Document Type EIS – Administrative Record
Index Field: Draft Environmental Impact Statement
Project Name: Cumberland Fossil Plant Retirement
Index No.: 2021-13

CUMBERLAND FOSSIL PLANT RETIREMENT

DRAFT ENVIRONMENTAL IMPACT STATEMENT

TENNESSEE VALLEY AUTHORITY
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COVER SHEET

Cumberland Fossil Plant Retirement

Proposed action: The Tennessee Valley Authority (TVA) proposes to retire and demolish the two coal-fired units at the Cumberland Fossil Plant (CUF) in Cumberland City, Stewart County, Tennessee and construct and operate natural gas-fired or solar generating facilities to replace part of the retired generation. The replacement generation would be (1) a gas-fired combined cycle plant on the CUF Reservation and associated new 32-mile gas pipeline lateral, (2) gas-fired combustion turbine plants at TVA's Johnsonville and Gleason generating plant sites, or (3) multiple solar generating facilities and battery energy storage systems in Middle Tennessee.

Type of document: Draft Environmental Impact Statement

Lead agency: Tennessee Valley Authority

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Comments due date: June 13, 2022

Abstract: TVA prepared this EIS to evaluate the environmental and social effects of the proposed retirement and demolition of the two Cumberland Fossil Plant (CUF) units and the addition of at least 1,450 MW of replacement generation for commercial operation. In addition to the No Action Alternative, TVA is evaluating three alternatives for replacement of generation lost as a result of retiring one CUF unit: construction and operation of a combined cycle combustion turbine (CC) gas plant on the CUF Reservation (Alternative A); construction and operation of two simple cycle combustion turbine (CT) gas plants at alternate locations (Alternative B); and construction and operation of multiple solar generation and energy storage facilities, at alternate locations primarily in middle Tennessee (Alternative C). This EIS also evaluates related actions associated with gas supply and transmission components for each alternative. Under the No Action Alternative, TVA would not retire the two CUF units and additional repairs and maintenance would be necessary to maintain reliability. Existing conditions at CUF and in the vicinity would remain unaffected except for the continued management of coal combustion residuals. TVA's Proposed Action Alternatives align with the 2019 Integrated Resource Plan (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's preferred alternative is Alternative A, as financial and system analysis indicate a CC gas plant is the best overall solution to provide low-

cost, reliable, and cleaner energy to the TVA power system. TVA has also selected Alternative A as its preferred alternative because the proposed CC plant at CUF provides the flexibility to reliably integrate 10 GW of solar onto the system by 2035 and enables the CUF coal-fired units to be retired on an accelerated schedule., Further, the proposed CC plant could be built and made operational sooner than other alternatives, which reduces economic, reliability and environmental risks.

SUMMARY

Introduction
Following the publication of the Tennessee Valley Authority (TVA) 2019 Integrated Resource Plan (IRP), TVA began conducting end-of-life evaluations of its operating coal-fired generating plants not already scheduled for retirement to inform long-term planning. This evaluation confirmed that the aging TVA coal fleet is among the oldest in the nation and is experiencing deterioration of material condition and performance challenges. The performance challenges are projected to increase because of the coal fleet’s advancing age and the difficulty of adapting the fleet’s generation within the changing generation profile. The continued long-term operation of some of TVA coal plants, including the Cumberland Fossil Plant (CUF), is contributing to environmental, economic, and reliability risks.

Purpose and Need for Action
Built between 1968 and 1973, CUF is 15 to 20 years younger than all but one of the operating TVA coal plants. However, frequent cycling of the large super-critical units, a recent change in operation for which the plant was not originally designed, presents reliability challenges that are difficult to anticipate and expensive to mitigate. As TVA continues to transition the rest of the fleet to cleaner and more flexible technologies, CUF will continue to be challenged to reliably operate outside of baseload operations. Based on this analysis, TVA has developed planning assumptions for CUF retirement. The Proposed Action to retire CUF and pursue an alternative power generation source would provide cost-effective replacement generation, consistent with the 2019 IRP and near-term future TVA energy production goals. The purpose of this EIS is to address the potential environmental effects associated with the proposed retirement and demolition of two CUF units and addition of replacement generation for one of those retired units.

Alternatives
In this EIS, TVA assesses a No Action Alternative and three Action Alternatives. Under all Action Alternatives, two CUF units would be retired and demolished. TVA is evaluating three alternatives for the addition of at least 1,450 MW of replacement generation, including construction and operation of a combined cycle combustion turbine (CC) gas plant on the CUF Reservation (Alternative A); construction and operation of simple cycle combustion turbine (CT) gas plants at two alternate locations (Alternative B); and construction and operation of solar generation and energy storage facilities, at alternate locations primarily in middle Tennessee (Alternative C). This EIS also evaluates related actions associated with gas supply and transmission components for each alternative.

Under the No Action Alternative, TVA would not retire the two CUF units therefore additional repairs and maintenance would be necessary to maintain reliability. Existing conditions at CUF and in the vicinity would remain unaffected except for the continued management of coal combustion residuals. TVA’s Proposed Action Alternatives align 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’s preferred alternative is Alternative A, as financial and system analysis indicate a CC gas plant is the best overall solution to serve low-cost, reliable, and cleaner energy to the TVA power system. TVA has also selected Alternative A as a preferred alternative because the proposed CC plant enables the accelerated retirement of the CUF coal-fired units; provides the flexibility needed to reliably integrate 10 GW of solar onto the system by 2035, and could be built and made operational sooner than other alternatives, which reduces economic, reliability and environmental risks.

The following summary of resources focuses on the preferred alternative, Alternative A. Detailed information about the affected environment and environmental consequences associated with each Action Alternative is contained within the EIS.

Environmental Justice

TVA's EIS first identifies environmental justice (EJ) populations in proximity to each Alternative, then incorporates analyses of potential effects in relation to each of the subsequent resource areas. A summary of the anticipated effects by resource area is provided within Section 3.4 and given in abbreviated form below.

Affected Environment

No census block groups within the CUF Reservation and the pipeline corridor EJ study areas were identified as minority EJ populations. Low-income EJ populations were identified in each study area, however, consisting of two census blocks in the CUF Reservation EJ study area and one census block in the pipeline corridor EJ study area. At the census block group level, both the CUF Reservation and the pipeline corridor EJ study areas had higher poverty ratios than the state.

Environmental Consequences

Under Alternative A, no disproportionate effects to EJ populations are projected with CUF coal unit retirement and implementation of Alternative A. Minor, temporary effects to EJ and other populations would occur during construction due to loss of prime farmland resources of the pipeline, closure of the Lake Barkley Recreation Area, and effects to public roads near the CUF Reservation and the pipeline. Minor, effects to EJ and other populations would be experienced during operations due to potential indirect effects to aquatic life used for subsistence and loss of forested areas in the pipeline corridor. These potential adverse effects would not be disproportionate on EJ populations, however, because other populations nearby would experience similar effects. Minor beneficial effects to EJ and other populations would also occur with implementation of Alternative A due to the addition of wildlife in areas surrounding the Proposed Action areas. EJ and other populations would also benefit from temporary, local employment increases.

Physical Characteristics (Geology, Soils, Prime Farmland, and Floodplains)

Affected Environment

The CUF Reservation lies in the Western Highland Rim Physiographic Province of Tennessee, which is characterized by rolling hills and incised valleys. Multiple fault lines are in the vicinity of CUF Reservation. The presence of fault lines within the carbonate rocks can contribute to the formation of karst-related features. While prime farmland is present on CUF, some of these acres were previously impacted by the construction of existing structures, and therefore, would no longer be considered prime farmland. The remaining potential prime farmland soils are located on federal property and land use is planned for industrial use; thus, the conversion of those soils has also already occurred. The Reservation is located between Cumberland River miles 102.0 and 104.6, on Barkley Lake, in Stewart County, Tennessee. Scott Branch and Wells Creek are two tributaries that cross the CUF Reservation.

Environmental Consequences

Minor direct effects to geology would occur during demolition of the coal plant and construction of the CC plant and related pipeline and transmission lines. Geologic features, such as sinkholes or karst terrain, would be avoided. Minor direct effects to soils would be reduced using appropriate BMPs. Floodplains would be avoided, and effects would be minimized by maintaining pre-construction hydrology.

Water Resources (Groundwater, Surface Water, and Water Quality, Wetlands)

Affected Environment

The CUF Reservation overlies the Mississippian carbonate aquifer system. CUF is located just to the north of the center of the Wells Creek Impact Structure. The center of the impact structure to the south of the plant is mostly overlain by the Wells Creek Embayment. This embayment is low lying and drains into the Cumberland River to the north. Wells Creek drains from the south to the north and borders the southern and western portion of CUF. Wetlands and perennial, intermittent, and ephemeral streams are located on the CUF Reservation, but not within the coal plant footprint. Mooring structures are within the Cumberland River. Streams and wetlands are located within or in proximity to the proposed CC plant site.

Environmental Consequences

There is a potential for direct minor but temporary effects from the demolition of the mooring cells located in the Cumberland River, and indirect minor but temporary effects from the demolition of the existing coal plant. There is the potential for stream and wetland effects associated with construction of the CC plant and related pipeline and transmission corridors. Applicable CWA Section 404 and 401 permits would be obtained from USACE and TDEC, and necessary mitigation credits purchased in the event that wetlands and streams cannot be avoided. Erosion and sediment control BMPs would be used to minimize indirect effects to wetlands and streams. Minor effects to groundwater may occur, but would be mitigated through the use of BMPs. Avoidance, minimization, and mitigation efforts are expected to reduce or eliminate the potential for cumulative effects to streams and wetlands.

Air Quality and Greenhouse Gases, Climate Change

Affected Environment

The CUF Reservation is located in Stewart County, Tennessee, which is an attainment area for all criteria pollutants. The CUF Reservation is currently a Prevention of Significant Deterioration (PSD) major source and is subject to a Title V air operating permit. The proposed 30-mile natural gas pipeline would pass through Dickson, Houston, and Stewart counties. All three counties are currently in attainment for all criteria pollutants.

Environmental Consequences

Decontamination and deconstruction of the coal plant and construction of the CC plant are expected to have short-term, localized, and minor effects on air quality and no appreciable direct or indirect effect on regional climate change. The replacement of CUF coal-fired plant operations with natural gas-fired CC plant operations are expected to have long-term, moderate, beneficial effects on local air quality and on regional climate change in comparison to the No Action Alternative.

Biological Environment (Vegetation, Wildlife, Aquatic Life, Threatened and Endangered Species)

Affected Environment

CUF and surrounding areas are located within the Western Highland Rim, a subregion of the Interior Plateau Ecoregion. Outside of the existing coal plant, most of the CUF site is forested with deciduous plant communities or disturbed, agricultural fields. Deciduous forests located on the CUF Reservation provide habitat for an array of terrestrial animal species, including birds and bats. The primary aquatic environments related to CUF include Barkley Reservoir (Cumberland River, a tributary to the Ohio River), Wells Creek, and Scott Branch. Fish, wildlife, and plant species under state or federal protection that may be found on or in the vicinity of the CUF Reservation are described in the EIS. No federally designated critical habitat is located on the CUF Reservation. Three species of migratory birds of conservation concern have been confirmed with nesting locations and/or colonies on the CUF Reservation.

Environmental Consequences

Construction of the proposed CC plant and related pipeline and transmission lines would affect vegetation by converting forested areas to industrial land uses and/or maintained corridors. Vegetation within the active transmission right-of-way would have to be managed to assure the safe and reliable operation of the transmission facilities. Generally, areas within the transmission line and pipeline easements would be maintained as scrub/shrub and herbaceous land.

Wildlife, such as birds, reptiles, or amphibians could also be impacted during demolition activities and construction of the CC plant and related pipeline and transmission lines. Mobile wildlife habituated to the area are likely to move to other suitable environments offsite or outside of the demolition boundary, which are plentiful, and it is expected that they would return to useable habitats within the project area upon project completion.

The retirement of CUF would result in elimination of entrainment and impingement mortality of fish and mollusks in the vicinity of the CUF cooling water intake structure. Thermal discharges would also cease, generally improving water quality. Effects to aquatic life during construction of the CC plant and related pipeline and transmission line would be minimized through erosion and sediment control BMPs.

Direct effects to state- or federally listed threatened and endangered aquatic species are not anticipated to occur from CUF retirement and demolition. Removal of suitable summer roosting habitat for federally listed bats during construction of the proposed CC plant and related pipeline requires consultation with USFWS under Section 7 of the Endangered Species Act. This consultation with the USFWS is underway. To minimize effects to bat species, any tree removal will occur between November 15 and March 31 when these bats are not roosting in trees. Tree removal during this timeframe would also avoid direct effects to nesting migratory songbirds and other birds of conservation concern.

Natural Areas, Parks, and Recreation

Affected Environment

A boat ramp is located on the CUF Reservation, and several public and commercial recreation and natural areas are in the vicinity of CUF. Natural areas, parks, and recreation areas are also located in proximity to the proposed natural gas pipeline lateral. No Wild and Scenic Rivers were identified in proximity to Alternative A.

Environmental Consequences
Public access to the boat launching ramp located within the CUF boundary could be temporarily interrupted during construction or deconstruction activities. The existing barge unloading area would continue to serve as a public boat ramp after construction is complete. Improvements would be made largely for public enjoyment, as TVA would only utilize the unloading area on scheduled delivery days. Adverse effects to boat launching activities will be temporary and minor during construction but beneficial and long-term after construction is complete. No additional effects on natural areas, parks, and recreation areas in the project vicinity are anticipated outside of the CC Plant site. No direct, long-term effects to natural areas, parks and recreation would occur as a result of the related pipeline action.

Land Use

Affected Environment
The CUF Reservation is a previously disturbed area within existing TVA property. Although the area has had intense disturbance as a result of plant operations, the proposed CC plant site is a greenfield site composed of fields, woodlands, and wetlands and has been farmed in the past. Land within the proposed pipeline corridor is largely deciduous forest and pastureland, meaning the land is likely unused forest land or is farmed pastureland or timber.

Environmental Consequences
Once the coal plant is demolished, there is the potential for land use changes if the coal plant site is redeveloped. Land use on the developed portions of the CC plant site would change from the current, largely agricultural use to industrial and the rest of the site would remain largely undeveloped. Land use within the pipeline corridor would be impacted by construction in the short-term, with some land uses being able to resume after construction is complete when pasture and cropland is restored. Long-term effects will occur to other land uses within the corridor, such as forest management.

Transportation

Affected Environment
CUF is served by highway, railway, and waterway modes of transportation. The proposed gas pipeline lateral corridor is served by highway and railway modes of transportation.

Environmental Consequences
Traffic volume generated by the deconstruction and construction workforce and the construction-related vehicles would be minor and temporary. Project materials and equipment would be delivered to the CC plant site by highway for smaller items and railway or waterway for larger items.

Utilities

Affected Environment
The CUF Reservation is currently served by telecommunication providers, Cumberland Electric Membership Corporation, and Cumberland City utilities. Due to the pipeline corridor being predominantly outside of incorporated municipality limits, some utilities may not be available and water supply may be provided by private wells and septic.

Environmental Consequences
During demolition of the CUF coal plant, all buried utilities would be cut and capped within the project boundary and abandoned in place if they do not interfere with other ongoing

projects in the vicinity. Prior to starting CC plant construction, TVA would coordinate with existing telecommunications, electricity, natural gas, and water and sewer utilities. During construction of the pipeline, service disruptions will be minimized through coordination between TGP, TVA, and the affected utilities. Adverse effects to existing utilities would not occur.

Cultural Resources

Affected Environment

The Henry Hollister House (also known as the Jesse Brunson Place) is located on the CUF Reservation and immediately adjacent to the proposed CC plant. This property includes a ca. 1850 house and historic cemetery. One archaeological site that is listed in the National Register of Historic Places (NRHP), one site determined eligible for listing, and three sites that are potentially eligible for listing are located within proximity to the proposed CC plant site. Surveys have identified 24 archaeological sites within the pipeline corridor, outside of the CUF Reservation, 3 of which identified as potentially eligible for listing in the NRHP.

Environmental Consequences

Vibrations during demolition would not adversely affect historic properties on the CUF Reservation. Based on the current siting of the CC plant, physical effects to the archaeological sites would be avoided. The NRHP-listed Henry Hollister House is located within the ½-mile buffer of the proposed CC Plant and switchyard. Views to the CC Plant and switchyard would be partially blocked by trees. TVA will consider potential visual and vibrational effects caused by the construction, implementation, and operation of the CC Plant on this resource and will consult further with the State Historic Preservation Office (SHPO) regarding potential adverse effects. Archaeological sites have been identified within the proposed pipeline corridor. To fulfill its obligations under Section 106 of the NHPA, TVA and FERC will each consult with the TN SHPO and federally recognized Indian tribes on their respective actions regarding specific effects to cultural resources along the pipeline corridor.

Solid and Hazardous Waste

Affected Environment

The primary solid wastes that result from the operation of CUF are CCRs in the form of ash and gypsum. In Tennessee, CCRs require special waste approval for the wastes to be disposed of at a landfill specifically permitted to receive those types of wastes (Class I or II disposal facility). CUF is considered a small quantity generator of hazardous waste by TDEC and a small quantity handler of universal waste.

Environmental Consequences

Demolition and construction debris would be generated during the demolition of the metal buildings, footings, asphalt, etc. Direct effects would be minor due to the limited potential for hazardous waste to be discharged and/or released into the environment during demolition activities. The proposed construction activities of the CC plant would result in a potential increase in generation of hazardous waste. TVA will manage all solid and hazardous wastes in accordance with applicable state regulations and TVA BMP procedures. Spill Prevention Control and Countermeasure (SPCC) plans would be implemented to minimize the potential of a spill during construction and operation of the pipeline.

Safety

Affected Environment

Public emergency services in the vicinity of the CUF Reservation include law enforcement services and fire protection services in Cumberland City, as well as urgent care clinics and a hospital in the city of Erin. Public emergency services in the area of the proposed pipeline include urgent care clinics, hospitals, law enforcement services, and fire protection services.

Environmental Consequences

TVA's Standard Programs and Processes related to safety would be strictly adhered to during implementation of all the action alternatives. The safety programs and processes are designed to identify actions required for the control of hazards in all activities, operations, and programs. They also establish responsibilities for implementing Section 19 of the Occupational Safety and Health Act of 1970 (OSHA). TVA and its contractors are required to comply with OSHA regulations and follow a Site-Specific Safety & Health Plan. With proper planning, adherence to OSHA regulations and health and safety plans, and implementation of BMPs, effects from the project in relation to public health and safety would not occur.

Socioeconomics

Affected Environment

The CUF labor market area, which includes counties in Tennessee and Kentucky, and the pipeline corridor socioeconomic study area, which includes census tracts in Tennessee, are largely rural. From 2010 to 2020, population growth was less than the growth for the associated states for the most part. Based on the 2015-2019 American Community Survey (ACS) 5-year estimates (2019 ACS), the populations were generally more aged and had fewer high school graduates or higher academic level than the overall state populations. Housing units were generally owner-occupied and newer than those from across the states. The study areas generally had higher unemployment rates and lower per capita income when compared to the associated states. Manufacturing and healthcare generally led the industries for employment in both study areas, with education services employing large percentages, as well. Each study area exceeded state percentages for civilians employed in transportation, manufacturing, and utilities.

As of June 2021, CUF directly employed 252 people with average annual salaries approximately 125 percent higher than the average annual wages across the CUF labor market area. CUF also employs contractors for both short- and long-term operations support and contracts with coal and limestone mining operations and transportation companies that support additional employment and contributions to the area economy. Indirect and induced effects on the local economy associated with CUF occur through effects to sales, income, and employment in the region and the recirculation of money received through direct and indirect income sources and subsequent creation of new jobs and economic activities.

Environmental Consequences

With CUF retirement, contracts associated with coal operations and indirect and induced economic activities would be canceled or cease. The 252 people currently employed by CUF, approximately nine percent of the total employment in Stewart County, may become temporarily unemployed. TVA would help offset this loss by placing some interested employees in available positions across the TVA region. Current CUF employees may also find alternative employment in locally prominent industries. However, based on the 2019 ACS, the median earnings for full-time employment in these other industries are approximately $16,000 to $29,000 less on average than in the utilities industry. CUF employees and associated family members may also temporarily relocate for work or follow recent depopulation trends and permanently relocate outside the CUF area, and these changes may affect familial and community relations in the CUF labor market area. The retirement of the CUF coal facilities may result in indirect employment effects to the nearby mining, trucking, and barge industries and likewise affect familial and community relations in the region from which these CUF products are purchased.

Employment in relation to construction and operations of the new CC plant and the 32-mile natural gas pipeline lateral and associated gas system infrastructure would be new temporary and permanent employment options in the CUF labor market area and in the pipeline corridor socioeconomic study area. An estimated 50 percent of the construction workforce would be sourced locally, which would have a net positive affect on the local economy. Approximately 25 to 35 of the existing operational personnel at CUF would remain to operate and maintain the new CC plant facilities.

Noise

Affected Environment

Noise generating sources in the vicinity of the project site include boat traffic, routine vehicle operations at the project site, and the existing coal facility. Sensitive noise receptors in the vicinity of the CUF Reservation include residences and recreational areas, including the NRHP-eligible Hollister House. Sensitive noise receptors in the vicinity of the proposed pipeline include residences and recreational areas.

Environmental Consequences

Temporary noise effects would occur during demolition of the coal plant and as a result of construction traffic for the CC plant and related pipeline and transmission lines. Noise effects from construction-related traffic are expected to be temporary and minor. After the construction of the pipeline, there would be little to no noise during its operation aside from occasional maintenance activities, including the periodic mowing of the pipeline ROW.

Visual Resources

Affected Environment

Except for CUF and the other industrial plants to the southeast, the surrounding region is largely undeveloped with residential and commercial development in the vicinity of Cumberland City to the east and Erin to the south. Based on the criteria used for this analysis, the overall scenic value class for the affected environment ranges from poor within the plant facility to good in the surrounding area. The proposed CC plant site is an area of common scenic attractiveness, as the site contains viewscapes comparable to the surrounding land use. The viewscape of the proposed pipeline corridor is largely pre-disturbed open space, elements associated with the adjacent transmission line, and forest.

Environmental Consequences

Most of the deconstruction actions are not expected to be discernible due to the screening effects of terrain and overall distance, nor would they contrast with the overall landscape. The proposed CC plant would generally be absorbed by surrounding industrial components and would become visually subordinate to the overall landscape character associated with the plant site. While most of the pipeline would not be visible once buried and operational, based on TVA’s desktop review of the 200-ft study corridor, the proposed pipeline would cause long-term visual effects due to the conversion of forest to fields.

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Acronyms and Abbreviations

Acronym	Description
AADT	Average Annual Daily Traffic
AC	Alternating Current
ACM	Asbestos Containing Material
ARAP	Aquatic Resources Alteration Report
ARPA	American Rescue Plan Act of 2021
AASHTO	American Association of State Highway and Transportation Officials
BACT	Best Available Control Technology
BESS	Battery Energy Storage System
BG	Block Group
BGEPA	Bald and Golden Eagle Protection Act
BMP	Best Management Practice
CAA	Clean Air Act
CC	Combined Cycle
CCR	Coal Combustion Residuals
CCVT	Capacitor-controlled Voltage Transformer
CCS	Carbon Capture and Sequestration
CCW	Condenser Cooling Water
CEMC	Cumberland Electric Membership Corporation
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CO	Carbon Monoxide
CO_2	Carbon Dioxide
CRM	Cumberland River Mile
CT	Combustion Turbine
CUF	Cumberland Fossil Plant
CWA	Clean Water Act
D4	Decommissioning, Deactivation, Decontamination, and Demolition
DC	Direct Current
DER	Distributed Energy Resources
DLN	Dry Low NO_x
DO	Dissolved Oxygen
DOJ	Department of Justice
DR	Demand Response
EA	Environmental Assessment
EE	Energy Efficiency
EIS	Environmental Impact Statement
EJ	Environmental justice
ELG	Effluent Limit Guidelines
EMA	Emergency Management Agency
EMF	Electromagnetic Field
EO	Executive Order
EPCRA	Emergency Planning and Community Right-to-Know Act

Acronym	Description
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FAL	Fish and Aquatic Life
FERC	Federal Energy Regulatory Commission
FGD	Flue Gas Desulfurization
FHWA	Federal Highway Administration
FPPA	Farmland Protection Policy Act
FY	Fiscal Year
gal/d/mi^2	Gallons per Day per Square Mile
GHG	Greenhouse Gas
GIS	Global Information System
GPM	Gallons per Minute
GPS	Global Positioning System
GWP	Global Warming Potential
HAP	Hazardous Air Pollutants
HDD	Horizontal Directional Drilling
HOV	High Occupancy Vehicle
HRSG	Heat Recovery Steam Generator
HUC	Hydrologic Unit Code
HUD	U.S. Department of Housing and Urban Development
HVAC	Heating, Ventilation, and Air Conditioning
IDL	Industrial Landfill
IMP	Internal Monitoring Point
IRP	Integrated Resource Plan
IRR	Irrigation
IWG	Interagency Working Group on Social Cost of Greenhouse Gases
IWS	Industrial Water Supply
JCT	Johnsonville Combustion Turbine Plant
kV	Kilovolt
LAER	Lowest Achievable Emission Rate
LCEA	Life Cycle Emissions Analysis
LEP	Limited English proficiency
LF	Linear Foot
LOLE	Loss of Load Event
LOS	Level of Service
LPC	Local Power Companies
LWW	Livestock, Watering, and Wildlife
MATs	Mercury and Air Toxics Standards
MBTA	Migratory Bird Treaty Act
MCL	Method Control Limit
MBtu	Million British Thermal Units
MGD	Million Gallons per Day
MLEC	Meriweather Lewis Electric Cooperative
MMT	Million Metric Tons

Acronym	**Description**
MVA	Megavolt Amperes
MW	Megawatt
MWh	Megawatt-hour
N_2O	Nitrous Oxide
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NESHAP	National Emissions Standard for Hazardous Air Pollutants
NHD	National Hydrography Dataset
NHPA	National Historic Preservation Act
NLCD	National Land Cover Dataset
NO_x	Nitrogen Dioxide
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NPV	Net Present Value
NREL	National Renewable Energy Laboratory
NRHP	National Register of Historic Places
NRTS	Naturally Reproducing Trout Stream
NSPS	New Source Performance Standard
NWI	National Wetland Inventory
OHGW	Overhead Ground Wire
OPGW	Fiber-Optic Ground Wire
ORL	Owner Requested Limit
O-SAR	Office-Level Sensitive Area Review
OSHA	Occupational Safety and Health Administration
PCB	Polychlorinated Biphenyl
PM	Particulate Matter
PPA	Power Purchase Agreement
ppe	Personal Protective Equipment
ppm	Parts per Million
PSA	Power Service Area
PSD	Prevention of Significant Deterioration
PTE	Potential to Emit
PURPA	Public Utility Regulatory Policies Act
PV	Photovoltaic
RACT	Reasonably Available Control Technology
RBI	Reservoir Benthic Index
RBLC	Reasonably Available Control Technology, Best Available Control Technology/Lowest Achievable Emission Rate Clearinghouse Database
RCRA	Resource Conservation and Recovery Act
REC	Recreation
RFAI	Reservoir Fish Assemblage Index

Acronym	Description
RFFA	Reasonably Foreseeable Future Actions
RICE	Reciprocating Internal Combustion Engines
RM	River Mile
RNHD	TVA Regional Natural Heritage Database
RO	Reverse Osmosis
ROD	Record of Decision
ROW	Right-of-way
SAIPE	Small Area Income and Poverty Estimates
SCADA-RTU	Supervisory Control and Data Acquisition Remote Terminal Unit
SCC	Social Cost of Carbon
SCR	Selective Catalytic Reduction
SERVM	Strategic Energy and Risk Valuation Model
SHPO	State Historic Preservation Office
SI	Spark Ignition
SMR	Small Modular Reactors
SO_2	Sulfur Dioxide
SPCC	Spill Prevention Counter Measure and Control Plan
SVC	Static VAR Compensator
SWDA	Solid Waste Disposal Act
SWPPP	Stormwater Pollution Prevention Plan
TCP	Traditional Cultural Properties
TDC	Traditional Cultural Property
TDEC	Tennessee Department of Environment and Conservation
TDOA	Tennessee Department of Archaeology
TDOT	Tennessee Department of Transportation
TDS	Total Dissolved Solids
TENORM	Technology Enhanced Naturally Occurring Radioactive Material
TGP	Tennessee Gas Pipeline Company, LLC
TL	Transmission Line
TN AAQS	Tennessee Ambient Air Quality Standards
TRDA	Loudon- Tellico Reservoir Development Agency
TRAM	Tennessee Rapid Assessment Method
TRM	Tennessee River Mile
TSCA	Toxic Substances Control Act
TS	Trout Stream
TSS	Total Suspended Solids
TVA	Tennessee Valley Authority
TWRA	Tennessee Wildlife Resources Agency
USACE	U.S. Army Corps of Engineers
USBLS	U.S. Bureau of Labor Statistics
USCB	U.S. Census Bureau
USDA	U.S. Department of Agriculture
USDOT	U.S. Department of Transportation
USEIA	U.S. Energy Information Administration

Acronym	Description
USEPA	U.S. Environmental Protection Agency
USET	United South and Eastern Tribes, Inc.
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UST	Underground Storage Tank
VOC	Volatile Organic Compounds
WCMES	Weakly County Municipal Electric System

CHAPTER 1 – PURPOSE AND NEED FOR ACTION

Following the publication of the Tennessee Valley Authority (TVA) 2019 Integrated Resource Plan (TVA 2019a), TVA began conducting end-of-life evaluations of its operating coal-fired generating plants not already scheduled for retirement to inform long-term planning. This evaluation confirmed that the aging TVA coal fleet is among the oldest in the nation and is experiencing deterioration of material condition and performance challenges. The performance challenges are projected to increase because of the coal fleet's advancing age and the difficulty of adapting the fleet's generation within the changing generation profile. The continued long-term operation of some of TVA coal plants, including the Cumberland Fossil Plant (CUF), is contributing to environmental, economic, and reliability risks.

