 or otherwise determined to have no effect on federally listed bats. Bat Strategy Project Review Form NOT required." This form is to assist in determining required conservation measures per TVA's ESA Section 7 programmatic consultation for routine actions and federally listed bats.*[1]

Project Name: Paradise and Colbert Combustion Turbine Plants **Date:** 12/15/2020

Contact(s): Ashley Pilakowski/Emily Willard **CEC#:** **Project ID:** 36502

Project Location (City, County, State): Colbert, Lauderdale, and Morgan Counties, Alabama; Hardin, Lawrence, Montgomery, S

Project Description:

The proposed action is to replace the existing capacity from the retirement of 1,400 MW of frame CTs at the Allen and Johnsonville sites with the addition of 1,500 MW to be split between TVA's Paradise and Colbert sites for commercial operation no later than December 31, 2023. Actions will include transmission upgrades and natural gas supply upgrades.

SECTION 1: PROJECT INFORMATION - ACTION AND ACTIVITIES

STEP 1) Select TVA Action. If none are applicable, contact environmental support staff, Environmental Project Lead, or Terrestrial Zoologist to discuss whether form (i.e., application of Bat Programmatic Consultation) is appropriate for project:

- ☐ 1 Manage Biological Resources for Biodiversity and Public Use on TVA Reservoir Lands
- ☐ 2 Protect Cultural Resources on TVA-Retained Land
- ☐ 3 Manage Land Use and Disposal of TVA-Retained Land
- ☐ 4 Manage Permitting under Section 26a of the TVA Act
- ☒ 5 Operate, Maintain, Retire, Expand, Construct Power Plants
- ☐ 6 Maintain Existing Electric Transmission Assets
- ☐ 7 Convey Property associated with Electric Transmission
- ☐ 8 Expand or Construct New Electric Transmission Assets
- ☐ 9 Promote Economic Development
- ☐ 10 Promote Mid-Scale Solar Generation

STEP 2) Select all activities from Tables 1, 2, and 3 below that are included in the proposed project.

TABLE 1. Activities with no effect to bats. Conservation measures & completion of bat strategy project review form NOT required.		
☐ 1. Loans and/or grant awards	☐ 8. Sale of TVA property	☐ 19. Site-specific enhancements in streams and reservoirs for aquatic animals
☐ 2. Purchase of property	☐ 9. Lease of TVA property	☐ 20. Nesting platforms
☐ 3. Purchase of equipment for industrial facilities	☐ 10. Deed modification associated with TVA rights or TVA property	☐ 41. Minor water-based structures (this does not include boat docks, boat slips or piers)
☐ 4. Environmental education	☐ 11. Abandonment of TVA retained rights	☐ 42. Internal renovation or internal expansion of an existing facility
☐ 5. Transfer of ROW easement and/or ROW equipment	☐ 12. Sufferance agreement	☒ 43. Replacement or removal of TL poles
☐ 6. Property and/or equipment transfer	☐ 13. Engineering or environmental planning or studies	☒ 44. Conductor and overhead ground wire installation and replacement
☒ 7. Easement on TVA property	☐ 14. Harbor limits delineation	☐ 49. Non-navigable houseboats

TABLE 2. Activities not likely to adversely affect bats with implementation of conservation measures. Conservation measures and completion of bat strategy project review form REQUIRED; review of bat records in proximity to project NOT required.

☒ 18. Erosion control, minor	☐ 57. Water intake - non-industrial	☐ 79. Swimming pools/associated equipment
☐ 24. Tree planting	☐ 58. Wastewater outfalls	☐ 81. Water intakes – industrial
☐ 30. Dredging and excavation; recessed harbor areas	☐ 59. Marine fueling facilities	☒ 84. On-site/off-site public utility relocation or construction or extension
☐ 39. Berm development	☐ 60. Commercial water-use facilities (e.g., marinas)	☐ 85. Playground equipment - land-based
☐ 40. Closed loop heat exchangers (heat pumps)	☐ 61. Septic fields	☐ 87. Aboveground storage tanks
☐ 45. Stream monitoring equipment - placement and use	☐ 66. Private, residential docks, piers, boathouses	☐ 88. Underground storage tanks
☐ 46. Floating boat slips within approved harbor limits	☐ 67. Siting of temporary office trailers	☐ 90. Pond closure
☒ 48. Laydown areas	☐ 68. Financing for speculative building construction	☐ 93. Standard License
☒ 50. Minor land based structures	☐ 72. Ferry landings/service operations	☐ 94. Special Use License
☐ 51. Signage installation	☐ 74. Recreational vehicle campsites	☐ 95. Recreation License
☐ 53. Mooring buoys or posts	☒ 75. Utility lines/light poles	☐ 96. Land Use Permit
☐ 56. Culverts	☐ 76. Concrete sidewalks	

Table 3: Activities that may adversely affect federally listed bats. Conservation measures AND completion of bat strategy project review form REQUIRED; review of bat records in proximity of project REQUIRED by OSAR/Heritage eMap reviewer or Terrestrial Zoologist.

☐ 15. Windshield and ground surveys for archaeological resources	☒ 34. Mechanical vegetation removal, includes trees or tree branches > 3 inches in diameter	☐ 69. Renovation of existing structures
☐ 16. Drilling	☒ 35. Stabilization (major erosion control)	☐ 70. Lock maintenance/ construction
☒ 17. Mechanical vegetation removal, does not include trees or branches > 3” in diameter (in Table 3 due to potential for woody burn piles)	☒ 36. Grading	☐ 71. Concrete dam modification
☐ 21. Herbicide use	☐ 37. Installation of soil improvements	☐ 73. Boat launching ramps
☒ 22. Grubbing	☐ 38. Drain installations for ponds	☐ 77. Construction or expansion of land-based buildings
☐ 23. Prescribed burns	☒ 47. Conduit installation	☐ 78. Wastewater treatment plants
☒ 25. Maintenance, improvement or construction of pedestrian or vehicular access corridors	☐ 52. Floating buildings	☐ 80. Barge fleeting areas
☐ 26. Maintenance/construction of access control measures	☐ 54. Maintenance of water control structures (dewatering units, spillways, levees)	☐ 82. Construction of dam/weirs/ levees
☐ 27. Restoration of sites following human use and abuse	☐ 55. Solar panels	☒ 83. Submarine pipeline, directional boring operations
☐ 28. Removal of debris (e.g., dump sites, hazardous material, unauthorized structures)	☐ 62. Blasting	☐ 86. Landfill construction
☐ 29. Acquisition and use of fill/borrow material	☒ 63. Foundation installation for transmission support	☐ 89. Structure demolition
☐ 31. Stream/wetland crossings	☒ 64. Installation of steel structure, overhead bus, equipment, etc.	☐ 91. Bridge replacement
☐ 32. Clean-up following storm damage	☒ 65. Pole and/or tower installation and/or extension	☐ 92. Return of archaeological remains to former burial sites
☐ 33. Removal of hazardous trees/tree branches		

STEP 3) Project includes one or more activities in Table 3? ◉ **YES (Go to Step 4)** ○ **NO (Go to Step 13)**

STEP 4) Answer questions *a* through *e* below (applies to projects with activities from Table 3 ONLY)

a) Will project involve continuous noise (i.e., ≥ 24 hrs) that is greater than 75 decibels measured on the A scale (e.g., loud machinery)?

○ **NO** (NV2 does not apply)
◉ **YES** (NV2 applies, subject to records review)

b) Will project involve entry into/survey of cave?

◉ **NO** (HP1/HP2 do not apply)
○ **YES** (HP1/HP2 applies, subject to review of bat records)

c) If conducting **prescribed burning** (**activity 23**), estimated acreage**:** [ ] and timeframe(s) below; ■ **N/A**

STATE	SWARMING	WINTER	NON-WINTER	PUP
GA, KY, TN	☐ Oct 15 - Nov 14	☐ Nov 15 - Mar 31	☐ Apr 1 - May 31, Aug 1- Oct 14	☐ Jun 1 - Jul 31
VA	☐ Sep 16 - Nov 15	☐ Nov 16 - Apr 14	☐ Apr 15 - May 31, Aug 1 – Sept 15	☐ Jun 1 - Jul 31
AL	☐ Oct 15 - Nov 14	☐ Nov 15 - Mar 15	☐ Mar 16 - May 31, Aug 1 - Oct 14	☐ Jun 1 - Jul 31
NC	☐ Oct 15 - Nov 14	☐ Nov 15 - Apr 15	☐ Apr 16 - May 31, Aug 1 - Oct 14	☐ Jun 1 - Jul 31
MS	☐ Oct 1 - Nov 14	☐ Nov 15 - Apr 14	☐ Apr 15 - May 31, Aug 1 – Sept 30	☐ Jun 1 - Jul 31

d) Will the project involve vegetation piling/burning?

○ **NO** (SSPC4/ SHF7/SHF8 do not apply)
◉ **YES** (SSPC4/SHF7/SHF8 applies, subject to review of bat records)

e) If **tree removal (activity 33 or 34)**, estimated amount: 14.5 ◉**ac** ○**trees** ○**N/A**

STATE	SWARMING	WINTER	NON-WINTER	PUP
GA, KY, TN	■ Oct 15 - Nov 14	■ Nov 15 - Mar 31	■ Apr 1 - May 31, Aug 1- Oct 14	☐ Jun 1 - Jul 31
VA	☐ Sep 16 - Nov 15	☐ Nov 16 - Apr 14	☐ Apr 15 - May 31, Aug 1 – Sept 15	☐ Jun 1 - Jul 31
AL	■ Oct 15 - Nov 14	■ Nov 15 - Mar 15	■ Mar 16 - May 31, Aug 1 - Oct 14	☐ Jun 1 - Jul 31
NC	☐ Oct 15 - Nov 14	☐ Nov 15 - Apr 15	☐ Apr 16 - May 31, Aug 1 - Oct 14	☐ Jun 1 - Jul 31
MS	☐ Oct 1 - Nov 14	☐ Nov 15 - Apr 14	☐ Apr 15 - May 31, Aug 1 – Sept 30	☐ Jun 1 - Jul 31

If warranted, does project have flexibility for bat surveys (May 15-Aug 15): ◉ **MAYBE** ○ **YES** ○ **NO**

**** For **PROJECT LEADS** whose projects will be reviewed by a Heritage Reviewer (Natural Resources Organization only), **STOP HERE**. Click File/ Save As, name form as "ProjectLead_BatForm_CEC-or-ProjectIDNo_Date", and submit with project information. Otherwise continue to Step 5. ****

SECTION 2: REVIEW OF BAT RECORDS (applies to projects with activities from Table 3 ONLY)

STEP 5) Review of bat/cave records conducted by Heritage/OSAR reviewer?

◉ **YES** ○ **NO** (Go to Step 13)

Info below completed by:

☐ **Heritage Reviewer**	(name)		Date	
☐ **OSAR Reviewer**	(name)		Date	
■ **Terrestrial Zoologist**	(name)	Elizabeth Hamrick	Date	Dec 15, 2020

Gray bat records: ☐ None ☒ Within 3 miles* ☒ Within a cave* ☐ Within the County

Indiana bat records: ☐ None ☒ Within 10 miles* ☐ Within a cave* ☐ Capture/roost tree* ☒ Within the County

Northern long-eared bat records: ☐ None ☒ Within 5 miles* ☐ Within a cave* ☐ Capture/roost tree* ☒ Within the County

Virginia big-eared bat records: ☒ None ☐ Within 6 miles* ☐ Within the County

Caves: ☐ None within 3 mi ☐ Within 3 miles but > 0.5 mi ☐ Within 0.5 mi but > 0.25 mi* ☐ Within 0.25 mi but > 200 feet* ☒ Within 200 feet*

Bat Habitat Inspection Sheet completed? ◉ **NO** ○ **YES**

Amount of SUITABLE habitat to be removed/burned (may differ from STEP 4e): 9.2 (◉**ac** ○**trees**)* ○**N/A**

STEP 6) Provide any additional notes resulting from Heritage Reviewer records review in Notes box below then . . . . Go to Step 13

Notes from Bat Records Review (e.g., historic record; bats not on landscape during action; DOT bridge survey with negative results):

STEPS 7-12 To be Completed by Terrestrial Zoologist (if warranted):

STEP 7) Project will involve:

- ☐ Removal of suitable trees within 0.5 mile of P1-P2 Indiana bat hibernacula or 0.25 mile of P3-P4 Indiana bat hibernacula or any NLEB hibernacula.
- ☐ Removal of suitable trees within 10 miles of documented Indiana bat (or within 5 miles of NLEB) hibernacula.
- ☒ Removal of suitable trees > 10 miles from documented Indiana bat (> 5 miles from NLEB) hibernacula.
- ☐ Removal of trees within 150 feet of a documented Indiana bat or northern long-eared bat maternity roost tree.
- ☐ Removal of suitable trees within 2.5 miles of Indiana bat roost trees or within 5 miles of Indiana bat capture sites.
- ☒ Removal of suitable trees > 2.5 miles from Indiana bat roost trees or > 5 miles from Indiana bat capture sites.
- ☐ Removal of documented Indiana bat or NLEB roost tree, if still suitable.
- ☐ N/A

STEP 8) Presence/absence surveys were/will be conducted: ○ **YES** ◉ **NO** ○ **TBD**

STEP 9) Presence/absence survey results, on [ ] ○ **NEGATIVE** ○ **POSITIVE** ◉ **N/A**

STEP 10) Project ◉ **WILL** ○ **WILL NOT** require use of Incidental Take in the amount of 9.2 ◉ **acres or** ○ **trees** proposed to be used during the ■ **WINTER** ■ **VOLANT SEASON** ○ **NON-VOLANT SEASON** ○ **N/A**

STEP 11) Available Incidental Take (prior to accounting for this project) as of Dec 15, 2020

TVA Action	Total 20-year	Winter	Volant Season	Non-Volant Season
5 Operate, Maintain, Retire, Expand, Construct Power Plants	1,717.14	1,325.94	281.47	109.73

STEP 12) Amount contributed to TVA's Bat Conservation Fund upon activity completion: $ 4,600 OR ○ **N/A**

TERRESTRIAL ZOOLOGISTS, after completing SECTION 2, review Table 4, modify as needed, and then complete section for Terrestrial Zoologists at end of form.

SECTION 3: REQUIRED CONSERVATION MEASURES

STEP 13) Review Conservation Measures in Table 4 and ensure those selected are relevant to the project. If not, manually override and uncheck irrelevant measures, and explain why in ADDITIONAL NOTES below Table 4.

Did review of Table 4 result in ANY remaining Conservation Measures in **RED**?

- ○ **NO** (Go to Step 14)
- ◉ **YES** (STOP HERE; Submit for Terrestrial Zoology Review. Click File/Save As, name form as "ProjectLead_BatForm_CEC-or-ProjectIDNo_Date", and submit with project information).

Table 4. TVA's ESA Section 7 Programmatic Bat Consultation Required Conservation Measures

The Conservation Measures in Table 4 are automatically selected based on your choices in Tables 2 and 3 but can be manually overridden, if necessary. To Manually override, press the button and enter your name.

Manual Override

Name: Elizabeth Hamrick

Check if Applies to Project	Activities Subject To Conservation Measure	Conservation Measure Description
		NV1 - Noise will be short-term, transient, and not significantly different from urban interface or natural events (i.e., thunderstorms) that bats are frequently exposed to when present on the landscape.
		NV2 - Drilling, blasting, or any other activity that involves continuous noise (i.e., longer than 24 hours) disturbances greater than 75 decibels measured on the A scale (e.g., loud machinery) **within a 0.5 mile radius of documented winter and/or summer roosts** (caves, trees, unconventional roosts) will be conducted when bats are absent from roost sites.
		SHF2 - Site-specific conditions (e.g., acres burned, transport wind speed, mixing heights) will be considered to ensure smoke is limited and adequately dispersed away from caves so that smoke does not enter cave or cave-like structures.
		SHF4 - If burns need to be conducted during April and May, when there is some potential for bats to present on the landscape and more likely to enter torpor due to colder temperatures, burns will only be conducted if the air temperature is 55° or greater, and preferably 60° or greater.
		SHF7 - Burning will only occur if site specific conditions (e.g. acres burned, transport wind speed, mixing heights) can be modified to ensure that smoke is adequately dispersed away from caves or cave-like structures. This applies to prescribed burns and burn piles of woody vegetation.
		SHF8 - Brush piles will be burned a **minimum of 0.25 mile from documented, known, or obvious caves or cave entrances** and otherwise in the center of newly established ROW when proximity to caves on private land is unknown.
		SHF9 - A **0.25 mile buffer of undisturbed forest** will be maintained around documented or known gray bat maternity and hibernation colony sites, documented or known Virginia big-eared bat maternity, bachelor, or winter colony sites, Indiana bat hibernation sites, and northern long-eared bat hibernation sites. Prohibited activities within this buffer include cutting of overstory vegetation, construction of roads, trails or wildlife openings, and prescribed burning. Exceptions may be made for maintenance of existing roads and existing ROW, or where it is determined that the activity is compatible with species conservation and recovery (e.g., removal of invasive species).
		TR1* - Removal of potentially suitable summer roosting habitat during time of potential occupancy has been quantified and minimized programmatically. TVA will track and document alignment of activities that include tree removal (i.e., hazard trees, mechanical vegetation removal) with the programmatic quantitative cumulative estimate of seasonal removal of potential summer roost trees for Indiana bat and northern long-eared bat. Project will therefore communicate completion of tree removal to appropriate TVA staff.
		TR4* - Removal of suitable summer roosting habitat within potential habitat for Indiana bat or northern long-eared bat will be tracked, documented, and included in annual reporting. Project will therefore communicate completion of tree removal to appropriate TVA staff.
		TR7 (**Existing Transmission ROW only**) - **Tree removal within 100 feet of existing transmission ROWs will be limited to hazard trees**. On or adjacent to TLs, a hazard tree is a tree that is tall enough to fall within an unsafe distance of TLs under maximum sag and blowout conditions and/or are also dead, diseased, dying, and/or leaning. Hazard tree removal includes removal of trees that 1) currently are tall enough to threaten the integrity of operation and maintenance of a TL or 2) have the ability in the future to threaten the integrity of operation and maintenance of a TL.

TR9 - If removal of suitable summer roosting habitat occurs when bats are present on the landscape, a funding contribution (based on amount of habitat removed) towards future conservation and recovery efforts for federally listed bats would be carried out. Project can consider seasonal bat presence/absence surveys (mist netting or emergence counts) that allow for positive detections without resulting in increased constraints in cost and project schedule. This will enable TVA to contribute to increased knowledge of bat presence on the landscape while carrying out TVA's broad mission and responsibilities.

SSPC1 (**Transmission only**) - Transmission actions and activities will continue to Implement A Guide for Environmental Protection and Best Management Practices for Tennessee Valley Authority Construction and Maintenance Activities. This focuses on control of sediment and pollutants, including herbicides. Following are key measures:

- o BMPs minimize erosion and prevent/control water pollution in accordance with state-specific construction storm water permits. BMPS are designed to keep soil in place and aid in reducing risk of other pollutants reaching surface waters, wetlands and ground water. BMPs will undertake the following principles:
    - Plan clearing, grading, and construction to minimize area and duration of soil exposure.
    - Maintain existing vegetation wherever and whenever possible.
    - Minimize disturbance of natural contours and drains.
    - As much as practicable, operate on dry soils when they are least susceptible to structural damage and erosion.
    - Limit vehicular and equipment traffic in disturbed areas. Keep equipment paths dispersed or designate single traffic flow paths with appropriate road BMPs to manage runoff.
    - Divert runoff away from disturbed areas.
    - Provide for dispersal of surface flow that carries sediment into undisturbed surface zones with high infiltration capacity and ground cover conditions.
    - Prepare drainage ways and outlets to handle concentrated/increased runoff.
    - Minimize length and steepness of slopes. Interrupt long slopes frequently.
    - Keep runoff velocities low and/or check flows.
    - Trap sediment on-site.
    - Inspect/maintain control measures regularly & after significant rain.
    - Re-vegetate and mulch disturbed areas as soon as practical.
- o Specific guidelines regarding sensitive resources and buffer zones:
    - Extra precaution (wider buffers) within SMZs is taken to protect stream banks and water quality for streams, springs, sinkholes, and surrounding habitat.
    - BMPs are implemented to protect and enhance wetlands. Select use of equipment and seasonal clearing is conducted when needed for rare plants; construction activities are restricted in areas with identified rare plants.
    - Standard requirements exist to avoid adverse impacts to caves, protected animals, unique/ important habitat (e.g., cave buffers, restricted herbicide use, seasonal clearing of suitable habitat).

SSPC2 - Operations involving chemical/fuel storage or resupply and vehicle servicing will be handled outside of riparian zones (streamside management zones) in a manner to prevent these items from reaching a watercourse. Earthen berms or other effective means are installed to protect stream channel from direct surface runoff. Servicing will be done with care to avoid leakage, spillage, and subsequent stream, wetland, or ground water contamination. Oil waste, filters, other litter will be collected and disposed of properly. Equipment servicing and chemical/fuel storage will be limited to locations greater than 300-ft from sinkholes, fissures, or areas draining into known sinkholes, fissures, or other karst features.