CUF is situated on a 2,388-acre reservation on the Cumberland River at its confluence with Wells Creek (Figure 1.1-1). The CUF reservation is located in Cumberland City, Stewart County, Tennessee, approximately 22 miles southwest of Clarksville. The two-unit, coal-fired steam-generating plant is the largest plant in the TVA coal fleet, with a summer net generating capacity of 2,470 megawatts (MW).

Built between 1968 and 1973, CUF is 15 to 20 years younger than all but one of the operating TVA coal plants. However, frequent cycling of the large super-critical units, a recent change in plant operation for which the plant was not originally designed, presents reliability challenges that are difficult to anticipate and expensive to mitigate. As TVA continues to transition the rest of its fleet to cleaner and more flexible technologies, CUF will continue to be challenged to reliably operate outside of baseload operations. Based on this analysis, TVA has developed planning assumptions for CUF retirement. These assumptions include the Proposed Action of retiring both CUF units and the addition of at least 1,450 MW of replacement generation to recover the generation capacity lost from retirement of one CUF unit. Replacement generation of this capacity will allow TVA to recover the dependable capacity of the first unit as well as account for modest load increases driven by residential growth from higher Valley in-migration paired with slightly higher industrial load. The replacement generation would need to be online prior to retirement of the first CUF unit. Planning for the replacement generation for the second retired CUF unit (likely consisting of some combination of gas, solar, and storage) would be deferred to allow additional time for the assessment of specific types and locations of that generation.

The Proposed Action to retire CUF and pursue an alternative power generation source would provide cost-effective replacement generation, consistent with the 2019 IRP and near-term future TVA energy production goals. The purpose of this EIS is to address the potential environmental effects associated with the proposed retirement and demolition of two CUF units and addition of replacement generation for one of those retired units.

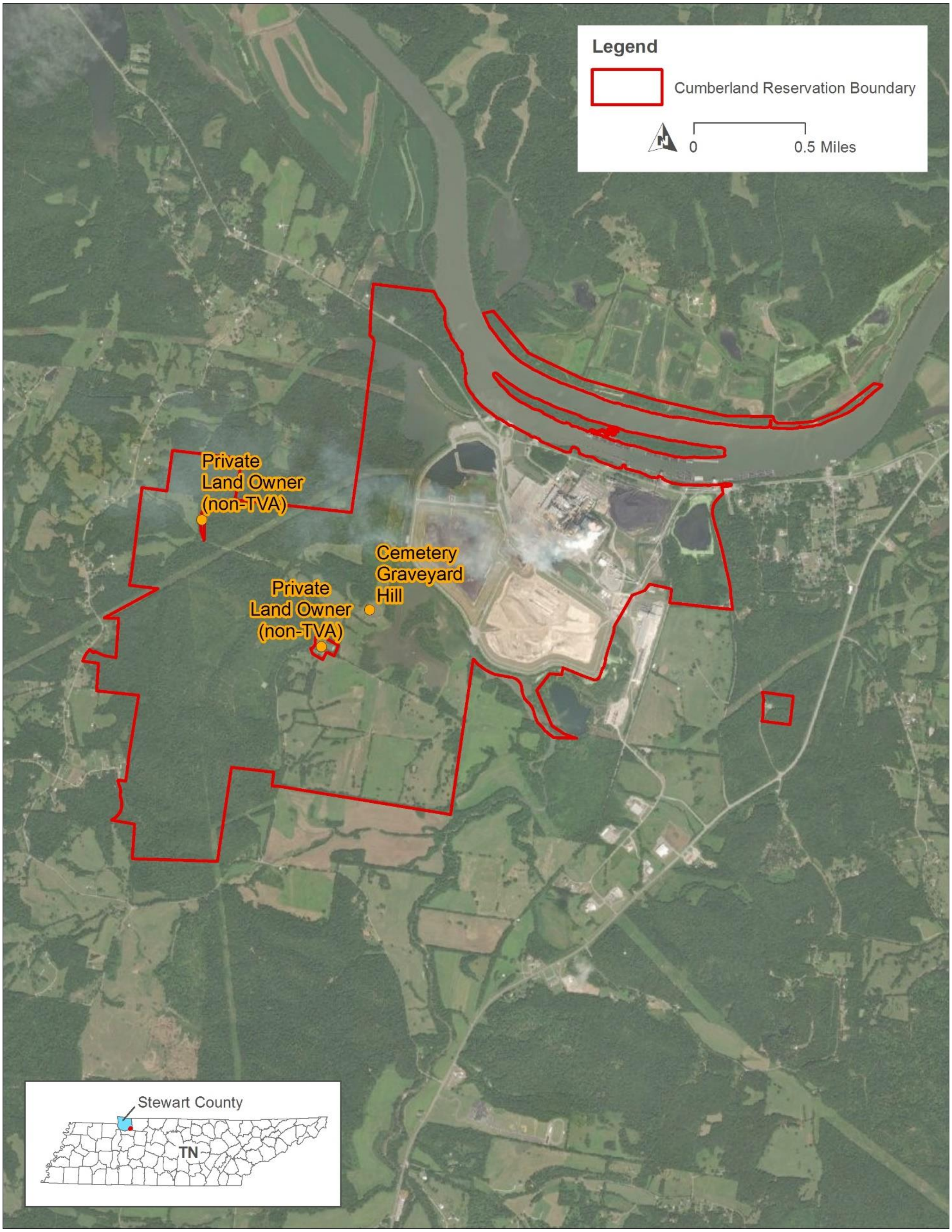

Figure 1.1-1. The Cumberland Fossil Plant Reservation

1.1 Background

In June 2019, TVA published the 2019 IRP (TVA 2019a), a comprehensive study of how TVA can best meet the future energy demand in its power service area which encompasses approximately 80,000 square miles covering most of Tennessee and parts of Alabama, Georgia, Kentucky, Mississippi, North Carolina, and Virginia. The IRP was developed with input from stakeholder groups and the general public. It evaluated six scenarios (plausible futures) and five strategies (potential TVA responses to those futures) and identified a range of potential energy resource additions and retirements. The target power supply mix adopted by the TVA Board through the 2019 IRP included the potential retirement of 2,200 MW of coal-fired generation by 2038. The IRP acknowledged continued operational challenges for the aging coal fleet and included a recommendation to conduct end-of-life evaluations to determine whether retirements greater than 2,200 MW would be appropriate. The potential environmental effects of implementing the IRP were the subject of an accompanying programmatic EIS (TVA 2019b). Subsequent decisions on individual energy resources are the subject of separate environmental reviews that tier from the IRP EIS. This EIS tiers off the 2019 IRP programmatic EIS.

TVA's asset strategy incorporates the strategic direction from the 2019 IRP and continues to support affordable, reliable, and cleaner energy for customers. Alternatives to be studied as part of this EIS are one piece of the overall asset strategy, which also includes:

- Maintaining the existing low-cost, carbon-free nuclear and hydro fleets
- Retiring aging coal units as they reach the end of their useful life, expected by 2035
- Adding 10,000 MW of solar by 2035 to meet customer demands and system needs, complemented with storage
- Using natural gas to enable needed coal retirements and solar expansion as other technologies develop
- Leveraging demand-side options, in partnership with local power companies (LPCs)
- Partnering to develop new carbon-free technologies for greater reduction in carbon emissions

TVA utilizes least-cost planning in the development of its asset strategy in order to provide electricity at the lowest feasible rate for its customers. As provided in the TVA Strategic Intent and Guiding Principles document (May 2021), TVA has a plan for 70 percent carbon reductions by 2030, a path to ~80 percent carbon reductions (referenced to 2005 baseline) by 2035 and aspires to net-zero carbon emissions by 2050.

1.2 Decision to be Made

TVA prepared this EIS to evaluate the environmental and social effects of the proposed retirement and demolition of the two CUF units and the addition of at least 1,450 MW of replacement generation for commercial operation. In addition to the No Action Alternative, TVA is evaluating three alternatives for replacement of generation lost as a result of retiring one CUF unit within this analysis:

A. Retirement and demolition of CUF and construction and operation of a combined cycle combustion turbine (CC) gas plant at the same site;

B. Retirement and demolition of CUF and construction and operation of simple cycle combustion turbine (CT) gas plants at two alternate locations; and,

C. Retirement and demolition of CUF and construction and operation of solar generation and energy storage facilities, at alternate locations primarily in middle Tennessee.

Related actions, such as construction of a natural gas pipeline lateral and transmission system upgrades, are also considered in this assessment.

1.3 Related Environmental Reviews and Other Documentation

Related environmental documents and materials relevant to this assessment are listed below. The contents of these documents help describe the affected properties and are incorporated by reference as appropriate.

1.3.1 TVA Integrated Resources Plan and EIS (July 2019)

This programmatic EIS (TVA 2019b) evaluated the potential effects of TVA's long-term IRP, which provides direction on how TVA can best meet future electricity demand. The 2019 IRP evaluated six scenarios (plausible futures) and five strategies (potential TVA responses to those futures) and identified a range of potential resource additions and retirements throughout the TVA power service area.

1.3.2 TVA Natural Resource Plan (February 2020)

This Supplemental EIS assessed the potential environmental, social, and economic effects associated with implementing an updated Natural Resource Plan.

1.3.3 TVA Aging Coal Fleet Evaluation (May 2021)

This evaluation was performed to recommend near-term retirement planning assumptions to reflect practical timelines for replacement generation.

1.3.4 Fossil Plant Ash Impoundment Closure (June 2016)

This programmatic EIS evaluated the closure of ash impoundments containing Coal Combustion Residuals (CCRs) at fossil fuel plants across the Tennessee Valley to support the implementation of TVA's goal to eliminate all wet CCR storage at its coal plants.

1.3.5 Cumberland Fossil Plant Borrow Areas and Access Road (August 2017)

This environmental assessment (EA) evaluated the development of a new access road and onsite borrow sites at CUF to support ongoing operations, including partial closure of the fly ash and gypsum stacks, in accordance with TDEC regulations.

1.3.6 Cumberland Fossil Plant Coal Combustion Residuals Management Operations (April 2018)

This EIS evaluated the construction and operation of a bottom ash dewatering facility, an onsite CCR landfill, and process water basins at CUF.

1.3.7 Cumberland Fossil Plant Wastewater Treatment Facility (July 2019)

This EA evaluates the environmental consequences of the proposed construction and operation of a new wet flue gas desulfurization wastewater treatment system at CUF.

1.3.8 Johnsonville Aeroderivative Combustion Turbine Project (January 2022)

TVA released the draft EA for the Johnsonville Aeroderivative Combustion Turbine project in Humphreys County, Tennessee. TVA is proposing the addition of 10 natural gas-fired Aero CTs at the Johnsonville Reservation.

1.4 Scoping and Public Involvement

TVA initiated a 30-day public scoping period (May 11 to June 10, 2021) when it published the Notice of Intent (NOI) in the *Federal Register* announcing plans to prepare an EIS for the retirement of CUF and construction and operation of facilities to replace part of the retired generating capacity (TVA 2021a). In the NOI, TVA requested comments on other reasonable alternatives that should be assessed in the EIS. The purpose of the scoping period was to present TVA's project objectives and initial alternatives for input from the public and interested stakeholders.

In addition to the NOI published in the *Federal Register*, TVA invited members of the public as well as federal, state, and local agencies and federally recognized Indian tribes to comment on the scope of the EIS. Project-specific information and a news release (TVA 2021b) were listed on TVA's website at www.tva.com/nepa, including a link to a virtual public scoping meeting room and an online public comment page. TVA published notices regarding the NOI in local newspapers, including the following cities and associated newspapers:

- Dover, TN – Stewart County Standard and Houston County Herald
- Clarksville, TN – The Leaf-Chronicle

The virtual meeting room was hosted online for the duration of the scoping period and provided navigation to the following materials: welcome board and video, project purpose and need, project alternatives overview map and detailed maps of each alternative, overview of the National Environmental Policy Act (NEPA) compliance process and scoping, a form to submit comments, information on the virtual scoping meeting, and links to other related websites. The virtual meeting room also contained text-accessible versions of the content.

A virtual public scoping meeting was held on May 27, 2021, from 5:30pm to 7:00pm CDT via Adobe Connect. The meeting was attended by 28 members of the public, regulatory agencies, and other organizations. TVA used comments submitted prior to and during the virtual public meeting to develop a list of Frequently Asked Questions, which has been posted onto the TVA's CUF Retirement EIS website (TVA 2021b). In accordance with Section 1318.402(h) of TVA's NEPA regulations, a scoping report was developed and includes information about NEPA, federal and local laws, and executive orders (EOs) that are relevant to this EIS. The scoping report (TVA 2021c) was made available to the public on the TVA project website and presents the public comments received, as well as information on how the EIS is being developed. A summary of comment submissions and TVA responses is provided in the scoping report; comment submissions were compiled and provided in Appendix C of the scoping report; and where relevant, TVA's responses to the comments are incorporated into this draft EIS.

Based on internal and public scoping, identification of applicable laws, regulations, EOs, and policies, TVA identified the resource areas listed below as requiring review within the EIS:

- Land use and recreation
- Geology, soils, and prime farmland
- Water resources, including groundwater, wetlands and surface water, and floodplains
- Biological resources, including natural areas, vegetation, wildlife, rare, threatened, and endangered species
- Visual resources

- Noise
- Air quality and emissions of greenhouse gases (GHGs)
- Cultural resources
- Utilities
- Waste management
- Public and occupational health and safety
- Transportation
- Socioeconomics
- Environmental justice

No other environmental resources were identified during the scoping process that TVA has determined should be addressed in detail in this EIS.

During the EIS scoping period, TVA received approximately 830 comments, including comments from two Federal agencies, one state agency, six non-governmental organizations, and members of the public, including landowners potentially affected by the proposed natural gas pipeline lateral associated with Alternative A. Most of the comments received resulted from a form letter campaign by the Sierra Club. Comments received during the scoping period were related to the alternatives under consideration, land use, prime farmland, water resources, biological resources, greenhouse gas (GHGs) emissions, cultural resources, socioeconomic and environmental justice effects, and cumulative effects.

Since conclusion of the public scoping period, TVA sent a postcard update to residences within a two-mile radius of the Cumberland, Johnsonville and Gleason Reservations, as well as landowners within Dickson County who requested to be added to TVA's mailing list. TVA also distributed informational flyers to clients of the Highland Rim Economic Corporation during a commodity distribution event to provide notice of the upcoming comment period and potential public involvement events.

1.5 Necessary Permits, Licenses, and Consultations

TVA holds the permits necessary for the current operation of CUF. A summary of the laws and executive orders relevant to the Proposed Action is provided in Table 1.5-1.

Table 1.5-1. Laws and Executive Orders Relevant to the Proposed Action

Environmental Resource Area	Law / Executive Order
Geology, Soils, and Prime Farmland	Farmland Protection Policy Act
Water Resources	Administrative Code of Tennessee Department of Environment and Conservation (TDEC), Chapter 0400-04 Clean Water Act (CWA) Sections 401, 402, and 404 EO 11988 – Floodplain Management EO 11990 – Protection of Wetlands

Environmental Resource Area	Law / Executive Order
	EO 13778 – Restoring the Rule of Law, Federalism, and Economic Growth by Reviewing the “Waters of the U.S.” Rule EO 14008 – Tackling the Climate Crisis at Home and Abroad Safe Drinking Water Act TDEC Aquatic Herbicides General Permit
Biological Resources	Administrative Code of TDEC, Chapter 0400 Bald and Golden Eagle Protection Act Endangered Species Act (ESA) Section 7 (Consultation with U.S. Fish & Wildlife Service) EO 13112 – Invasive Species EO 13186 – Responsibilities of Federal Agencies to Protect Migratory Birds Migratory Bird Treaty Act (MBTA) EO 14008 – Tackling the Climate Crisis at Home and Abroad
Air Quality and GHG Emissions	Clean Air Act (CAA) EO 14008 – Tackling the Climate Crisis at Home and Abroad
Cultural Resources	Administrative Code of Tennessee, Chapter 0400.02 Archaeological Resources Protection Act (ARPA) National Historic Preservation Act (NHPA) Section 106 Native American Graves Protection and Repatriation Act
Waste Management	Administrative Code of Tennessee, Chapter 0400.10-12 Comprehensive Environmental Response, Compensation, and Liability Act Emergency Planning and Community Right-to-Know Act (EPCRA) Resource Conservation and Recovery Act (RCRA) Solid Waste Disposal Act (SWDA) Toxic Substances Control Act (TSCA)
Public and Occupational Health and Safety	Occupational Safety and Health Act
Environmental Justice	EO 12898 – Federal Actions to Address Environmental Justice in Minority and Low-Income Populations EO 14008 – Tackling the Climate Crisis at Home and Abroad

To implement the proposed action, TVA would have to maintain, obtain, or seek amendments to the following permits that are already in place at CUF:

- Tennessee Stormwater Multi-Sector General Permit for Industrial Activities: TNR050000
- Solid Waste Class II Disposal Permits from TDEC
- National Pollutant Discharge Elimination System (NPDES) permit: TN0005789

- Air permits for emissions
- CUF Gypsum Disposal Complex and Dry Ash Stack CCR Landfill – IDL 81-102-0086
- CUF – Proposed Cumberland Fossil Plant CCR Landfill – IDL 81-000-0222 (Pending)
- CUF Special Waste Permits
- CUF – Division of Water Resources Permits (TNR191811, TNR191752, TNR191734, TNR191725, TNR191704, TNR051933

Necessary permits would be evaluated based on site-specific conditions. Other potential permits or requirements relevant to the proposed action are identified in Table 1.5-2.

Table 1.5-2. Potential Permits Relevant to the Proposed Action

Submittal	Agency	Authorization	Applicability	Timing	Notes/ Assumptions
CWA 404/401 Permitting	U.S. Army Corps of Engineers (USACE) Nashville District	Section 404 Nationwide Permit	Effects to Wetlands & Waters (<0.5-acre)	45 days	Pre-Construction Notification may be required; mitigation may be required
		Section 404 Individual Permit	Effects to Wetlands & Waters (≥0.5-acre)	6 to 12 months. Typically, contingent on 401 Certification	Mitigation required
	TDEC DWR	Section 401 Water Quality Certification (ARAP)	Effects to Tennessee State Waters & Wetlands	45 days	Mitigation may be required for effects; requires pre-filing or clearing notice 30 days prior to submission
CWA 402 NPDES Permitting	TDEC DWR – NPDES Stormwater Permitting Program	Section 402 General Permit for Stormwater Discharges Associated with Construction Activities	Stormwater discharges from activities ≥1 acre of disturbance during construction	Notice of intent and stormwater pollution prevention plan (SWPPP) to be filed 30 days prior to construction	Early coordination recommended; NOI and SWPPP for Construction Activity – Stormwater Discharges (Form CN-0940). If granted, Permit TNR100000 would authorize discharges associated with construction activities that result in a total land disturbance of 1 acre or greater.
Encroachment and Crossing	TDOT	Rules and Regulations for	Aboveground or below ground	30-day review	N/A

Submittal	Agency	Authorization	Applicability	Timing	Notes/ Assumptions
Permits		Accommodating Utilities within Highway Rights-of-Way (ROW), Chapter 1680-6-1 TDOT 2018)	installation within state, federal-aid metro-urban, or State-aid highway system road ROWs	time	
	USDOT	U.S. Department of Transportation's Highway/Utility Guide (USDOT 1993)	Aboveground or below ground installation within U.S. highway ROWs	30-day Review time	N/A
Protected Species Coordination	USFWS	MBTA; ESA Section 7 Consultation	Federally listed endangered and threatened species / Migratory Birds	Varies, minimum of 30 days	Initial consultation letters have been issued
	TDEC NHP	None	State protected species	Varies	Initial consultation letters have been issued
Cultural Resources Coordination	Tennessee Historical Commission	NHPA Section 106 Consultation	Cultural Resources	30-day review time	Initial State Historic Preservation Office (SHPO) and tribal consultation letters have been issued (07/29/21). Consultation is ongoing regarding potential effects to a NRHP listed historic structure (Hollister House).

1.6 Environmental Impact Statement Overview

NEPA requires federal agencies to consider the environmental effects of their proposed actions in their decision-making. Actions, in this context, can include new and continuing activities that are conducted, financed, assisted, regulated, or approved by federal agencies, as well as new or revised plans, policies, or procedures. The NEPA review process is intended to ensure federal agencies consider the environmental effects of their actions in the decision-making process (40 CFR Parts 1500–1508 (2020)). NEPA also requires that federal agencies provide opportunities for public involvement in the decision-making process.

TVA has prepared this EIS to assess the environmental effects of the Proposed Action. TVA has used the input from the public scoping period, summarized in Section 1.4, in developing this Draft EIS. The Draft EIS will be distributed to interested individuals, organizations, and federal, state and local agencies for their review and comment. Following the 45-day public comment period for the Draft EIS, TVA will review the comments received and additional available information and develop the Final EIS. The Final EIS will include TVA's responses to the comments on the Draft EIS.

Transmission and electrical system upgrades required under the alternatives will also be reviewed under this analysis. The description of the anticipated effects of system upgrades required under each alternative presented in Chapter 3 is based on the best information available during the preparation of the EIS. If TVA determines, as a result of continuing analyses, that the upgrades are likely to result in adverse effects and need mitigation measures outside the range of those described in this EIS, TVA will conduct further reviews on those aspects of the Proposed Action.

The interstate natural gas pipeline lateral proposed under Alternative A would be developed by Tennessee Gas Pipeline Company, L.L.C. (TGP) pursuant to an agreement with TVA.[1]. TGP submitted a request to use the pre-filing procedures to the Federal Energy Regulatory Commission (FERC) under Docket No. PF22-2-000; the request was granted by FERC in November 2021 (TGP 2021). The pipeline requires approval by FERC, which is the lead federal agency for authorizing interstate natural gas transmission facilities under the Natural Gas Act and the lead federal agency for preparation of the environmental analysis for the proposed pipeline in accordance with NEPA. The proposed pipeline is considered a related action under TVA's Alternative A; therefore, TVA's analysis includes a desktop review of the proposed pipeline using GIS-based or publicly available information. The description of the anticipated effects of the pipeline presented in Chapter 3 is based on the best information available during the preparation of this EIS.

TVA intends to publish the Final EIS by mid- to late-2022 and will post the Final EIS on the TVA website; notices of its availability will be sent to those who received the Draft EIS or submitted comments on the Draft EIS. TVA will send the Final EIS to the USEPA, which will publish a notice of availability in the *Federal Register*. A Record of Decision will be issued by TVA no sooner than 30 days after the notice of availability of the Final EIS. It will include (1) the decision; (2) the rationale for the decision; (3) alternatives that were considered; (4) identification of the environmentally preferable alternative; and (5) associated mitigation measures, monitoring, and enforcement requirements.

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[1] TVA has entered into a precedent agreement with TGP. A precedent agreement between a transporter and shipper of natural gas is a preliminary agreement to enter into a future firm gas transportation agreement if certain conditions precedent are met.

CHAPTER 2 - ALTERNATIVES

This chapter describes the proposed action of retiring and demolishing the CUF plant and the alternatives for replacement of part of the retired generation.

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 generation as a result of retiring the first unit at CUF. This section describes the alternatives TVA intends to evaluate in its environmental review. Alternatives to be evaluated in detail include:

- No Action Alternative – The CUF units would continue to operate as part of the TVA generation portfolio. Additional plant modifications would be necessary to ensure compliance with USEPA’s CCR rules, effluent limitations guidelines (ELGs), and other future applicable requirements.

- Alternative A – Retirement of CUF, demolition of the units and construction and operation of a CC gas plant on the CUF Reservation. Alternative A also includes construction and operation of a natural gas pipeline lateral, a related action to be constructed, owned and operated by TGP pending FERC approval.

- Alternative B – Retirement of CUF, demolition of the units and construction and operation of simple cycle CT gas plants at alternate locations

- Alternative C – Retirement of CUF, demolition of the units and construction and operation of solar and energy storage facilities, at alternate locations primarily in Middle Tennessee

2.1.1 Coal Combustion Residual Activities to Occur with All Alternatives

CUF has significant future capital needs to support compliance with the U. S. Environmental Protection Agency (USEPA) CCR and ELG rules. TVA has previously conducted environmental reviews for activities necessary to comply with USEPA’s CCR and ELG rules (USEPA 2018). Under the No Action Alternative and the action alternatives, TVA would implement specific actions related to wastewater treatment and the management and disposal of CCRs at CUF. CCR management projects have been previously analyzed in NEPA documents listed in Section 1.3, or are future projects, which are either underway or would start within the next five years. CCR management actions would occur if CUF continues to operate (No Action alternative) or is retired as early as 2026 but no later than 2030 (all action alternatives).