	SSPC3 (**Power Plants only**) - Power Plant actions and activities will continue to implement standard environmental practices. These include: o Best Management Practices (BMPs) in accordance with regulations: • Ensure proper disposal of waste, ex: used rags, used oil, empty containers, general trash, dependent on plant policy • Maintain every site with well-equipped spill response kits, included in some heavy equipment • Conduct Quarterly Internal Environmental Field Assessments at each sight • Every project must have an approved work package that contains an environmental checklist that is approved by sight Environmental Health & Safety consultant. • When refueling, vehicle is positioned as close to pump as possible to prevent drips, and overfilling of tank. Hose and nozzle are held in a vertical position to prevent spillage o Construction Site Protection Methods • Sediment basin for runoff - used to trap sediments and temporarily detain runoff on larger construction sites • Storm drain protection device • Check dam to help slow down silt flow • Silt fencing to reduce sediment movement o Storm Water Pollution Prevention (SWPP) Pollution Control Strategies • Minimize storm water contact with disturbed soils at construction site • Protect disturbed soil areas from erosion • Minimize sediment in storm water before discharge • Prevent storm water contact with other pollutants • Construction sites also may be required to have a storm water permit, depending on size of land disturbance (>1ac) o Every site has a Spill Prevention and Control Countermeasures (SPCC) Plan and requires training. Several hundred pieces of equipment often managed at the same time on power generation properties. Goal is to • Minimize fuel and chemical use Ensure proper disposal of waste, ex: used rags, used oil, empty containers, general trash, dependent on plant policy • Maintain every site with well-equipped spill response kits, included in some heavy equipment • Conduct Quarterly Internal Environmental Field Assessments at each sight • Every project must have an approved work package that contains an environmental checklist that is approved by sight Environmental Health & Safety consultant. • When refueling, vehicle is positioned as close to pump as possible to prevent drips, and overfilling of tank. Hose and nozzle are held in a vertical position to prevent spillage o Construction Site Protection Methods • Sediment basin for runoff - used to trap sediments and temporarily detain runoff on larger construction sites • Storm drain protection device • Check dam to help slow down silt flow • Silt fencing to reduce sediment movement o Storm Water Pollution Prevention (SWPP) Pollution Control Strategies • Minimize storm water contact with disturbed soils at construction site • Protect disturbed soil areas from erosion • Minimize sediment in storm water before discharge • Prevent storm water contact with other pollutants • Construction sites also may be required to have a storm water permit, depending on size of land disturbance (>1ac) o Every site has a Spill Prevention and Control Countermeasures (SPCC) Plan and requires training. Several hundred pieces of equipment often managed at the same time on power generation properties. Goal is to minimize fuel and chemical use
	SSPC4 (**Transmission only**) - Woody vegetation burn piles associated with transmission construction will be placed in the center of newly established ROWs to minimize wash into any nearby undocumented caves that might be on adjacent private property and thus outside the scope of field survey for confirmation. Brush piles will be burned a **minimum of 0.25 miles from documented caves** and otherwise in the center of newly established ROW when proximity to caves on private land is unknown.

	SSPC5 (**26a, Solar, Economic Development only**) - Section 26a permits and contracts associated with solar projects, economic development projects or land use projects include standards and conditions that include standard BMPs for sediment and contaminants as well as measures to avoid or minimize impacts to sensitive species or other resources consistent with applicable laws and Executive Orders.
	SSPC7 - Clearing of vegetation **within a 200-ft radius of documented caves** will be limited to hand or small machinery clearing only (e.g., chainsaws, bush-hog, mowers). This will protect potential recharge areas of cave streams and other karst features that are connected hydrologically to caves.
	L1 - Direct temporary lighting away from suitable habitat during the active season.
	L2 - Evaluate the use of outdoor lighting during the active season and seek to minimize light pollution when installing new or replacing existing permanent lights by angling lights downward or via other light minimization measures (e.g., dimming, directed lighting, motion-sensitive lighting).

[1] Bats addressed in consultation (02/2018), which includes gray bat (listed in 1976), Indiana bat (listed in 1967), northern long-eared bat (listed in 2015), and Virginia big-eared bat (listed in 1979).

Hide All Unchecked Conservation Measures

- (•) HIDE
- ( ) UNHIDE

Hide Table 4 Columns 1 and 2 to Facilitate Clean Copy and Paste

- (•) HIDE
- ( ) UNHIDE

NOTES (additional info from field review, explanation of no impact or removal of conservation measures).

STEP 14) Save completed form (Click File/Save As, name form as "ProjectLead_BatForm_CEC-or-ProjectIDNo_Date") in project environmental documentation (e.g. CEC, Appendix to EA) AND send a copy of form to batstrategy@tva.gov
Submission of this form indicates that Project Lead/Applicant:

[ ] (name) is (or will be made) aware of the requirements below.

- Implementation of conservation measures identified in Table 4 is required to comply with TVA's Endangered Species Act programmatic bat consultation.
- TVA may conduct post-project monitoring to determine if conservation measures were effective in minimizing or avoiding impacts to federally listed bats.

For Use by Terrestrial Zoologist Only

☒ Terrestrial Zoologist acknowledges that Project Lead/Contact (name) [Ashley Pilakowski and Emil] has been informed of any relevant conservation measures and/or provided a copy of this form.

☒ For projects that require use of Take and/or contribution to TVA's Bat Conservation Fund, Terrestrial Zoologist acknowledges that Project Lead/Contact has been informed that project will result in use of Incidental Take [9.2] ◉ ac ○ trees and that use of Take will require $ [4,600] contribution to TVA's Conservation Fund upon completion of activity (amount entered should be $0 if cleared in winter).

For Terrestrial Zoology Use Only. Finalize and Print to Noneditable PDF.

Appendix C – Coordination

Tennessee Valley Authority, 400 West Summit Hill Drive, Knoxville, Tennessee 37902

September 9, 2020

Mr. E. Patrick McIntyre, Jr.
Executive Director
and State Historic Preservation Officer
Tennessee Historical Commission
2941 Lebanon Road
Nashville, Tennessee 37243-0442

Dear Mr. McIntyre:

TENNESSEE VALLEY AUTHORITY (TVA), PARADISE COMBUSTION TURBINE (PCT)/COLBERT COMBUSTION TURBINE (CCT) MODERNIZATION PROJECT, COLBERT, LAUDERDALE, LAWRENCE, LIMESTONE, AND MORGAN COUNTIES, ALABAMA; MUHLENBERG AND TODD COUNTIES, KENTUCKY; AND CHESTER, GILES, HARDIN, LAWRENCE, MAURY, MCNAIRY, MONTGOMERY, SUMNER, WAYNE, AND WILSON COUNTIES, TENNESSEE – INITIATION OF CONSULTATION

In 2019, TVA completed a Combustion Turbine (CT) Modernization study to evaluate the condition of TVA's current CT power generation units and evaluate steps needed to ensure a reliable power peaking fleet into the future. CTs are designed to meet peaks in power demand very quickly. TVA's CT plants run on natural gas as a fuel, and they can be activated on very short notice. Natural gas serves an increasingly important role in TVA's mission to provide clean, reliable energy to the people and businesses of the Tennessee Valley.

The CT Modernization study identified CT units that are over 40 years old and require replacement to ensure electrical reliability in the TVA power grid. These include Units 1-20 at Allen CT plant in Memphis, Tennessee and Units 1-16 at Johnsonville CT plant in New Johnsonville, Tennessee. TVA proposes to retire these outdated CT units and construct new frame CTs to replace the lost capacity. TVA would construct three 250-MW frame CTs at PCT plant in Muhlenberg County, Kentucky and three 250-MW frame CTs at CCT plant in Colbert County, Alabama.

These changes will require updates to the TVA electrical power grid. Thus, as part of this project, TVA also proposes to complete uprates and reconductors of transmission lines in Tennessee, Alabama, and Kentucky. Uprates involve making changes to allow the operation of a transmission line at a higher voltage. These changes could include such activities as replacing and/or modifying existing structures, installing intermediate structures, replacing or modifying conductor to increase ground clearance, adding tower extensions, and replacing structures with new, taller ones. Reconductoring projects involve removing the old conductor (cables that carry the electricity) and pulling new conductor into place. The proposed undertaking would affect segments of ten transmission lines scattered throughout Tennessee, Kentucky and northern Alabama. TVA proposes to uprate approximately 50 miles of transmission lines in Tennessee, and to reconductor approximately 155 miles of line in all three states. The total length of affected transmission lines is approximately 205 miles. However, not all of the lines would be affected throughout their extent. Activities with potential for ground disturbance would only take place at a limited number of locations within each transmission line. The scope would also include potential natural gas pipeline corridors within which a gas pipeline may need to be constructed and/or upgraded.

TVA has determined that the proposed CT Modernization Project is an undertaking (as defined at 36 CFR § 800.16(y)) with potential to cause effects on historic properties. Pursuant to §800.3(c), we are initiating consultation with your office and the State Historic Preservation Officers of Kentucky and Alabama. We are also initiating consultation with the federally recognized Indian tribes who have expressed an interest in the affected counties.

Based on current information about the project, TVA has determined that the area of potential effects (APE) should include the following areas (Figure 1):

- all areas at CCT and PCT plants where ground disturbance related to the undertaking would take place;
- all areas within proposed natural gas pipeline corridors;
- all areas within the right-of-way (ROW) of the affected transmission lines where ground disturbing activities would take place and/or work resulting in changes to the viewshed (such as tower extensions exceeding 20% of the height of the original tower structure) are proposed;
- any off-ROW access routes that are not surfaced in asphalt, concrete, or gravel; and
- the viewsheds within a one-half mile radius of those proposed activities that have potential for visual effects on above-ground historic properties.

The ground-disturbing portion of the undertaking's APE within the state of Tennessee would include the following:

- Uprates of approximately 37 miles of transmission lines in Hardin, Wayne, Lawrence, Sumner, and Wilson Counties; and
- Reconductoring approximately 46 miles of transmission lines in Chester, McNairy, Giles, Lawrence, Maury, and Wilson Counties.

The APE would include areas within the following counties in Tennessee: Chester, Giles, Hardin, Lawrence, Maury, McNairy, Montgomery, Sumner, Wayne, and Wilson.

TVA does not anticipate the retirement and removal of outdated CT units at Allen and Johnsonville CT plants to require any ground disturbance outside of previously disturbed areas. TVA also expects that work would not result in visual effects on any above-ground historic properties, given the settings of those locations and that our offices have previously agreed that both Allen Fossil Plant and Johnsonville Fossil Plant are ineligible for inclusion in the National Register of Historic Places (NRHP).

Project plans are still being developed. At this time, TVA is unable to completely determine the undertaking's APE. We will consult further with your office to fully determine the APE as project plans are developed.

Considering the scope and complexity of the proposed undertaking, TVA proposes to use a phased process to conduct identification and evaluation efforts, pursuant to 36 CFR Part 800.4(b)(2) and Stipulation III-D-3 of TVA's Section 106 Programmatic Agreement.

Pursuant to 36 CFR Part 800.3(f)(2), TVA is consulting with federally recognized Indian tribes regarding historic properties within the proposed project's APE that may be of religious and cultural significance and are eligible for the NRHP.

Should you have any questions or comments, please contact Steve Cole at sccole0@tva.gov.

Sincerely,

Michaelyn Harle

Michaelyn Harle on Behalf of Clinton E. Jones
Manager
Cultural Compliance

SCC:ABM
Enclosures
cc (Enclosures):

Ms. Jennifer Barnett (Enclosure)
Tennessee Division of Archaeology
1216 Foster Avenue, Cole Bldg. #3
Nashville, Tennessee 37210

INTERNAL COPIES ONLY, NOT TO BE INCLUDED WITH OUTGOING LETTER:

S. Dawn Booker, WT 11B-K
Stephen C. Cole, WT 11C-K
Michael C. Easley, BR 2C-C
Bennie J. Foshee, Jr., LP 5D-C
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Joseph E. Melton, MR 4G-C
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Nathan Schweighart, MR BA-C
Rebecca C. Tolene, WT 11B-K
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ECM, ENVRecords

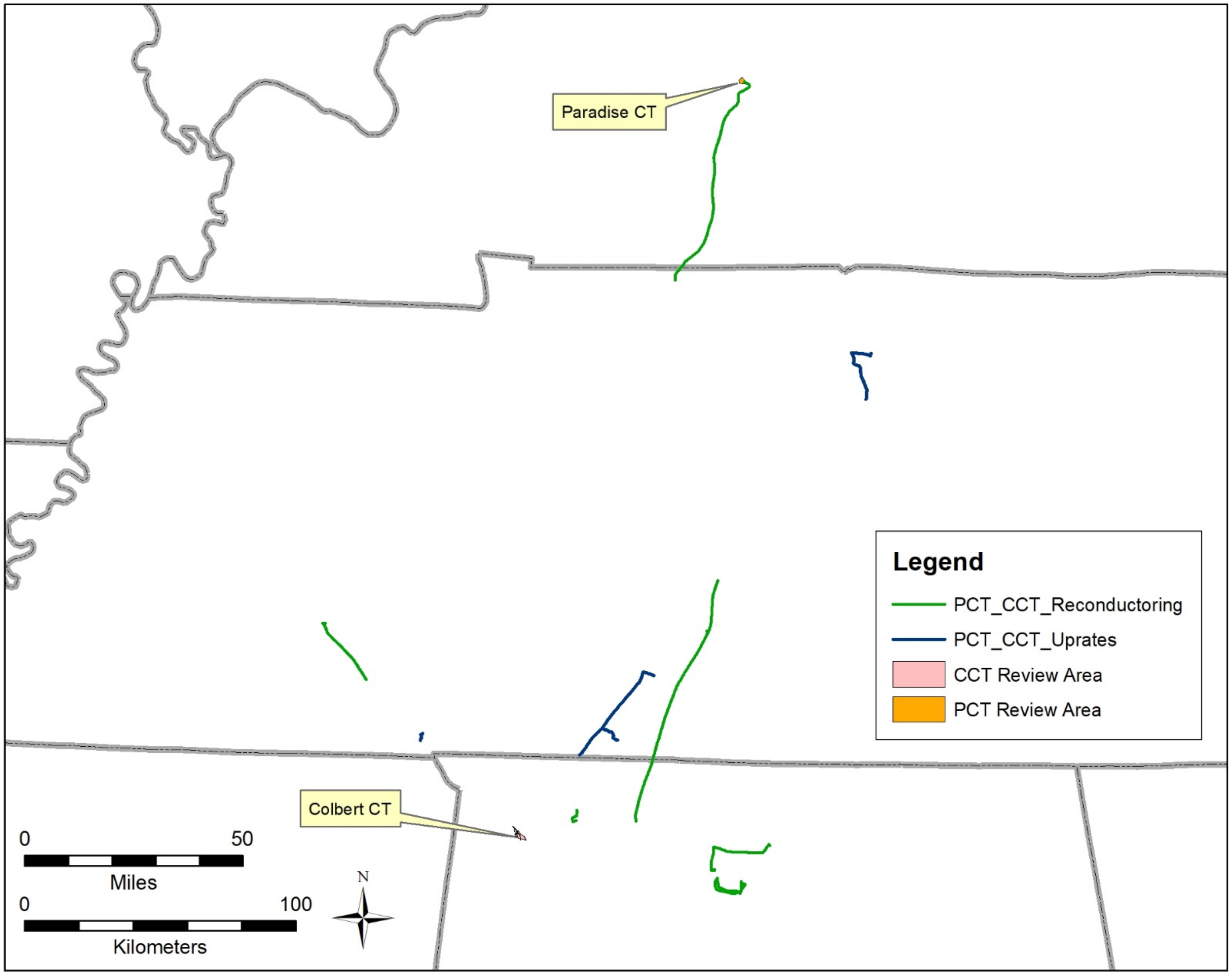

Figure 1. Overview of project APE.

Tennessee Valley Authority, 400 West Summit Hill Drive, Knoxville, Tennessee 37902

December 8, 2020

Mr. E. Patrick McIntyre, Jr.
Executive Director
and State Historic Preservation Officer
Tennessee Historical Commission
2941 Lebanon Road
Nashville, Tennessee 37243-0442

Dear Mr. McIntyre:

TENNESSEE VALLEY AUTHORITY (TVA), PARADISE COMBUSTION TURBINE/COLBERT COMBUSTION TURBINE (PCT/CCT) MODERNIZATION PROJECT, HARDIN, LAWRENCE, MONTGOMERY, SUMNER, WAYNE, AND WILSON COUNTIES, TENNESSEE – PHASE I SURVEY

We initiated consultation with your office in September regarding our Section 106 review of the above-cited multi-state project. Since that time, TVA has made progress in project design, which enabled us to further define the area of potential effects (APE). Figure 1 shows an updated map of the overall project's APE (which no longer includes any work in Chester, Tiles, McNairy, or Maury counties). We have also completed a Phase I Archaeological survey in the project footprint, and have assessed the undertaking's potential for direct and indirect effects on historic properties. In this letter, we describe how we determined the APE, discuss the survey, and present our findings for the portion of the project within Tennessee. We continue to consult with the State Historic Preservation Officers of Alabama and Kentucky concerning the portion of the project in their respective states.

Project description
Project activities in Tennessee would consist of two types of work: 1) uprating three transmission lines (TL) (L5617-03, L5989-02, and L5823-01), and 2) installation of new fiber optic line along 3.3 miles of TL L6057-01. Uprates involve making changes to allow the operation of a TL at a higher voltage. These changes could include such activities as replacing and/or modifying existing structures, cutting and sliding conductor to increase ground clearance, adding tower extensions, and replacing structures with new ones. Each activity would affect only a small number of structures or spans in each TL. The new fiber optic line may be installed by helicopter. Designated pull points along the TL corridor would be used to set up reels of fiber optic cable for installation. The pull points would require use of a trailer-mounted cable reel. Table 1 lists the modifications that TVA would make to these four TLs as part of the uprates and fiber optic installation.

Table 1. TLs and structures to be affected by proposed uprates and fiber optic installation.

TL number	TL name	Structure(s)	Modification
L5617-03	Colbert-Lawrenceburg 161-kV	122, 124, 130, 135, 147	Conductor cut
L5617-03	Colbert-Lawrenceburg 161-kV	513/613	Replace structure
L5989-02	Pickwick-Counce 161-kV	9D, A-D, Ending	161kV Bus
L5823-01	Wilson-Gallatin 161-kV	76	16-foot extension and conductor cut
L5823-01	Wilson-Gallatin 161-kV	77	Conductor slide
L5823-01	Wilson-Gallatin 161-kV	79, 91	Conductor cut
L5823-01	Wilson-Gallatin 161-kV	86, 87	Replace structure
L6057-01	Paradise-Montgomery 500-kV	238-248, Ending	Fiber optic installation

APE

All of the proposed work could potentially require the use of large equipment such as heavy-duty bucket trucks or cranes. Therefore, TVA included the access routes for each of the work locations. Access routes outside of TVA's TL right-of-way (ROW) consist of existing roads surfaced in dirt, gravel, or pavement. TVA would make no modifications to any of the roads and would keep vehicles on those roads during travel to and from the work locations. For access within the ROW, TVA considers the project footprint to include the width of the entire ROW (100 feet for 161-kV TLs; 150 feet for the 500-kV TL). TVA also included a 50-foot radius surrounding each work structure to account for potential ground disturbance at the work set-up locations. We refer to all locations of potential ground disturbance, including access routes, as the "project footprint". We considered the undertaking's potential physical effects on both archaeological sites and potentially historic TLs when reviewing this project. The project footprint encompasses approximately 35 acres (combined).

The fiber optic installation, and most of the TL uprate work, would not include any new visual elements. Any structure replacements would be carried out using similar structure types and the same material (steel). Therefore, that work has no potential for visual effects on any aboveground properties that may be in the viewshed. One possible exception is the proposed addition of a 16-foot extension to Structure 76 on L5823-01, which would result in a 22% increase in height of this tower structure. TVA included the viewshed within a half-mile radius of this structure as part of the APE (Figure 2).

Previous Section 106 reviews in the Project Footprint

TVA has no record of any prior historic architectural surveys for area within the half-mile radius of Structure 76 in L5823-01, which is located in Gallatin, Tennessee. We also have not previously evaluated any of the affected TLs for historic significance. A small part of one access road associated with L6057-01 falls within a corridor previously surveyed for archaeology (Robinson et al. 2015). However, we did not exclude that area from the current survey. The remainder of the project footprint has not been included in any previous archaeological surveys.

Potential for historic TLs

We consulted TVA's TL index regarding the construction dates, structure types, and number of replacement structures for each of the affected TLs, in order to determine whether any would meet criteria of historic significance. Table 2 shows the data. All of the affected TLs were built by TVA between 1948 and 1968 using steel lattice-type towers. The oldest of these (L5823-01) lacks historic integrity, as nearly all of its original structures have been replaced. All of the structures in these lines are of types that TVA still uses today. TVA does not consider these structures to have historic significance because these types of structures are ubiquitous throughout the US and are still being made today. Therefore, TVA does not consider any of the affected TLs to be eligible for inclusion in the National Register of Historic Places (NRHP).

Table 2. Age and composition of affected TLs

TL	Affected section	Construction Date	Structure type	Original structures remaining
L5617-03	Structures 117-152A	1954	Steel towers	94%
L5989-02	Structures 9A, 9B, 9C, 9D, and A-D	1960	Steel towers (6) and steel poles (2)	75%
L5823-01	Structures 72-97 and A-F	1948	Steel towers	6%
L6057-01*	Structures 1-237 (in Kentucky) and 238-248 (in Tennessee)	1968	Steel towers	100%

*Including the entire ca. 51-mile TL extending from Paradise Combustion Turbine plant to the Montgomery, TN Substation

Potential for visual effects on aboveground properties

As mentioned above, the only action related to this undertaking that has potential for visual effects on aboveground properties in Tennessee would be the addition of a 16-foot extension to tower 76 on the on line L5823-01. The tower is 74 feet tall, and the extension would result in a 22% increase in height. TVA carried out a desktop review of the half-mile radius surrounding this structure (see Figure 2) in order to identify any historic architectural properties. The review included the following sources: the Tennessee Historical Commission (THC) Online viewer; the NRHP; the 1956 and 2010 editions of the USGS Laguardo, TN 7.5-minute topographic quadrangle; current satellite imagery provided by Bing; Google Street View; and TVA's Integrated Cultural Database.

There are no NRHP listings within one-half mile of Structure 76. Six houses and eight barns are shown within the half-mile radius on the 1956 topographic quadrangle. Only two of the houses, and three of the barns, appear to be extant based on recent satellite imagery. The THC Online Viewer lists two structures in this review area, and these correspond with the two extant houses: SU-24 (900 Lock 4 Road), and SU-1001 (1033 Lock 4 Road). Based on current satellite imagery, SU-24 appears to be heavily modified and is located in a small lot in a modern subdivision. Maps, satellite images, and Google Street View all indicate that views to Structure 76 from this property are blocked by vegetation and other structures. SU-1001 is located approximately 0.21 miles west/northwest of Structure 76, at the southern edge of a modern subdivision (Figure 3). The TL tower does appear to be in view from SU-1001 currently, although the views are partially blocked by a line of trees (Figure 4). Google Street View indicates SU-1001 has been modified, and the THC Online Viewer lists the construction date as 1880 and describes it as “ext. altered dwelling w/ original entrance.” The three extant barns are in proximity and are potentially associated with the house. The setting of this property has been extensively altered by the construction of a modern subdivision. The property is surrounded on three sides by modern homes and streets. TVA has not assessed the NRHP eligibility of SU-1001. However, given that its integrity of setting has been altered, and that the tower extension represents a relatively small increase in visibility of an existing visual element, TVA finds that the tower extension would not further diminish the property’s integrity, and therefore, that the undertaking would not result in an adverse effect, were this property to be found eligible for the NRHP.

Archaeological Survey
TVA contracted with Wood Environment and Infrastructure (Wood) for an archaeological survey of the project footprint in order to identify archaeological sites that could be affected by the undertaking. The total survey area encompassed approximately 35 acres of land. A low-resolution version of the report, titled, *Phase I Archaeological Survey, TVA, PCT/CCT Modernization Project, Hardin, Lawrence, Montgomery, Sumner, Wayne, and Wilson Counties, Tennessee*, is attached. A high-resolution version can be downloaded.

The survey consisted of pedestrian survey and systematic shovel testing. Background research carried out remotely using the Tennessee Division of Archaeology files indicated that one previously-recorded archaeological site (40MT1152) is located within the project footprint. This site was previously recommended ineligible for inclusion in the NRHP. The survey revisited this site and identified four previously-unrecorded sites (40LR212, 40LR213, 40LR214, and 40WY231). Wood recommends that sites 40MT1152, 40LR212, 40LR213, and 40LR214 are ineligible for the NRHP due to a lack of intact subsurface deposits. Wood recommends that site 40WY231 should be avoided or, if avoidance is not possible, that TVA should conduct additional investigations at the site to determine eligibility.

Although not mentioned in the attached report, the Paradise-Montgomery 500-V TL intersects known terrestrial routes of the Trail of Tears/Removal Route (TOT/RR) in Montgomery County. However, the route follows a modern road and the undertaking would not include any work within a 500-foot radius of the TOT/RR.

TVA has read the attached report, finds it meets survey standards, and agrees with the authors’ recommendations. Potentially-eligible site 40WY231 is located in a proposed access route to Structure 131 on L5617-01. TVA was unable to identify an alternate access route. TVA proposes to avoid project effects to site 40WY231 by creating a 30-meter buffer surrounding the site, indicating this buffer as “sensitive area” on project-related drawings and notes, and requiring Transmission to deploy wetland mats when moving or using heavy-duty equipment within the site buffer. TVA finds that with this condition on the work, the undertaking would result in no effects on any NRHP-listed or –eligible archaeological sites in Tennessee.

Conclusion
One inventoried aboveground property is located within view of a proposed 16-foot tower extension. TVA finds that adding the extension would not result in an adverse effect on this property, were the property to be found eligible for inclusion in the NRHP. TVA finds that all four of the affected TLs are ineligible for inclusion in the NRHP.

The project footprint contains five archaeological sites. TVA finds that four of these sites (40MT1152, 40LR212, 40LR213, and 40LR214) are ineligible, and one (40WY231) is potentially eligible, for inclusion in the NRHP. TVA proposed to avoid project effects on 40WY231 by creating a buffer and using wetland mats in the access route where the site is located. TVA finds that with this condition on the undertaking, the PCT/CCT Modernization Project would result in no effects on historic properties in Tennessee.

Pursuant to 36 CFR Part 800.3(f)(2), TVA is consulting with federally-recognized Indian tribes regarding historic properties within the proposed project's APE that may be of religious and cultural significance and are eligible for the NRHP.

Pursuant to 36 CFR Part 800.4(d)(1) we are notifying you of TVA's finding of no historic properties affected, providing the documentation specified in § 800.11(d); and inviting you to review the finding. Also, we are seeking your agreement with TVA's eligibility determinations and finding that the undertaking as currently planned will have no effects on historic properties.

Should you have any questions or comments, please contact Steve Cole by email at sccole0@tva.gov.

Sincerely,

Clinton E. Jones
Manager
Cultural Compliance

SCC:ABM
Enclosures
cc (Enclosures)
Ms. Jennifer Barnett
Tennessee Division of Archaeology
1216 Foster Avenue, Cole Bldg. #3
Nashville, Tennessee 37210

Reference Cited

Robinson, Ryan, Danny Gregory, Brian Cavanaugh, and Ashley Cavanaugh
2015 *Archaeological Survey of the Proposed Clarksville Natural Gas Interconnect Pipeline, Montgomery County, Tennessee and Todd County, Kentucky*. Prepared by Barge Waggoner Sumner and Cannon, Inc. Prepared for the Federal Energy Regulatory Commission.

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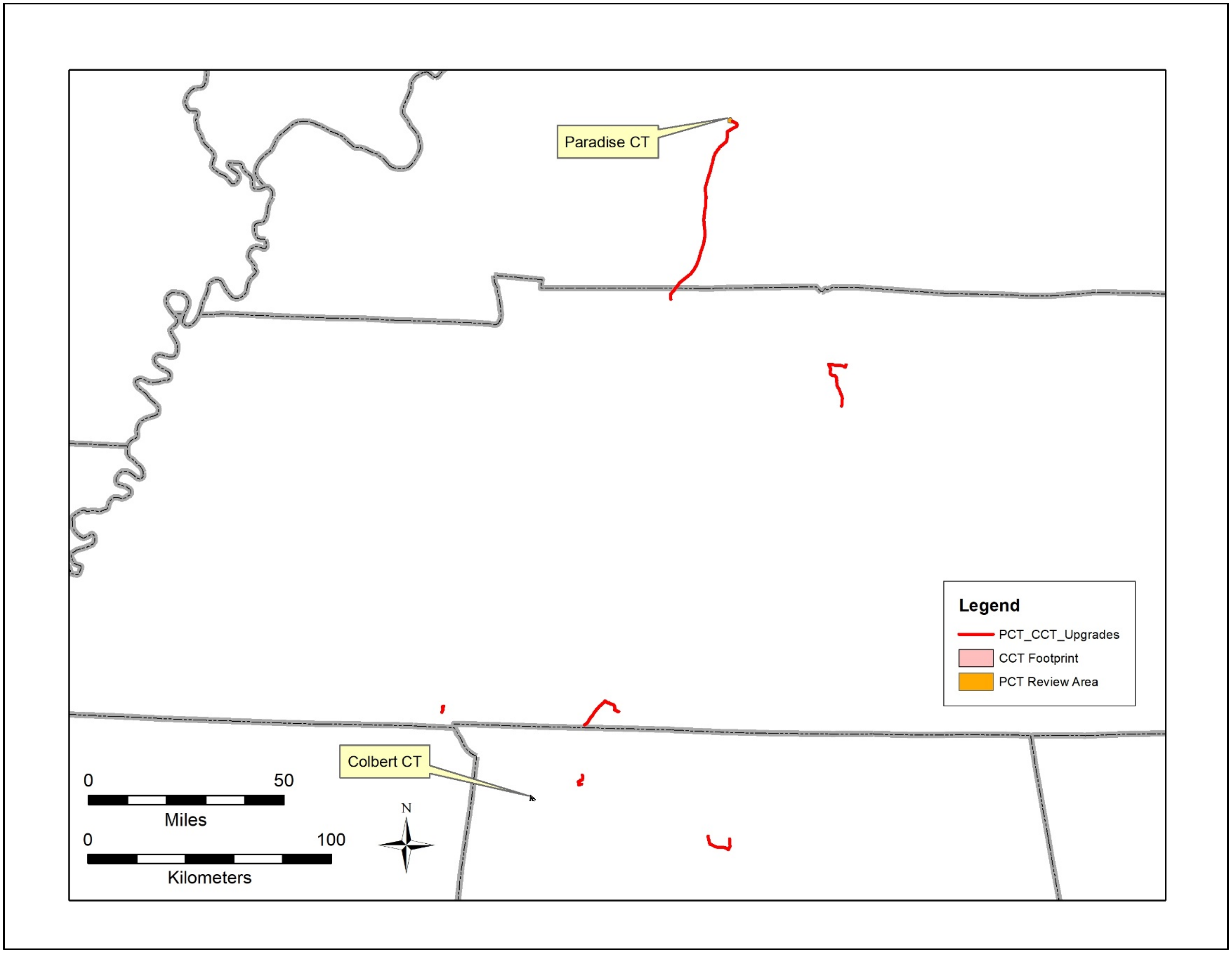

Figure 1. Updated map of overall project APE.

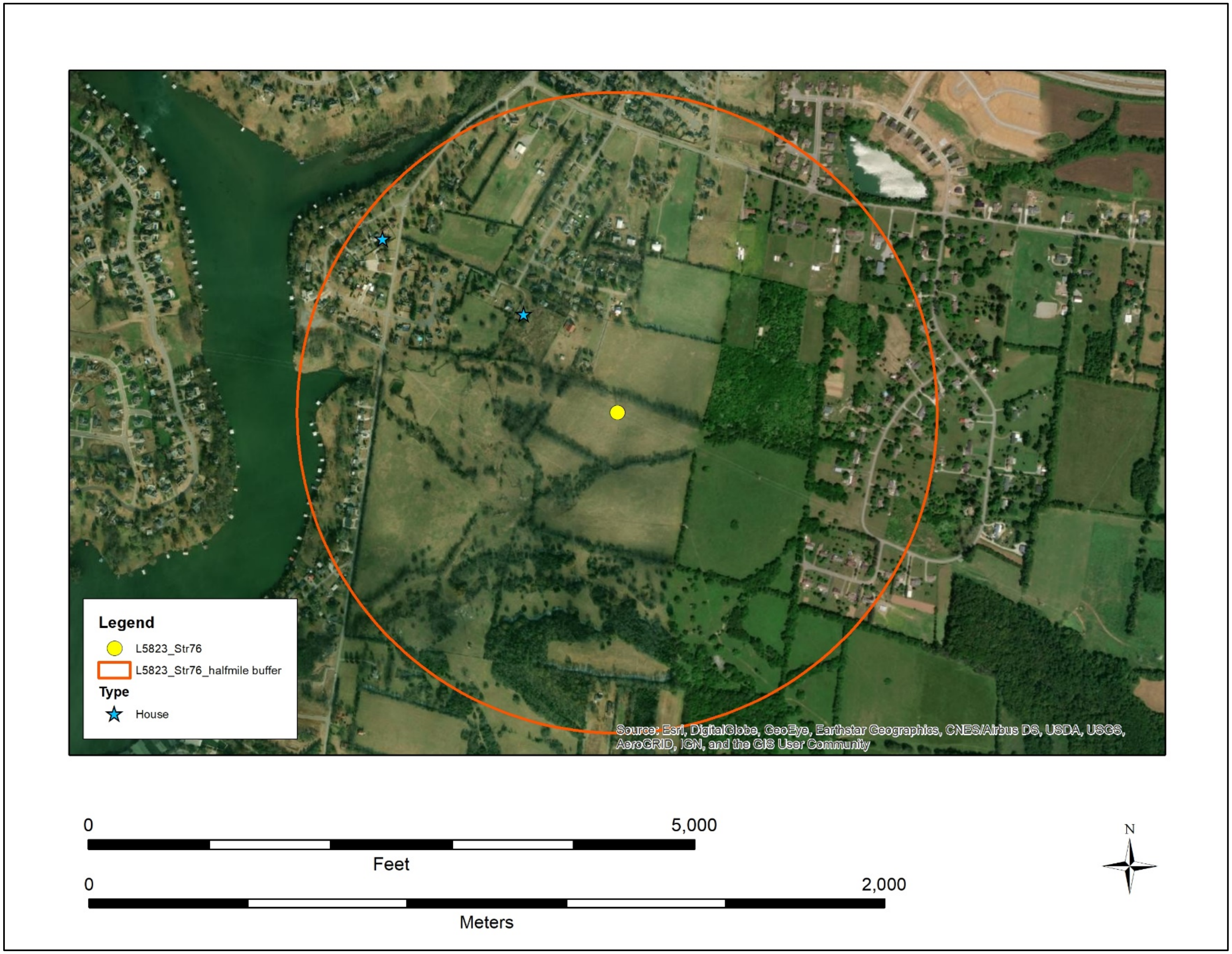

Figure 2. Half-mile radius surrounding L5823-01 Structure 76, and THC-inventoried properties.

Figure 3. Structure 76 (in L5823-01) and property SU-1001.

Figure 4. Google Street View looking from Connie Drive east toward L5823 Structure 76 (center-left of photo). Property SU-1001 is partially visible behind tree in center of photo.

Tennessee Valley Authority, 400 West Summit Hill Drive, Knoxville, Tennessee 37902

September 9, 2020

Mr. Craig Potts
State Historic Preservation Officer
and Executive Director
Kentucky Heritage Council
300 Washington Street
Frankfort, Kentucky 40601

Dear Mr. Potts:

TENNESSEE VALLEY AUTHORITY (TVA), PARADISE COMBUSTION TURBINE (PCT)/COLBERT COMBUSTION TURBINE (CCT) MODERNIZATION PROJECT, COLBERT, LAUDERDALE, LAWRENCE, LIMESTONE, AND MORGAN COUNTIES, ALABAMA; MUHLENBERG AND TODD COUNTIES, KENTUCKY; AND CHESTER, GILES, HARDIN, LAWRENCE, MAURY, MCNAIRY, MONTGOMERY, SUMNER, WAYNE, AND WILSON COUNTIES, TENNESSEE – INITIATION OF CONSULTATION

In 2019, TVA completed a Combustion Turbine (CT) Modernization study to evaluate the condition of TVA's current CT power generation units and evaluate steps needed to ensure a reliable power peaking fleet into the future. Combustion turbines are designed to meet peaks in power demand very quickly. TVA's CT plants run on natural gas as a fuel, and they can be activated on very short notice. Natural gas serves an increasingly important role in TVA's mission to provide clean, reliable energy to the people and businesses of the Tennessee Valley.

The CT Modernization study identified CT units that are over 40 years old and require replacement to ensure electrical reliability in the TVA power grid. These include Units 1-20 at Allen CT plant in Memphis, Tennessee and Units 1-16 at Johnsonville CT plant in New Johnsonville, Tennessee. TVA proposes to retire these outdated CT units and construct new frame CTs to replace the lost capacity. TVA would construct three 250-MW frame CTs at PCT plant in Muhlenberg County, Kentucky and three 250-MW frame CTs at CCT plant in Colbert County, Alabama.

These changes will require updates to the TVA electrical power grid. Thus, as part of this project, TVA also proposes to complete uprates and reconductors of transmission lines in Tennessee, Alabama, and Kentucky. Uprates involve making changes to allow the operation of a transmission line at a higher voltage. These changes could include such activities as replacing and/or modifying existing structures, installing intermediate structures, replacing or modifying conductor to increase ground clearance, adding tower extensions, and replacing structures with new, taller ones. Reconductoring projects involve removing the old conductor (cables that carry the electricity) and pulling new conductor into place. The proposed undertaking would affect segments of ten transmission lines scattered throughout Tennessee, Kentucky and northern Alabama. TVA proposes to uprate approximately 50 miles of transmission lines in Tennessee, and to reconductor approximately 155 miles of line in all three states. The total length of affected transmission lines is approximately 205 miles. However, not all of the lines would be affected throughout their extent. Activities with potential for ground disturbance would only take place at a limited number of locations within each transmission line. The scope would also include potential natural gas pipeline corridors within which a gas pipeline may need to be constructed and/or upgraded.

TVA has determined that the proposed CT Modernization Project is an undertaking (as defined at 36 CFR § 800.16(y)) with potential to cause effects on historic properties. Pursuant to §800.3(c), we are initiating consultation with your office and the State Historic Preservation Officers of Alabama and Tennessee. We are also initiating consultation with the federally recognized Indian tribes who have expressed an interest in the affected counties.

Based on current information about the project, TVA has determined that the area of potential effects (APE) should include the following areas (Figure 1):

- all areas at CCT and PCT plants where ground disturbance related to the undertaking would take place;
- all areas within proposed natural gas pipeline corridors;
- all areas within the right-of-way (ROW) of the affected transmission lines where ground disturbing activities would take place and/or work resulting in changes to the viewshed (such as tower extensions exceeding 20% of the height of the original tower structure) are proposed;
- any off-ROW access routes that are not surfaced in asphalt, concrete, or gravel; and
- the viewsheds within a one-half mile radius of those proposed activities that have potential for visual effects on above-ground historic properties.

The ground-disturbing portion of the undertaking's APE within the Commonwealth of Kentucky would be located in Muhlenberg and Todd Counties, and would include the following:

- areas affected by ground disturbance at PCT plant and the Paradise Fossil Plant reservation;
- installing one new 500-kV tower structure on the Paradise-Montgomery 500-kV Transmission Line;
- constructing feeds connecting the 500-kV and 69-kV switchyards to the new frame CT units; and
- reconductoring the approximately 52-mile long Paradise-Montgomery 500-kV Transmission Line. TVA may be able to accomplish this reconductoring using methods that do not cause ground disturbance.

TVA has conducted a preliminary desktop review of the area within the proposed limits of disturbance at Paradise Fossil and CT plants. A majority of the area has been included in previous archaeological surveys. Other parts of the project area consists of developed facilities, such as roads, buildings, and impoundments, which have little or no potential for intact archaeological sites, and some areas are in reclaimed open-pit strip mines. TVA estimates that archaeological survey would be needed for approximately 17 acres of land at Paradise Fossil Plant. TVA has initiated a phase I archaeological survey of this area. TVA does not anticipate the installation of new units to result in potential effects on above-ground properties in the viewshed. However, TVA will continue to assess the undertaking's potential effects as project plans are developed.

Project plans are still being developed. At this time, TVA is unable to completely determine the undertaking's APE. We will consult further with your office to fully determine the APE as project plans are developed.

Considering the scope and complexity of the proposed undertaking, TVA proposes to use a phased process to conduct identification and evaluation efforts, pursuant to 36 CFR Part 800.4(b)(2) and Stipulation III-D-3 of TVA's Section 106 Programmatic Agreement.

Pursuant to 36 CFR Part 800.3(f)(2), TVA is consulting with federally-recognized Indian tribes regarding historic properties within the proposed project's APE that may be of religious and cultural significance and are eligible for the National Register of Historic Places.

Should you have any questions or comments, please contact Steve Cole at sccole0@tva.gov.

Sincerely,

Clinton E. Jones
Manager
Cultural Compliance

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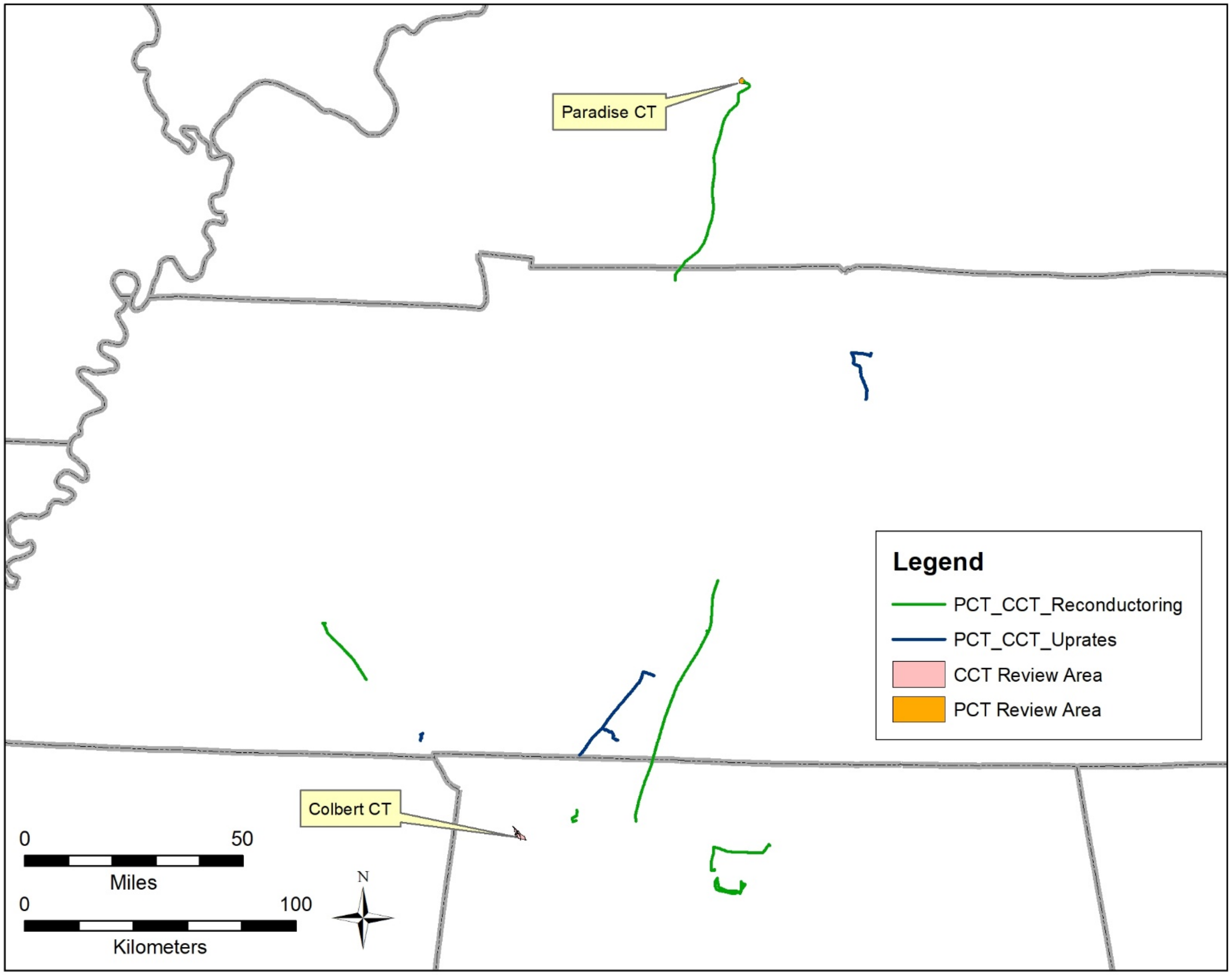

Figure 1. Overview of project APE.