2.1.2 The No Action Alternative

Under the No Action Alternative, TVA would not retire the two CUF units. These units would continue to operate as part of the TVA generation portfolio. For the existing units to remain operational, additional repairs and maintenance would be necessary to maintain reliability. Under the No Action Alternative, TVA would not construct new replacement generation. Based on the age, material condition and cost required to ensure reliability of CUF, this alternative does not meet the purpose and need of TVA’s proposed action and is carried forward in this EIS as a baseline for comparison to the action alternatives.

2.1.3 Alternative A - Retirement of CUF, demolition of the units and construction and operation of a CC Gas Plant on the CUF Reservation

2.1.3.1 Retire and Demolish CUF

Following completion of construction of the proposed CC plant, one of the units at CUF would be retired as early as 2026 but no later than 2030. The second unit at CUF would be retired as early as 2028 but no later than 2033. The retired coal facilities would transition to the Decommissioning, Deactivation, Decontamination, and Demolition (D4) process as described in Table 2.1-1. Routine CUF plant deliveries would also be discontinued. The anticipated CUF demolition boundary under Alternative A is shown in Figure 2.1-1. The existing switchyard would continue to support the second unit at CUF until that unit is retired, after which the switchyard would be demolished. Employment at the plant would be reduced. All previously approved CCR management projects would continue to be implemented.

Table 2.1-1. Key D4 Activities

Decommissioning	Deactivation	Decontamination	Demolition
Tagging out all unit or plant equipment except service water, lighting, etc.	Performing electrical and mechanical isolation of systems, components and areas	Removal and proper disposal of regulated materials	Demolition of all buildings and structures within the proposed demolition boundary to three feet below final grade via mechanical deconstruction and/or explosives
Emptying and cleaning hoppers, bins, bunkers, etc.	Installing bulkheads and/or fill tunnels	Periodic materials condition monitoring	Backfill all buildings and structures with below grade features using concrete and masonry from the demolished facilities in addition to fill
Opening all equipment electrical breakers not in use	Providing alternate power and services for sump pumps, Federal Aviation Administration (FAA) stack lighting, etc.	Periodic waste removal as materials deteriorate over time	Cut and cap all buried utilities within the project boundary and abandon in place if they do not interfere with other ongoing projects that overlap the project footprint
Draining and disposing/recycling of oil and fluids			Decommission and seal all hollow pipe utilities with a mechanical cap or plug
Salvaging, storing, and relocating useable equipment, components, materials, spare parts, office products, etc.			Restore site to grade to provide proper drainage
Salvaging and storing all key plant records			

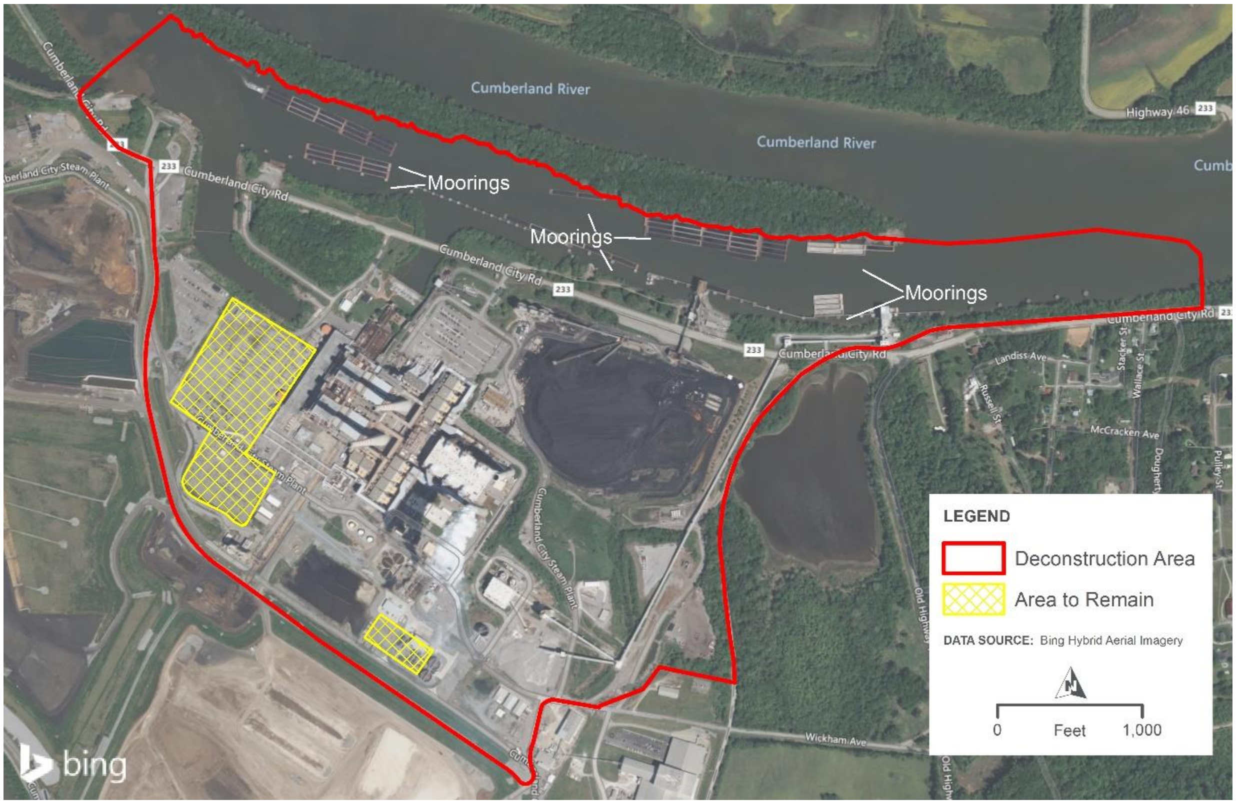

Figure 2.1-1. Map of Cumberland Fossil Plant Deconstruction Area under all Action Alternatives

Virtually all coal unit operational activities would be discontinued, and the coal plant would be demolished. All buildings, structures, conveyers, and silos associated with plant operations would be decontaminated and demolished to three feet below final grade. All below-grade building areas would be backfilled, and the site would be restored to grade while providing proper drainage. The following buildings and structures are proposed for demolition:

- Powerhouse Units 1 and 2
- Smokestacks
- Aboveground Coal Conveyors and Coal Conveyor Tunnels to three feet below final grade
- Steam Lines
- Tank Farms
- Wash Pads
- Office Wing
- Service Bay
- Utility Building
- Breaker Building
- Training Building
- Fuel/Chemical Storage and associated piping
- Railroad and crossties within the plant boundary
- Silos
- Light towers
- Scrubber Facility
- Water Treatment Plant
- Hydrogen Ports
- Warehouses
- Security Portal/ Guard Building
- Fire Engine Building
- Scrubber Absorber Building
- Mooring Cells
- Power Stores Buildings
- Electrical Shop
- Silo Filling House
- Surge Hopper
- Car Wash
- Ball Mill Building (Limestone Prep)
- Transformer Yard
- Precipitator Building
- Coal Barge Unloading Area, Transfer Stations and Surge Hopper
- Waste Storage Building
- Fish Screens
- Limestone Barge Unloader and Transfer Stations
- Oil Water Separators
- Control Building
- Other unnamed structures within the demolition boundary

The following features are also included for consideration for deconstruction/demolition:

- Select plant roads and parking lots
- Street Lighting
- Intake Condenser Circulating Water Tunnels (bulkheading[2])
- Discharge Condenser Circulating Water Tunnels (bulkheading)
- All decommissioned piping from the tank farm (that may contain residuals) to the Utility Building, the Coal Pile, and the Tug Fueling Station
- Coal Conveyor Tunnels and Transfer Pits to 3 feet below final grade (facilities below 3 feet would be abandoned in place)
- Dock Service Building

[2] Bulkheading consists of installing an engineered seal, potentially constructed of concrete, flowable fill or other barrier material for the purpose of preventing water intrusion.

- Rotary Car Dumper and associated railroad track, ties, and ballast
- Sanitary Sewer Connections from Demolished Facilities
- Plant Perimeter Fencing
- Water Treatment Building and Reverse Osmosis (RO) Trailers
- RO Plant
- Demineralization Plant

The following buildings and facilities located within the Deconstruction Area will remain in place and operational at CUF:

- Intake Pump Station
- Barge Unloader
- Booster Fan Building
- Draft Sys XFMR YD Transformer
- Diesel Fire Pump House
- Existing 161-kV and 500-kV switchyards and all associated insulating oil piping and pit (indicated by yellow cross hatching in Figure 2.1-1)[3]
- FGD Wastewater Treatment system

Primary operational activities that would be discontinued include daily coal barge operations, coal pile management, pumping and use of water from the Cumberland River for the coal plant, and thermal discharges from the coal plant back into the Cumberland River. The combustion of coal for the production of power would cease, as would generation of wastes associated with such power production.

2.1.3.2 Construction and Operation of a New CC Plant

A CC power plant uses a natural gas CT and a steam turbine together to produce up to 50 percent more electricity from the same fuel than a traditional simple-cycle (i.e., without a steam turbine) CT plant. The waste heat from the gas turbine is routed to the heat recovery steam generator (HRSG). The steam from the HRSG then goes to the nearby steam turbine, which generates extra power (GE Gas Power 2021). A typical CC plant configuration is illustrated in Figure 2.1-1.

[3] The existing switchyards would continue to support the existing second unit at CUF until that unit is retired, after which the switchyards would be demolished.

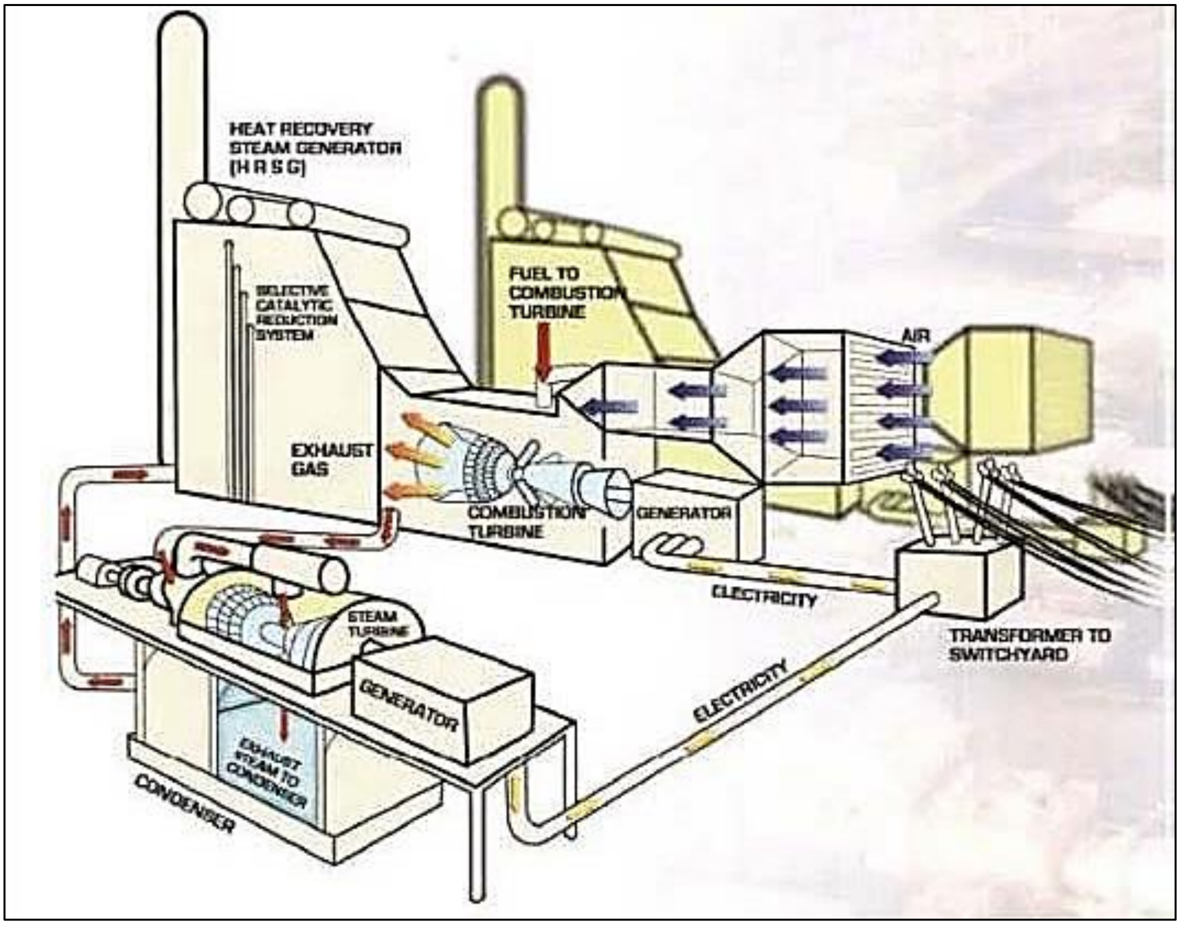

Figure 2.1-2. Typical Components of a CC Power Plant

2.1.3.2.1 Site Evaluation for New CC Plant

TVA identified candidate sites for the proposed location of a new CC plant based on a desktop review of land parcels located near existing transmission access, existing natural gas supply, and with direct access to large quantities of water for steam and cooling operations. Initial site screening resulted in several potential locations for a new CC plant, including other facility reservations within the TVA system. These sites were then further evaluated using the criteria summarized in Table 2.1-2.

Table 2.1-2. Summary of Criteria Evaluated to Determine the Location of the CC Plant

Transmission	Site Considerations	Operational Considerations
• System upgrades needed • Locational value	• TVA vs non-TVA owned sites • Site availability (available for purchase) • Land cost • Access to water	• Supply chain considerations • Staffing

Transmission	**Site Considerations**	**Operational Considerations**
Fuel Supply	**Environmental Considerations**	**Financial and Planning Considerations**
• Cost • Availability • Reliability • Operational considerations	• Environmental regulations • Sensitive environmental/cultural resources present • Water discharge considerations and potential regulations	• TVA’s Long Range Financial Plan • TVA’s Integrated Resource Plan

Based on evaluation of the screening criteria, TVA proposes to construct a new CC plant of approximately 1,450 MW generating capacity on the 2,388-acre Cumberland Reservation. This location offered several benefits:

- The construction footprint for the new CC plant could be located on land within existing TVA property as opposed to purchasing property.
- The Cumberland Reservation currently includes transmission interconnection to the TVA system, which can be repurposed for the new plant. This would not only reduce costs to interconnect the new plant but would largely eliminate costs associated with potential transmission upgrades required following coal plant retirement.
- While there is not currently natural gas service to the Cumberland Reservation, it is approximately 32 miles from a major interstate pipeline with adequate capacity to service a new CC plant. Additionally, the proposed route for the new connecting pipeline lateral is generally located along an existing TVA transmission line (TL) corridor, reducing potential environmental effects.
- This brownfield location has favorable air permitting prospects for a new CC, since it will be replacing a higher emitting coal unit.

TVA proposes to construct a CC plant on the Cumberland Reservation and performed a screening evaluation for three potential plant sites within the reservation. Option A1 was eliminated due to its proximity to an existing TL, its inability to meet Project timeline, and insufficient acreage. Option A3 was eliminated due to the extensive clearing of mature trees and grading that would be necessary. Option A2 (Figure 2.1-3), which is approximately 277 acres, was identified as the preferred location for the proposed CC plant on the Cumberland Reservation.

Alternative A also includes proposed improvements to the existing barge unloading facility identified in Figure 2.1-3, which would consist of grading and creation of dirt/rock ramping to the nose of the barge as well as potential concrete resurfacing and widening. The existing barge unloading area would continue to serve as a public boat ramp after construction is complete. The improvements would be made largely for public recreation, as TVA would only utilize the unloading area on scheduled delivery days.

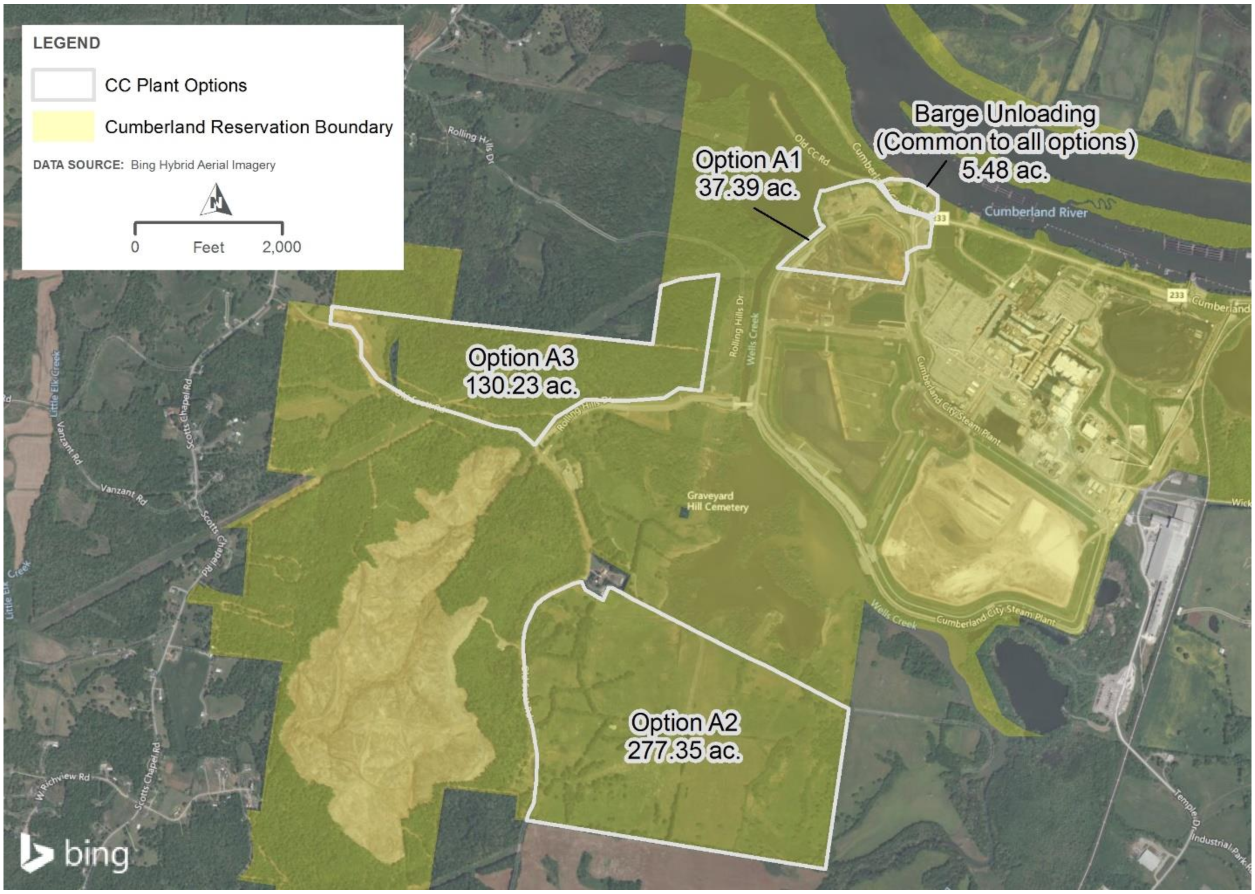

Figure 2.1-3. Alternative CC Plant Locations on CUF Reservation

2.1.3.2.2 Components of the CC Plant

Conceptual plans for the proposed CC Plant and associated transmission lines have been developed within Site A2 (Figure 2.1-3). Major components of the proposed CC plant are as follows:

- Two of the largest advanced class combustion turbines currently available on the market.
- HRSGs (one per combustion turbine) and air-cooled condensers.
- Auxiliary boilers to provide start-up steam.
- Selective catalytic reduction (SCR) system.
- Aqueous ammonia systems for the SCR.
- New natural gas-fired dew point heaters may be required depending on requirements of the selected CTs.
- Gas system upgrades to existing infrastructure to enable connection of the plant to an approximately 32-mile-long natural gas pipeline lateral proposed to be constructed and operated by TGP.

Additional plant components include:

- Electric and diesel emergency firewater pumps.
- Two, one-million-gallon tanks for demineralized water storage
- Pond(s) for holding and treating process and storm water flow; size of pond(s) to be determined after further engineering
- Connection of the CC plant to the new 500-kV switchyard, and subsequent tie-in to existing 500-kV TL corridor.
- Preliminary estimates indicate that approximately 250,000,000 standard cubic feet per day of natural gas would be required for the CC plant. This demand would require gas pressure of up to 750 pounds per square inch, requiring TVA to construct and operate an on-site gas compression system to increase the pressure of the gas delivered to the site. The gas compression located on the CUF Reservation will not be part of the proposed TGP pipeline project.

Water Requirements

After further study, TVA proposes to use air-cooling instead of water-cooling, which would eliminate the need for water withdrawal from the Cumberland River or groundwater wells for the new CC. To prevent concentration of minerals in the steam cycle the HRSG would require a demineralized water feed and boiler blowdown to remove accumulating minerals. CT compressor washing also requires demineralized water. Wash effluent would be collected in tanks and, after analysis, disposed of at an approved wastewater treatment facility off-site.

Potable water would be obtained from the existing public supply at the Cumberland Reservation (City of Erin Water Department), and demineralized water would be made onsite and stored onsite in two, one-million-gallon tanks that would be constructed at the site of the CC plant. Some water treatment will be required to support the CC steam cycle and will be integrated into plant design.

Emission Monitoring and Controls

Operating the plant would require emission monitoring and controls in both CC and CT mode. Reduction of emissions of nitrogen oxides (NO_x) from CCs would be achieved through dry low-NO_x combustion systems. The CC plant would use an SCR system located within the HRSG for additional NO_x reduction. The SCR system would use 19.5 percent aqueous ammonia that would require installation of an independent storage/receiving system. Reduction of carbon monoxide (CO) would be achieved using a separate catalyst layer specifically for that pollutant. The new exhaust stacks would be equipped with continuous emissions monitoring systems.

Transmission and Electrical System Components

TVA would construct a new 500-kV switchyard at the CC plant site (Figure 2.1-4). The new switchyard will include a minimum of 8-double breaker bays, two 3-phase shunt reactor banks, and a new control house, including water and septic systems. TVA would install new station service to the new 500-kV control house. TVA will terminate four 500-kV generator ties in the new switchyard and will loop in two existing 500-kV TLs. All construction, including 500-kV line work, would be contained within the existing CUF Reservation boundary. All unit substation transformers would be oil filled; therefore, concrete foundations and an oil containment system would be included.

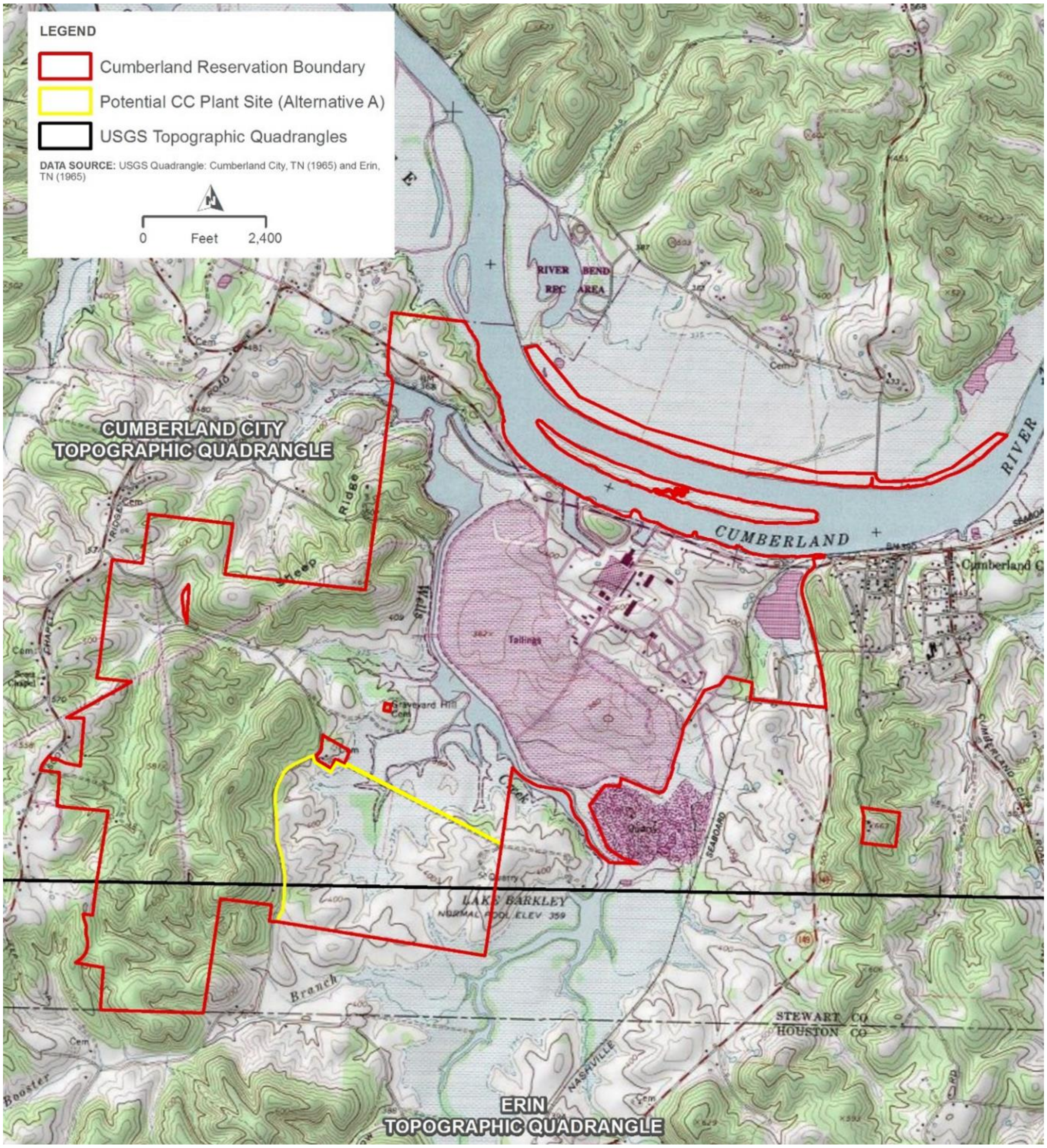

Figure 2.1-4. US Geological Survey Map of Cumberland Fossil Plant for Alternative A

Installation of approximately 6 miles of fiber-optic ground wire (OPGW) would be performed with the aid of a helicopter along an existing transmission line (Figure 2.1-5). The helicopter would be utilized to place blocks at the top of each structure, which would be used to remove the existing overhead ground wire and pull in the new OPGW. Splice cases and pull points would be located approximately every 2 miles along the fiber route. TVA would need temporary access roads at each of these pull point locations to get to the structures. Additional details regarding this network upgrade, such as the exact locations of pull points or access routes, are still being developed. Supplemental environmental analysis would be conducted as details become available. Efforts would be made to minimize ground disturbance at these places, such as through the use of light trucks and/or ground matting.