Tennessee Valley Authority, 400 West Summit Hill Drive, Knoxville, Tennessee 37902

December 8, 2020

Mr. Craig Potts
State Historic Preservation Officer
and Executive Director
Kentucky Heritage Council
300 Washington Street
Frankfort, Kentucky 40601

Dear Mr. Potts:

TENNESSEE VALLEY AUTHORITY (TVA), PARADISE COMBUSTION TURBINE/COLBERT COMBUSTION TURBINE (PCT/CCT) MODERNIZATION PROJECT, MUHLENBERG AND TODD COUNTIES, KENTUCKY – PHASE I SURVEY

We initiated consultation with your office in September regarding our Section 106 review of the above-cited multi-state project. Since that time, TVA has made progress in project design, which enabled us to further define the area of potential effects (APE). We have also completed a Phase I Archaeological survey in the project footprint, and have assessed the undertaking's potential for direct and indirect effects on historic properties. In this letter, we describe how we determined the APE, discuss the survey, and present our findings for the portion of the project within Kentucky. We continue to consult with the State Historic Preservation Officers of Tennessee and Alabama concerning the portion of the project in their respective states.

APE

Two main types of activities would be carried out in Kentucky as part of the project: installation of three frame combustion turbine (CT) units at Paradise Combustion Cycle plant (PCC); and transmission line (TL) upgrades on TVA's Paradise-Montgomery 500-kilovolt (kV) TL. In addition to the major equipment systems, the proposed CT facilities would include plant equipment and systems such as natural gas metering and handling systems; instrumentation and control systems; transformers; and administration and warehouse/maintenance buildings. Subsurface piles would be installed to support foundations for plant components, as required. At full buildout, the CT plant would occupy about 4.4 acres on the reservation. Related activities would include the installation of 0.31 miles (1,622 feet) of new gas pipeline, construction of a six-bay 500-kV switchyard, the removal of 0.88 miles (4,641 feet) of retired 69-kV TL, and the use of lay down areas. The new TL would be built with lattice tower structures of varying heights, depending on the terrain and existing obstacles on the reservation. All of these activities would take place either in PCC or within the Paradise Fossil Plant (PAF) reservation. The installation of new units would also result in the introduction of new visual elements, which has the potential for visual effects on any historic architectural properties that may be in view of the new units within one-half mile. Figure 1 shows the area that would be affected by installation of the three new CT units at PCC. We refer to this area as the PAF/PCT Footprint.

The TL upgrade would include reconfiguration/retermination of the existing Paradise – Montgomery 500-kV TL into a new planned 500-kV switching station at PCT. This would require approximately 1.9 miles of new TL (all of which would be within the PAF/PCT Footprint shown in Figure 1). Additionally, new fiber optic line would be installed along 51 miles of the Paradise – Montgomery 500-kV TL (approximately 48 miles of which are in Kentucky, with the remainder in Tennessee; see Figure 2). The new fiber optic line may be installed by helicopter. Designated pull points along the TL corridor would be used to set up reels of fiber optic cable for installation. The pull points would require use of a trailer-mounted cable reel. Therefore, TVA included the access routes for each of the potential pull points (total of 22 non-contiguous access routes). These access routes consist of existing roads surfaced in dirt, gravel, asphalt, or concrete. TVA would make no modifications to any of the roads and would keep vehicles on those roads during travel to and from the work locations. This TL upgrade would not include any new visual elements and therefore does not have potential for visual effects on any above-ground properties that may be in the viewshed.

The new CT units at PCC, construction of the new 500-V switchyard, and the 1.9 miles of new TL (to be built as part of the reconfiguration/retermination of the Paradise-Montgomery 500-kF TL) would introduce new visual elements. Therefore TVA has included the viewshed within one-half mile of these three elements in the APE, to account for visual effects on any above-ground properties that could result directly from the undertaking. Figure 3 shows a half-mile radius surrounding these elements.

In sum, TVA has determined that the portion of the undertaking's APE in Kentucky should include the following areas:

- all areas at PAF and PCC where ground disturbance related to the undertaking would take place ("PAF/PCT Footprint");

- twenty-two access routes for potential on-the-ground work for reconductoring the Paradise-Montgomery TL, along with a fifty-foot radius surrounding each work location (pull point); and

- the viewshed within a one-half mile radius of the locations of the new CT units at PCC, the new switchyard, and the new 1.9-mile long TL.

Previous Archaeological Reviews in the Project Footprint

TVA has conducted six reviews under Section 106 of the National Historic Preservation Act within parts of the APE at PAF and PCT, in connection with various prior undertakings between 2013 and 2017 (Figure 4):

- construction of a baghouse (emissions control structure);
- construction of PCC (referred to in our 10/11/2013 letter as the Paradise Fossil Plant Combined Combustion-Combustion Turbine Plant Project);
- a transmission line feed to the new PCC units;
- barge roll-off area improvements;
- demolition of the Coal Wash Facility; and

- CCR (coal combustion residuals) Management.

All of these reviews began with a desktop review that included examination of historic and current topographic maps, current and historic satellite imagery, reports of previous investigations, TVA's technical reports on the Paradise Steam Plant Project (TVA 1964 and 1979), and historic photographs taken at ground level or from above. Three of the reviews included an archaeological survey, and one included a survey of historic architectural properties. The archaeological surveys involved systematic shovel testing and visual examinations of exposed ground surfaces. No archaeological sites were recorded in the PAF/PCT Footprint as a result of these investigations. In archaeological surveys, shovel testing provided evidence of past ground disturbance that has altered or removed the original soils and sediments. Such ground disturbance results in low (or no) probability for intact archaeological sites.

In addition to these prior reviews, TVA is currently consulting with your office concerning the proposed Paradise Fossil Plant Decommissioning, Decontamination, De-energizing, and Deconstruction (D4) Project. The footprint of that project is within the PAF/PCT Footprint. Based on our review of previous Section 106 reviews, data regarding previous disturbance in the PAF D4 APE, and a recent architectural assessment of PAF (Karpynec and Weaver 2020), we are proposing a finding of no historic properties affected for that project.

Four of the access routes associated with the Paradise-Montgomery TL upgrade intersect the survey area for a natural gas interconnect pipeline (Robinson et al. 2015). Four other access routes intersect a previous archaeological survey for a transmission line project (Wampler 2004). These surveys had identified three previously-recorded sites (15MU83, 15MU84, and 15MU248) in the current project footprint. (Please see the current report, referenced below, for maps showing the locations of these access routes). TRC, who conducted the 2004 survey, recommended site 15MU83 as not eligible and site 15MU84 as unassessed for listing in the NRHP. They recommended that the portion of site 15MU248 within the APE was not eligible.

Areas in the PAF/PCT portion of the APE not included in previous archaeological investigations

Roughly half of the PAF/PCT portion of the affected area was not included within previous archaeological investigations. As we have explained in previous consultation letters (October 11, 2013 [CC-CT Plant], August 20, 2014 [Slag Mountain], February 22, 2017 [CCR Operations], November 19, 2020 [D4]), large portions of this area lack potential for undisturbed archaeological deposits due to ground disturbance from past coal mining. Figure 4 shows areas that were surface mined and sub-surface (auger) mined by the Peabody Coal Company, as well as historical surface mines, both within and outside the APE. A very extensive portion of the PAF reservation, including much of the APE, has been affected by surface mining, which destroyed any archaeological sites that may have been present.

Nearly all areas within the PAF/PCT Footprint that have not been surveyed for archaeology, and were not affected by coal mining, consist of the developed areas of PAF and contain the powerhouse, the cooling water intake, ash storage areas, impoundments, coal pile, conveyors, various other structures, drives, and parking areas. These features are documented to some extent by engineering drawings and historic photographs, and by current satellite images of the APE, and we have provided some of this documentation in past consultations. Figure 5, for example, shows PAF soon after completion of Units 1 and 2, looking east from what is now the coal pile toward the powerhouse; note the extensive grading and fill placement. Historic photos taken from various viewpoints at PAF, and grading plans drafted for plant construction, document extensive grading, excavation, and fill placement throughout the plant operations areas. Excavation and grading during construction resulted in the destruction of any archaeological sites that may have been present prior to TVA's acquisition of the property.

Archaeological Survey
A small amount of area within the PAF/PCT Footprint has not been included in previous archaeological reviews and is not obviously affected by mining or construction. This portion consists of two tracts totaling approximately 73.5 acres--a 33.5-acre tract east of PCC, and a 40-acre tract east of the former Coal Wash Plant (please see "PCT_survey areas" in Figure 4). TVA contracted with Wood Environment and Infrastructure (Wood) for an archaeological survey of these two tracts and the 22 TL access routes/pull points in order to identify archaeological sites that could be affected by the PCT/CCT Modernization Project. The total survey area encompassed approximately 95.3 acres. A low-resolution version of the report, titled, *Phase I Survey – Phase I Archaeological Survey, Tennessee Valley Authority, PCT/CCT Modernization Project, Muhlenberg and Todd Counties, Kentucky*, is attached. A high-resolution version can be downloaded.

The survey consisted of pedestrian survey and systematic shovel testing. The survey identified no archaeological sites within the PAF/PCT Footprint, but it did identify one cemetery in this area, the McDougal Cemetery. The survey revisited the three previously-recorded sites (15MU83, 15MU84, and 15MU248), and documents that for each of these sites, the portion within the current project footprint has been disturbed by the construction of gravel roads. These gravel roads are private, and were not built by TVA. No cultural material associated with any of the sites was identified. The survey also identified a previously unrecorded site, 15TO89. Wood recommends that the portion of this site within the APE does not demonstrate eligibility for the National Register of Historic Places (NRHP) due to a lack of integrity. We have read this report and agree with the findings and recommendations of the authors.

TVA has no plans for any ground disturbing activities within or adjacent to the McDougal Cemetery. TVA agrees with Wood that the portions of sites 15MU83, 15MU84, and 15MU248 within the project footprint consist of gravel roads lacking in archaeological deposits, and that the portion of site 15TO89 within the project footprint is ineligible for inclusion in the NRHP. Therefore, TVA finds that the Kentucky portion of the project footprint contains no NRHP-eligible or –listed archaeological sites.

Previous Reviews of Historic Architectural Properties in the Viewshed of PCT
TVA has carried out four historic architectural surveys and assessments in connection with past projects. TVA has also completed desktop reviews for historic architectural resources in association with two other past projects on the PAF reservation. One of these reviews was in regards to the then-proposed Paradise Combined Combustion-Combustion Turbine plant (see our October 11, 2013 letter). The half-mile radius for that review was based on a study area that included the current location of PCC plus some additional area. Taken together, the four surveys/assessments and two desktop reviews have included nearly the entire PCT half-mile radius (Table 3, Figure 6). None of the surveys identified any resources that are listed in or eligible for listing in the NRHP within the PAF reservation. Based on the 2013 architectural assessment (Karpynec and Weaver 2013) TVA determined that PAF is ineligible for inclusion in the NRHP, due to physical changes that have compromised the historic integrity of the plant. Your office agreed with that assessment by letter dated May 8, 2013, but you also recommended that TVA complete a second assessment of PAF in 2020. A 2016 re-assessment of PAF in connection with the CCR Operations Project also found that PAF was ineligible (TVA did not receive a comment from your office). In 2020, we completed a third assessment of PAF and have again determined it is ineligible for inclusion in the NRHP. Our November 19, 2020 letter to your office regarding the PAF D4 project presents the findings of that study.

Neither of the desktop reviews identified any NRHP-listed or –eligible above-ground resources. We consulted with your office regarding our finding of no effect (letters dated October 11, 2013 and February 11, 2015, respectively), and you replied with concurrence in both cases.

The southeastern portion of the half-mile radius was not included in any of TVA's previous reviews of historic architectural properties. Some of the new TL structures would be visible from within some areas in this portion. To identify any potential aboveground historic properties in this area, TVA carried out a desktop review. This review included examinations of current topographic maps (Paradise, Kentucky and Rochester, Kentucky 7.5-minute quadrangles), historic topographic maps (1954 and 1963 editions of the Paradise, Kentucky quadrangle; 1953 edition of the Rochester, Kentucky quadrangle), current satellite imagery, reports of previous investigations, the Kentucky Heritage Council (KHC) Historic Resources online database, and the National Register of Historic Places. The KHC Historic resources online database and National Register of Historic Places show no properties in this part of the APE. TVA did not identify any potential historic structures on the historic maps.

Based on these previous surveys and assessments, our previous consultations with your office, and this desktop review, TVA finds that the PCT/CCT Modernization Project would not affect any aboveground historic properties in Kentucky.

Table 3. Previous historic architectural reviews that overlap portions of the APE

Review type and year	Report Title/Project Name	Consultant
Survey, 2005	*Phase I Architectural and Historical Survey for a Proposed Communications Tower at the Paradise Fossil Plant, Muhlenberg County, Kentucky* (Comm Tower Project)	TRC
Survey, 2013	*Architectural Assessment of the Proposed Improvements to the TVA Paradise Fossil Plant* (Baghouse Project)	TVAR
Survey, 2016	*Phase I Architectural Survey of a Proposed Dry Ash Landfill and Dewatering Facility at TVA's Paradise Fossil Plant (PAF), Muhlenberg County, Kentucky* (CCR Operations Project)	TVAR
Survey, 2020	*National Register of Historic Places Assessment of the Tennessee Valley Authority's Paradise Fossil Plant, Muhlenberg County, Kentucky*	TRC
Desktop, 2013	Paradise Combined Combustion-Combustion Turbine Plant Project (CC)	N/A
Desktop, 2014	Transmission Line Connection to PCC/PCT (TL Route)	N/A

Removal of 0.88 miles of retired 69-kV TL
The 69-kV TL to be removed consist of steel conductor supported on wood poles. This line was constructed as part of PAF Units 1 and 2 in ca. 1962. The materials and design are the same that were used throughout the TVA Power Service area for TLs carrying power at voltages below 161-kV in the period from the 1940s through the 1980s. TVA finds that this line lacks historic significance and is not eligible for inclusion in the NRHP.

Conclusion
The project footprint contains no NRHP-listed or –eligible archaeological sites and the undertaking's APE contains no NRHP-listed or –eligible historic architectural properties. Therefore, TVA finds that the PCT/CCT Modernization Project would result in no effects on historic properties in Kentucky.

Pursuant to 36 CFR Part 800.3(f)(2), TVA is consulting with federally-recognized Indian tribes regarding historic properties within the proposed project's APE that may be of religious and cultural significance and are eligible for the NRHP.

Pursuant to 36 CFR Part 800.4(d)(1) we are notifying you of TVA's finding of no historic properties affected, providing the documentation specified in § 800.11(d); and inviting you to review the finding. Also, we are seeking your agreement with TVA's eligibility determination for 15TO89, and TVA's finding that the undertaking as currently planned will have no effects on historic properties.

Should you have any questions or comments, please contact Steve Cole by email, at sccole0@tva.gov.

Sincerely,

Clinton E. Jones
Manager
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Enclosures

References Cited

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2016 *TVA Paradise Fossil Plant CCR Management, Muhlenberg County, Kentucky - Abbreviated- Negative Find Report.* KY OSA Registration No. FY17 8984.

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2013 *Architectural Assessment of the Proposed Improvements to the TVA Paradise Fossil Plant*. Prepared by Tennessee Valley Archaeological Research, Huntsville, Alabama. Prepared for TVA, Knoxville, Tennessee.

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2020 *National Register of Historic Places Assessment of the Tennessee Valley Authority's Paradise Fossil Plant, Muhlenberg County, Kentucky*. Prepared by TRC, Nashville, Tennessee. Prepared for TVA, Knoxville, Tennessee.

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2014 *Phase I Archaeological Survey of TVA's Upgrade of the Paradise Plant's Slag and Flyash Ponds, Emergency Spillways, and Additional Rip-Rap for Dike Stability, Muhlenberg County, Kentucky*. Amec Report of Investigations # 2014-011

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2015 *Phase I Archaeological Survey, Paradise Fossil Plant Gas Pipeline Easement and Unloading Facility, Muhlenberg County, Kentucky*. Amec Foster Wheeler Project # 73611581062.

Tennessee Valley Authority (TVA)
1964 *The Paradise Steam Plant: A Report on the Planning, Design, Construction, Costs, and first Power Operations of the Initial Two-Unit Plant*. Published by TVA, Knoxville, Tennessee.

1979 *The Paradise Steam Plant Unit 3: A Report on the Planning, Design, Construction, Costs, and first Power Operations of the One-Unit Addition*. Published by TVA, Knoxville, Tennessee.

Wampler, Marc
2004 *Archaeological Survey for the Kirkmansville-Clifty City Power Improvement Project, Muhlenberg, Todd, and Christian Counties, Kentucky. Prepared by TRC, Nashville, Tennessee*. Submitted to the Tennessee Valley Authority, Knoxville, Tennessee.

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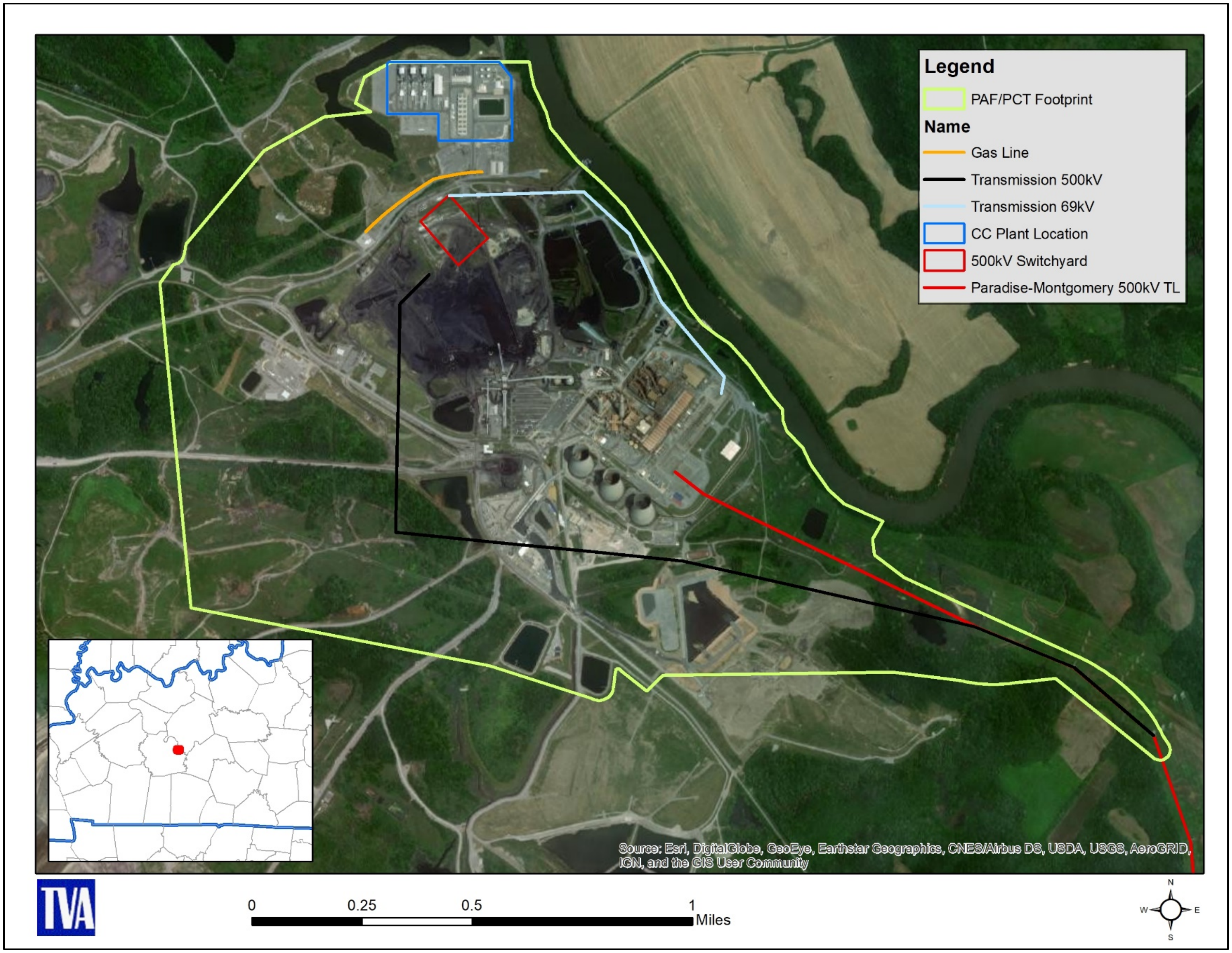

Figure 1. PAF/PCT portion of project footprint. The CC Plant, Paradise-Montgomery 500-kV TL, and 69kV TL are existing. Gas line, 500-kV transmission line, and 500-kV switchyard are proposed.

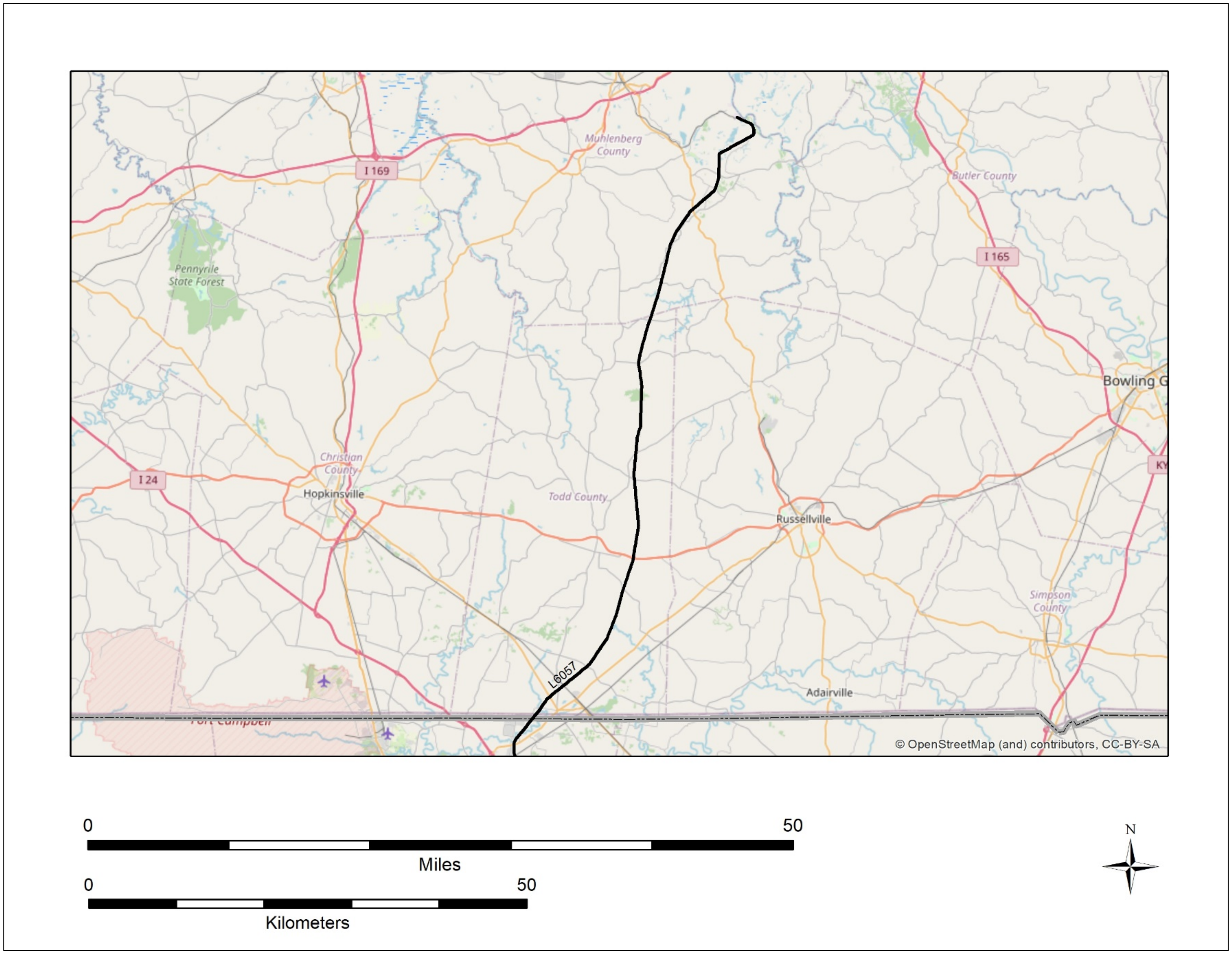

Figure 2. Location of transmission line L6057-02 (Paradise-Montgomery 500-kV TL).

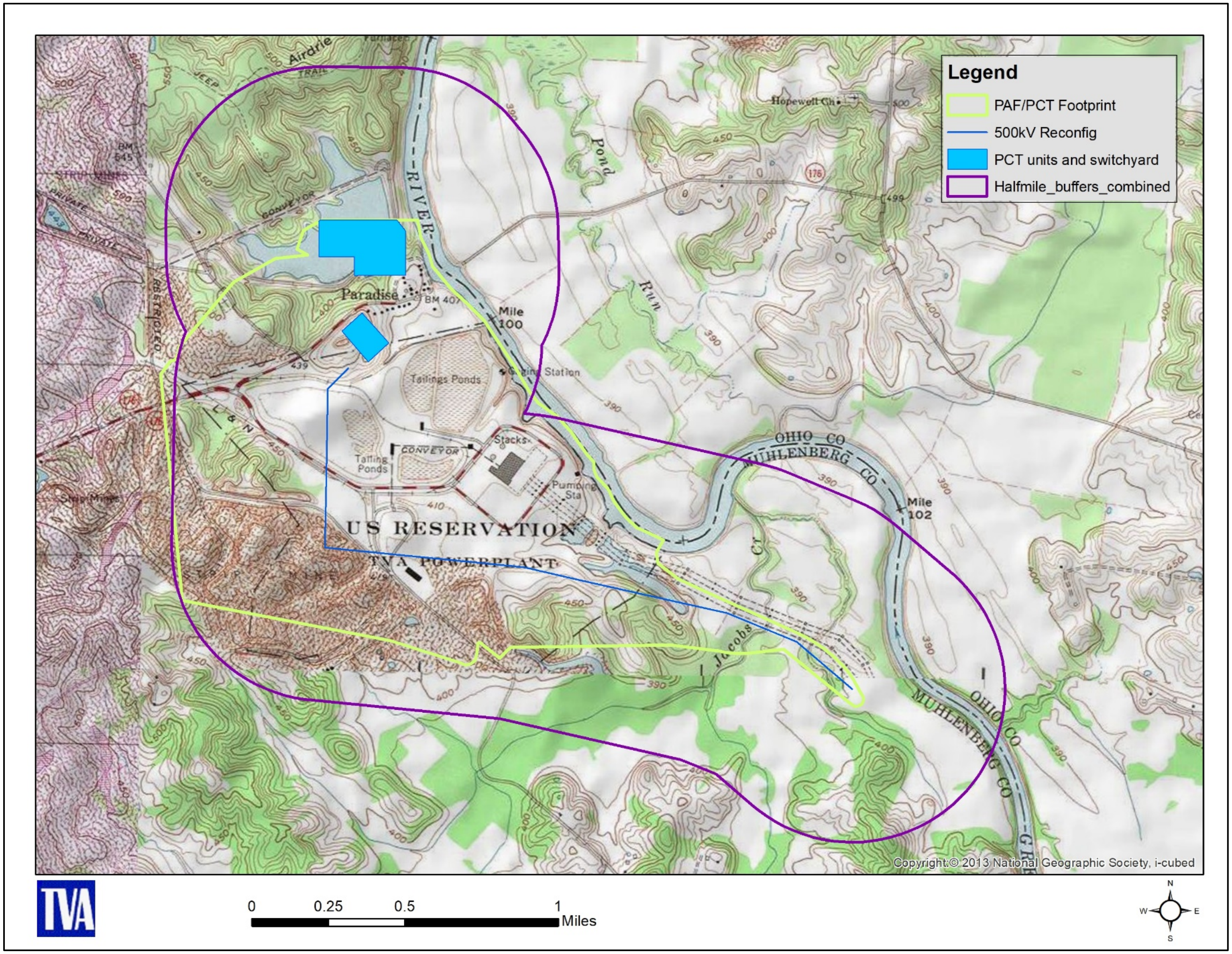

Figure 3. PAF/PCT Footprint and half-mile radius surrounding proposed new construction (new CT units, new 500-kV switchyard, and reconfiguration/retermination of the existing Paradise – Montgomery 500-kV TL).

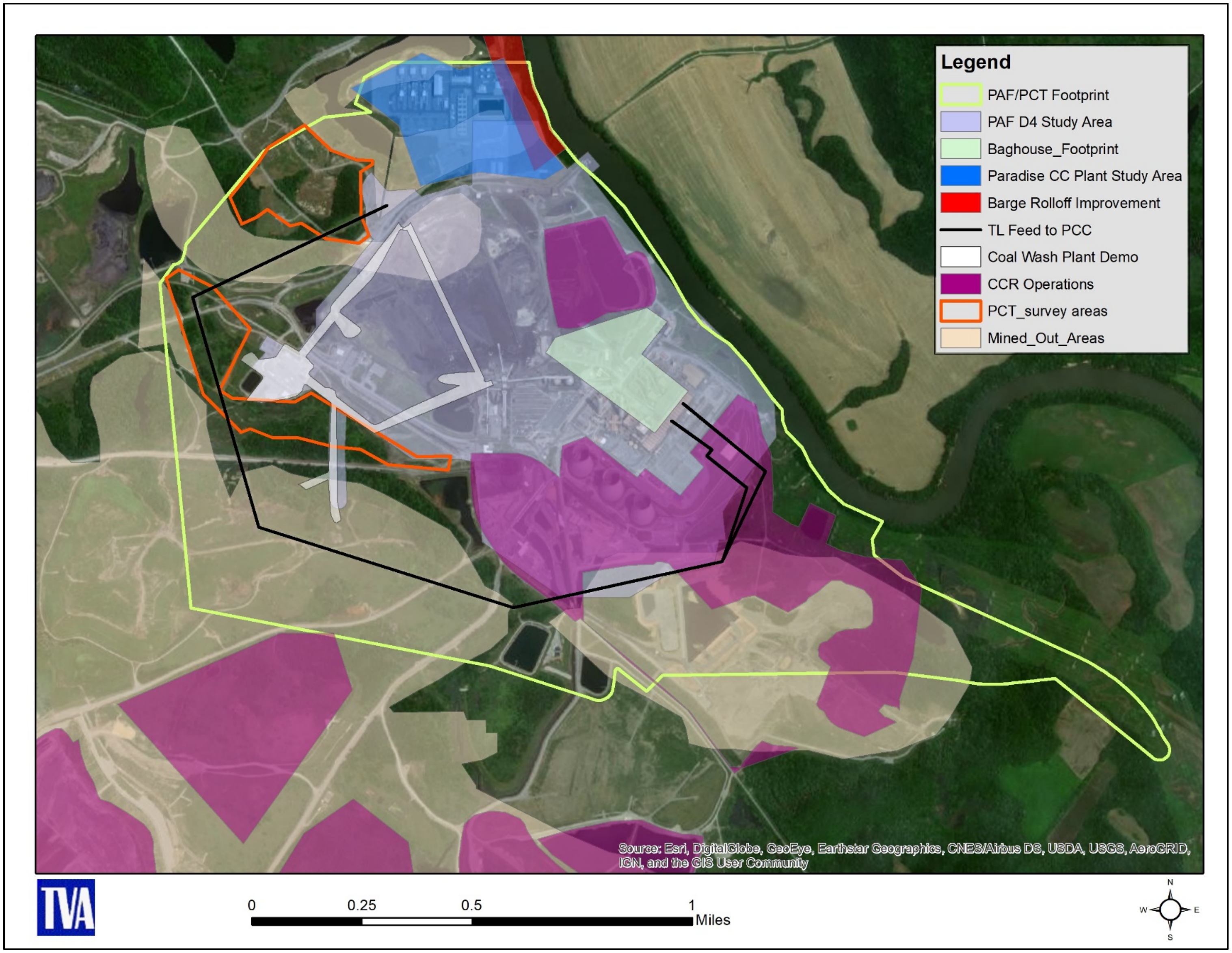

Figure 4. Areas in the PAF/PCT Footprint that have been reviewed previously for archaeological sites, and areas affected by past mining activities.

Figure 5. Photo taken June 1963, looking east from what is now the coal yard toward the powerhouse. The railroad tracks in foreground are no longer extant.

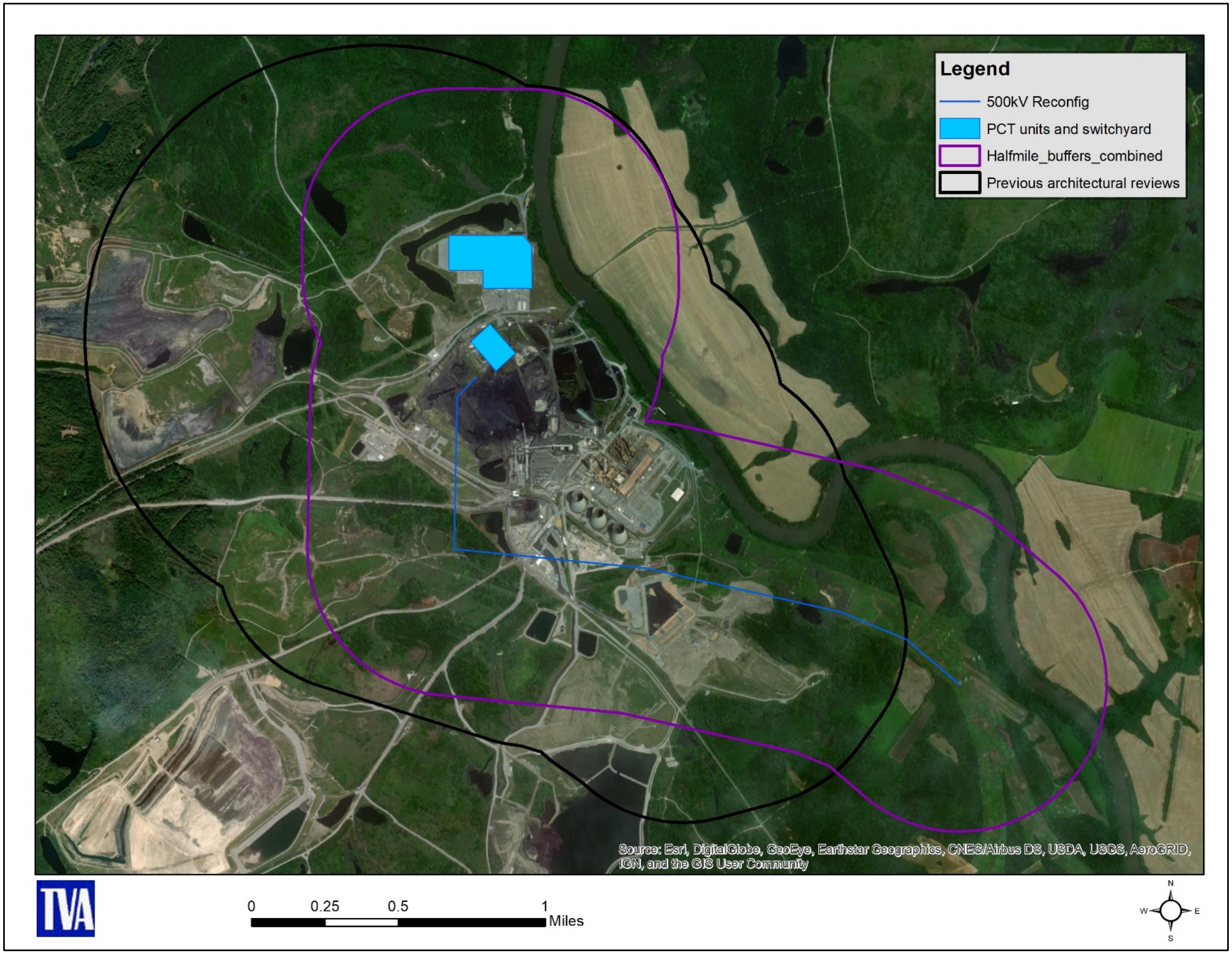

Figure 6. Locations of new construction (CT units, 500-kV Switchyard, and 500-kV TL reconfiguration), with half-mile radius, compared with the combined areas of previous reviews for visual effects.

Tennessee Valley Authority, 400 West Summit Hill Drive, Knoxville, Tennessee 37902

September 9, 2020

Ms. Lee Anne Wofford
Deputy State Historic Preservation Officer
Alabama Historical Commission
468 South Perry Street
Montgomery, Alabama 36130-0900

Dear Ms. Wofford:

TENNESSEE VALLEY AUTHORITY (TVA), PARADISE COMBUSTION TURBINE (PCT)/COLBERT COMBUSTION TURBINE (CCT) MODERNIZATION PROJECT, COLBERT, LAUDERDALE, LAWRENCE, LIMESTONE, AND MORGAN COUNTIES, ALABAMA; MUHLENBERG AND TODD COUNTIES, KENTUCKY; AND CHESTER, GILES, HARDIN, LAWRENCE, MAURY, MCNAIRY, MONTGOMERY, SUMNER, WAYNE, AND WILSON COUNTIES, TENNESSEE – INITIATION OF CONSULTATION

In 2019, TVA completed a Combustion Turbine (CT) Modernization study to evaluate the condition of TVA's current CT power generation units and evaluate steps needed to ensure a reliable power peaking fleet into the future. Combustion turbines are designed to meet peaks in power demand very quickly. TVA's CT plants run on natural gas as a fuel, and they can be activated on very short notice. Natural gas serves an increasingly important role in TVA's mission to provide clean, reliable energy to the people and businesses of the Tennessee Valley.

The CT Modernization study identified CT units that are over 40 years old and require replacement to ensure electrical reliability in the TVA power grid. These include Units 1-20 at Allen CT plant in Memphis, Tennessee and Units 1-16 at Johnsonville CT plant in New Johnsonville, Tennessee. TVA proposes to retire these outdated CT units and construct new frame CTs to replace the lost capacity. TVA would construct three 250-MW frame CTs at PCT plant in Muhlenberg County, Kentucky and three 250-MW frame CTs at CCT plant in Colbert County, Alabama.

These changes will require updates to the TVA electrical power grid. Thus, as part of this project, TVA also proposes to complete uprates and reconductors of transmission lines in Tennessee, Alabama, and Kentucky. Uprates involve making changes to allow the operation of a transmission line at a higher voltage. These changes could include such activities as replacing and/or modifying existing structures, installing intermediate structures, replacing or modifying conductor to increase ground clearance, adding tower extensions, and replacing structures with new, taller ones. Reconductoring projects involve removing the old conductor (cables that carry the electricity) and pulling new conductor into place. The proposed undertaking would affect segments of ten transmission lines scattered throughout Tennessee, Kentucky and northern Alabama. TVA proposes to uprate approximately 50 miles of transmission lines in Tennessee, and to reconductor approximately 155 miles of line in all three states. The total length of affected transmission lines is approximately 205 miles. However, not all of the lines would be affected throughout their extent. Activities with potential for ground disturbance would only take place at a limited number of locations within each transmission line. The scope would also include potential natural gas pipeline corridors within which a gas pipeline may need to be constructed and/or upgraded.

TVA has determined that the proposed CT Modernization Project is an undertaking (as defined at 36 CFR § 800.16(y)) with potential to cause effects on historic properties. Pursuant to §800.3(c), we are initiating consultation with your office and the State Historic Preservation Officers of Kentucky and Tennessee. We are also initiating consultation with the federally recognized Indian tribes who have expressed an interest in the affected counties.

Based on current information about the project, TVA has determined that the area of potential effects (APE) should include the following areas (Figure 1):

- all areas at CCT and PCT plants where ground disturbance related to the undertaking would take place;
- all areas within proposed natural gas pipeline corridors;
- all areas within the right-of-way (ROW) of the affected transmission lines where ground disturbing activities would take place and/or work resulting in changes to the viewshed (such as tower extensions exceeding 20% of the height of the original tower structure) are proposed;
- any off-ROW access routes that are not surfaced in asphalt, concrete, or gravel; and
- the viewsheds within a one-half mile radius of those proposed activities that have potential for visual effects on above-ground historic properties.

The ground-disturbing portion of the undertaking's APE within the state of Alabama would include the following:

- areas affected by ground disturbance at Colbert CT plant (and the Colbert Fossil Plant reservation);
- the area just south of the CCT plant associated with potential new natural gas pipeline; and
- areas within the approximately 71 miles of transmission line in Alabama where reconductoring activities with potential for effects on historic properties are proposed, plus any associated unsurfaced access routes.

The APE would include areas within the following Alabama counties: Colbert, Lauderdale, Lawrence, Limestone, and Morgan.

TVA has conducted a preliminary desktop review of the area within the proposed limits of disturbance at CCT plant. A majority of the area has been included in previous archaeological surveys. Other parts of the project area at CCT plant consists of developed facilities, such as roads and impoundments, which have little or no potential for intact archaeological sites. TVA estimates that archaeological survey would be needed for approximately 27 acres of land at CCT plant. TVA has initiated a phase I archaeological survey of this area. Given the presence of existing CT units at CCT plant, and given that our offices have previously agreed that Colbert Fossil Plant is ineligible for inclusion in the National Register of Historic Places (NRHP), TVA does not anticipate the installation of new units to result in potential effects on above-ground properties in the viewshed.

Project plans are still being developed. At this time, TVA is unable to completely determine the undertaking's APE. We will consult further with your office to fully determine the APE as project plans are developed.

Pursuant to 36 CFR Part 800.3(f)(2), TVA is consulting with federally recognized Indian tribes regarding historic properties within the proposed project's APE that may be of religious and cultural significance and are eligible for the NRHP.

Considering the scope and complexity of the proposed undertaking, TVA proposes to use a phased process to conduct identification and evaluation efforts, pursuant to 36 CFR Part 800.4(b)(2) and Stipulation III-D-3 of TVA's Section 106 Programmatic Agreement.

Should you have any questions or comments, please contact Steve Cole at sccole0@tva.gov.