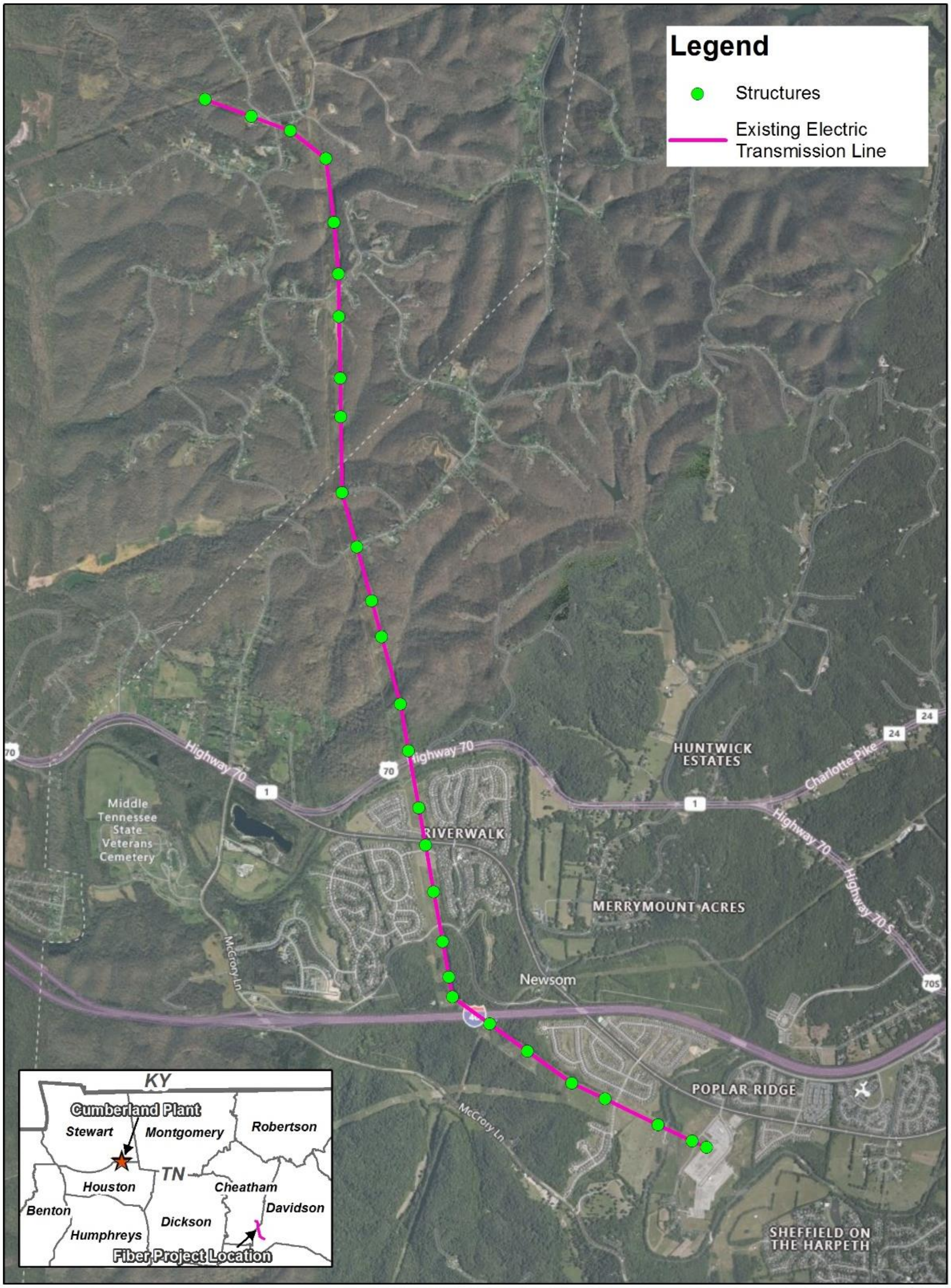

Figure 2.1-5. Proposed Fiber Optic Ground Wire

CC Plant Construction Activities

Construction activities associated with the CC plant other than the connecting natural gas pipeline lateral would occur on the TVA Cumberland Reservation, Site A2. The plant would occupy approximately 30 acres, and an additional 10 to 20 acres on site would be used for equipment laydown and mobilization. Subsurface piles or other deep foundation system would be installed to support foundations for plant components, as required.

Larger project equipment could be delivered to the site by rail or barge and smaller items by truck. Improvements to the current barge unloading facilities (identified in Figure 2.1-3) would consist of grading and creation of dirt/rock ramping to the nose of the barge as well as potential concrete resurfacing and widening. Should in-water work be necessary for completion of the upgrades to the barge unloading facilities, TVA will pursue permit authorizations, as needed. Most delivered items would be placed in project laydown areas to await installation. Roads within the Cumberland Reservation would be maintained during the construction process.

Site preparation work for the proposed CC plant and associated equipment would begin in 2023. Actual plant construction would begin fall of 2023 and the plant would begin commercial operation as early as summer 2026. A maximum of 600 workers would be employed onsite during peak construction activity.

Natural Gas Pipeline

The CUF Reservation is located about 32 miles from an existing major interstate natural gas pipeline lateral system, which has adequate mainline capacity to serve a new CC plant. The construction and operation of a new CC plant on the CUF Reservation would require construction of approximately 32miles of a new single, 30-inch-diameter natural gas pipeline lateral and associated gas system infrastructure in Dickson, Houston, and Stewart counties in Tennessee. The approximate route of the proposed pipeline lateral, to the extent that is practicable, feasible, and legally permitted, will be generally parallel and adjacent to an existing 500-kV TVA TL ROW, which is shown in Figure 2.1-6. Construction and operation of the pipeline lateral is considered a related action for this NEPA analysis. This EIS incorporates the results of a GIS-based environmental analysis of a 200-foot-wide corridor for the proposed pipeline lateral and temporary access or construction areas. While pipeline easements are typically 50 feet wide and the associated construction corridor 100-feet wide, TVA uses a wider 200-foot corridor for purposes of this analysis. The pipeline itself would be buried below the ground surface.

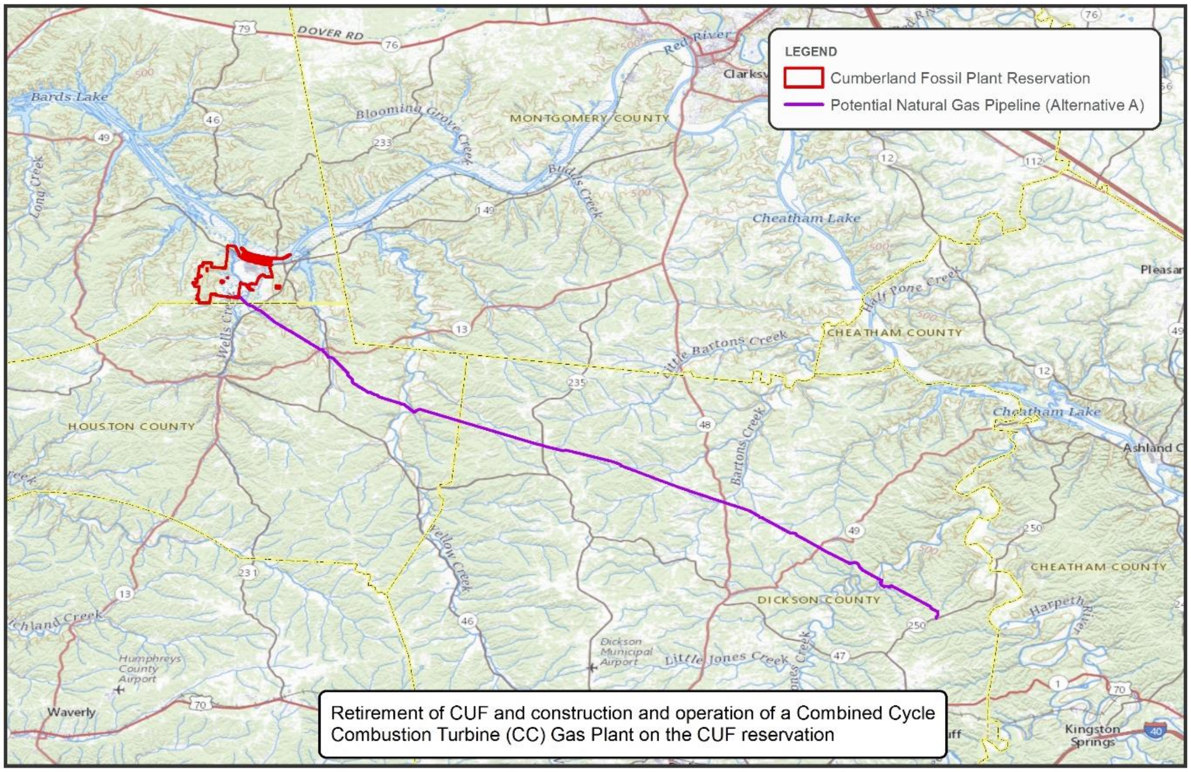

Figure 2.1-6. Alternative A – Proposed Natural Gas Pipeline Route

The pipeline requires approval by FERC through issuance of a certificate of public convenience and necessity under Section 7 of the Natural Gas Act. An application must be submitted by TGP to the FERC for approval, which is evaluated by FERC's engineering, environmental, legal, and economic staff in an EA or EIS issued for public comment before a decision is made by the FERC. TGP has submitted a request to use the pre-filing procedures to the FERC under Docket No. PF22-2-000 (TGP 2021). In addition to the approximately 32 miles of buried pipeline, the project includes the construction of the following aboveground facilities:

- a meter station to be located on the western end of the proposed pipeline and on 0.86 acres near the southwest corner of the CUF Reservation;
- new bi-directional back pressure regulation facilities near TGP's Lines 100-3 and 100-4); at the origin of the proposed new gas pipeline lateral in Dickson County, Tennessee;
- two new mainline valves at the connection with TGPs Lines 100-3 and 100-4;
- in-line inspection traps at each end of the proposed pipeline; and
- one mainline valve to be located at an intermediate location along the proposed pipeline.

TGP has initiated coordination with affected stakeholders and landowners and commenced civil, environmental, and cultural studies for the proposed pipeline route. Detailed analysis of the proposed pipeline will be provided by TGP as part of the FERC pre-filing process. TGPs Environmental Report to be submitted with their FERC certificate application is anticipated to be filed in mid- 2022. While TVA's analysis in this EIS is based on desk-top information for a 200-foot corridor, TVA will incorporate information from TGP's Environmental Report into the EIS, if necessary, to update the analysis, as this information becomes available. Construction on the pipeline is anticipated to begin in August 2024 and the pipeline is anticipated to be operational by September 2025.

TGP anticipates a maximum workforce of 400 people during construction of the pipeline. TGP would use existing operational personnel to operate and maintain the pipeline facilities and does not anticipate hiring permanent workers to operate and maintain the proposed pipeline following construction.

2.1.4 Alternative B - Retirement and demolition of CUF and construction and operation of Simple Cycle CT Gas Plants at alternate locations

2.1.4.1 Retire and Demolish CUF

The actions to retire and demolish CUF are the same as those described for Alternative A in Section 2.1.3.1.

2.1.4.2 Site Evaluation for New CTs

Under Alternative B, the construction of two CT plants at alternative locations would replace capacity of the first CUF unit, which would be retired as early as 2026 but no later than 2030 after construction is completed on the CT plants. The second unit at CUF would be retired as early as 2028 but no later than 2033. Combustion turbines (Figure 2.1-7) are designed to meet peaks in power demand very quickly (TVA 2021d). These CTs draw in air at the front of the unit, compress it, mix it with fuel, and ignite it. The combustion occurs immediately, allowing gases to then expand through turbine blades connected to a generator to produce electricity. CT plants are typically operated with natural gas, but in some cases utilize fuel oil as an emergency back-up source. However, the proposed CTs under Alternative B do not include the use of fuel oil.

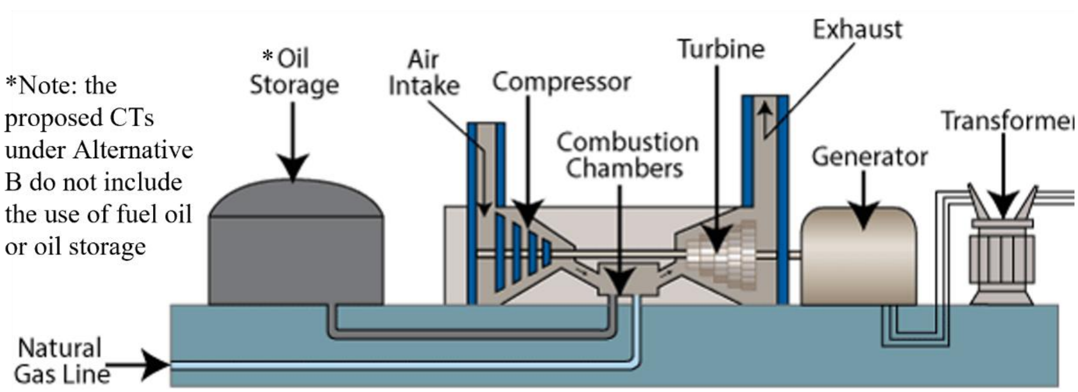

Figure 2.1-7. Illustration of a Typical Combustion Turbine Plant

Source: TVA 2021d

TVA identified candidate sites for the location of two new CT facilities based on a desktop review of TVA power plant reservations with existing transmission access and natural gas supply of sufficient additional capacity or that would require limited upgrades. Initial site screening resulted in five potential locations for new CT facilities. These sites were evaluated using the following criteria summarized in Table 2.1-3.

Table 2.1-3. Criteria Evaluated to Determine the Location of new CT Facilities

Transmission	Site Considerations	Operational Considerations

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

Based on evaluation of the above screening criteria, TVA identified five potential sites: Gleason, Johnsonville (JCT), Kemper, Lagoon Creek, and Southaven. Natural gas-fired power plants are currently operating on all these sites. After further evaluation from a transmission and fuel supply perspective, Gleason and JCT were determined to be the preferred CT sites for Alternative B. TVA proposes to construct three frame CTs at Gleason and four at JCT for a combined total of approximately 1,530 MW. These two locations offered several advantages to alternative locations, including:

- The construction footprints for the new CTs could be located on TVA property as opposed to purchasing or utilizing greenfield property, resulting in lesser environmental effects than the alternative locations.
- These reservations currently include transmission interconnection to the TVA system, which can reduce costs to interconnect the new facilities.
- All potential sites currently host natural gas-fired generation and therefore have existing pipeline infrastructure to access gas supply, which can either be used or upgraded to supply the additional proposed generation.

2.1.4.3 Locations and Descriptions

2.1.4.3.1 Johnsonville Reservation

The JCT Reservation is located near New Johnsonville in Humphreys County, Tennessee (Figure 2.1-8). The reservation is approximately 720 acres and located on the east bank of Kentucky Reservoir on the Tennessee River. The reservation once hosted 10 coal-fired units, which have all been retired and demolished, and currently hosts 20 active CT units, one of which supplies co-generation steam to an adjacent industrial site. Current plans call for CT units 1-16 to be retired at the end of calendar year 2024. To support the IRP recommendation to enhance system flexibility, TVA proposes to construct and operate 10 natural gas-fired aeroderivative CTs generating approximately 550 MW on the JCT site. A separate EA is currently underway to evaluate this proposed project. These new CT units would be commercially operable at the JCT site no later than December 31, 2024, pending the completion of this environmental review.

In this EIS, TVA proposes to construct and operate an additional four natural gas-fired CTs on the JCT site. Potential areas suitable for the construction of the four additional CTs at JCT are identified in Figure 2.1-9.

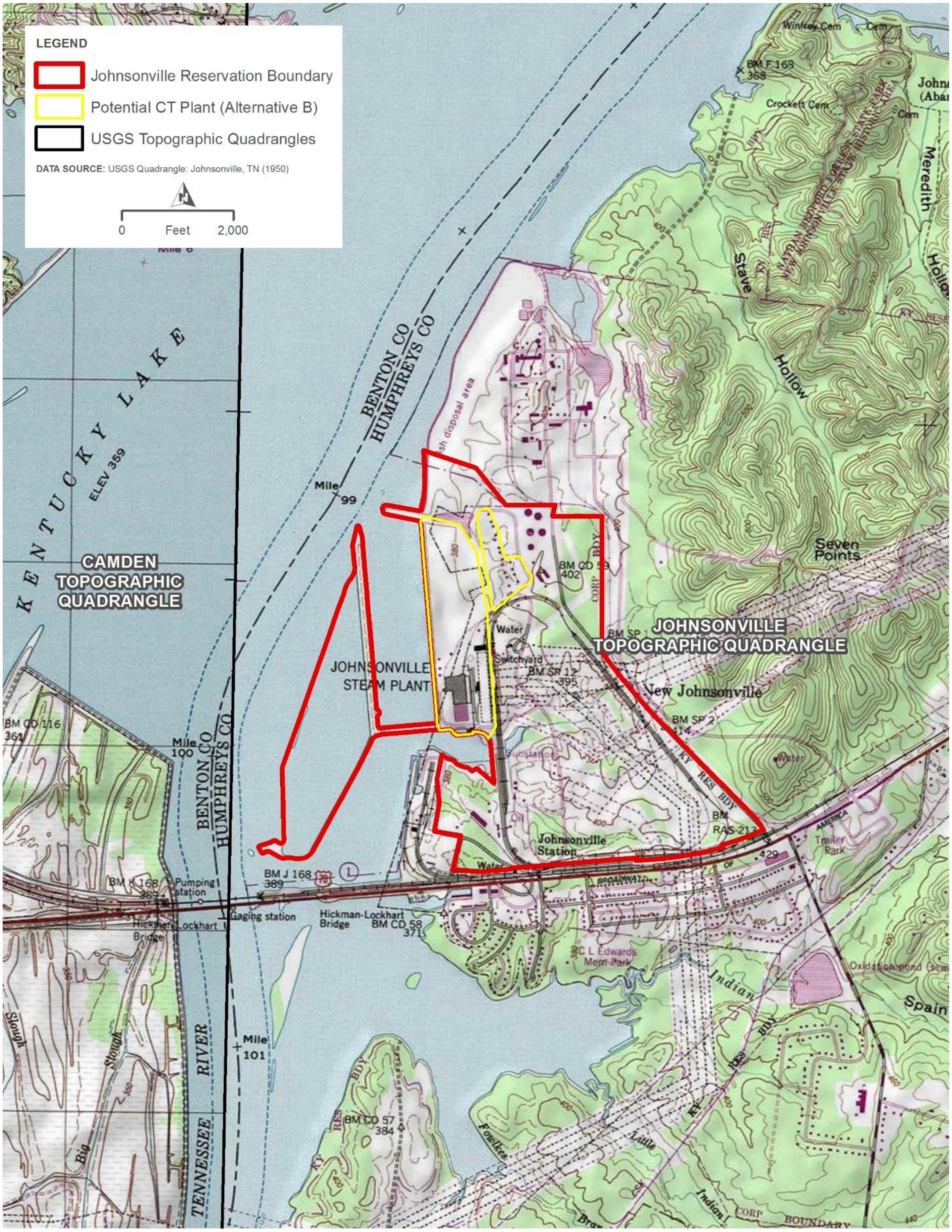

Figure 2.1-8. The Johnsonville Reservation

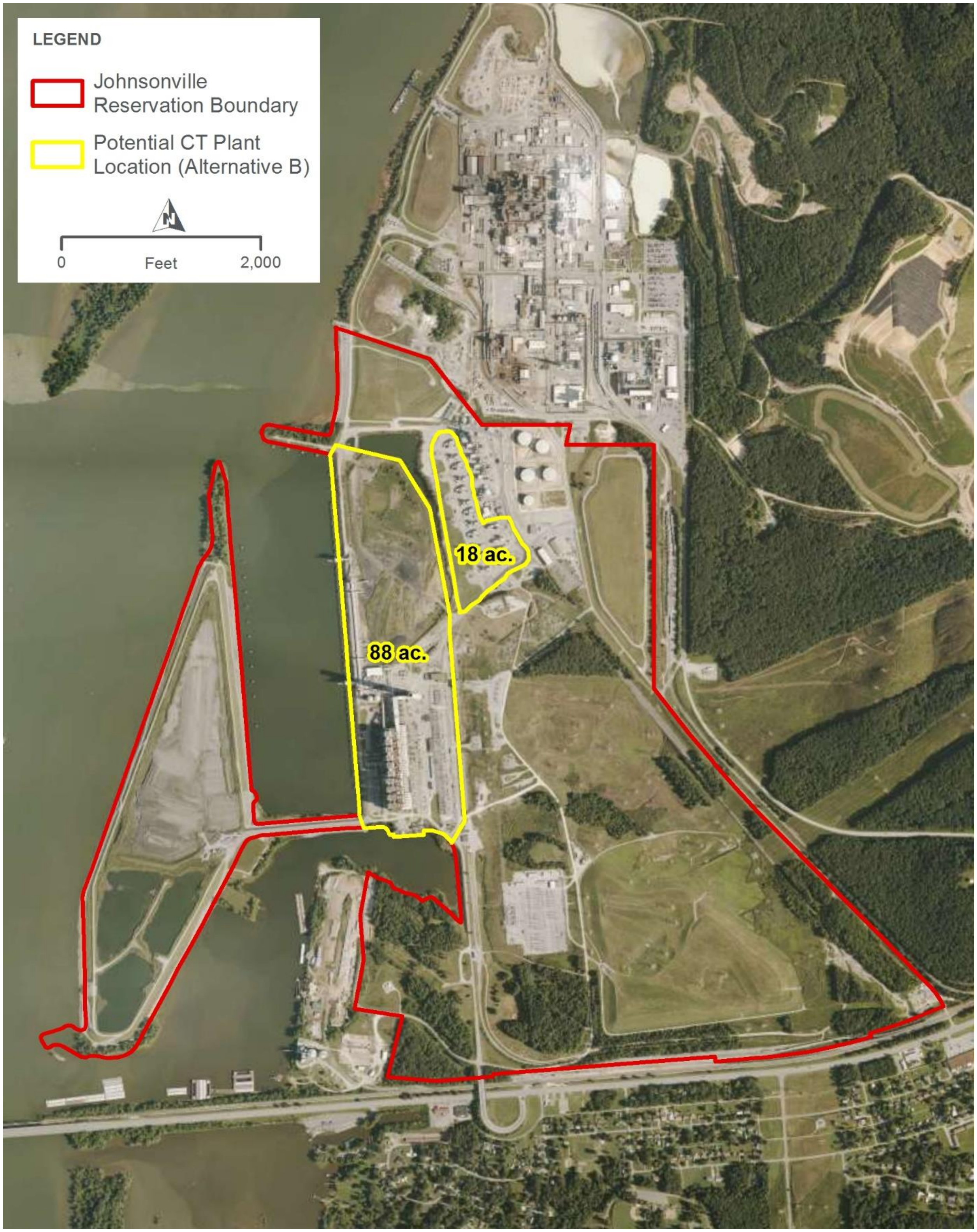

Figure 2.1-9. Potential Locations of CT Units on the Johnsonville Reservation

2.1.4.3.2 Gleason Reservation

The 97-acre Gleason Reservation is located near Dresden in Weakley County, Tennessee (Figure 2.1-10). The reservation currently hosts three active CT units with a combined generation capacity of 500 MW (TVA 2022a). Under Alternative B, three additional CTs would be constructed within the 62 acres of undeveloped land adjacent to the existing units. The proposed location for the new CTs is illustrated in Figure 2.1-11.