Sincerely,

Michaelyn Harle

Michaelyn Harle on Behalf of Clinton E. Jones
Manager
Cultural Compliance

SCC:ABM
Enclosures

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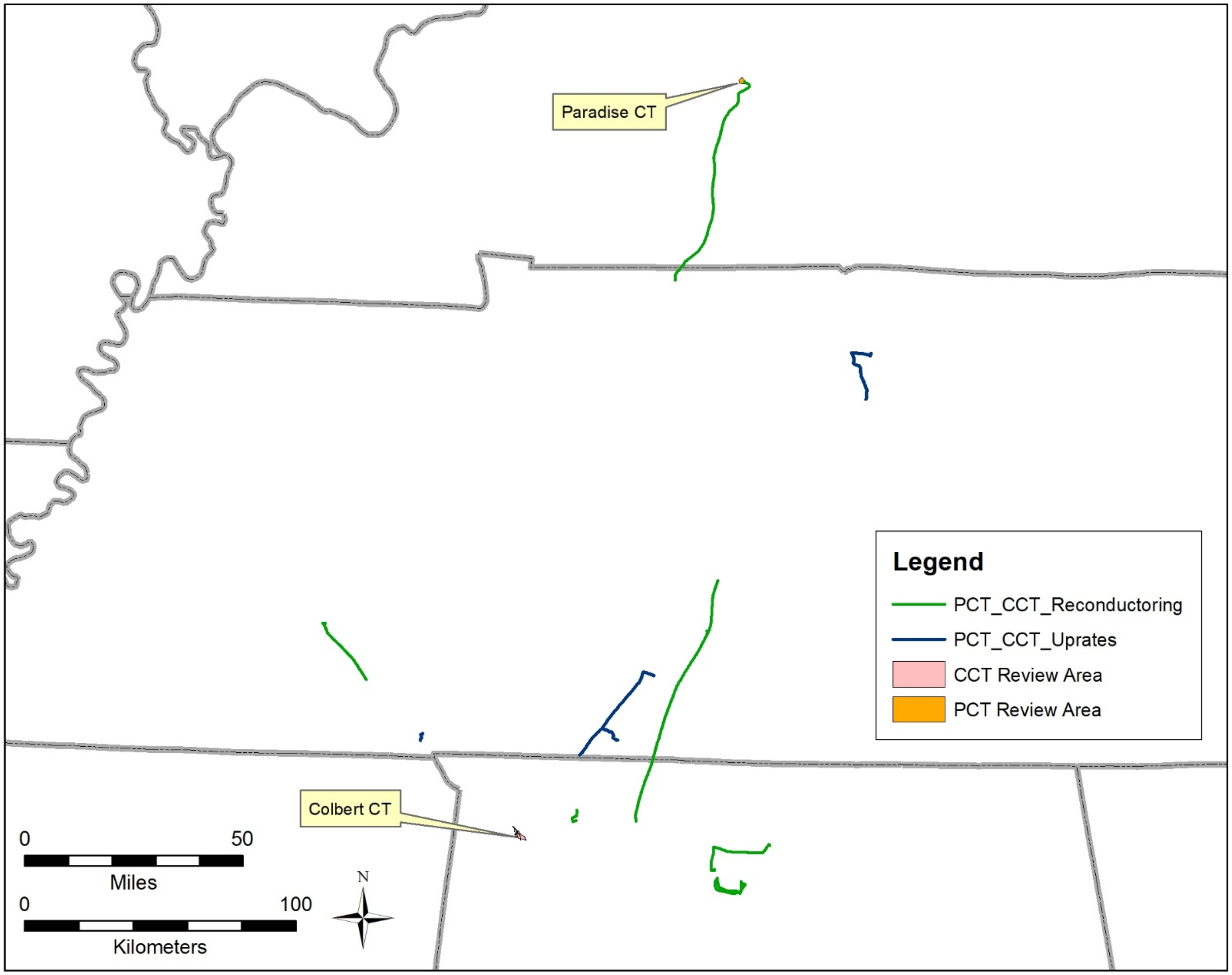

Figure 1. Overview of project APE.

Tennessee Valley Authority, 400 West Summit Hill Drive, Knoxville, Tennessee 37902

December 8, 2020

Ms. Lee Anne Wofford
Deputy State Historic Preservation Officer
Alabama Historical Commission
468 South Perry Street
Montgomery, Alabama 36130-0900

Dear Ms. Wofford:

TENNESSEE VALLEY AUTHORITY (TVA), PARADISE COMBUSTION TURBINE/COLBERT COMBUSTION TURBINE (PCT/CCT) MODERNIZATION PROJECT, COLBERT, LAUDERDALE, AND MORGAN COUNTIES, ALABAMA – PHASE I SURVEY

We initiated consultation with your office in September regarding our Section 106 review of the above-cited multi-state project. Since that time, TVA has made progress in project design, which enabled us to further define the area of potential effects (APE). Figure 1 shows an updated map of the overall project's APE. We have also completed a Phase I Archaeological survey in the project footprint, and have assessed the undertaking's potential for direct and indirect effects on historic properties. In this letter, we describe how we determined the APE, discuss the survey, and present our findings for the portion of the project within Alabama. We continue to consult with the State Historic Preservation Officers of Tennessee and Kentucky concerning the portion of the project in their respective states.

Project description

Three main types of activities would be carried out in Alabama as part of the project: installation of three frame combustion turbine (CT) units at Colbert Combustion Turbine plant (CCT) (Figure 2); installation of an approximately 0.X mile natural gas supply pipeline (Figure 2); and reconductoring approximately 14.4 miles of transmission line (Figures 3 and 4). Figure 2 shows the boundaries of the area where activities associated with the CT unit and natural gas pipeline installation would take place. We refer to this part of the project area as the CCT Footprint. The CCT Footprint encompasses a total of approximately 65 acres. The reconductoring work would take place in two locations: near Florence and near Decatur, Alabama.

Work associated with the construction of new frame CT units

CCT is on the same reservation as the Colbert Fossil plant in Tuscumbia, Alabama, and went online in 1972. TVA's Colbert Reservation is situated on 1,354 acres on the south shore of Pickwick Lake in city of Tuscumbia in Colbert County, Alabama. The Colbert CT plant has eight frame CT units. The retired coal-fired plant on the reservation is currently undergoing decommissioning.

The three frame CT units would be constructed in a new power block to be built on heavily disturbed lands in the former Colbert Fossil Plant coal yard. In addition to the major equipment systems, the proposed CT facilities would include plant equipment; natural gas metering and handling systems; instrumentation and control systems; transformers; and administration and warehouse/maintenance buildings. Subsurface piles would be installed to support foundations for plant components, as required. At full buildout, the CT plant would occupy about 4.4 acres on the reservation.

In order to provide power to the CT plant, TVA would construct a new, 0.42-mile long, 161-kilovolt (kV) TL from the existing switchyard to the new CT plant. The new TL would be built to the north of the proposed CT units and would likely be constructed with double and single steel-pole structures of varying heights, depending on the terrain and existing obstacles on the reservation. The new TL structures would either be erected on concrete foundations or direct buried with spoil or gravel backfill. Some TL structures would likely require steel guy wires secured to buried anchors (e.g., wood logs or reinforced concrete). The TLs, CTs and supporting components would all be within the Colbert Reservation (formerly known as the Colbert Fossil Plant reservation).

Construction would also require minor improvements to an existing rail spur, and use of several laydown/staging areas and a temporary use area. These activities would be limited to the existing Colbert Reservation.

Work associated with installation of a natural gas supply pipeline
In order to provide the additional natural gas supply to the new CT units, a new lateral tie into the main distribution pipeline would be constructed just south of the intersection of Steam Plant Road and US Highway 72. Easements with landowners south of Highway 72 and with TVA for land on the reservation would be amended to reflect the proposed pipeline installation. The proposed pipeline and station upgrades would be constructed and operated by a commercial supplier. Gas to fuel the new CT units would be provided by a new 20-inch underground pipeline. This pipeline would run parallel to an existing 10-inch lateral natural gas pipeline on the Colbert Reservation. The new pipeline facilities would also require upgrades to the existing onsite natural gas delivery station to include replacement of metering and pressure/flow regulating equipment as well as additional piping and valves.

Transmission line reconductor work
Since initiating consultation, TVA has made changes to the planned TL upgrade work. Figures 3 and 4 show overviews of this work within the state of Alabama. The work would consist of reconductors of two line segments totaling approximately 4.2 miles in the Florence vicinity (Figure 3), and one line segment totaling 10.2 miles in the Decatur vicinity (Figure 4). Reconductoring projects involve removing the old conductor (cables that carry the electricity) and pulling new conductor into place. One 72-foot tall tower structure on L5670, near Florence, would receive a 10-foot extension. Designated pull points along the TL corridor would be used to set up cable reels of conductor for installation. The pull points would require use of a trailer-mounted cable reel. Therefore, TVA included the access routes for each of the potential pull points (total of 49 non-contiguous access routes). These access routes consist of existing roads surfaced in dirt, gravel, or pavement. TVA would make no modifications to any of the roads and would keep vehicles on those roads during travel to and from the work locations. The

TL reconductoring would not include any new visual elements and therefore does not have potential for visual effects on any above-ground properties that may be in the viewshed.

APE
New construction in the CCT Footprint (installation of CT units, laying new gas pipeline, and building the 0.4-mile 161-kV TL) would result in ground disturbance. TVA has included the entire 65-acre CCT Footprint in the APE in order to fully capture any and all project activities that could take place on the Colbert Reservation. Setting up cable reels and replacing TL structures, also could result in ground disturbance and TVA has included a fifty-foot radius around each of these areas in the APE as well, along with the associated access routes, Project elements with potential for visual effects would be limited to the new CT units and new TL feed. TVA has included a half-mile radius surrounding these proposed features to account for the undertaking's potential visual effects (Figure 5).

Previous Archaeological Surveys in the Project Footprint

CCT Footprint
TVA has conducted several reviews under Section 106 of the National Historic Preservation Act within parts of the CCT Footprint in connection with various prior undertakings (Figure 6). Some of these reviews (e.g., Hubbert 1981, Lafferty 1978, Webb and DeJarnette 1942) were completed prior to the development of standard survey guidelines and TVA's current practice of systematically surveying projects as part of our Section 106 reviews. The reports for those reviews lack the level of detail needed to satisfy documentation standards of 36 CFR Part 800.11. Therefore, for this project, we relied solely on the more recent surveys, for which sufficient detail is given and survey methods were consistent with current guidelines.

Ten archaeological surveys meeting the above conditions have included nearly 100% of the surveyable land in the CCT Footprint. Table 1 lists the project titles and survey years; Figure 6 shows the previously-surveyed areas.

Table 1. Previous archaeological surveys that overlap portions of the CCT Footprint.

Year	Author(s)	Report Title	Consultant
1993	Shaw, S.	*A Cultural Resources Assessment of the Proposed Colbert Coproduction Site at the Colbert Reservation Near Pride, Colbert County, Alabama*	University of AL
1995	Goldman-Finn, Nurit S.	*Archaeological Survey in the Middle Tennessee River Uplands, Colbert and Lauderdale Counties, Alabama*	University of AL
2001	Pearce, K. and H. Johnson	*Phase I Cultural-Resource Survey of the Proposed Bamagas Pipeline through Colbert, Lawrence, and Morgan Counties, Alabama*	Panamerican

Year	Author(s)	Report Title	Consultant
2002	Wild, M. J. and J. Holland	*Archaeological Survey of An Approximately 6-Acre Tract, As Part of a Project to Install* *Ammonia Removal Equipment at Colbert Fossil Plant in Colbert County, Alabama*	TRC
2003	D'Angelo, J. and T. Cleveland	*Cultural Resource Survey of Approximately 150 Acres Proposed for a Borrow Pit and Other New Facilities at Colbert Fossil Plant in Colbert County, Alabama*	TRC
2004	D'Angelo, J.	*An Archaeological Survey of Three Tracts Totaling Approximately 200 Acres for the Colbert Steam Plant Scrubber Project, Colbert County, Alabama*	TRC
2010	Tucker-Laird, E.K. and J.L. Holland	*Archaeological Survey of Two Tracts Totaling Approximately 216.2 Acres for Geophysical Survey at the Colbert Fossil Plant, Colbert County, Alabama*	TRC
2015	Manning, K.M., H.. Rosenwinkel, T. Rael, and J. le Roux	*A Phase I Archaeological Survey of Tennessee Valley Authority's Electrical Resistivity Imaging Project at the Colbert Fossil Plant Reservation in Colbert County, Alabama*	TVAR
2015	De Gregory, R. and H. Rosenwinkel	*A Phase I Archaeological Survey of Tennessee Valley Authority's Bottom Ash Pond No. 4 Seismic Remediation Project #417259 at Colbert Steam Plant in Colbert County, Alabama*	TVAR
2016	Rosenwinkel, H. T. Karpynec, M. Weaver, K. Wright, E. Crook, K. Manning, and C. Medeiros	*A Phase I Archaeological Survey of Tennessee Valley Authority's Colbert Fossil Plant Decommissioning in Colbert County, Alabama*	TVAR

Transmission Line Reconductors
Table 2 lists previous archaeological surveys within, or intersecting, the transmission line reconductor portion of the project footprint. These surveys account for a relatively minor portion of the APE. These surveys identified six archaeological sites in the current project footprint: 1MG778, 1MG1038, 1LU639, 1CT332, 1CT333, and 1CT334.

Table 2. Previous archaeological surveys in the transmission line reconductor portion of APE

Survey year	Author(s)	Report Title/Project Name	Consultant
1994	Shaw, S.	*A Cultural Resources Assessment of the Tennessee Valley Authority's Muscle Shoals Reservation, Colbert and Lauderdale Counties, Alabama*	University of AL
1998	Rooney	*A Cultural Resources Survey of a Proposed Transmission Line in Decatur, Morgan County, Alabama*	
2002	Stanyard, W.F., L.M. Pietak, and J.L. Holland	*Phase I Archaeological Investigations along the Calpine-Solutia Transmission Line, Morgan County, Alabama*	TRC

Areas in the Project Footprint Not Included In Previous Archaeological Investigations
Four small areas within the CCT Footprint have not been included in any previous archaeological surveys. One of these is a thin sliver of land in the southern portion of the CCT Footprint within the right-of-ways of Highway 72 and a railroad. Given the prior disturbance from road and railroad construction, TVA considers the potential for archaeological sites in this area to be very low. Three other tracts in the CCT Footprint totaling 27.3 acres have not been included in any previous archaeological surveys and appear to have some potential for the presence of archaeological sites. The majority of land affected by the TL reconductor work has not been included in previous archaeological surveys.

After completing the archaeological survey described below, TVA modified the CCT Footprint portion of the APE slightly. This resulted in some previously unsurveyed land being omitted from the survey. This can be seen in Figures 6 and 7 by comparing the CCT Survey Area with the CCT Footprint. However, TVA is not planning any physical work in the area that was not surveyed. Should plans change, resulting in proposed ground disturbance in that area, we will consult further with your office.

Previously-Recorded Archaeological Sites in the Project Footprint
Background research revealed that 15 previously-recorded archaeological sites are located within the CCT Footprint, and six previously-recorded sites are located in parts of the TL corridors that would be affected by potentially ground-disturbing work. Table 3 lists these sites and gives their current National Register of Historic Places (NRHP) status according to data maintained by the Alabama Office of Archaeological Research and/or recent investigations.

Table 3. Previously-recorded archaeological sites in the Project Footprint, with current NRHP status based on OAR listing and/or previous investigations.

Site number	NRHP status	Location
1CT16	Non-extant	CCT Footprint
1CT20	Undetermined	CCT Footprint
1CT21	Undetermined	CCT Footprint

Site number	NRHP status	Location
1CT22	Undetermined	CCT Footprint
1CT75	Undetermined	CCT Footprint
1CT77	Non-extant	CCT Footprint
1CT78	Undetermined	CCT Footprint
1CT113	Undetermined	CCT Footprint
1CT116	Undetermined	CCT Footprint
1CT437	Undetermined	CCT Footprint
1CT625	Potentially-eligible	CCT Footprint
1CT626	Ineligible	CCT Footprint
1CT630	Potentially-eligible	CCT Footprint
1CT631	Potentially-eligible	CCT Footprint
1CT632	Ineligible	CCT Footprint
1MG778	Eligible	Transmission line corridor
1MG1038	Ineligible	Transmission line corridor
1LU639	Undetermined	Transmission line corridor
1CT332	Undetermined	Transmission line corridor
1CT333	Undetermined	Transmission line corridor
1CT334	Undetermined	Transmission line corridor

Archaeological Survey
TVA contracted with Wood Environment and Infrastructure (Wood) for an archaeological survey of previously unsurveyed land in the project footprint (CCT Footprint and footprint of the TL reconductor work) in order to identify archaeological sites that could be affected by the undertaking. The total survey area encompassed approximately 27.3 acres of land in the CCT Footprint (shown in Figures 6 and 7), and access routes and a 50-foot radius surrounding each proposed work structure in the TLs to be affected by the reconductor work (please see figures in the accompanying report showing these survey areas). A reduced-resolution version of the report, titled, *Phase I Survey – Phase I Archaeological Survey, Tennessee Valley Authority, PCT/CCT Modernization Project, Colbert, Lauderdale, and Morgan Counties, Alabama*, is attached. A high-resolution version can be downloaded.

The survey consisted of pedestrian survey and systematic shovel testing. The survey revisited the locations of seven previously-recorded archaeological sites in the survey area—one in the CCT Footprint (1CT437) and six in the TL portion of the project footprint (1MG778, 1MG1038, 1LU639, 1CT332, 1CT333, and 1CT334). The latter six sites were not relocated, and it appears that the portions of these sites within the APE are no longer extant. One previously-recorded site located in the survey area within the CCT Footprint (1CT437) was relocated. Wood recommends that this late historic site is ineligible for the NRHP, and that no further work on the site should be necessary. The survey did not identify any previously-unrecorded archaeological sites. The remaining previously-recorded sites have been addressed by the surveys listed in Table 1.

Two of the affected TLs intersect known terrestrial routes of the Trail of Tears/Removal Route (TOT/RR). L5670-01 intersects a known TOT/RR in Morgan County, Alabama (Figure 8). The TOT/RR at this location aligns with a railroad; use of two access routes would be within a 500-foot radius of the route. Shovel testing along the access routes and at work structures 117 and 118 indicated disturbed soils and yielded no cultural material. L5676-01 intersects a portion of the TOT/RR in Lauderdale County, Alabama (Figure 9). Here, the only portion of the APE within 500 feet of the TOT/RR is a small section of an access route that follows a dirt road to a substation. Shovel test here and elsewhere in the vicinity indicated disturbed soils and yielded no artifacts. Given the disturbed nature of the soils at these two locations, TVA did not pursue further testing within the TOT/RR radius.

Assessment of Effects on Archaeological Sites
Most of the 13 extant sites in the CCT Footprint are located outside areas where planned activities would occur related to the undertaking (Figure 7). Of these sites, the OAR database lists the status of 10 as unassessed/undetermined or potentially eligible. Based on Wood's survey, we have determined that site 1CT437 should be considered ineligible. TVAR's survey for the Decommissioning Project indicated that two sites (1CT16 and 1CT77) are non-extant. Sites 1CT20, 1CT21, 1CT22, 1CT75, and 1CT113 (all potentially-eligible cave and rockshelter sites) are located on the bluff north of the former coal pile (now reclaimed), on the northern edge of the CCT Footprint. TVA plans no activities in this area; the undertaking will not affect any of these sites. Site 1CT78 (undetermined) is located adjacent to, but almost entirely outside of, a proposed laydown/staging area. Rosenwinkel et al. (2016) were unable to access site 1CT78 due to the presence of contaminated soils. For that same reason, TVA would not use the area where site 1CT78 is located, and therefore the undertaking will not affect that site. Site 1CT116 is also located outside of a planned laydown/staging area, on the bluff overlooking the Tennessee River (Figure 10 shows a close-up of the area containing sites 1CT78 and 1CT116). Sites 1CT630 and 1CT631 (both potentially eligible) are located in land along the left descending bank of Cane Creek; TVA has planned no activities in this area. This area was included in the project footprint early in the stages of project scoping, but as design developed, TVA has not seen any need to use this part of the footprint for any project activities. Site 1CT625 (potentially-eligible) is located on the right descending bank of Cane Creek adjacent to the railroad paralleling Highway 72. A gravel road passes through the site. TVA may use the gravel road during construction, but has no plans to make any improvements to the road. Therefore, based on current project design, the undertaking would not affect potentially eligible/undetermined sites 1CT20, 1CT21, 1CT22, 1CT75, 1CT78, 1CT113, 1CT116, 1CT630, 1CT631, or 1CT625.

Historic Architectural Properties in the Viewshed of CCT
TVA has carried out one historic architectural survey of an area surrounding the COF powerblock, in connection with a proposed dry ash storage facility (Tucker-Laird and Holland 2010). The survey area was based on two proposed dry ash storage areas located west and south of the powerblock. Figure 11 shows a comparison of that study area with the half-mile radius surrounding the proposed CT units and proposed 161-kV TL. Most of the latter area was

contained within the previously-surveyed area, save a portion along the river bluff that contains the decommissioned COF units, the COF waterfront facility, and some of the former coal yard.

The 2010 survey, performed by TRC, identified fifteen properties, and recommended that COF, the Old Lee Highway, and the Memphis and Charleston Railroad, were potentially eligible for inclusion in the NRHP. All of these resources except COF are located outside the APE. Despite TRC's recommendation that COF was potentially eligible, our offices agreed in consultation that COF was ineligible. We reiterated that consultation consensus in our 2016 consultation regarding the COF Decommissioning Project.

Two of the TLs that would be reconductored meet the minimum age criterion for consideration as potential historic properties: L5670-01, constructed in 1936, and L5676-01, constructed in 1924. (L5676-02 was built in 2001). Thirty-four (62%) of the original structures in L5670-01 are extant; the remainder were replaced with a modern type of structure between 1952 and 1970. TVA is currently developing a context for TVA's historic transmission system. Although we have not yet consulted with your office on this context, based on the research we have completed in developing the context, TVA will propose that replacement of 20 percent or more of the original structures compromises the integrity of design, materials, and feeling of historic transmission lines. Based on this threshold, L5670-01 is ineligible for the NRHP. As mentioned above, the only proposed modification to any of the structures in L5670-01 is the addition of a 10-foot extension to one structure (Structure 134, which is one of the original A-frame structures). L5676-01 consists of seven structures, of which five date to 1924 and are associated with Wilson Hydroelectric Project (listed in the NRHP). No modifications would be made to any of those structures. Therefore, TVA finds that the proposed transmission line work would not result in effects on any NRHP-listed or –eligible transmission lines.