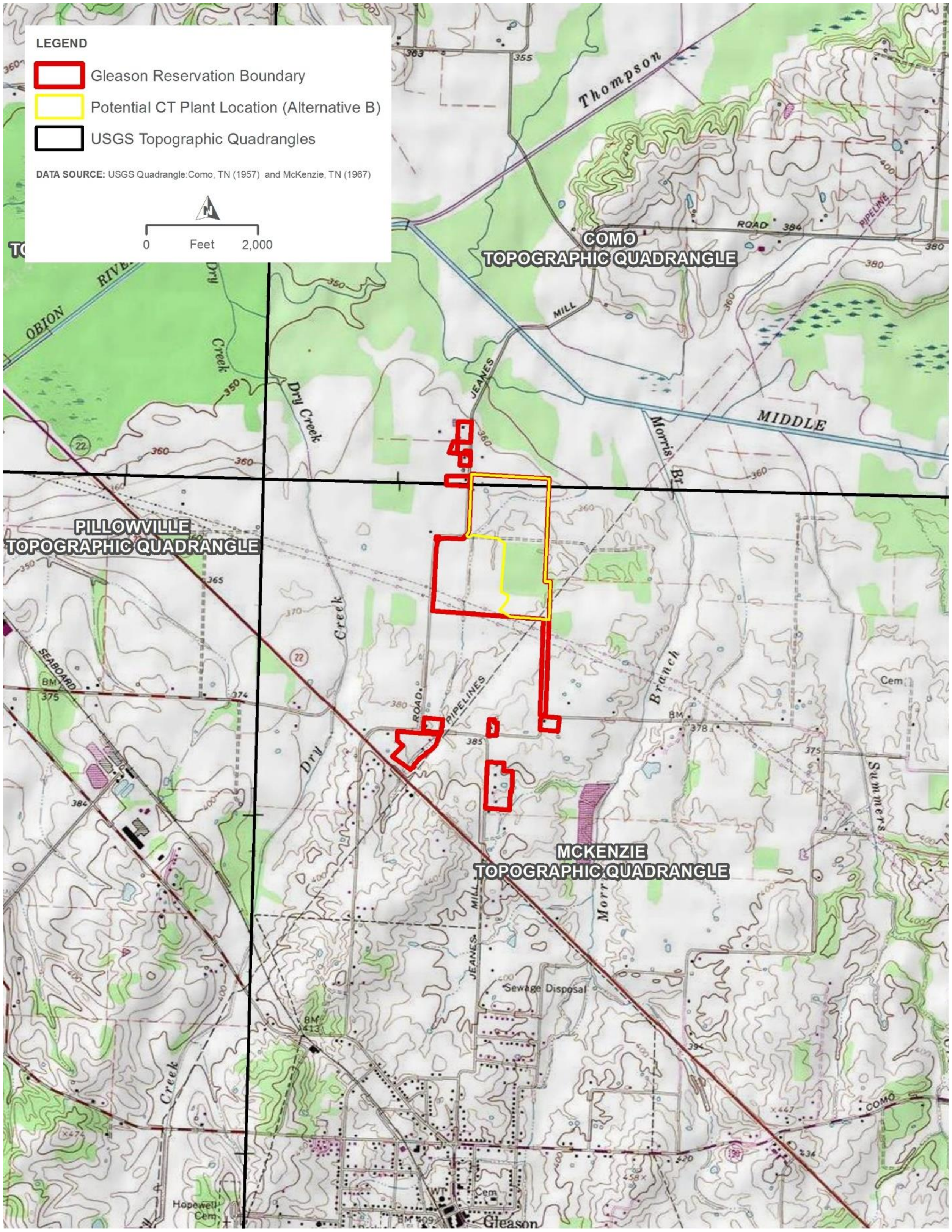

Figure 2.1-10. Gleason Reservation

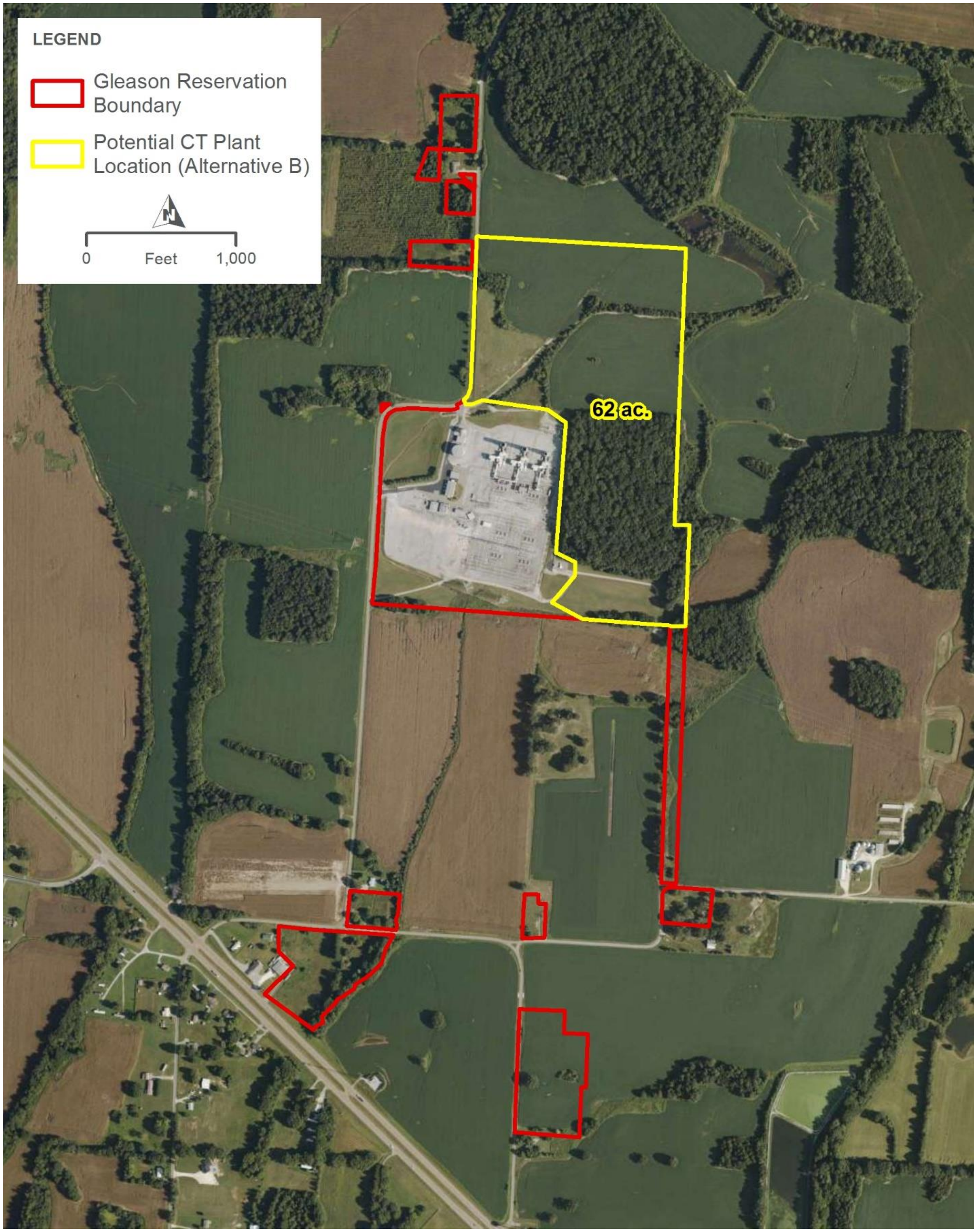

Figure 2.1-11. Gleason Reservation Aerial Photograph

2.1.4.4 Components of the CT Facilities

The components, processes, and other features of the proposed CT facilities are described in Table 2.1-4.

Table 2.1-4. Components, processes, and other features of the proposed CT Facilities for Alternative B

System components	Johnsonville Reservation	Gleason Reservation
Major Equipment Systems	Gas-fired frame CT generators with inlet evaporative cooling and natural gas-fired dew-point gas heaters. Subsurface piles would be installed to support foundations for plant components, as required.	
Plant Equipment and Systems	Natural gas metering and handling systems; instrumentation and control systems; transformers; and administration and warehouse/maintenance buildings	
CT Plant Area	Less than 10 acres each for both sites	
Area Available for Vehicle and Equipment Parking, Materials Storage, Laydown, and Construction Administration During Construction	33 acres from previous projects, inclusive of temporary use area that could 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	60 acres from previous projects, inclusive of temporary use area that could 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
Project Material and Equipment Delivery	By rail, utilizing the existing rail spur, and trucks	Delivered by rail to McKenzie, TN and then delivered to the project site by truck and placed in designated project laydown areas until used. It is approximately 13 miles from the rail station to the Gleason Reservation, and it is assumed approximately 10 truck trips would be needed for the delivery of

System components	Johnsonville Reservation	Gleason Reservation
		materials from the rail station to Gleason.
Equipment Used During the Construction Phase	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 effects per TVA BMPs	
Workers Needed*	A maximum of 180 workers would be employed at each site at the peak of the two-year construction period, and four to six additional staff would be utilized for operations after construction for both Gleason and JCT.	
Water Requirements	Up to about 130 gallons per minute (GPM) for inlet air evaporative cooling in summer ambient temperatures. Potable water for domestic use and safety showers would be obtained from the existing public supply.	Up to about 100 GPM of potable water for inlet air evaporative cooling in summer ambient temperatures. Potable water for domestic use and safety showers would be obtained from the existing public supply.
Emission Monitoring and Controls	Reduction of NO_x emissions from the CTs would be achieved through DLN combustion systems. Exhaust stacks would be equipped with continuous emissions monitoring systems. Emissions from the units would adhere to the requirements of TDEC and federal regulations.	
Natural Gas	New gas compression would likely be needed onsite. 220 million standard cubic feet per day (MCF/day) of natural gas would be needed to fuel four frame CT units at each plant, running at maximum capacity. Three gas heaters would burn 240,000 standard cubic feet of natural gas per day if running at the same maximum capacity, requiring piping to connect the CTs to the existing natural gas pipeline lateral and metering station. Expansion of the existing metering station will be constructed within plant boundaries. Exact location has not yet been determined.	New gas compression may be needed onsite. 165 MCF/day of natural gas would be needed to fuel three frame CT units at each plant, running at maximum capacity. Three gas heaters would burn 240,000 standard cubic feet of natural gas per day if running at the same maximum capacity, requiring piping to connect the CTs to the existing natural gas pipeline lateral and metering station. Expansion of the existing

System components	Johnsonville Reservation	Gleason Reservation
		metering station will be constructed within plant boundaries. Exact location has not yet been determined.
Transmission and Electrical System Components	Add four new double breaker bays to 500-kV yard for the four new CT units and four new breakers in the existing bays with TLs that only have one breaker. Construct new switchyards or expand current switchyards as needed to allow for expansion. Provide redundant metering and install digital fault recorders and relays for all new transmission and generation work.	Convert 500-kV yard to a double breaker configuration, add three new double breaker bays for the three new CT units, and add two breakers each in two existing double breaker bays. Construct new switchyards or expand current switchyards as needed to allow for expansion. Provide redundant metering and install digital fault recorders and relays for all new transmission and generation work.
Transmission Upgrades	Construct a new approximately 40-mile 500-kV TL from Weakley 500-kV station to a new switching station on the Marshall-Cumberland 500-kV TL; install a new 500kV breaker to convert the existing 3-position ring bus at Weakley into a 4-position ring bus; install redundant metering and relays; construct the new 500 kV station on the Marshall-Cumberland 500 kV TL with three double breaker bays; install a new switch house potentially including water and septic systems; install new station service to the new 500 kV switch house; and provide redundant metering and install digital fault recorders and relays for all new transmission and generation work. All unit substation transformers would be oil filled; therefore, concrete foundations and an oil containment system would be included.	
Offsite Upgrades to Existing TLs and Stations	Existing 161-kV TLs may need to be reconductored or rebuilt. Also, reactive support in the form of installing tertiary reactors on area transformers and/or a static var compensator site may be required at 500-kV and/or 161-kV substations.	

*This does not include the construction workforce needed for offsite TL upgrades, if required, as this work is not centralized in one location for any significant period of time. Once constructed, eight to twelve employees could be needed to operate the CTs at both JCT and Gleason in addition to current staff

2.1.4.4.1 Transmission Lines

As noted in Table 2.1-4, Alternative B would involve construction of approximately 40-miles of new 500 kV-TL from the existing Weakley 500-kV substation south of Martin, Tennessee to a new station on the Marshall-Cumberland 500-kV TL near Buchanan, Tennessee. Additional 161-kV TL's may need to be reconductored or rebuilt.

Although the exact route of the proposed TL has not been determined, upgrades that are typically performed to increase the electrical capacity of the existing TLs 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 safely and would be moved.
- *Replacement or Modification of Existing TL Structures or Installation of Intermediate TL Structures*. 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, resulting in taller structures. Disturbance is usually limited to an approximately 100-foot radius 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 standard-size bucket truck; disturbance is minimal and confined to the immediate area of the clearance issue. The end result of these modifications is to raise the conductor to increase ground clearance.
- *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 structures 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 rock 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 rock or dirt 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 distribution line 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, which allows technicians to clip in the new wire at designated pull points along the TL corridor where cable reels of optic fiber ground wire are set up. 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.

Standard practices that are typically performed to install new TLs include the following:

- *Clearing and Grubbing.* The clearing contractor will clear minor wooded portions of the ROW, bush hog other areas as necessary, and install BMPs, which helps reduce erosion and sedimentation during soil disturbance and line installation.
- *Establish Site Access*. Access roads suitable for construction equipment will be constructed at points strategic to structure locations. When feasible, existing roads will be used and improved with minor grading. Construction exits will be installed if needed where access points intersect paved roads.
- *Line Construction*. Construction crews will spot the material at the site, install the new pole structures, string and sag conductor, and clip in conductor.
- *Site Restoration*. After line installation, the clearing contractor will perform final restoration of the site and remove all temporary BMPs. Areas disturbed by clearing but not expected to be disturbed further will be restored during initial clearing.

Development of new permanent access roads to support upgrades to the existing TLs or installation of new TLs may be required. 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 or new TL installation work is completed. Areas such as pasture, agricultural fields, or lawns would be returned to their former condition.

If detailed studies are performed in the future that evaluate needed improvements to the regional transmission system to maintain system stability and integrity and additional transmission needs are identified, site-specific reviews would be conducted to further investigate potential effects to the environment. If warranted, tiered NEPA documentation would be prepared.

2.1.5 Alternative C - Retirement of CUF, demolition of the units and construction and operation of Solar and Storage Facilities, at alternate locations, primarily in Middle Tennessee

2.1.5.1 Retire and Demolish CUF

The actions to retire and demolish CUF are the same as those described for Alternative A in Section 2.1.3.1

2.1.5.2 Solar Plus Storage Approach

Under Alternative C, solar and battery storage facilities would be completed primarily at alternative locations to replace the generation of one of the units at CUF, which would be retired as early as 2026 but no later than 2030. The second unit at CUF would be retired as early as 2028 but no later than 2033. TVA would replace the power generated and dependable capacity provided by one of the CUF units through the construction and operation of utility-scale solar facilities and battery storage facilities. To sustain low costs and high reliability, TVA anticipates a portion of these new facilities would need to be located in middle Tennessee, where they can help support transmission grid stability following the retirement of the CUF unit. Battery storage, or battery energy storage systems (BESS), are devices that store energy from the grid and renewable sources, typically during periods of surplus power or low demand, and then release that energy when customers need power. Mechanical or chemical battery options could be utilized for storage. The following section describes TVA's approach to combining solar and storage to replace the first CUF unit and meet the capacity and energy needs of the TVA system.

Solar resource additions would be needed to provide replacement energy for the TVA system. TVA is a dual-peaking utility, meaning that it could experience the highest annual peak days in the summer or in the winter. During the winter, the peak typically occurs around 7:00 a.m., when solar resources are not generating. As such, battery storage additions would be needed to provide year-round replacement capacity, especially in winter.

A generating facility's "**capacity factor**" is the ratio of the electrical energy produced by a generating unit for the period of time considered to the electrical energy that could have been produces at continuous full power operation during the same period.

While solar resources generate energy during daylight hours, this energy is both intermittent in nature and non-dispatchable. Recent proposals for in-Valley, utility-scale single-axis tracking solar resources indicate an average annual capacity factor of approximately 25 percent. Therefore, to match the total energy output lost to the TVA system from the retirement of a CUF unit, a higher nameplate capacity would be required for a solar resource than the 1,450 MW minimum resource requirement for a fully dispatchable resource, such as a gas plant.

Additionally, new storage facilities would be required to provide dispatchable capacity to meet peak loads, as well as to store a portion of solar generation for use at other times, typically not exceeding a few hours, when needed. In both summer and winter peak seasons, the CUF units provide dependable capacity and energy for extended time periods. Oftentimes, high loads caused by warm or cold weather events can last for several days in a row, leading to difficulty in sufficiently recharging storage resources. As a result, storage resources will need to have a nameplate capacity that is higher than the 1,450 MW minimum resource requirement for a fully dispatchable resource in order to dependably meet system needs following the retirement of the first CUF unit.

2.1.5.2.1 Solar Plus Storage Evaluation & Reliability Analysis

TVA performed a reliability analysis to determine an appropriate combination of solar and storage resources to maintain year-round system reliability for Alternative C. TVA began the solar plus storage evaluation by determining the appropriate level of solar resources needed to replace the energy needs resulting from the retirement of the first CUF unit. Multiple years of history were used to determine an average annual capacity factor and resulting average annual energy output. Using a 25 percent capacity factor, which is typical for recent single axis tracking solar proposals, TVA calculated the nameplate capacity of solar resources required to supply this same amount of annual energy. The resulting calculations indicated a need for approximately 3,000 MW of nameplate solar to replace system energy needs from the first unit retirement at CUF. This 3,000 MW would be in addition to the approximately 10,000 MW of solar additions by the mid-2030s that are forecasted in TVA's current plans.

The next step was to determine the amount of battery storage to pair with the additional 3,000 MW of solar capacity. TVA assumed that battery storage additions would be four hours in duration, as is typical for utility scale lithium-ion battery energy storage systems. To ensure year-round reliability, TVA performed a reliability analysis utilizing the Strategic Energy and Risk Valuation Model (SERVM) from Astrapé, which is the same model TVA utilizes when updating its Reserve Margin Study every few years. The objective function of the study was to determine the level of storage, paired with 3,000 MW of additional solar, needed to maintain an industry best practice level of reliability of one loss of load event (LOLE) every 10 years (or 0.1 LOLE), with this risk balanced evenly between summer and winter. The SERVM model accounts for uncertainties related to weather, load forecasts, and system performance. Modeling the retirement of the first CUF unit, study results indicated that approximately 1,700 MW of four-hour battery energy storage systems paired with 3,000 MW of additional solar will maintain a 0.1 LOLE with balanced seasonal risk. Based on this analysis, this EIS evaluates additions of 3,000 MW of solar capacity paired with 1,700 MW of battery storage for Alternative C.

Battery storage is a new resource for TVA, with multiple projects either planned or under contract to occur in the next few years. The operating experience gained from these early projects will provide insight on how battery storage is utilized in the TVA system. When short-duration battery storage systems are added and become a larger part of the TVA power portfolio, as experienced by other utilities, the capacity credit incremental battery additions will receive toward reserve margin will decrease. Early battery experiences will further inform how battery storage is valued in future planning.

2.1.5.2.2 Resource Procurement and Site Evaluation

As TVA is unable to directly benefit from tax credits available for the deployment of solar facilities and associated storage, TVA typically utilizes Power Purchase Agreements (PPAs) with third-party developers for its solar facilities. Since TVA also has the option to construct and own ("self-build") these facilities, solar and storage facilities constructed under Alternative C could be a combination of PPAs and self-built facilities. For modeling purposes, Alternative C assumes that TVA continues its practice of soliciting competitive bids for new solar and storage PPAs to meet the need determined in this analysis. While site locations remain unknown, TVA anticipates that a portion of these facilities will need to be physically located in the Middle Tennessee region to maintain grid reliability and stability. Power from these facilities would typically be delivered by direct connection to TVA's transmission system or via interconnections with local power companies that distribute TVA power to customers.

2.1.5.2.3 Components of Solar and Storage Facilities

Solar facilities convert sunlight into direct current (DC) electrical energy within PV panels (modules) (Figure 2.1-12). PV power generation is the direct conversion of light into electricity at the atomic level. Some materials exhibit a property known as the photoelectric effect that causes them to absorb photons of light and release electrons. When these free electrons are captured, an electric current is produced, which can be used as electricity (TVA 2014; TVA 2021d).

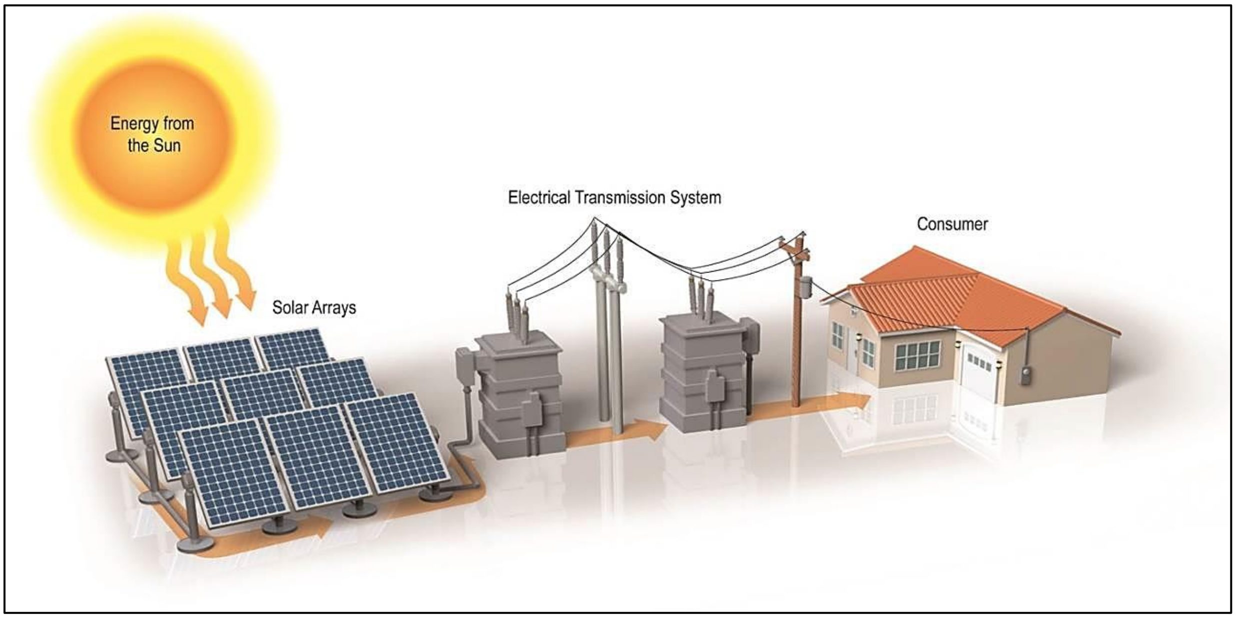

Figure 2.1-12 General energy flow diagram of PV solar system (not to scale)

Solar facilities would be composed of PV modules mounted together in arrays. Groups of panels would be connected electrically in series to form “strings” of panels, with the maximum string size chosen to ensure that the maximum inverter input voltage is not exceeded by the string voltage at the project’s high design temperature. The panels, estimated to be approximately 6.5 feet by 3.5 feet, would be located in individual blocks consisting of the PV arrays and an inverter station on a concrete pad or steel piles, to convert the DC electricity generated by the solar panels into AC electricity. The solar facility would be enclosed by chain-link security fencing. Apart from access roads, the portions of the project outside the fenced-in area are typically not developed.

The modules would be attached to single-axis trackers that follow the path of the sun from the east to the west across the sky (Figure 2.1-13). The inverter specification would fully comply with the applicable requirements of the National Electrical Code and Institute of Electrical and Electronics Engineers standards. Each inverter would be collocated with a medium voltage transformer, which would step-up the AC voltage to minimize the AC cabling electrical losses between the central inverters and the proposed on-site Project substation. Underground AC power cables would connect all of the medium voltage transformers to the main power transformer, located within the substation.

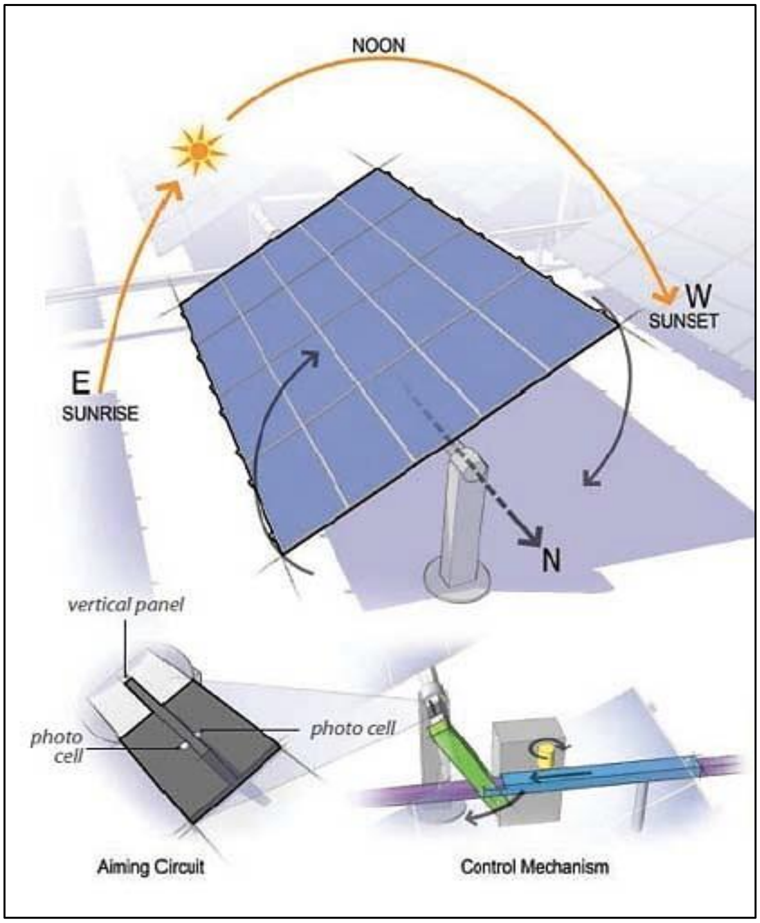

Figure 2.1-13 Diagram of single-axis tracking system (not to scale)

Other temporary or permanent project components would include construction laydown areas and security and communications equipment. Compacted gravel or native fill access roads would provide access to each inverter block and the proposed substation. Also, if determined necessary, the project would include project water wells, a septic system or pump-out septic holding tank, and an operations and maintenance building. Vegetation on individual solar facilities could be managed using intermittent mowing or grazing sheep.

Lithium-ion technology is the most common BESS. Storage facilities are typically small sites and sited near existing substations, transmission lines, or solar facilities. Construction would consist of grading the site and installing a foundation to place the battery containers, inverters, electrical and communications connections for the BESS and heating, ventilation, and air conditioning (HVAC) system monitoring and control. The battery containers are modular steel construction similar to intermodal shipping containers in which the modular lithium-ion battery cells are mounted on racks and connected by cabling. The battery containers are equipped with air conditioning and fire protection systems, auxiliary distribution board, and lighting.

2.1.5.2.4 Transmission and Electrical System Components

Over the past several years, TVA has connected multiple solar facilities to TVA's transmission system. Most of these projects include transmission interconnection as well as network upgrades elsewhere on TVA's system. These network upgrades could include the construction of new TLs or upgrades to existing TLs to increase electrical capacity. TVA looked at 31 solar projects of various MW size from 2014 to 2021 and determined that the average length of new

TL for solar facility interconnection is 1.71 miles. The lengths ranged from 0 to 16 miles, with the majority being between 0 and 2 miles. The average number of acres impacted due to transmission and electrical system components ranged from 0 to 225 acres, with the average being 17.73 acres. Upgrades are typically performed to increase the electrical capacity of the existing TLs and would include the items listed in Section 2.1.4.4.1.

The anticipated amount of construction of new or upgraded transmission facilities would vary amongst each solar and/or storage project. All new generating and storage facilities would require connections to the transmission system, either directly or through an interconnection with a local power company. The length of connecting TLs and the need for new substations and switching stations would depend on the location and capacity of the facilities. Depending on the solar and battery site locations, line upgrades may be required to increase the capacity of the lines. Optical fiber ground wire may also need to be installed on TLs to facilitate the needed relay protection.

Since exact locations for solar and storage facilities are unknown at this time, detailed transmission impacts are undetermined. Significant transmission network upgrades to facilitate the delivery of power to the Nashville area will likely be required, possibly including new 500-kV facilities. Furthermore, the loss of large synchronous generation near the Nashville area (a high load region) will increase the risk of instability events (including fault-induced delayed voltage recovery [FIDVR] events), jeopardizing the reliability of the bulk transmission system. These events will not be effectively mitigated with inverter-based resources alone, and could require multiple dynamic reactive compensation devices installed in the Nashville area to provide fast acting reactive power/grid support.

The above information was compiled to provide an estimate of the potential effects associated with the construction of transmission and electrical system components to support solar and storage facilities in order to provide a comparison to other action alternatives being considered in more detail. Since exact site locations for solar and storage facilities are not known at this time, additional site specific tiered NEPA analysis will need to be completed as projects are identified and the scope is further defined.

2.1.6 Alternatives Considered but Eliminated from Further Discussion

TVA considered various resource types for replacement of generation lost as a result of retiring the first unit at CUF. The replacement generation must be capable of providing year-round peak capacity as well as serving large energy needs, as CUF serves an intermediate-to-baseload function. Considered resources were required to be mature technologies, capable of being constructed and installed within a five-year timeframe.

In addition to replacement generation at CUF, TVA expects to add 10,000 MW of solar generation by 2035 to meet customer demands and system needs. Integrating this significant number of intermittent resources requires a generation fleet that is highly flexible and capable of ramping up and down quickly to cover gaps in renewable generation.

TVA continuously monitors a variety of market signals to inform its planning, including forecasts for loads, commodities, and resource costs. Higher demand expectations for residential and supporting services, such as data centers, is being driven by an observed shift in interstate migration patterns into the Valley that is expected to continue. Incorporating these trends, our current load forecasts indicate slightly increasing peak loads over the next 20 years. With the approved retirement of Bull Run Fossil Plant in 2023, TVA will be at minimum reserve targets and must therefore replace any retiring capacity with dependable capacity to maintain summer and winter load targets.

While not exhaustive, TVA considered the resource options listed in Table 2.1-5 to replace the first unit at CUF.