Conclusion

The project footprint contains 10 archaeological sites that are potentially eligible for inclusion in the NRHP, or of undetermined/unassessed eligibility. All of these sites are located in areas where TVA plans no project-related activities. One site, 1CT437, which previously had an undetermined eligibility status, is herein recommended to be not eligible. No NRHP-listed or –eligible above-ground properties are located in the viewshed of activities that could have visual effects. While the undertaking would result in a physical change (tower extension) to one transmission structure in TL L5670-01 (built 1936), TVA recommends that this TL, while meeting the minimum age threshold for eligibility, lacks integrity and is not eligible for the NRHP. Therefore, TVA finds that the PCT/CCT Modernization Project, which includes work associated with (i) installation of CT Units, (ii) a new natural gas supply pipeline, and (iii) transmission line reconductor efforts, would result in a finding of no effects on historic properties in Alabama for each of these three components and, as a result, the Modernization Project in its entirety.

Pursuant to 36 CFR Part 800.3(f)(2), TVA is consulting with federally-recognized Indian tribes regarding historic properties within the proposed project's APE that may be of religious and cultural significance and are eligible for the NRHP.

Pursuant to 36 CFR Part 800.4(d)(1) we are notifying you of TVA's finding of no historic properties affected, providing the documentation specified in § 800.11(d); and inviting you to review the finding. Also, we are seeking your agreement with TVA's eligibility determinations and finding that the undertaking as currently planned will have no effects on historic properties.

Should you have any questions or comments, please contact Steve Cole by email at sccole0@tva.gov.

Sincerely,

Clinton E. Jones
Manager
Cultural Compliance

SCC:ABM
Enclosures

References Cited

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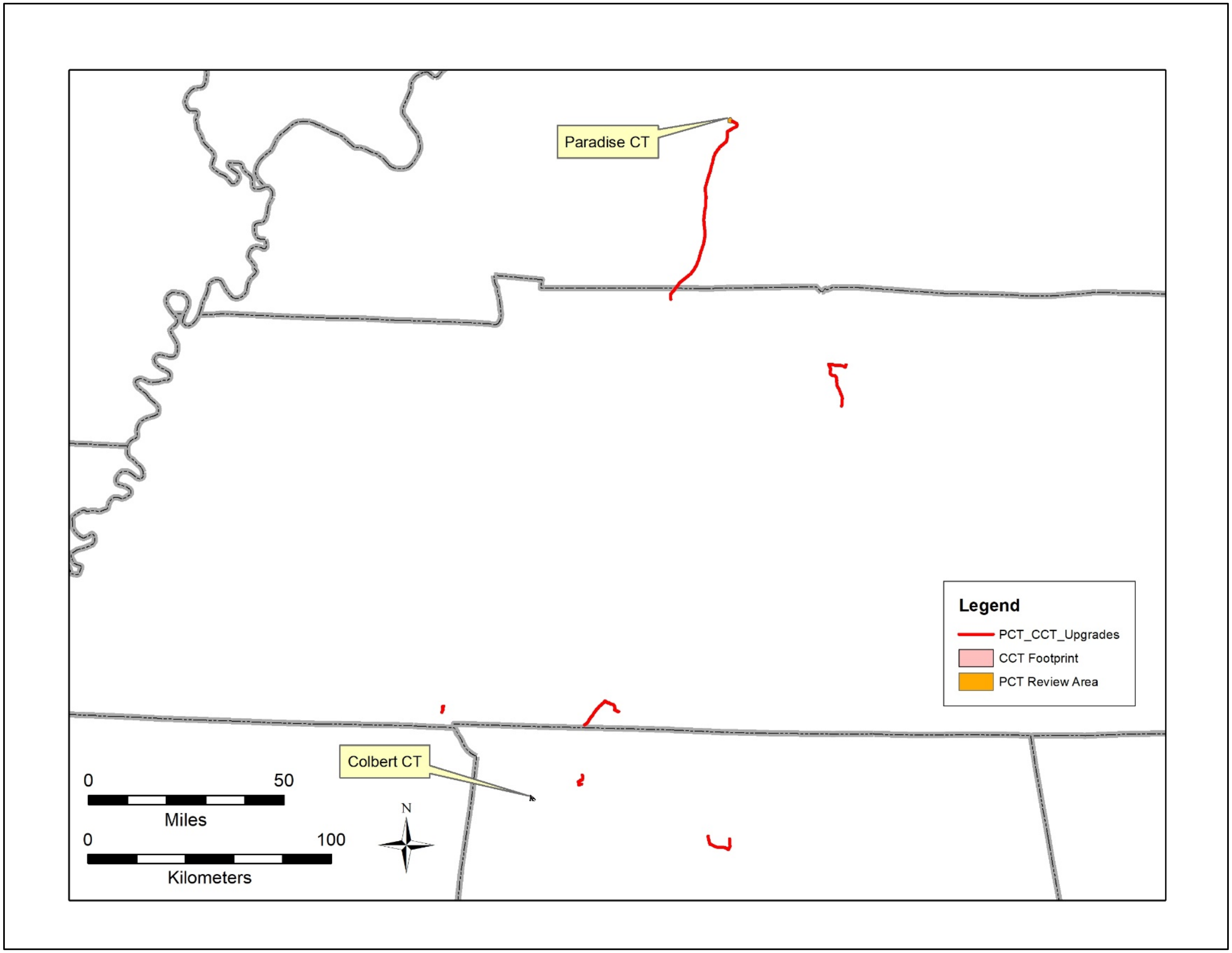

Figure 1. Updated map of overall project APE.

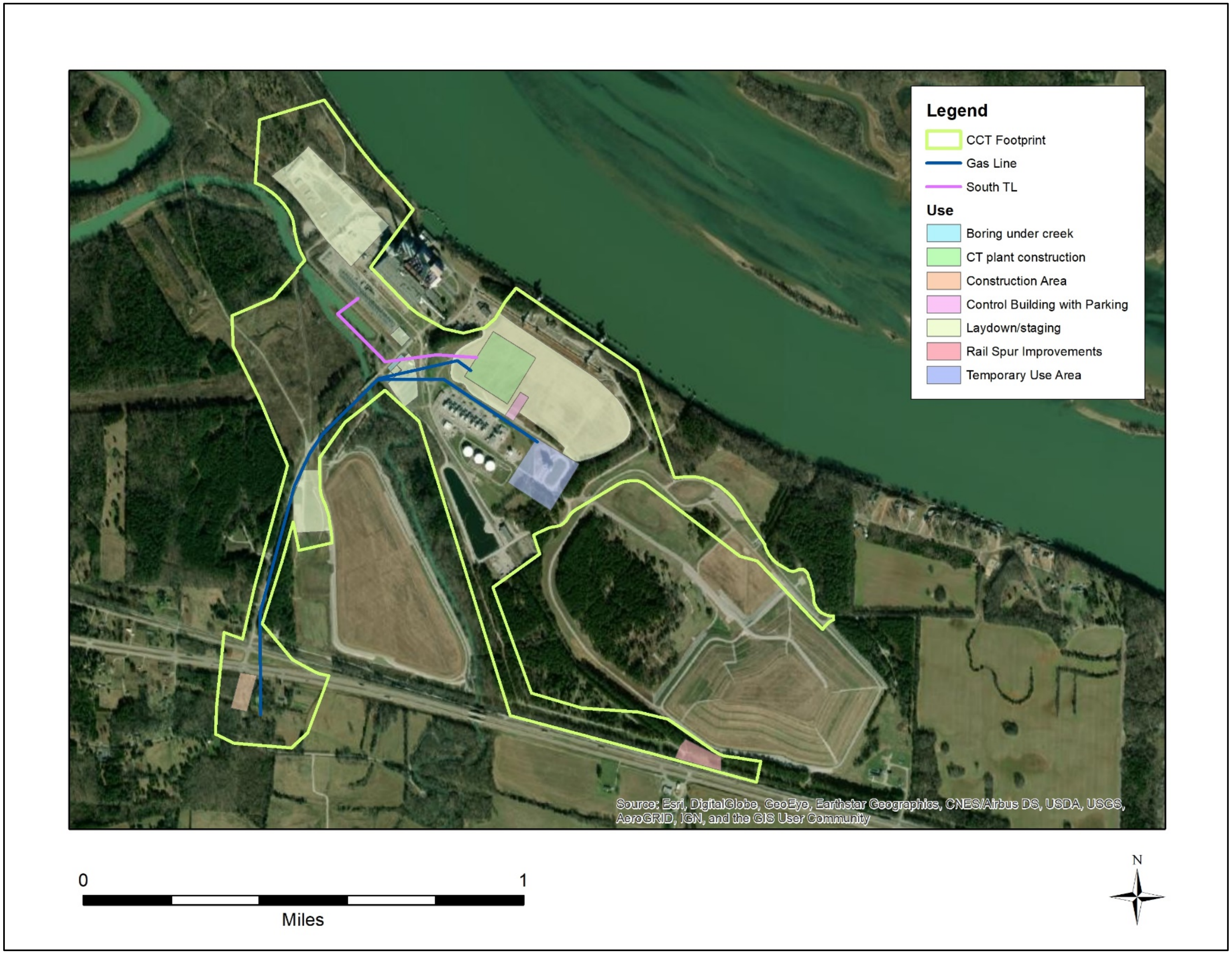

Figure 2. Proposed construction activities in the CCT Footprint.

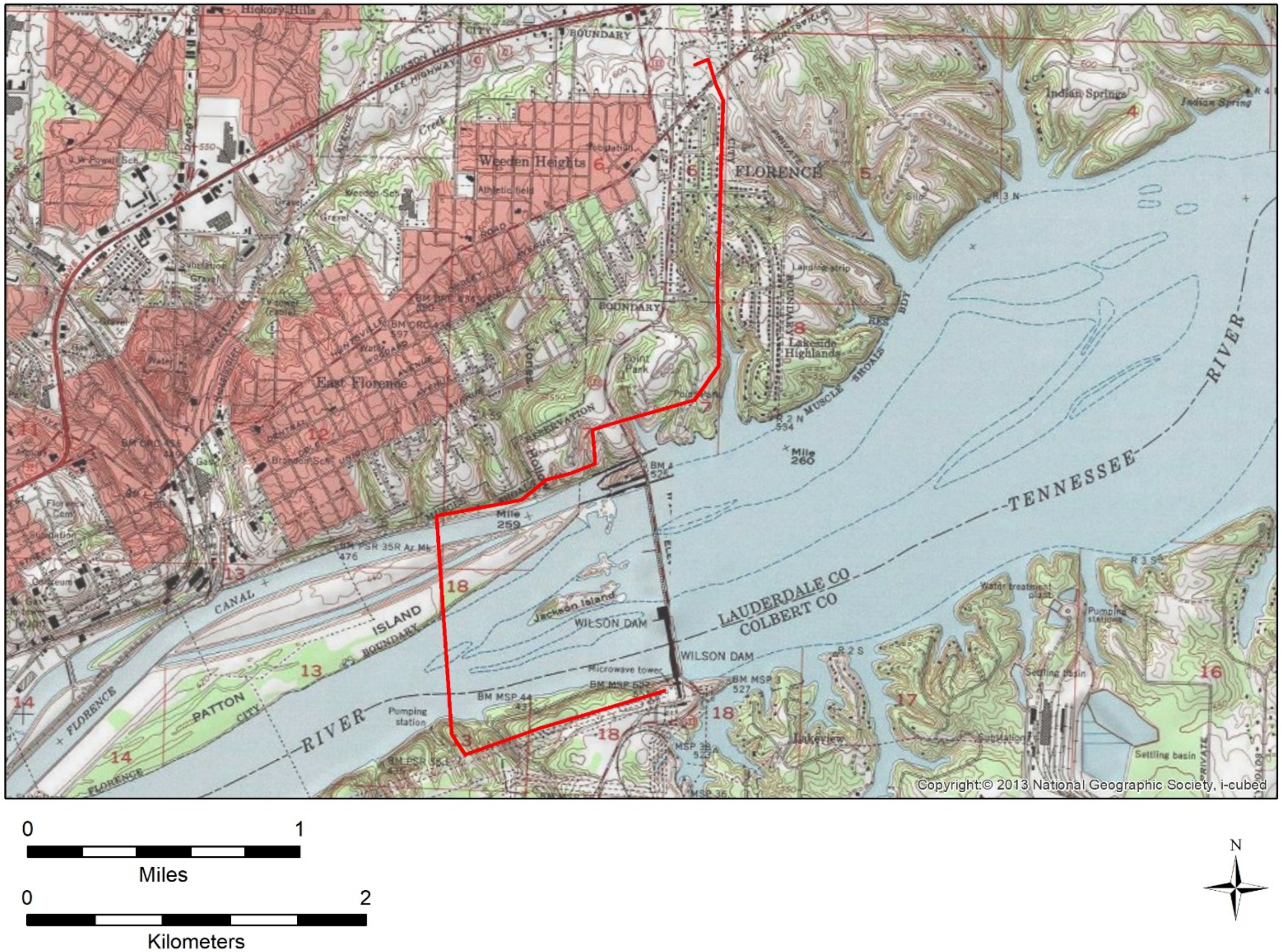

Figure 3. Transmission line segments that would be reconductored in the Florence, Alabama vicinity (L5676, segments 1 and 2).

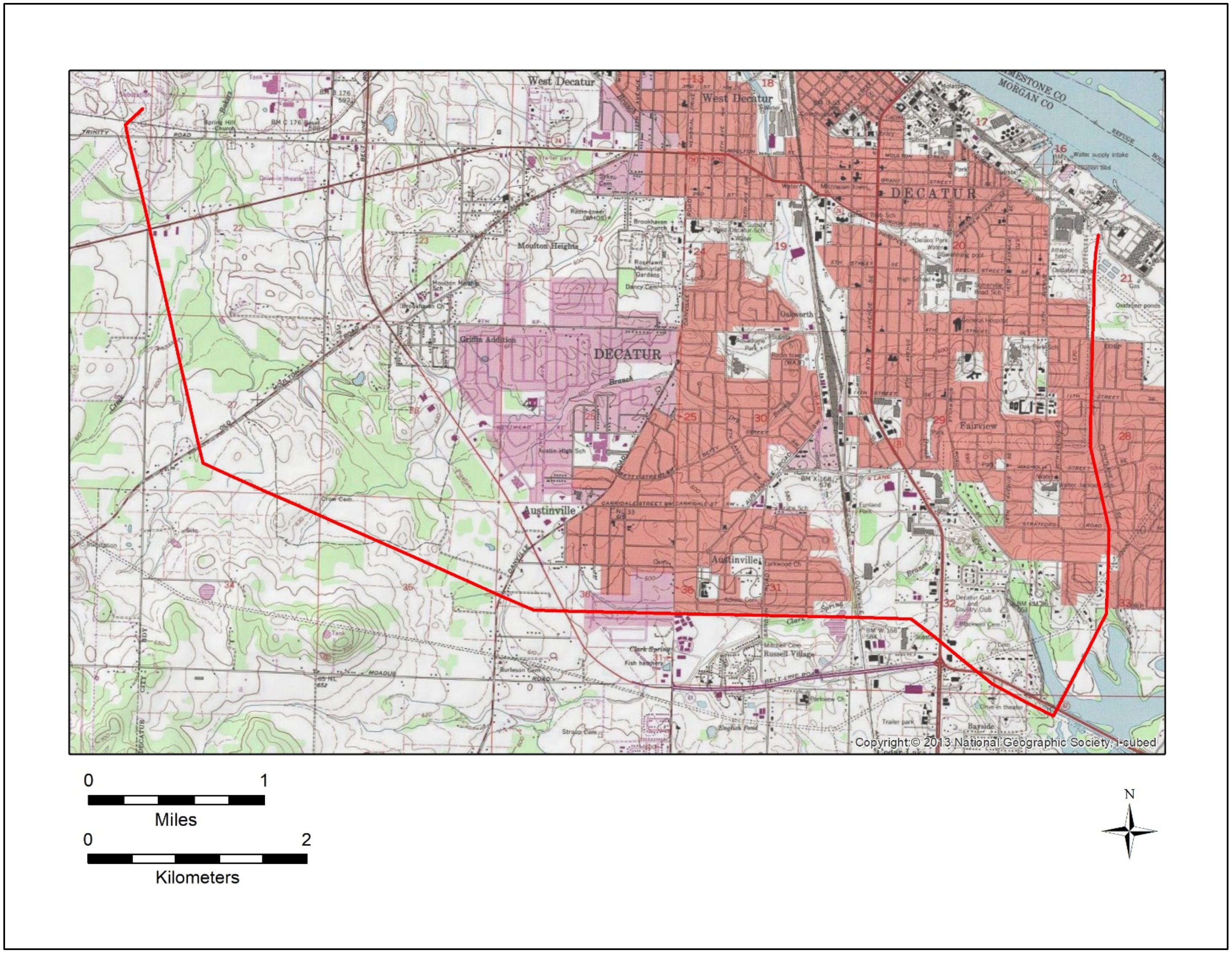

Figure 4. Transmission line that would be reconductored in the Decatur, Alabama vicinity (L5670, segment 01).

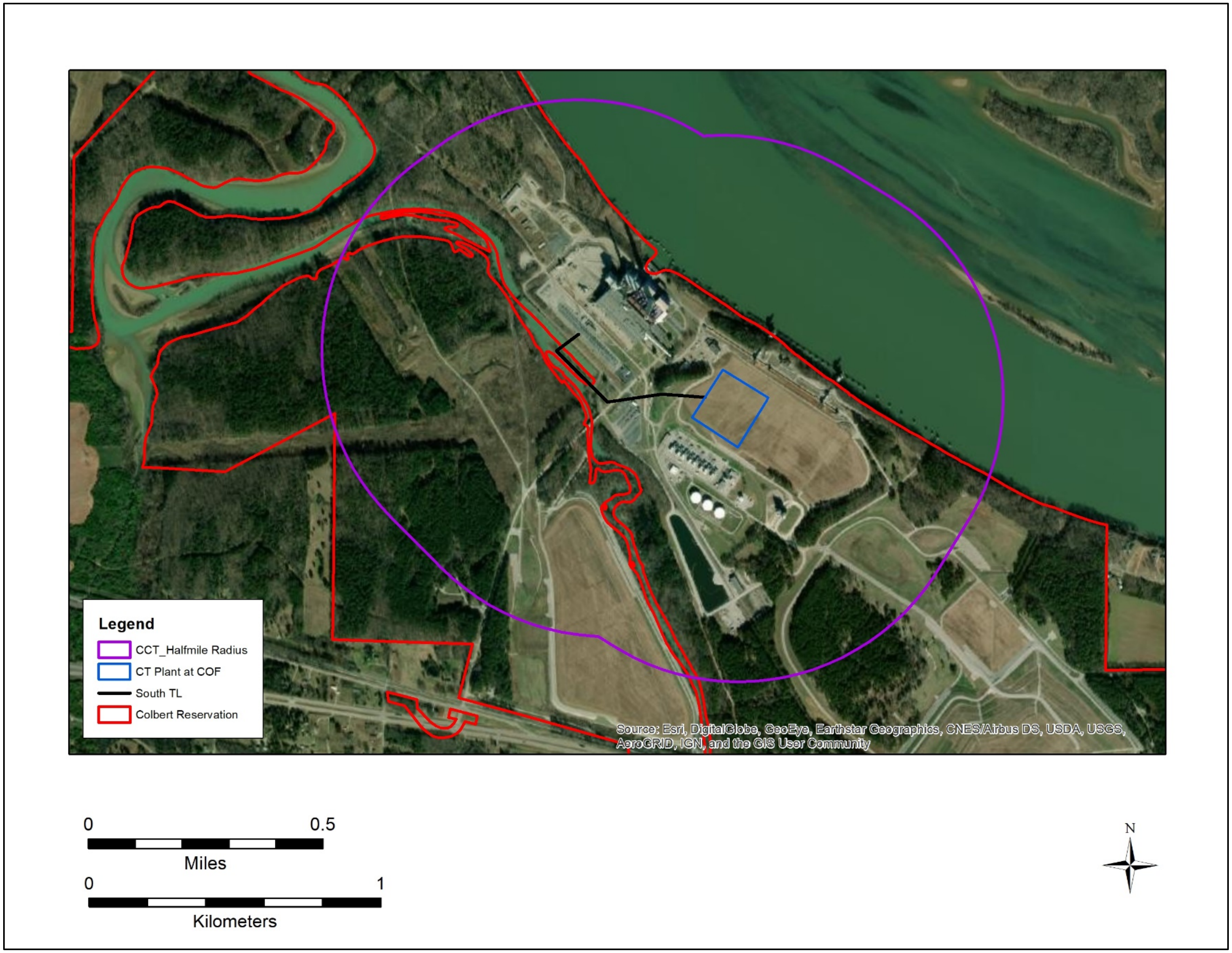

Figure 5. Locations of new construction (CT units and 161-kV transmission line), with half-mile radius.