Table 2.1-5. Alternatives Considered

Resource Option	Selected (Y/N)	Reasoning
Natural Gas-Fired CC	Y (Alternative A)	High fuel efficiency with large energy potential and ability to provide grid support and follow load; relatively low construction cost; and fully dispatchable year-round with the ability to ramp up and down throughout the day to meet changes in demand and fluctuations in output from renewable resources
Natural Gas-Fired CT	Y (Alternative B)	Ability to start and ramp quickly on short notice as well as provide grid support and follow load; fully dispatchable year-round with the ability to meet capacity needs during short periods; lowest installed capital cost per MW and offers flexibility to assist in the integration of renewable resources
BESS	Y (Alternative C)	Provides dispatchable complement to intermittent nature of solar and wind resources; represents one of the lowest cost storage options; customizable output rating
Utility-Scale PV Solar	Y (Alternative C)	Carbon-free renewable resource; relatively inexpensive on a cost per megawatt hour (MWh) basis but not dispatchable and generation is intermittent; therefore, must be paired with new dispatchable resources, such as storage or gas to meet the needs of this project
Hydro Pumped Storage	N	Long-duration storage that is currently being studied by TVA for further evaluation and potential deployment in the early 2030s. Longer timelines to meet environmental requirements and for construction are incompatible with time frame proposed for the first unit retirement at CUF
Small Modular Reactors (SMR)	N	Potential to serve cost-effective baseload or load following needs in the future with low fuel costs, carbon-free generation, advanced passive safety systems, and anticipated cost reductions achieved by assembling components in a factory setting; however, longer timeline and first of kind deployment risks are incompatible with the needs of this project

Resource Option	Selected (Y/N)	Reasoning
In- and/or Out-of-Valley Wind	N	Can provide dependable capacity in both summer and winter, though intermittent. Was not selected due to low wind speeds in Tennessee Valley and higher transmission costs for out-of-Valley wind, both of which increase relative costs.
Energy Efficiency (EE)	N	Well-positioned to play a role in absorbing load growth resulting from increased electrification of the economy; however, EE programs take time to scale and market and face increasing costs at the high penetration levels required to meet the needs of this project
Demand Response (DR)	N	Well-positioned to play a role in absorbing load growth resulting from increased electrification of the economy and allow TVA to offset physical capacity needs; however, they are limited in the number of calls available and would not meet the needs of this project

Distributed generation, such as distributed solar, storage, and wind, was also considered. Distributed Energy Resources (DER) are generally smaller in size and can be aggregated together in a program or agreement for planning purposes. TVA's flexibility option, available to LPC Long-term Partners, provides an avenue for additional levels of DER by allowing LPCs to self-generate up to 5 percent of their annual load. TVA's IRP (TVA 2019a) includes assumptions for DER adoption, including DER added by LPCs on the distribution system. In general, the cost for distributed generation is higher than utility-scale generation for the same type of resource. TVA has therefore determined that the combination solution of utility-scale solar paired with utility-scale storage as presented in Alternative C provides a feasible lower-cost solution for replacement generation and capacity utilizing renewable energy.

2.1.7 Alternative Fuels Considered but Eliminated from Further Discussion

Combustion turbine units hold promise in further contributing to a net-zero future through the use of alternative fuels, such as hydrogen, and/or carbon capture and sequestration (CCS) technology. Most modern combustion turbine units available today have the capability to burn a blend of hydrogen in combination with fossil fuels to reduce the unit's carbon footprint. It is anticipated that this capability will continue to advance and increase the percentage of alternative fuel blending or exclusive alternative fuel use that these units will be capable of in the future. CCS systems typically work by capturing carbon emissions before being released into the atmosphere, transporting them, and then storing them in underground geological formations. Given cost considerations, CCS technology would likely be paired with higher capacity factor units, such as those in combined cycle configuration. At this time, high costs and maturity of alternative fuels and CCS remain barriers to widespread commercial use. TVA is exploring partnerships with federal agencies and peer utilities to advance the research and development of both alternative fuels and CCS technology, which could enable their use at existing or future TVA facilities. Given current cost and maturity challenges with alternative fuels and CCS, these options were not considered viable within the time frame proposed for the first unit retirement at CUF.

2.2 Comparison of Alternatives

A comparison of the environmental consequences associated with each alternative is presented in Table 2.2-1.

Table 2.2-1. Summary and Comparison of Alternatives by Resource Area

Resource Area	No Action Alternative	Retirement and Demolition of CUF Plant (All Action Alternatives)	Alternative A	Alternative B	Alternative C
Environmental Justice	No disproportionate effects to EJ populations are projected.	No disproportionate effects to EJ populations are projected.	No disproportionate effects on EJ populations are projected.	No disproportionate effects to EJ populations are projected.	No disproportionate effects to EJ populations are projected.
Land Use	No direct or indirect project-related effects	Minor temporary effects during demolition.	Minor temporary effects during construction. Conversion of hay/pastureland within the CC Plant site to developed land for construction. Land disturbance as a result of pipeline construction.	JCT: Negligible temporary effects during construction. Gleason: Minor temporary effects during construction. Transmission Line: Direct effects in conversion of land to transmission line easement.	Minor temporary effects during construction. Moderate effect in conversion of agricultural land to developed land with potential for later restoration of agricultural use.
Geology	No direct or indirect project-related effects.	Minor direct effects to geology during demolition.	Minor direct effects to geology during construction. Minor potential for seismic activity. Geologic features, such as sinkholes or karst terrain, would be avoided.	Minor direct effects to geology during construction. Minor potential for seismic activity. Geologic features, such as sinkholes or karst terrain, would be avoided.	Minor direct effects to geology during construction. Minor potential for seismic activity. Geologic features, such as sinkholes or karst terrain, would be avoided.

Resource Area	No Action Alternative	Retirement and Demolition of CUF Plant (All Action Alternatives)	Alternative A	Alternative B	Alternative C
Soils	No direct or indirect project-related effects.	Minor temporary effects during demolition.	Minor direct effects that would be reduced using appropriate BMPs.	Minor direct effects that would be reduced using appropriate BMPs.	Minor direct effects that would be reduced using appropriate BMPs.
Prime Farmland	No direct or indirect project-related effects.	No direct or indirect project-related effects.	Minor direct effects from loss of on-site prime farmland soils at CC plant and pipeline corridor.	Minimal to negligible direct effects.	Moderate direct effects from loss of on-site prime farmland soils.
Floodplains	No direct or indirect project-related effects.	Minor effects due to disposal of demolition material in the 100-yr floodplain..	Minor direct effects in the 100-yr floodplain that would be reduced using appropriate BMPs	Minor direct effects in the 100-yr floodplain that would be reduced using appropriate BMPs	Minor direct effects in the 100-yr floodplain that would be reduced using appropriate BMPs
Water Resources	No direct or indirect project-related effects	Long-term beneficial effect from reduced cooling water withdrawals. Short term, temporary and minimal effects to surface waters during demolition. BMPs would be employed where appropriate. Minor effects to groundwater mitigated with the use of appropriate BMPs.	Direct temporary effects from mooring cell demolition and indirect effects from the demolition of the existing coal plant facilities. Potential direct and/or indirect, long-term and/or short-term stream and wetland effects from CC plant, pipeline, and TL construction. Effects will be minimized with appropriate BMPs or mitigated through	No effects on JCT site. Potential long-term or short-term effects to streams and wetlands on site and/or within Gleason CT plant site and transmission corridor. Minor effects to groundwater mitigated with the use of appropriate BMPs.	Potential long-term or short-term effects to streams and wetlands within solar sites and transmission corridors. Minor effects to groundwater mitigated with the use of appropriate BMPs.

Resource Area	No Action Alternative	Retirement and Demolition of CUF Plant (All Action Alternatives)	Alternative A	Alternative B	Alternative C
			purchase of mitigation credits. Minor effects to groundwater may occur, but would be mitigated through the use of BMPs. Avoidance, minimization, and mitigation are expected to reduce or eliminate cumulative effects to groundwater, streams and wetlands.		
Biological Resources	No direct or indirect project-related effects	Minor adverse effects if light towers or mooring cells are removed or if bridge over Wells Creek is impacted during CUF retirement that are currently used for osprey or barn swallow colony nesting. Long-term beneficial effect to aquatic life. Likely adverse effect to protected bats due to forest removal, but these effects would be mitigated by use	Minor long-term adverse effects due to vegetation, wildlife, aquatic life removal for CC plant, pipeline and transmission construction. Minor long-term permanent effects to aquatic life due to loss of perennial stream habitat. Likely adverse effect to protected bats due to forest removal, but these effects would be mitigated by use of specific	Minor long-term adverse effects due to vegetation, wildlife, aquatic life habitat removal for CT construction (Gleason) and/or transmission construction (JCT and Gleason). Likely adverse effect to protected bats due to forest removal, but these effects would be mitigated by use of specific conservation	Minor long-term adverse effects due to vegetation, wildlife, aquatic life habitat removal for solar site and transmission construction. Likely adverse effect to protected bats due to forest removal, but these effects would be mitigated by use of specific conservation measures established through Section 7 Consultation with the USFWS for protected bats.

Resource Area	No Action Alternative	Retirement and Demolition of CUF Plant (All Action Alternatives)	Alternative A	Alternative B	Alternative C
		of specific conservation measures established through TVA's programmatic consultation with USFWS for protected bats.	conservation measures established through TVA's programmatic consultation with USFWS for protected bats.	measures established through TVA's programmatic consultation with USFWS for protected bats.	
Natural Areas, Parks, and Recreation	No direct or indirect project-related effects	Minor short-term effects during demolition. Minor long-term effects to recreation activities currently hosted onsite.	Short-term adverse effects but long-term beneficial effects to recreational areas (fishing, boating) adjacent to the CUF site (barge unloading area).	No significant effects.	Unlikely to affect natural areas, parks, or recreation.
Noise	No direct or indirect project-related effects	Short-term, minor effects during demolition.	Short-term, minor effects during construction.	Short-term, minor effects during construction.	Short-term, minor effects during construction.
Visual	No direct or indirect project-related effects	Short-term, minor effects during demolition. Long-term beneficial effects to viewshed.	Short-term, minor effects during construction. Long-term effects due to pipeline easement construction. Possible visual effects to the Henry Hollister House.	Short-term, minor effects during construction.	Short-term, minor effects during construction. Likely long-term effects post-construction depending on original visual character of the sites selected.
Air Quality and GHGs	No direct or indirect project-related effects.	Short-term, minor effects during demolition. Long-	Short-term, minor effects during construction. Long-	Short-term, minor effects during construction.	Short-term, minor effects during construction. Long-

Resource Area	No Action Alternative	Retirement and Demolition of CUF Plant (All Action Alternatives)	Alternative A	Alternative B	Alternative C
		term, beneficial effects.	term, beneficial effects.	Long-term, beneficial effects.	term, beneficial effects.
Cultural Resources	No direct or indirect project-related effects.	No direct or indirect project-related effects.	No effects if significant cultural resources can be avoided. Traffic-related construction effects to the Henry Hollister House would be avoided or minimized by routing truck traffic along Old Scott Road from the south. Possible visual effects to the Henry Hollister House from the proposed CC.	No direct effects to cultural resources at JCT as it would be located on a previously disturbed site. No effects to historical architectural structures. Effects to cultural resources at Gleason unknown, pending cultural resources survey.	No effects if significant cultural resources can be avoided.
Utilities	No direct or indirect project-related effects	Long-term effects to buried utilities. No effects to switchyards.	Long-term, beneficial effects.	Long-term, beneficial effects.	Long-term, beneficial effects.
Waste Management	No direct or indirect project-related effects	Short-term, minor effects due to the limited potential for hazardous waste to be discharged and/or released into the environment during demolition activities.	Temporary increase in generation of hazardous waste during construction. Long-term increase in waste at CC plant.	Temporary increase in generation of hazardous waste during construction. Long-term increase in waste at JCT and Gleason CT plants.	Temporary increase in generation of hazardous waste during construction.

Resource Area	No Action Alternative	Retirement and Demolition of CUF Plant (All Action Alternatives)	Alternative A	Alternative B	Alternative C
Public Health and Safety	No direct or indirect project-related effects	Short-term, minor effects during demolition. Long-term beneficial effects.	Short-term, minor effects during construction.	Short-term, minor effects during construction.	Short-term, minor effects during construction.
Transportation	No direct or indirect project-related effects	Short-term, minor effects during demolition. Long-term beneficial effects.	Short-term, minor effects during construction and long-term, beneficial effects during operations	Short-term, minor effects during construction.	Short-term, minor effects during construction.
Socioeconomics	No direct or indirect project-related effects.	Permanent, minor direct and indirect employment loss due to CUF closure.	Long-term employment loss from CUF closure would be offset by new employment options due to construction and operations of the CC plant and the pipeline.	Long-term employment loss from CUF closure would be offset by new employment options due to construction and operations of the CC plant and the pipeline.	Anticipated temporary beneficial effects to local population numbers; temporary and permanent beneficial effects to local employment; temporary indirect beneficial effects to the local economy; and long-term beneficial effects to the local tax base.

2.3 Identification of Mitigation Measures

2.3 Identification of Mitigation Measures

TVA would employ standard practices and routine measures and other project-specific measures to avoid and minimize effects to resources from implementation of the Proposed Action Alternatives. Minimization and mitigation measures were provided by TDEC as recommendations regarding demolition materials in lieu of open burning such as beneficial reuse or transport to a recycling facility or landfill, general permitting, and BMP guidance regarding cultural, air, and water resources.

TVA's siting processes for generation and transmission facilities, as well as practices for modifying these facilities, are designed to avoid and/or minimize potential adverse environmental effects. Potential effects are also reduced through pollution prevention measures and environmental controls, such as air pollution control systems and wastewater treatment systems. Other potentially adverse effects can be mitigated by measures such as compensatory wetland mitigation, avoidance of sensitive areas, payments to in lieu stream mitigation programs and related conservation initiatives, enhanced management of other properties, documentation and recovery of cultural resources, and infrastructure improvement assistance to local communities.

TVA would implement minimization and mitigation measures. These would be developed with consideration of BMPs, permit requirements, and adherence to erosion and sediment control plans. TVA would utilize standard BMPs to minimize erosion during construction, operation, and maintenance activities. These BMPs are described in *A Guide for Environmental Protection and BMPs for TVA Construction and Maintenance Activities – Revision 3* (TVA 2017a) and the *Tennessee Erosion and Sediment Control Handbook* (TDEC 2012).

2.3.1 Standard practices and routine measures

In association with the potential construction of an Action Alternative, TVA would employ standard practices and specific routine measures to avoid and minimize effects to resources. During development of the EIS, TVA would consider implementation of the following minimization and mitigation measures in relation to potentially affected resources:

Soils

- Install silt fence along the perimeter of vegetation-cleared areas;
- implement other soil stabilization and vegetation management measures to reduce the potential for soil erosion during site operations; and
- Try to balance cut-and-fill quantities to alleviate the transportation of soils offsite during construction.

Water Resources

- Perennial, intermittent, and ephemeral streams and wetlands that could be affected by the proposed construction would be protected by implementing standard BMPs as identified in TVA's BMP manual and the *Tennessee Erosion and Sediment Control Handbook*. Direct, permanent effects to streams and wetlands would be permitted and mitigated under the CWA Section 404 permit and TDEC ARAP/ CWA Section 401.
- Comply with the terms of the erosion and sediment control plans prepared as part of the NPDES permitting process;
- Use of TVA BMP procedures for controlling soil erosion and sediment control, such as the use of 50 foot buffer zones surrounding perennial and intermittent streams and wetlands and the installation of erosion control silt fences and sediment traps; and

- Implement other routine BMPs as necessary, such as:
  - non-mechanical tree removal within surface water buffers,
  - placement of silt fence and sediment traps along buffer edges,
  - selective herbicide treatment to restrict application near receiving water features,
  - proper vehicle maintenance to reduce the potential for adverse effects to groundwater, and
  - use of wetland mats for temporary crossing, dry season work across wetlands, and no soil rutting of 12” or more in wetlands

Biological Resources

- Revegetate with native and/or noninvasive vegetation, including pollinator species, to reintroduce habitat, reduce erosion, and limit the spread of invasive species,
- Follow USFWS recommendations regarding biological resources and pollinator species:
  - use of downward and inward facing lighting to limit attracting wildlife, particularly migratory birds and bats;
  - instruct personnel on wildlife resource protection measures, including applicable federal and state laws such as those that prohibit animal disturbance, collection, or removal, the importance of protecting wildlife resources, and avoiding unnecessary vegetation removal;
  - Perform surveys inside buildings prior to demolition to ensure they have not been colonized by bats or migratory birds. If listed bats are found, these buildings would not be demolished until one of two mitigation actions occurs: 1) bats are transitioned out of the buildings, or 2) consultation with USFWS is completed. If active nests of migratory birds are present and demolition activities must occur within the active nesting season; TVA would coordinate with USFWS, which assists with managing any potential effects to birds, to determine best options for carrying out demolition activities.
- Should actions near nesting osprey rise to levels above normal routine disturbance typically encountered on CUF, USDA-Wildlife Services will be contacted to ensure compliance under federal law.
- TVA would remove trees between November 15 and March 31 when listed bat species are not expected to be roosting in trees and when most migratory bird species of conservation concern are not nesting in the region.
- Several activities associated with the proposed actions were reviewed under TVA’s programmatic consultation with USFWS on routine actions and federally listed bats in accordance with ESA Section 7(a)(2) (USFWS 2018). For those activities with potential to affect bats, TVA would commit to implementing specific conservation measures to ensure effects to federally-listed bat species would not be significant.

Cultural Resources

- Keep access routes and construction activities outside of the 30-meter buffers surrounding any archaeological sites listed in, or eligible or potentially eligible for listing in, the NRHP.
- When access routes must be placed within such buffers, avoid modifications and use wetland mats and light-duty equipment when practicable.
- Locate new structures and buildings at least one-half mile from, and out of view of, any NRHP-listed or –eligible historic architectural structures, when practicable. When avoidance is not practical, mitigation will be performed in consultation with the SHPO.

- Plant vegetative screening to prevent clear views from any NRHP-listed or –eligible above-ground resources to the proposed new facilities or structures.

Waste Management

- Develop and implement a variety of plans and programs to ensure safe handling, storage, and use of hazardous materials.

Public and Occupational Health and Safety

- Implement BMPs for site safety management to minimize potential risks to workers.

Transportation

- Implement staggered work shifts during daylight hours and a flag person during the heavy commute periods to manage construction traffic flow near the project site(s), if needed.

Noise

- Minimize construction activities during overnight hours, where possible, and ensure that heavy equipment, machinery, and vehicles utilized at the project site meet all federal, state, and local noise requirements.

Visual

- Use of downward and inward facing lighting.

Air Quality and GHG Emissions

- Comply with local ordinances or burn permits if burning of vegetative debris is required and use BMPs such as periodic watering, covering open-body trucks, and establishing a speed limit to mitigate fugitive dust.

Vegetation

- To minimize the introduction and spread of invasive species in the ROW, access roads, and adjacent areas, TVA would follow standard operating procedures consistent with EO 13112 (Invasive Species) for revegetating the areas with noninvasive plant species as defined by TVA.
- In areas requiring chemical treatment, only USEPA-registered and TVA-approved herbicides would be used in accordance with label directions designed, in part, to restrict applications near receiving waters and to prevent unacceptable aquatic effects. TVA would apply for coverage under TDEC's NPDES General Permit for Application of Pesticides prior to use of herbicides in aquatic environments.

Blasting/Explosives

- TVA would work to minimize one-time emissions of fugitive dust from facilities expected to produce large volumes (such as demolition of the stack) by working with the demolition contractor on a site-specific plan. The plan may use mitigation methods that include the treatment of fall zones, misting, and application of tackifier inside the stacks, or cleaning and removal of ash and other materials. The fall zones may have berms to reduce the lateral extent of the dust cloud. Also, a hardened berm near the base of the stack could act as a backstop to prevent rock and debris spreading from the base of the stacks during demolition.
- TVA would develop a project-specific SWPPP as required under the General Permit for Stormwater Discharges Associated with Construction Activities (TDEC 2021a) prior to beginning demolition.

- To mitigate the potential for effects to public safety, TVA would restrict or close roads in the vicinity should blasting be used to demolish the stack. No barge or boat traffic would be allowed in the area during the stack blasting activities.
- TVA would work with the demolition contractor to create a detailed site-specific plan for any public road closures that would be distributed to affected parties, including emergency personnel.
- TVA would require the demolition contractor to develop and implement a blast plan to minimize vibration effects at CUF and in the vicinity. After obtaining site specific data provided by the blasting contractor, and if deemed necessary during development of the demolition plan, TVA would work with a documentation services company to prepare a vibration model simulating the effects of discharge of the explosives or vibrations due to the stack hitting the ground. If indicated by the results, imported fill, dirt binder, and geofabric could be used for mitigation of noise and vibration.
- During the construction planning process, TVA would determine mitigation measures to minimize potential effects to onsite power transmission equipment from vibrations caused by explosive demolition of the stacks. Use of such mitigation measures would address any power disruptions.
- Explosives would be managed under the direction of a licensed blaster, 24-hour security would be provided to monitor the explosives, and detailed security plans would be developed and provided to area emergency response agencies as part of measures that would be taken to mitigate potential effects on the safety of personnel and the public.
- If construction or operations have the potential to emit pollutants greater than acceptable thresholds in CUF's existing Title V permit, mitigation would include a request to modify the permit, which would be required for the prevention of significant deterioration of air quality.

Floodplains

- To minimize adverse effects on natural and beneficial floodplain values, the following mitigation measures would be implemented:
    - BMPs would be used during construction activities;
    - Transmission construction activities would adhere to the TVA subclass review criteria for transmission line location in floodplains;
    - CUF decommissioning and deconstruction debris would be disposed of outside 100-year floodplains;
    - The natural gas pipeline lateral would be installed through trenching or directional drilling, and any excess fill resulting from this would be disposed of outside 100-year floodplains;
    - For any access roads proposed within 100-year floodplains but not floodways, the roads would be constructed such that flood elevations would not increase more than 1.0 foot;
    - For any roads proposed within 100-year floodways, and 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;

- Any switchyard(s) located in the floodplain would be located a minimum of one foot above the 100-year flood elevation at that location for a regular action as well as be consistent with local floodplain regulations;
- The flood-damageable components of the solar panels, as well as other flood-damageable structures and facilities sited in floodplains, would be located at least one foot above the 100-year flood elevation at that location, and otherwise consistent with local floodplain regulations; and
- In construction laydown areas, flood-damageable equipment or materials located within the 100-year floodplain would be relocated outside the floodplain during a flood.

2.3.2 Non-routine mitigation measures

TVA is considering the use of a distribution solar facility on the CUF Reservation as a non-routine mitigation measure to offset energy usage at the plant. TVA may also consider incorporating environmentally beneficial features, such as pollinator habitat, at the CUF site in the future.

2.4 The Preferred Alternative

TVA completed an alternatives evaluation for the proposed retirement of CUF (TVA 2022b) and has identified Alternative A as its preferred alternative. Under the preferred alternative, TVA would demolish the old units, construct a new natural gas-fueled CC plant at Cumberland with a generating capacity of approximately 1,450 MW, which would replace the generation lost as a result of retiring one CUF Unit. 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. Financial and system analysis indicates that replacement with a CC plant is the best overall solution to provide low-cost, reliable, and cleaner energy to the TVA power system. TVA has also selected Alternative A as its preferred alternative because the proposed CC plant at CUF provides the flexibility needed to reliably integrate 10GW of solar into the system by 2035 and enables the CUF coal-fired units to be retired on an accelerated schedule. Further, the proposed CC plant could be built and made operational sooner than other alternatives, which reduces economic, reliability and environmental risks.

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CHAPTER 3 – AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This chapter begins with a description of other actions that are considered in the cumulative analyses and the analyses methodology for solar and storage facilities and transmission corridors. It continues with the existing environmental conditions of the project area, as defined for each resource area, and the potential environmental effects that could result from implementing the No Action or Proposed Action Alternatives.

3.1 Identification of Other Actions

In addition to the action alternatives identified in Chapter 2, this analysis also considers the past, present, and reasonably foreseeable future actions (RFFAs) listed in Table 3.1-1. These actions were identified within the overall 10-mile geographic area of analysis surrounding each action alternative as having the potential to, in aggregate, result in larger and potentially adverse effects to the resources of concern. Potential cumulative effects for resources in which adverse effects from the proposed project are anticipated are discussed in each resource section.

Table 3.1-1. Summary of other past, present, or reasonably foreseeable future actions within a 10-mile radius of the Action Alternatives

Action	Description	Project Type
CUF Reservation		
Borrow site and access roads	Described in Cumberland Fossil Plant Borrow Areas and Access Road EA (TVA 2017b).	Past
Wastewater treatment facilities	Described in Cumberland Fossil Plant Wastewater Treatment Facility EA (TVA 2019c).	Past
CCR Management Activities, including new landfill, groundwater monitoring wells, haul roads, process flow management facilities, gypsum storage areas.	Described in Cumberland Fossil Plant Coal Combustion Residuals Management Operations EIS (TVA 2018a).	RFFA
Alternative A Natural Gas Pipeline		
Dickson Terminal Project	A proposed mid-sized petroleum storage and distribution terminal in an unincorporated portion of Dickson County near Interstate 40 zoned for heavy industrial use.	RFFA
Dickson County Municipal Airport Lighting Upgrade	The Dickson County Municipal Airport is upgrading its lighting system on the runway and tarmacs. The lighting plan includes LED lights for runway and taxiway lights, landing aids and navigational lighting	Past/Present
Magnum Manufacturing Expansion	Magnum manufactures metal stamping and produces raw metal seat frames and doors for the automotive sector. In 2017, Magnum announced plans to expand its facilities in Erin and Houston counties, TN.	Past/Present

Cumberland River Compact In-Lieu Fee Program	The Cumberland River Compact established the Compensatory Mitigation program in 2018 with the goal of creating a mechanism and source of revenue for stream restoration projects.	Present and RFFA
Alternative B: JCT Reservation		
JCT Coal Plant Deconstruction	TVA retired all ten units of the JCT coal-fired plant gradually beginning in 2012, with the final four units on Dec. 31, 2017. While Units 1 – 8 have been demolished, deconstruction activities are currently occurring at Unit 9.	Past/Present
JCT Aeroderivative CTs	TVA is proposing the addition of 10 natural gas-fired Aero CTs at the Johnsonville Reservation. The Aero CTs would generate approximately 550 MW for commercial operation no later than December 31, 2024. TVA's Johnsonville Reservation currently houses 20 simple-cycle CT units within the JCT plant. The existing JCT Units 1-16 will be retired with their combined generation being replaced at TVA's Paradise and Colbert facilities.	RFFA
Alternative C: Solar and Storage Facilities		
Expansion of solar facilities under the 2019 IRP	TVA is proposing to add 10,000 MW of solar by 2035 throughout the TVA power service area. While projects have not yet been identified, they would require individual NEPA reviews once identified as a potential TVA project or under a power purchase agreement.	RFFA

3.2 Analyses Methodology for Solar and Storage Facilities

As noted in the 2019 IRP, TVA currently operates a number of small solar photovoltaic (PV) installations and purchases power from numerous small and large (utility scale) PV facilities. TVA has assessed the potential environmental effects of solar PV facilities in multiple EAs and a Draft EIS over the past several years. Since the exact project locations for solar and/or storage projects are not known at this time, TVA has compiled a list of typical effects associated with the construction and operation of PV facilities within the TVA region (Table 3.2-1). This list was compiled by reviewing the EAs and Draft EIS for PV projects, ranging from community scale to utility scale, over the past several years, 2014 through 2021. A total of 31 projects were included in the review.

Table 3.2-1. Typical Effects of Solar Facility Construction Activities Determined from a Review of Project Planning Documents of 31 Solar Construction Projects, 2014-2021

Land Use Effects	
Land Requirements (Acres of Solar Installation within the Site)	Average of 7.3 Acres per MW[1] Range: 2 – 9.6 acres per MW
Solar Facility Effects	
Floodplain Fill (Acres) per MW	Average of 0.02 acre per MW affected Range: 0 to 1.8 acres per MW

Prime Farmland Converted	80.6% of solar projects resulted in prime farmland conversion.
Forest Cleared (Acres)	Average of 63.66 acres Range 0 to 434 acres Average of 1.2 acres per MW Range of 0 to 15 acres per MW
Parks and Public Lands	6.5% of solar projects affected parks and public lands
Historic Properties	3.2% of Solar Projects affected Historic Properties
Water Resource Effects	
Wetland Area Affected	Average of 0.14 acres Range 0 to 0.73 acres Average of 0.003 acres per MW Range of 0 to 0.1 acres per MW
Forested Wetland Area Cleared	Average of 0.34 acres Range: 0 to 4.26 acres Average of 0.01 acres per MW Range of 0 to 0.1 acres per MW
Stream Effects	Average of 366.56 linear feet (LF) Range: 0 – 6,900 linear feet Average of 8.7 LF per MW Range of 0 to 41 acres per MW
Biological Effects	
Endangered and Threatened Species	48% of solar projects affected federally listed endangered or threatened species or species proposed or candidates for listing,
Migratory Bird Effects	9% of solar projects resulted in migratory bird effects
Bald and Golden Eagle Effects	None
Visual Effects	99% of solar projects resulted in visual effects
Environmental Justice	None

[1]All MW are reported in Alternating Current (AC).

BESS is a new resource and technology for TVA; therefore, TVA does not have experience of multiple projects to assess typical effects, as it does for solar facilities. For the purposes of analyzing Alternative C in this EIS, TVA proposes to use the anticipated effects associated with a BESS pilot study project that is capable of generating 20 megavolt amperes (MVA) with a storage capacity of 40 MW in Vonore, Monroe County, Tennessee (TVA 2022c). Approximately 10 to 15 acres of land would be required for the BESS pilot project, including an associated new 161-kV substation consisting of a transformer, breakers, power quality meters, a Supervisory Control and Data Acquisition Remote Terminal Unit (SCADA RTU), relays, alarms, a capacitor-controlled voltage transformer (CCVTs), switch house, and other equipment. The battery site will be approximately four acres at completion. Construction will consist of grading the site and installing a foundation to place the battery containers, inverters, electrical and communications connections for the BESS and heating, ventilation, and air conditioning (HVAC) system monitoring and control. The battery containers are modular steel construction similar to intermodal shipping containers in which the modular lithium-ion battery cells are mounted on racks and connected by cabling. The battery containers are equipped with air conditioning and fire protection systems, auxiliary distribution board, and lighting. There are 12, 40 ft. Battery Containers, 12 (2.5 MVA) transformers, 24 Inverter Cabinets and a 13.8-kV Switchgear for the Vonore Project. A new communication cabinet and a 1.5-MVA transformer will also be needed. Additionally, a loop connection point would be installed on the existing Loudon-Tellico Reservoir Development Agency (TRDA) 69-kV TL. Direct transfer trip and transfer trip work would occur at the Vonore, TN 161-kV Substation.

3.3 Analyses Methodology for Transmission and Electrical System Components

The analyses of environmental consequences for the 40-mile-long transmission line proposed in Alternative B and the transmission upgrades and lines anticipated to support solar and storage facilities in Alternative C use typical effects from construction activities related to transmission projects, as compiled in the 2019 IRP EIS. A total of 298 projects were included in the review (Table 3.3-1).

Table 3.3-1. Typical effects of Transmission System Construction Activities Determined from a Review of Project Planning Documents of 298 Transmission Construction Projects*, 2005-2018

Land Use Effects	Transmission Lines	Substations and Switching Stations
Land requirements	Average of 13.1 acres/line mile, range 3.5 – 39	Average of 10.8 acres, range 1 – 73 median for 500 kV: 49.5 acres Median for <500 kV: 5.5 acres
Floodplain fill	De minimis	Average of 0.1 acres, range 0 – 4 5% affected floodplains
Prime farmland converted	None	Average of 6.9 acres, range 0 – 29.1 64% affected prime farmland
Forest cleared	Average of 5.5 acres/line mile for new lines, range 0 – 30.5	Average of 4.5 acres, range 0 – 50 29% cleared forest
Parks and Public Lands	40 (16%) of 249 projects affected parks and public lands	
Historic Properties	41 (14%) of 288 projects affected historic properties	
Water Resources Effects		
Wetland area affected	Average of 0.9 acres/line mile for new line, range 0 – 22.2 55% affected wetlands	Average of 0.1 acres, range 0 – 1.8 15% affected wetlands

Land Use Effects	Transmission Lines	Substations and Switching Stations
	Average of 0.9 acres/line mile of existing line, range 0 – 18.3 52% affected wetlands	
Forested Wetland Area Cleared	Average of 0.9 acres/line mile of new line, range 0 – 18.3 52% affected wetlands	
	Average of 0.02 acres/line mile of existing line, range 0 – 0.5 17% affected forest wetlands	
Stream crossings	Average of 2.9 per mile of new line, range 0 – 50, 76% crossed streams	N/A
	Average of 1.5 per mile of existing line, range 0 – 5.6, 64% crossed streams	
Forested stream crossings	Average of 1.0 per mile of new line, range 0 – 17.6, 48% crossed forested streams	N/A
	Average of 0.1 per mile of existing line, range 0 – 2.5, 8% crossed forested streams	
Biological Effects		
Endangered and threatened species	32 (11%) of 256 projects affected federally listed endangered or threatened species, or species proposed or candidates for listing 63 (22%) of 290 projects affected state-listed endangered, threatened, or special concern species	

*Note: Because some project planning documents did not contain all of the environmental data, the sample sizes for the various categories differ.

The above information was compiled to provide an estimate of the potential effects associated with the construction of transmission and electrical system components in an effort to provide a comparison to other action alternatives being considered in more detail. Since exact site locations for solar and storage facilities are not known at this time, additional site specific tiered NEPA analysis will need to be completed as projects are identified and the scope is further defined.

3.4 Environmental Justice

Potentially affected Environmental Justice (EJ) populations, including minority, low-income, and limited English proficiency (LEP) populations, are identified in this section using the U.S.

Census Bureau (USCB) 2010 decennial census (2010 Census), USCB 2020 decennial census (2020 Census), and the 2015-2019 American Community Survey (ACS) 5-year estimates (2019 ACS), depending on availability of data. State-level and, for some characteristics, county-level USCB data are included for analysis and comparison purposes. Decennial census and ACS data were obtained utilizing USCB Explore Census Data (USCB 2021a). Where appropriate, additional data from USCB are employed. EJ populations were determined through a comparison of the most recent available USCB census data (USCB 2021) to threshold criteria selected based on guidance from the Council of Environmental Quality (CEQ), as defined below. USEPA's EJScreen: Environmental Justice Screening and Mapping Tool (Version 2.0) was also reviewed and compared with the compiled USCB census data.

Potential effects to identified EJ populations are then analyzed in this section and subsequent sections in Chapter 3 where project effects are anticipated, in accordance with EO 12898, to identify and address disproportionately high and adverse human health or environmental effects of each alternative on minority populations and low-income populations. While not subject to this EO, TVA routinely considers environmental justice during its NEPA review processes.

The CEQ guidance for applying EO 12898 under NEPA directs identification of minority populations when the minority population of the affected area exceeds 50 percent, or the minority population percentage of the study area is meaningfully greater than the minority population percentage in the general population or through another appropriate unit of geographic analysis (CEQ 1997). CEQ defines minority populations as people who identify themselves as Asian or Pacific Islander, American Indian or Alaskan Native, Black (not of Hispanic origin), or Hispanic. Those indicating two or more races are also considered minorities due to necessarily including one of these minorities.

The CEQ guidance specifies that low-income populations are to be identified using the annual statistical poverty threshold from the USCB Current Population Reports Series P-60 on Income and Poverty. The current (2020) USCB-provided poverty threshold for individuals under age 65 is $13,465, and the official poverty rate for the US as a whole is currently 11.8 percent (USCB 2020). Study area income and poverty rates are compared with the county and/or state data using the 2019 USCB Small Area Income and Poverty Estimates (SAIPE) (USCB 2019), as recommended by USCB (USCB 2020). For purposes of this analysis, low-income populations are defined as those with poverty rates that are less than two times the poverty level (i.e., those with poverty ratios defined in the 2019 ACS as 1.99 or lower). More encompassing than the base poverty level, this low-income threshold, also used by USEPA in their delineation of low-income populations, is an appropriate measure for EJ 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 (USEPA 2017). According to USEPA, 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).

According to CEQ guidance, minority and low-income populations may be groups of people living in geographic proximity or scattered groups or individuals sharing common conditions. As such, CEQ directs identification of groups demonstrating differential patterns of consumption of natural resources among minority and low-income populations. Specialized groups are identified, where commensurate with anticipated effects, in relation to the subsequent resource areas; these are presented in the EJ Considerations subsections throughout Chapter 3.

The LEP population is assessed in relation to the three alternatives, pursuant to Title VI of the Civil Rights Act of 1964 (42 USC § 2000d et seq.), U.S. Department of Justice (DOJ) Guidance to Federal Financial Assistance Recipients Regarding Title VI Prohibition Against National Origin Discrimination Affecting Limited English Proficient Persons [DOJ LEP guidance; *Federal Register* 67(117):41455-41472, June 18, 2002], and EO 13166 [*Federal Register* 65(159):50121-50122, August 16, 2000]. Based on DOJ LEP guidance, LEP language groups that constitute five percent or 1,000 individuals, whichever is less, should be offered translated project materials, where relevant. Eligible LEP language groups are defined herein as those whose members self-report speaking English less than well, based on the 2019 ACS.

In addition to the desktop sources listed above, TVA reached out to local plant personnel and local government officials to verify that any known low-income, limited English or minority communities located near the CUF, JCT and Gleason plant sites were included in the desktop review.

For the CUF, Gleason, and Johnsonville Reservations, the area from which potentially affected EJ populations are identified is a 10-mile radius of the given project area. This area was selected to (1) assess the larger demographic context to allow for analysis of disproportionate effects on EJ populations, (2) evaluate EJ effects based on the full reach of project effects on other resource areas (such as transportation), and (3) analyze cumulative effects on EJ populations. For the pipeline corridor associated with Alternative A, the area from which potentially affected EJ populations are identified is a one-mile radius of the project area. A one-mile radius around the corridor provides an appropriate review of potentially affected EJ populations commensurate with noise, air, visual, and other effects associated with the pipeline and is consistent with FERC regulations.

For Alternative C, the area from which potentially affected EJ populations are identified is the Middle Tennessee region of the TVA power service area (PSA), as assessed by the census data associated with each county in the region.

The CUF, Gleason, and Johnsonville Reservation and pipeline corridor EJ study areas are defined by the census block groups they overlap (Figure 3.4-1). The census block groups are given in tables as 2019 ACS Census Tract number and Block Group number (e.g., CT 1106 BG 2) overlap. When counties are overlapped by less than two percent of the overall study area, the associated census block groups are not included in the analysis to avoid skewing results. The EJ study area for Alternative C is defined by the counties within the Middle Tennessee region of the TVA PSA (Figure 3.4-2). For each study area, the census block groups or counties with minority percentages that were 10 percentage points above the study area average or higher in the 2019 ACS are identified as the areas where the chance for disproportionate environmental and human health effects to minority populations may be greatest (i.e., the minority EJ populations). The census block groups or counties with poverty ratios that were 20 percentage points above the study area average and/or above 50 percent based on the 2019 ACS are identified as the areas where the chance for disproportionate environmental and human health effects to low-income populations may be greatest (i.e., the low-income EJ populations).

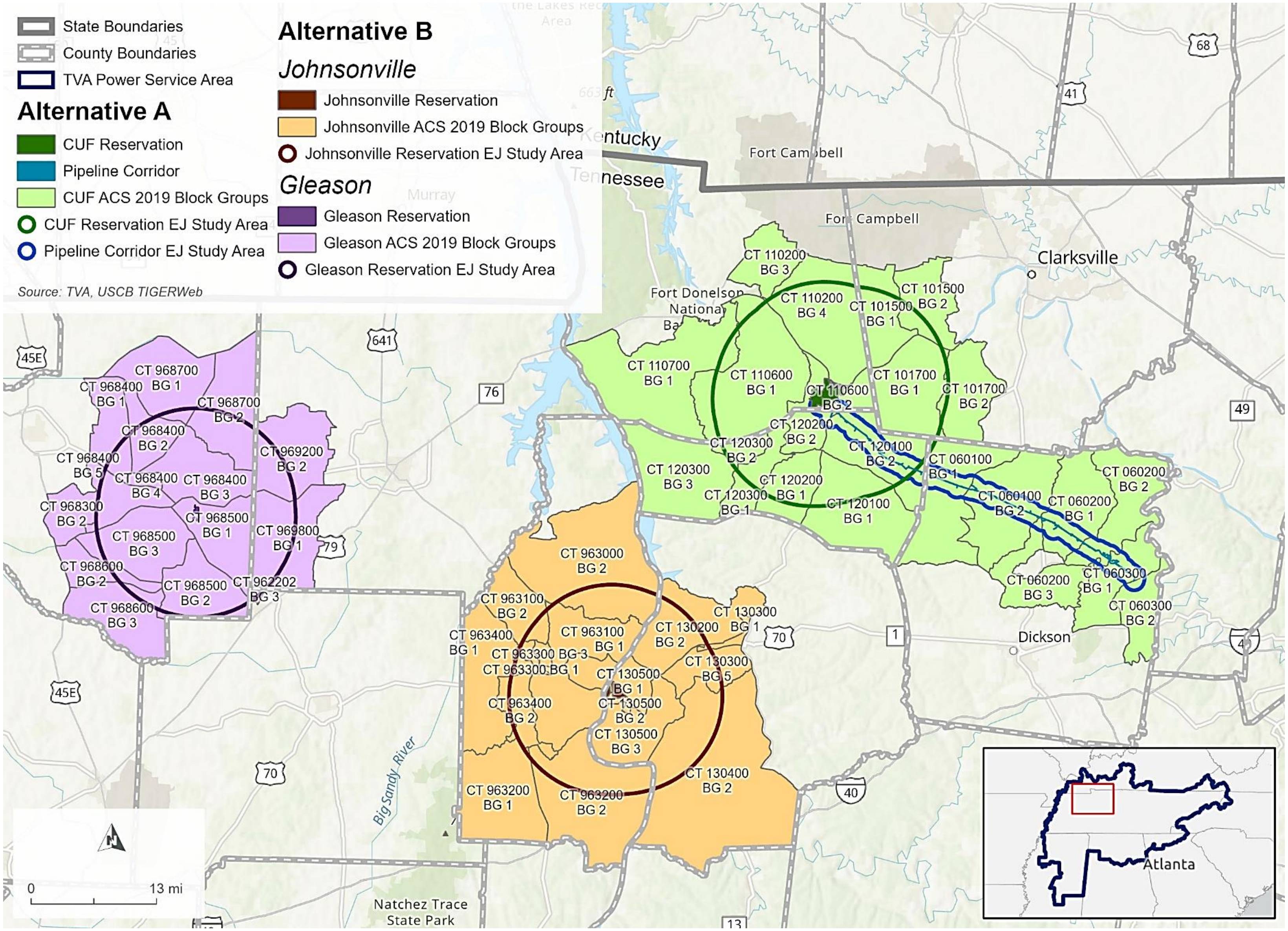

Figure 3.4-1. CUF Reservation and Alternative A and B Environmental Justice Study Areas

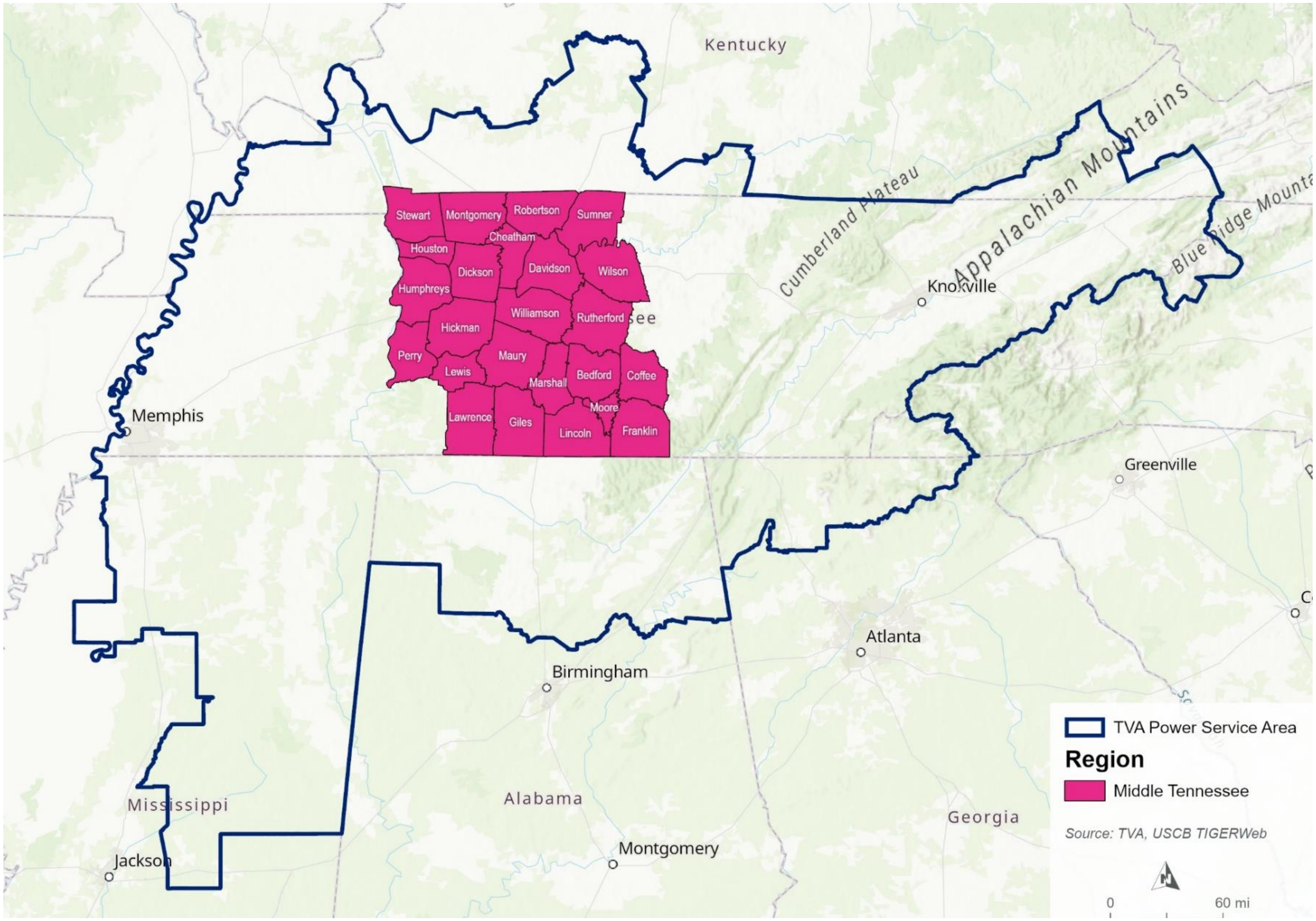

Figure 3.4-2. Alternative C Environmental Justice and Socioeconomic Study Area

3.4.1 Affected Environment

The EJ study areas associated with each alternative, as defined below, have recreational areas that support subsistence activities, such as fishing and hunting (see Section 3.9 for more detail on these specific resources). These recreational areas are utilized by diverse populations, including EJ populations, and are specifically considered in relation to EJ populations in relevant EJ Consideration subsections throughout Chapter 3. As this NEPA analysis tiers from the TVA IRP EIS (TVA 2019b), this EJ analysis likewise tiers from the human context information presented in the IRP EIS. Refer to the IRP EIS for more details on the tribal populations and the sociocultural characteristics of the TVA PSA and the subregions within it.

Based on a review of the EPA's EJSCREEN tool, the EJ study areas described below are not in areas with high concentrations of EJ populations, and those that are present are primarily low-income populations. Minority populations generally make up relatively small percentages of the total population of the study areas.

3.4.1.1 CUF Reservation

The 10-mile radius surrounding the CUF Reservation, called the CUF Reservation EJ study area, includes all or portions of 16 census block groups (Figure 3.4-1). These block groups encompass portions of Stewart County, where the CUF Reservation falls within CT 1106 BG 2, and Houston and Montgomery Counties, Tennessee. The CUF Reservation EJ study area would occur under all alternatives. This study area also encompasses the transmission line corridors associated with Alternative A.

3.4.1.1.1 Minority Populations

No census block groups within the CUF Reservation EJ study area were identified as minority EJ populations (Table 3.4-1). At the county level, a greater proportion of the populations of Stewart County, where the CUF Reservation is located, and all but one other affected county identified as non-minority than across the associated state, based on the 2019 ACS. Correspondingly, the minority populations in these counties were generally smaller proportionally than statewide. The exception to this was Montgomery County, where there were higher percentages of all minority populations than the state.

At the census block group level, based on the 2019 ACS, in the vicinity of the CUF Reservation, 8.5 percent of people identified as minorities, a lower proportion than across the study area and the state. While the overall study area had a lower minority percentage than the state, six of the 16 census block groups within the CUF Reservation EJ study area had higher percentages of minorities in comparison with the overall study area percentage.[4] However, no census block groups in the study area had minority percentages that are 10 percentage points or more above the study area average of 8.8 percent.

[4] Throughout Section 3.4, overall study area percentages, also referred to as study area averages, were obtained by getting a simple average of each of the associated census block groups.

Table 3.4-1. Minority Percentages and Ethnicities in the CUF Reservation EJ Study Area

Geography	**% Minority**	**% White**[1]	**% Black / African Am.**	**% Am. Indian / AK Native**	**% Asian**	**% Native Hawaiian / Pacific Islander**	**% Some Other Race**	**Two or More Races**	**% Hispanic / Latino**[2]
Study Area	8.8	91.2	3.1	0.5	0.5	0.0	0.6	4.0	3.0
CUF Reservation	8.5	91.5	2.9	0.3	0.2	0.0	2.0	3.0	2.4
Tennessee	*20.4*	*79.6*	*17.9*	*0.9*	*2.2*	*0.1*	*1.6*	*2.0*	*5.4*
Stewart County	*8.2*	*91.8*	*0.9*	*0.2*	*0.7*	*0.4*	*0.0*	*2.9*	*3.0*
CT 1106 BG 2 (CUF)	8.5	91.5	2.9	0.3	0.2	0.0	2.0	3.0	2.4
CT 1102 BG 3	15.8	84.2	3.8	0.0	1.9	0.0	1.5	8.5	1.8
CT 1102 BG 4	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	2.5
CT 1106 BG 1	8.1	91.9	0.0	0.8	0.0	0.0	2.8	4.5	4.7
CT 1107 BG 1	13.4	86.6	0.0	0.6	1.9	0.0	0.2	10.8	4.6
Houston County	*8.0*	*92.0*	*5.4*	*0.7*	*0.2*	*0.2*	*0.0*	*1.1*	*0.4*
CT 1201 BG 1	3.8	96.2	0.0	3.8	0.0	0.0	0.0	0.0	2.5
CT 1201 BG 2	10.9	89.1	7.6	0.0	0.0	0.8	0.0	2.4	0.0
CT 1202 BG 1	13.5	86.5	11.8	0.0	0.0	0.0	0.0	1.7	0.0
CT 1202 BG 2	11.3	88.7	11.3	0.0	0.0	0.0	0.0	0.0	0.0
CT 1203 BG 1	1.7	98.3	0.7	0.6	0.0	0.0	0.0	0.4	0.0
CT 1203 BG 2	3.1	96.9	0.5	0.2	1.1	0.0	0.0	1.3	0.0
CT 1203 BG 3	0.9	99.1	0.0	0.9	0.0	0.0	0.0	0.0	0.0
Montgomery County	*36.7*	*63.3*	*19.3*	*0.5*	*2.1*	*0.4*	*0.4*	*4.0*	*10.0*
CT 1015 BG 1	3.7	96.3	1.1	0.0	0.0	0.0	0.0	2.6	9.4
CT 1015 BG 2	16.7	83.3	5.8	0.9	0.8	0.0	1.3	7.9	7.8
CT 1017 BG 1	2.7	97.3	1.5	0.4	0.3	0.4	0.0	0.0	6.2
CT 1017 BG 2	7.7	92.3	0.0	0.0	0.0	0.0	0.0	7.7	3.7

Source: 2019 ACS

[1] Race percentages are provided for those reporting a particular race alone or in combination.

[2] This group is calculated separately from the other ethnicities and may include overlap from the other categories, as the USCB does not consider Hispanic or Latino a "race."

Note: Emboldened census block groups represent identified EJ populations as compared with the overall study area percentage.

3.4.1.1.2 Low-Income Populations

The census block groups emboldened in Table 3.4-2 represent areas with identified low-income EJ populations. Based on the 2019 SAIPE, a smaller proportion of the population of most affected counties, including Stewart County, was living in poverty when compared with the state as a whole. In Houston County, the proportion of the population living in poverty was higher than across Tennessee.

At the census block group level, based on the 2019 ACS, the immediate CUF Reservation vicinity and the CUF Reservation EJ study area as a whole had higher poverty ratios than the state. Eight of the 16 census block groups within the CUF Reservation EJ study area had higher percentages of people living in poverty than across the study area. Two census block groups had poverty ratios that were 20 percentage points or more above the study area average of 37.4 percent and/or were at or above 50 percent (Figure 3.4-3). These census block groups, emboldened in Table 3.4-2, are defined as the areas where the chance for disproportionate environmental and human health effects may be the greatest.

Table 3.4-2. Poverty Rates for the CUF Reservation EJ Study Area

	2019 SAIPE	2019 ACS	
Geography	**Poverty %***	**Poverty %, Households**	**Poverty Ratio, Two Times US Threshold ****
Study Area			37.4
CUF Reservation			38.9
Tennessee	*13.8*	*13.2*	*34.9*
Stewart County	*12.9*		
CT 1106 BG 2 (CUF)		13.9	38.9
CT 1102 BG 3		16.0	30.9
CT 1102 BG 4		15.5	42.2
CT 1106 BG 1		10.5	**52.8**
CT 1107 BG 1		13.1	26.8
Houston County	*17.8*		
CT 1201 BG 1		12.2	28.9
CT 1201 BG 2		15.7	35.5
CT 1202 BG 1		20.3	45.3
CT 1202 BG 2		13.5	45.6
CT 1203 BG 1		25.9	45.6
CT 1203 BG 2		20.5	47.9
CT 1203 BG 3		33.6	**62.4**
Montgomery County	*12.0*		
CT 1015 BG 1		3.1	20.4
CT 1015 BG 2		1.4	12.9
CT 1017 BG 1		6.6	27.7
CT 1017 BG 2		22.3	32.9

*For the respective county in which the block group is located
**Calculated based on percent of population with a ratio of income to poverty threshold ≤1.99
Source: 2019 SAIPE, 2019 ACS
Note: Emboldened census block groups represent identified EJ populations as compared with the overall study area percentage.