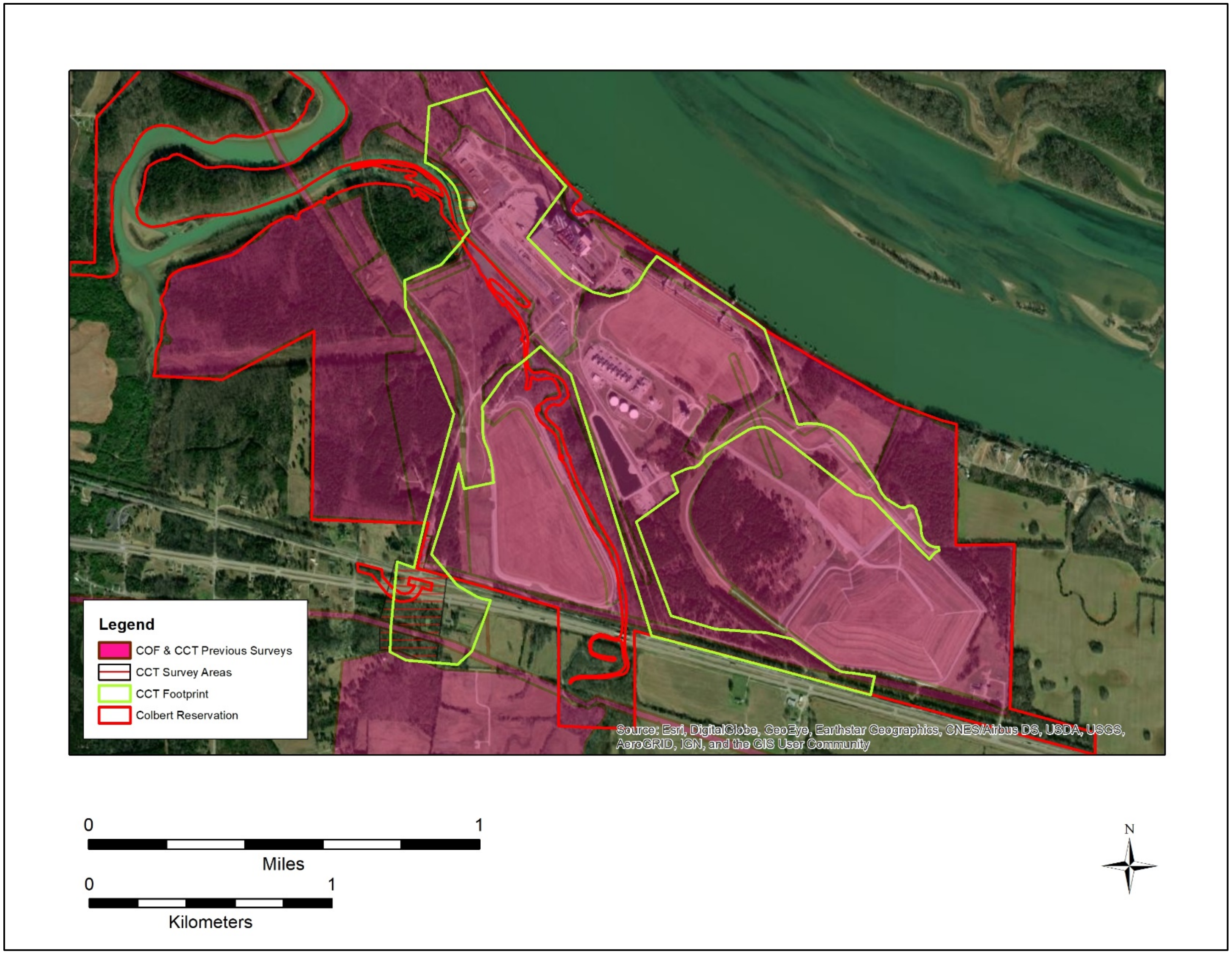

Figure 6. Coverage by Previous Archaeological surveys in the Colbert Reservation, and areas included in the current archaeological survey ("CCT Survey Area").

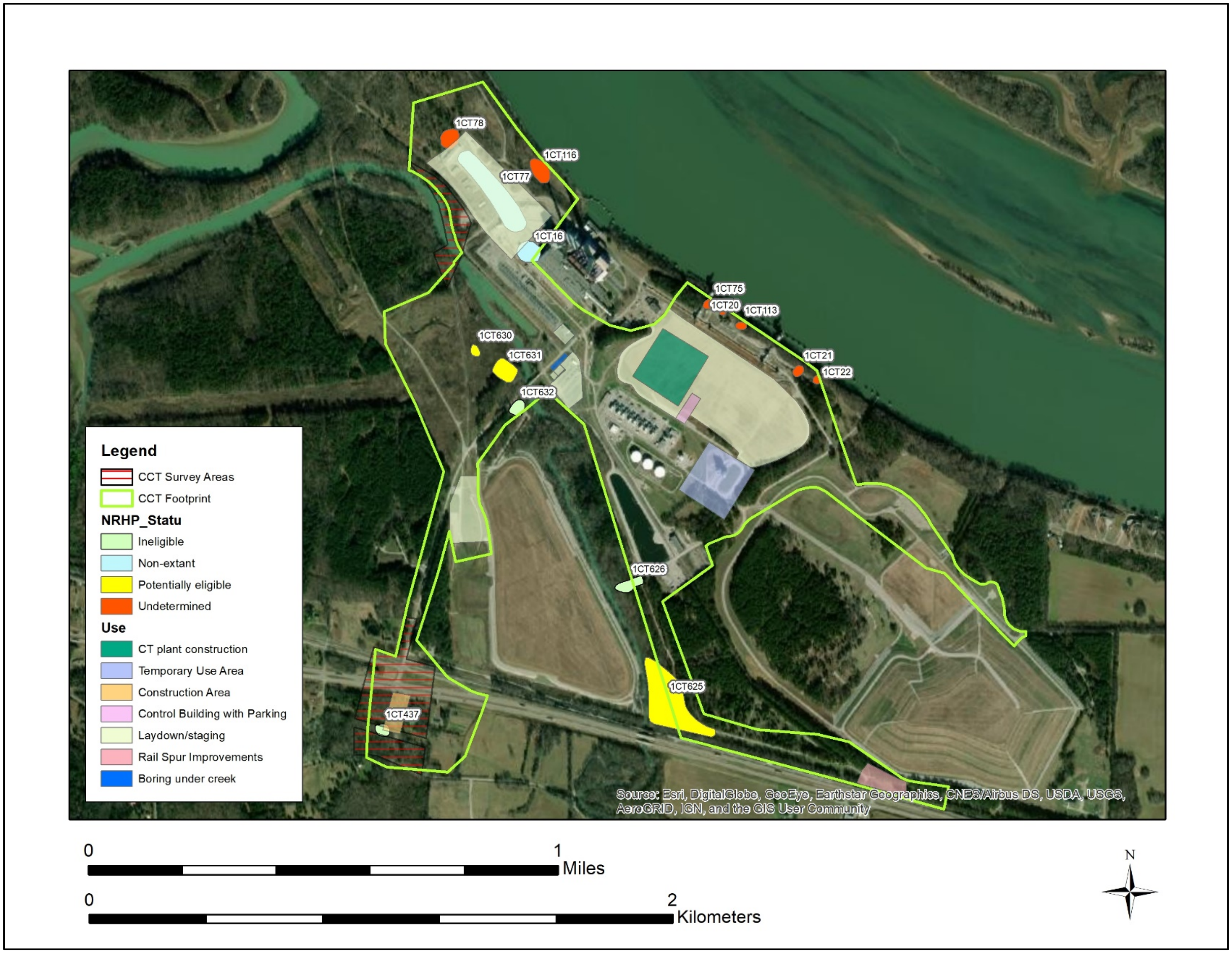

Figure 7. Previously-recorded archaeological sites in the CCT Footprint, with NRHP eligibility status, and proposed uses related to the undertaking.

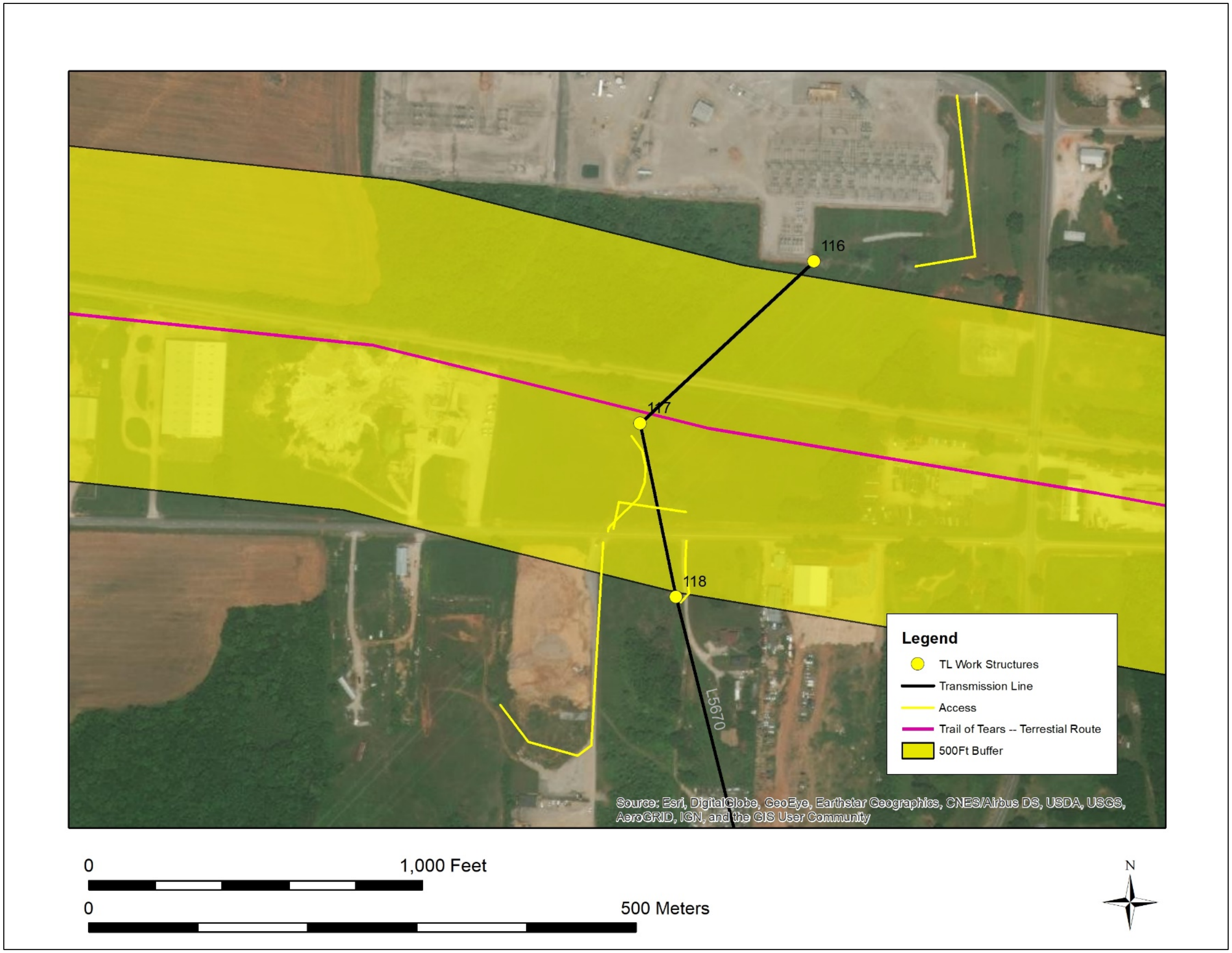

Figure 8. Location where L5670 intersects a Trail of Tears/Removal Route, in Morgan County, Alabama.

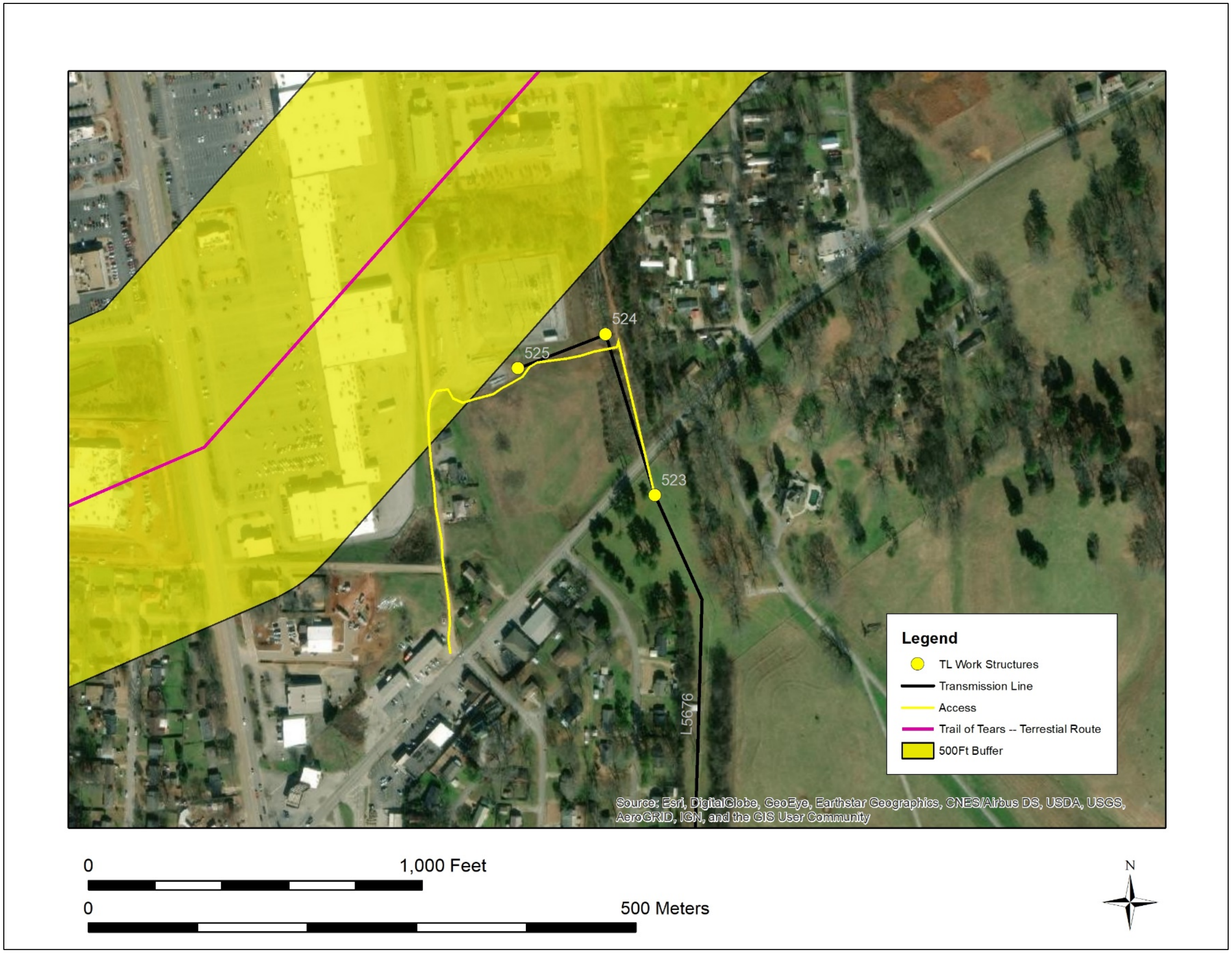

Figure 9. Location where L5676 intersects a Trail of Tears/Removal Route, in Lauderdale County, Alabama.

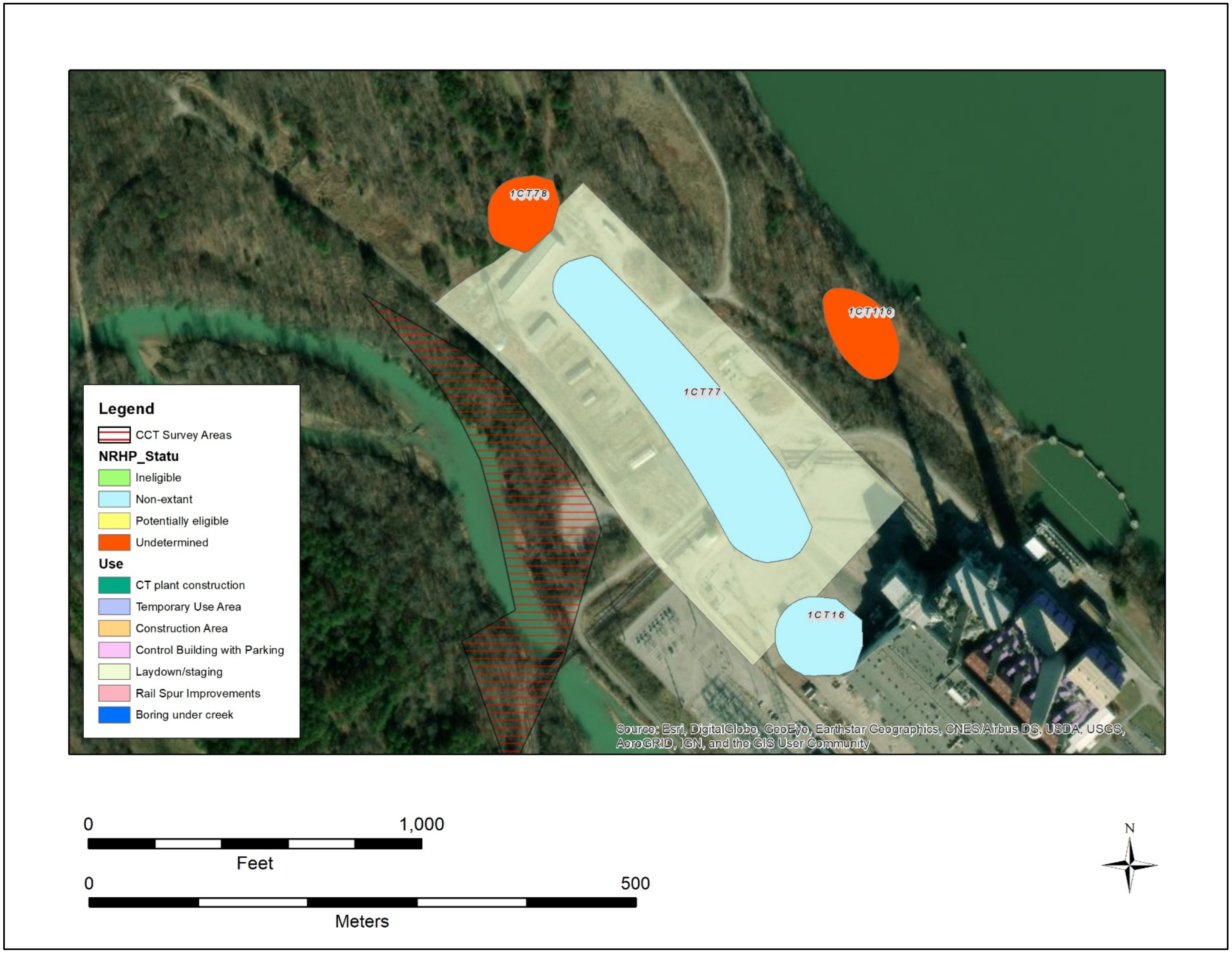

Figure 10. Close-up of area containing sites 1CT77, 1CT78, 1CT16, and 1CT116.

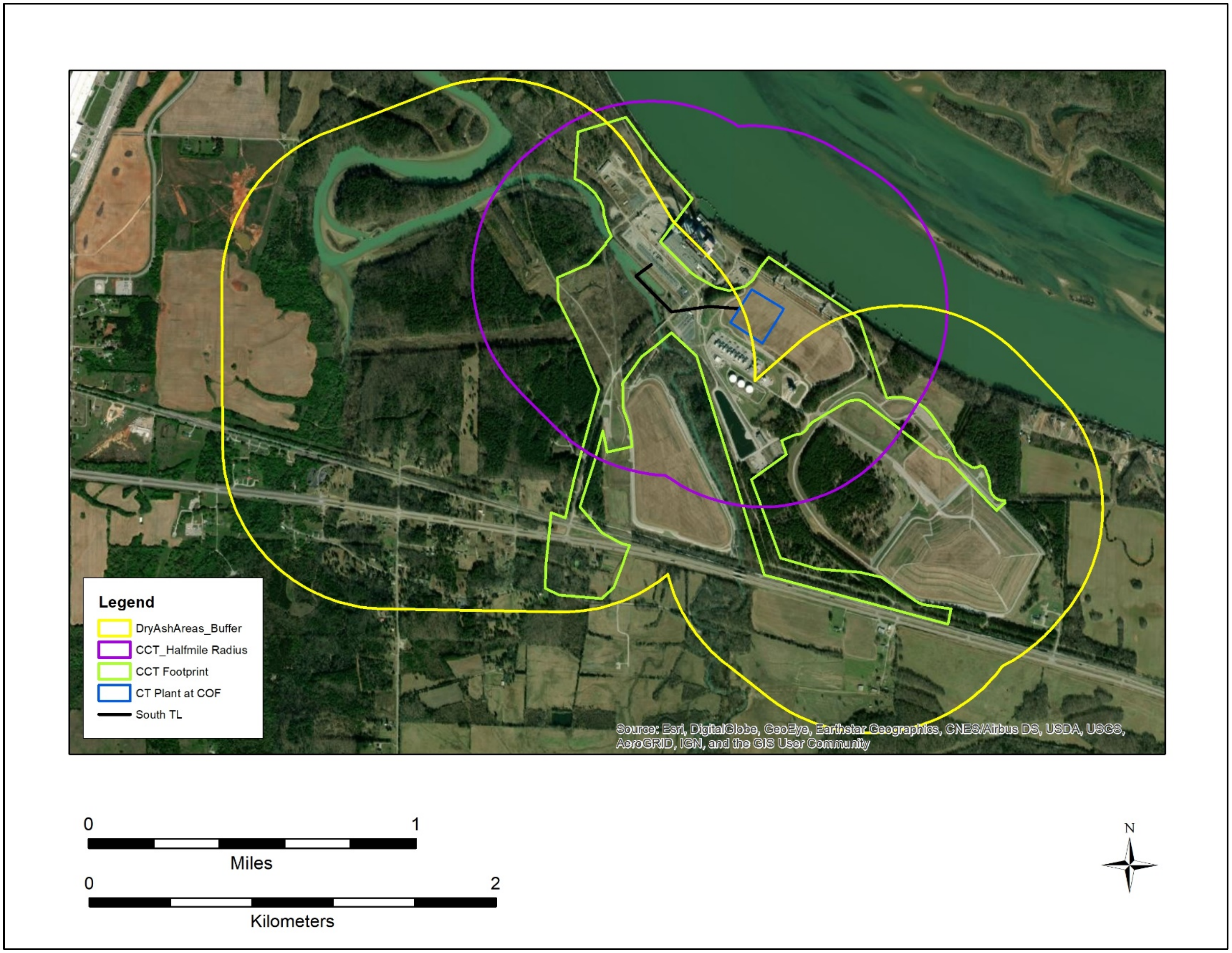

Figure 11. Comparison of half-mile radius surrounding the proposed CT plant and associated 161-kV TL with area surveyed for above-ground resources in 2010 for the dry ash storage areas project.