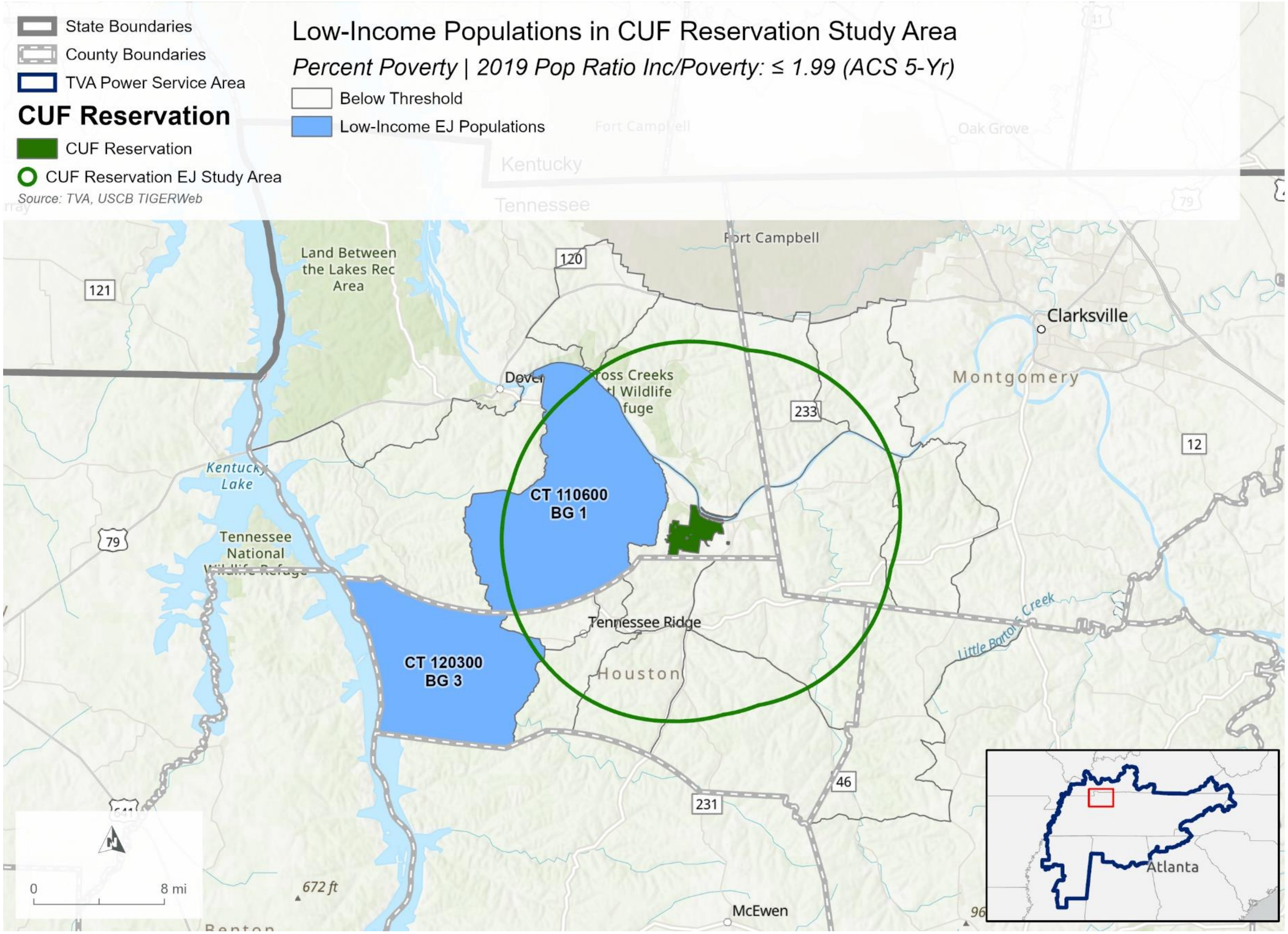

Figure 3.4-3. Low-Income Populations in CUF Reservation Environmental Justice Study Area

3.4.1.1.3 Limited English Proficiency Populations

Of the 16 census block groups in the CUF Reservation study area, 13 had no individuals who reported speaking English less than well. However, three of the census block groups had individuals who reported speaking English less than well. Those census block groups are:

- CT 1015 BG 2 (Montgomery County)
  - 18 individuals (Indo-European languages) out of 2,739 or less than one percent
  - 11 individuals (Asian and Pacific languages) out of 2,739 or less than one percent;
- CT 1106 BG 1 (Stewart County)
  - 11 individuals (Spanish) out of 1,644 or less than one percent; and
- CT 1106 BG 2 (Stewart County; CUF)
  - two individuals (Spanish) out of 807 or less than one percent.

None of these LEP populations constitute 1,000 individuals or five percent of the population aged five years or older. Therefore, the need for translation or interpreter services is not warranted unless requested.

3.4.1.2 Alternative A

3.4.1.2.1 Natural Gas Pipeline Corridor

The proposed natural gas pipeline lateral would be constructed within Stewart, Houston, and Dickson counties as described in Section 3.4.1.1. The one-mile radius surrounding the pipeline corridor, called the pipeline corridor EJ study area, includes all or portions of 10 census block groups (Figure 3.4-1). These block groups encompass portions of Stewart, Houston, and Dickson counties, Tennessee.

3.4.1.2.1.1 Minority Populations

No census block groups within the pipeline corridor EJ study area were identified as minority EJ populations, as shown on Table 3.4-3. At the county level, a greater proportion of the populations of Stewart County and all other affected counties identified as non-minority than across the associated state, based on the 2019 ACS. Correspondingly, the minority populations in these counties were generally smaller proportionally than statewide.

At the census block group level, based on the 2019 ACS, in the vicinity of the pipeline corridor, 6.1 percent of people identified as minorities, a higher proportion than across the study area but a lower proportion than the state. While the overall study area had a substantially lower minority percentage than the state, four of the 10 census block groups within the pipeline corridor EJ study area had higher percentages of minorities in comparison with the overall study area percentage. However, no census block groups in the study area had minority percentages that were 10 percentage points or more above the study area average of 5.7 percent.

Table 3.4-3. Minority Percentages and Ethnicities in the Pipeline Corridor EJ Study Area

Geography	% Minority	% White[1]	% Black / African American	% Am. Indian / Alaska Native	% Asian	% Native Hawaiian /Pacific Islander	% Some Other Race	Two or More Races	% Hispanic / Latino[2]
Study Area	5.7	94.3	3.4	0.0	0.3	0.1	0.5	1.3	0.9
Pipeline Corridor	6.1	93.9	3.7	0.0	0.3	0.1	0.5	1.4	1.0
Tennessee	*20.4*	*79.6*	*17.9*	*0.9*	*2.2*	*0.1*	*1.6*	*2.0*	*5.4*
Stewart County	*8.2*	*91.8*	*0.9*	*0.2*	*0.7*	*0.4*	*0.0*	*2.9*	*3.0*
CT 1106 BG 2 (Pipeline)	8.5	91.5	2.9	0.3	0.2	0.0	2.0	3.0	2.2
Houston County	*8.0*	*92.0*	*5.4*	*0.7*	*0.2*	*0.2*	*0.0*	*1.1*	*0.4*
CT 1201 BG 2 (Pipeline)	10.9	89.1	7.6	0.0	0.0	0.8	0.0	2.4	0.0
CT 1202 BG 2 (Pipeline)	11.3	88.7	11.3	0.0	0.0	0.0	0.0	0.0	0.0
Dickson County	*10.5*	*89.5*	*4.2*	*0.4*	*0.5*	*0.0*	*0.2*	*1.7*	*3.6*
CT 601 BG 1 (Pipeline)	9.7	90.3	6.5	0.0	2.7	0.0	0.0	0.4	0.7
CT 601 BG 2 (Pipeline)	2.6	97.4	0.1	0.0	0.0	0.0	0.2	2.4	3.5
CT 602 BG 1 (Pipeline)	2.7	97.3	1.2	0.0	0.0	0.0	0.0	1.5	0.4
CT 602 BG 2 (Pipeline)	4.3	95.7	3.4	0.0	0.0	0.0	0.0	0.9	0.0
CT 602 BG 3 (Pipeline)	4.1	95.9	0.7	0.0	0.0	0.0	2.4	1.0	1.8
CT 603 BG 1 (Pipeline)	0.7	99.3	0.0	0.0	0.0	0.0	0.0	0.7	0.0
CT 603 BG 2	2.4	97.6	0.4	0.0	0.0	0.0	0.8	1.1	0.0

Source: 2019 ACS

[1] Race percentages are provided for those reporting a particular race alone or in combination.

[2] This group is calculated separately from the other ethnicities and may include overlap from the other categories, as the USCB does not consider Hispanic or Latino a "race."

Note: Emboldened census block groups represent identified EJ populations as compared with the overall study area percentage.

3.4.1.2.1.2 Low-Income Populations

The emboldened census block group in Table 3.4-4 is the one area with identified low-income EJ populations. Based on the 2019 SAIPE, a smaller proportion of the population of two of the three affected counties was living in poverty when compared with the state as a whole. In Houston County, the proportion of people living in poverty was higher than the state.

At the census block group level, based on the 2019 ACS, the pipeline corridor EJ study area and the immediate vicinity of the pipeline corridor had higher poverty ratios than the state. In comparison with the study area as a whole, the pipeline corridor had a higher proportion of people living in poverty. Four of the 10 census block groups within the pipeline corridor EJ study area likewise had higher percentages of people living in poverty than across the study area. One census block group had a poverty ratio that was 20 percentage points or more above the study area average of 37.8 percent and/or was at or above 50 percent (Figure 3.4-4). This census block group, emboldened in Table 3.4-4, is defined as the area where the chance for disproportionate environmental and human health effects may be the greatest.

Table 3.4-4. Poverty Rates for the Pipeline Corridor EJ Study Area

	2019 SAIPE	**2019 ACS**	
Geography	**Poverty %***	**Poverty %, Households**	**Poverty Ratio, Two Times US Threshold ****
Study Area			37.8
Pipeline Corridor			38.1
Tennessee	*13.8*	*13.2*	*34.9*
Stewart County	*12.9*		
CT 1106 BG 2 (Pipeline)		13.9	38.9
Houston County	*17.8*		
CT 1201 BG 2 (Pipeline)		15.7	35.5
CT 1202 BG 2 (Pipeline)		13.5	47.9
Dickson County	*10.1*		
CT 601 BG 1 (Pipeline)		16.2	32.0
CT 601 BG 2 (Pipeline)		11.3	35.9
CT 602 BG 1 (Pipeline)		25.6	44.4
CT 602 BG 2 (Pipeline)		24.3	**54.9**
CT 602 BG 3 (Pipeline)		6.4	27.7
CT 603 BG 1 (Pipeline)		13.5	32.2
CT 603 BG 2		4.4	36.3

*For the respective county in which the block group is located
**Calculated based on percent of population with a ratio of income to poverty threshold ≤1.99
Source: 2019 SAIPE, 2019 ACS
Note: Emboldened census block groups represent identified EJ populations as compared with the overall study area percentage.

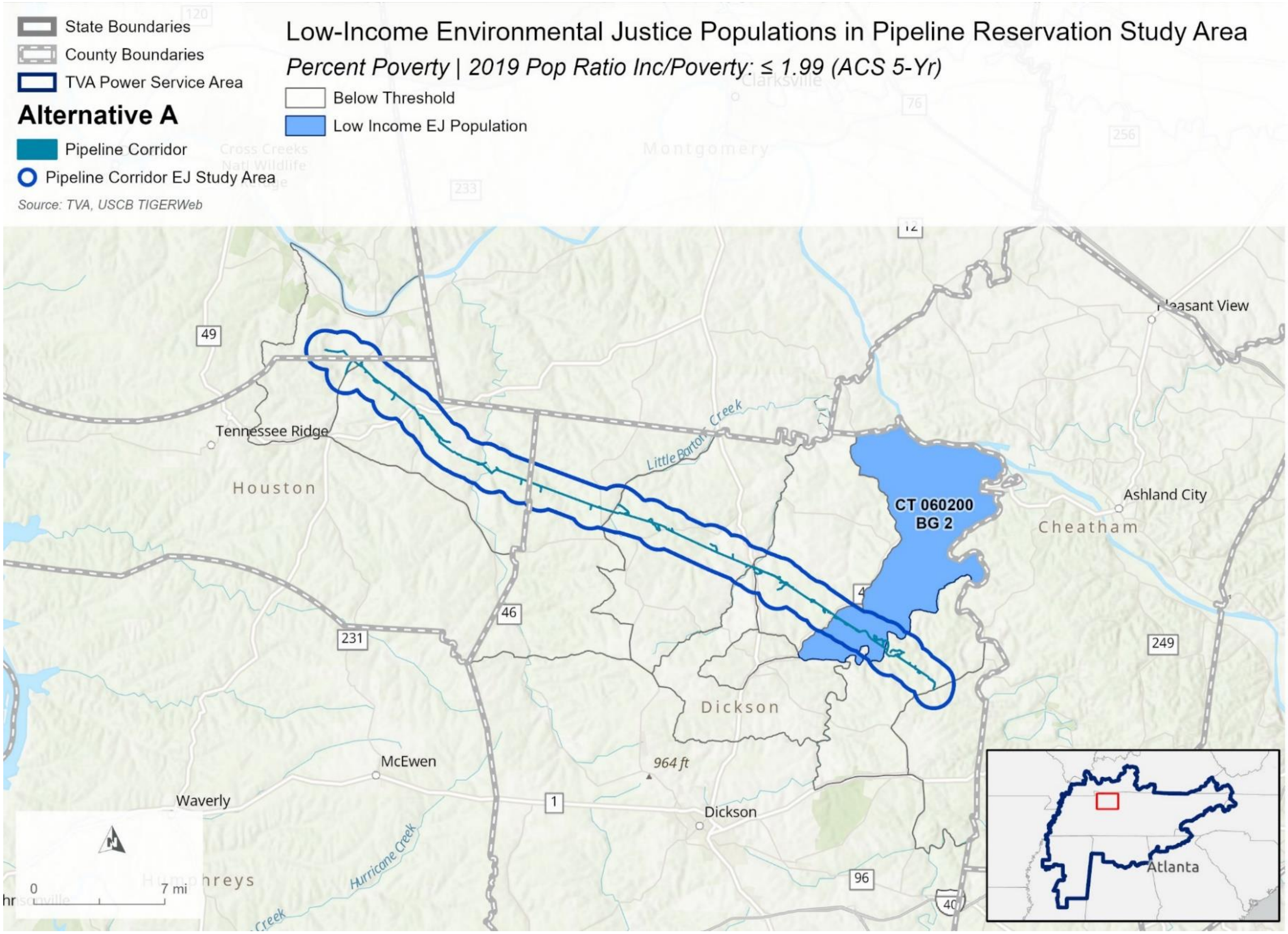

Figure 3.4-4. Low-Income Environmental Justice Populations in Pipeline Corridor Environmental Justice Study Area

3.4.1.2.1.3 Limited English Proficiency Populations

Of the 10 census block groups in the pipeline corridor EJ study area, seven had no individuals who reported speaking English less than well. However, three of the census block groups had individuals who reported speaking English less than well. Those census block groups were:

- CT 603 BG 1 (Dickson County; Pipeline)
  - 13 individuals (Spanish) out of 2,284 or less than one percent;
- CT 603 BG 2 (Dickson County)
  - 21 individuals (Spanish) out of 3,098 or less than one percent; and
- CT 1106 BG 2 (Stewart County; Pipeline)
  - two individuals (Asian and Pacific Languages) out of 807 or less than one percent.

None of these LEP populations constitute 1,000 individuals or five percent of the population aged five years or older. Therefore, the need for translation or interpreter services is not warranted unless requested.

3.4.1.3 Alternative B

3.4.1.3.1 Johnsonville Reservation

The 10-mile radius surrounding the Johnsonville Reservation, the Johnsonville Reservation EJ study area, includes all or a portion of 19 census block groups (Figure 3.4-1). These block groups encompass portions of Humphreys County, where the Johnsonville Reservation falls within CT 1305 BG 1, and Benton County, Tennessee.

3.4.1.3.1.1 Minority Populations

The census block groups emboldened in Table 3.4-5 represent areas with identified minority EJ populations. At the county level, a greater proportion of the populations of the two affected counties identified as non-minority than across Tennessee, based on the 2019 ACS. Correspondingly, the minority populations in these counties were generally smaller proportionally than statewide.

At the census block group level, based on the 2019 ACS, in the vicinity of the Johnsonville Reservation, 22.8 percent of people identified as minorities, a greater proportion than across the study area and the state. While the overall study area had a lower minority percentage than the state, nine of the 19 census block groups within the Johnsonville Reservation EJ study area had higher percentages of minorities in comparison with the overall study area percentage. Two census block groups had minority percentages that were 10 percentage points or more above the study area average of 7.4 percent (Figure 3.4-5). These areas, emboldened in Table 3.4-5, are considered minority EJ population areas, where the chance for disproportionate environmental and human health effects may be the greatest.

Table 3.4-5. Minority Percentages and Ethnicities in the Johnsonville Reservation EJ Study Area

Geography	% Minority	% White[1]	% Black / African American	% Am. Indian / Alaska Native	% Asian	% Native Hawaiian /Pacific Islander	% Some Other Race	Two or More Races	% Hispanic / Latino[2]
Study Area	7.4	92.6	4.0	0.6	0.2	0.0	0.0	2.5	2.3
Johnsonville Reservation	22.8	77.2	11.5	10.5	0.0	0.0	0.0	0.7	0.1
Tennessee	*20.4*	*79.6*	*17.9*	*0.9*	*2.2*	*0.1*	*1.6*	*2.0*	*5.4*
Humphreys County	*7.5*	*92.5*	*2.1*	*0.8*	*0.7*	*0.0*	*0.0*	*1.5*	*2.5*
CT 1305 BG 1 (Johnsonville)	**22.8**	77.2	11.5	10.5	0.0	0.0	0.0	0.7	0.1
CT 1302 BG 2	5.7	94.3	0.0	0.0	0.0	0.0	0.0	5.7	0.0
CT 1303 BG 1	16.5	83.5	16.5	0.0	0.0	0.0	0.0	0.0	0.0
CT 1303 BG 5	12.1	87.9	6.2	0.0	0.0	0.0	0.0	5.9	9.0
CT 1304 BG 2	4.2	95.8	3.9	0.0	0.0	0.0	0.2	0.0	0.4
CT 1305 BG 2	5.4	94.6	1.2	0.0	0.8	0.0	0.0	3.4	0.0
CT 1305 BG 3	13.4	86.6	3.0	0.0	0.0	0.0	0.0	10.5	2.4
Benton County	*7.3*	*92.7*	*3.0*	*0.4*	*0.0*	*0.0*	*0.0*	*1.4*	*2.4*
CT 9630 BG 2	2.1	97.9	0.0	1.8	0.3	0.0	0.0	0.0	2.8
CT 9631 BG 1	2.6	97.4	0.0	0.0	2.6	0.0	0.0	0.0	2.6
CT 9631 BG 2	**19.9**	80.1	8.2	2.7	0.0	0.0	0.0	9.0	0.0
CT 9631 BG 3	11.6	88.4	11.6	0.0	0.0	0.0	0.0	0.0	27.8
CT 9632 BG 1	10.0	90.0	9.1	0.0	0.0	0.0	0.0	0.9	1.7
CT 9632 BG 2	7.5	92.5	0.9	0.0	0.0	0.0	0.0	6.7	1.9
CT 9633 BG 1	0.9	99.1	0.9	0.0	0.0	0.0	0.0	0.0	0.4
CT 9633 BG 2	3.1	96.9	1.3	0.0	0.0	0.0	0.0	1.8	0.0
CT 9633 BG 3	1.5	98.5	1.5	0.0	0.0	0.0	0.0	0.0	1.4
CT 9634 BG 1	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CT 9634 BG 2	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CT 9634 BG 3	8.7	91.3	7.5	0.0	0.0	0.0	0.0	1.2	0.0

Source: 2019 ACS

[1] Race percentages are provided for those reporting a particular race alone or in combination. Less than 3 percent of the US population reported two or more races in the 2010 Census; thus, these percentages are closely representative of the whole ethnic group population.

[2] This group is calculated separately from the other ethnicities and may include overlap from the other categories, as the USCB does not consider Hispanic or Latino a "race."

Note: Emboldened census block groups represent identified EJ populations as compared with the overall study area percentage.

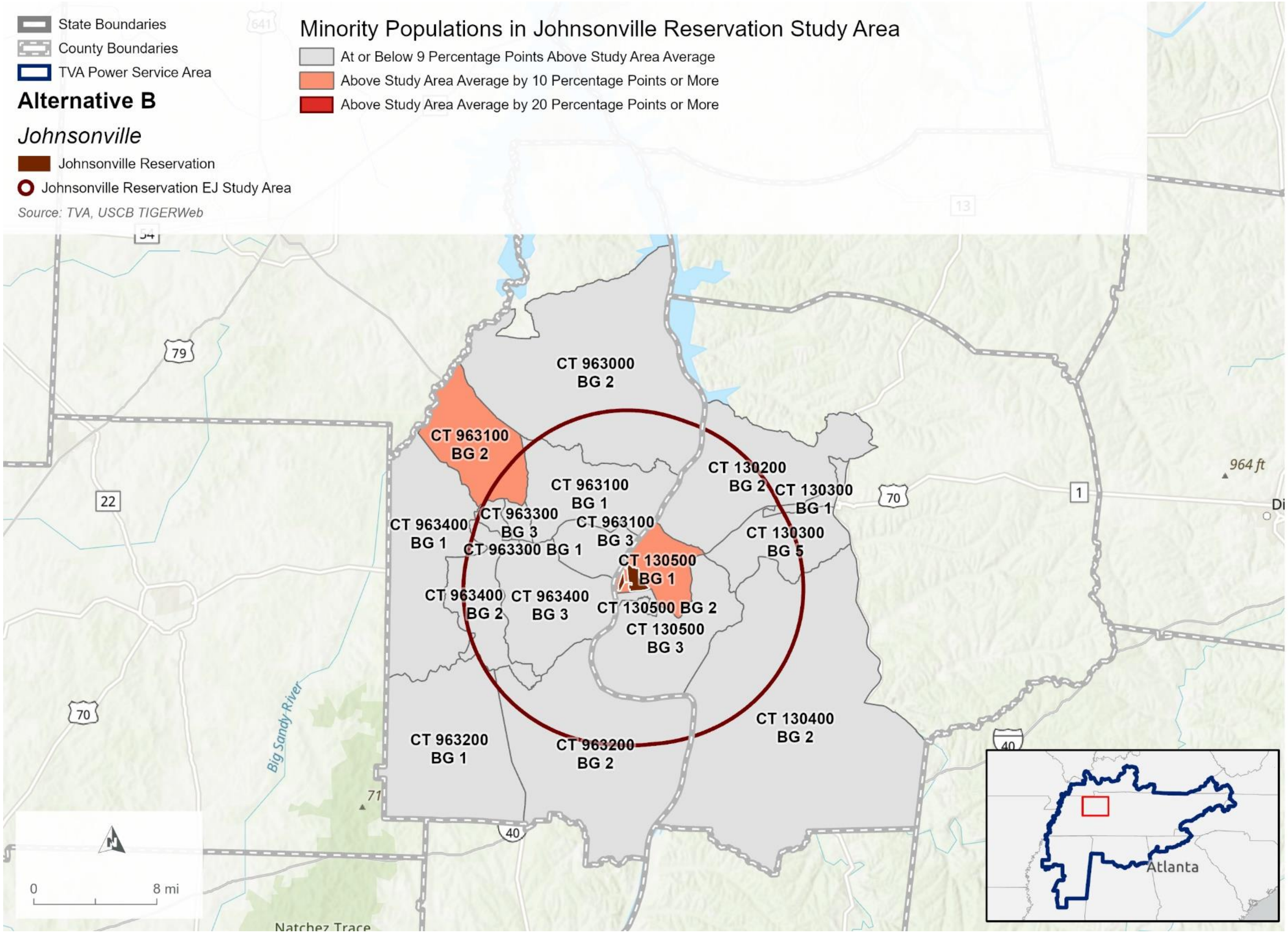

Figure 3.4-5. Minority Populations in Johnsonville Reservation Environmental Justice Study Area

3.4.1.3.1.2 Low-Income Populations

Emboldened census block groups in Table 3.4-6 represent areas with identified low-income EJ populations. Based on the 2019 SAIPE, a smaller proportion of the population of Humphreys County was living in poverty when compared with the state as a whole. In Benton County, the proportion of the population living in poverty was higher than across Tennessee.

At the census block group level, based on the 2019 ACS, the Johnsonville Reservation EJ study area as a whole and the immediate Johnsonville Reservation vicinity had higher poverty ratios than across the state. Nine of the 19 census block groups within the Johnsonville Reservation EJ study area had higher percentages of people living in poverty than across the study area. Four census block groups had poverty ratios that were 20 percentage points or more above the study area average of 42.2 percent and/or were at or above 50 percent (Figure 3.4-6). These areas, emboldened in Table 3.4-6, are considered low-income EJ populations, where the chance for disproportionate environmental and human health effects may be the greatest.

Table 3.4-6. Poverty Rates for the Johnsonville Reservation EJ Study Area

	2019 SAIPE	**2019 ACS**	
Geography	**Poverty %***	**Poverty %, Households**	**Poverty Ratio, Two Times US Threshold ****
Study Area			42.2
Johnsonville Reservation			35.6
Tennessee	*13.8*	*13.2*	*34.9*
Humphreys County	*13.1*		
CT 1305 BG 1 (Johnsonville)		8.4	35.6
CT 1302 BG 2		20.9	47.0
CT 1303 BG 1		35.6	**53.3**
CT 1303 BG 5		19.3	42.0
CT 1304 BG 2		11.0	32.3
CT 1305 BG 2		15.8	28.0
CT 1305 BG 3		10.5	30.8
Benton County	*17.6*		
CT 9630 BG 2		19.5	31.1
CT 9631 BG 1		11.8	33.8
CT 9631 BG 2		16.7	31.3
CT 9631 BG 3		23.4	34.8
CT 9632 BG 1		18.8	46.7
CT 9632 BG 2		18.9	45.5
CT 9633 BG 1		12.8	46.5
CT 9633 BG 2		36.2	**60.5**
CT 9633 BG 3		13.2	40.5
CT 9634 BG 1		17.9	**67.3**
CT 9634 BG 2		29.4	43.4
CT 9634 BG 3		24.8	**50.9**

*For the respective county in which the block group is located
**Calculated based on percent of population with a ratio of income to poverty threshold ≤1.99
Source: 2019 SAIPE, 2019 ACS
Note: Emboldened census block groups represent identified EJ populations as compared with the overall study area percentage.

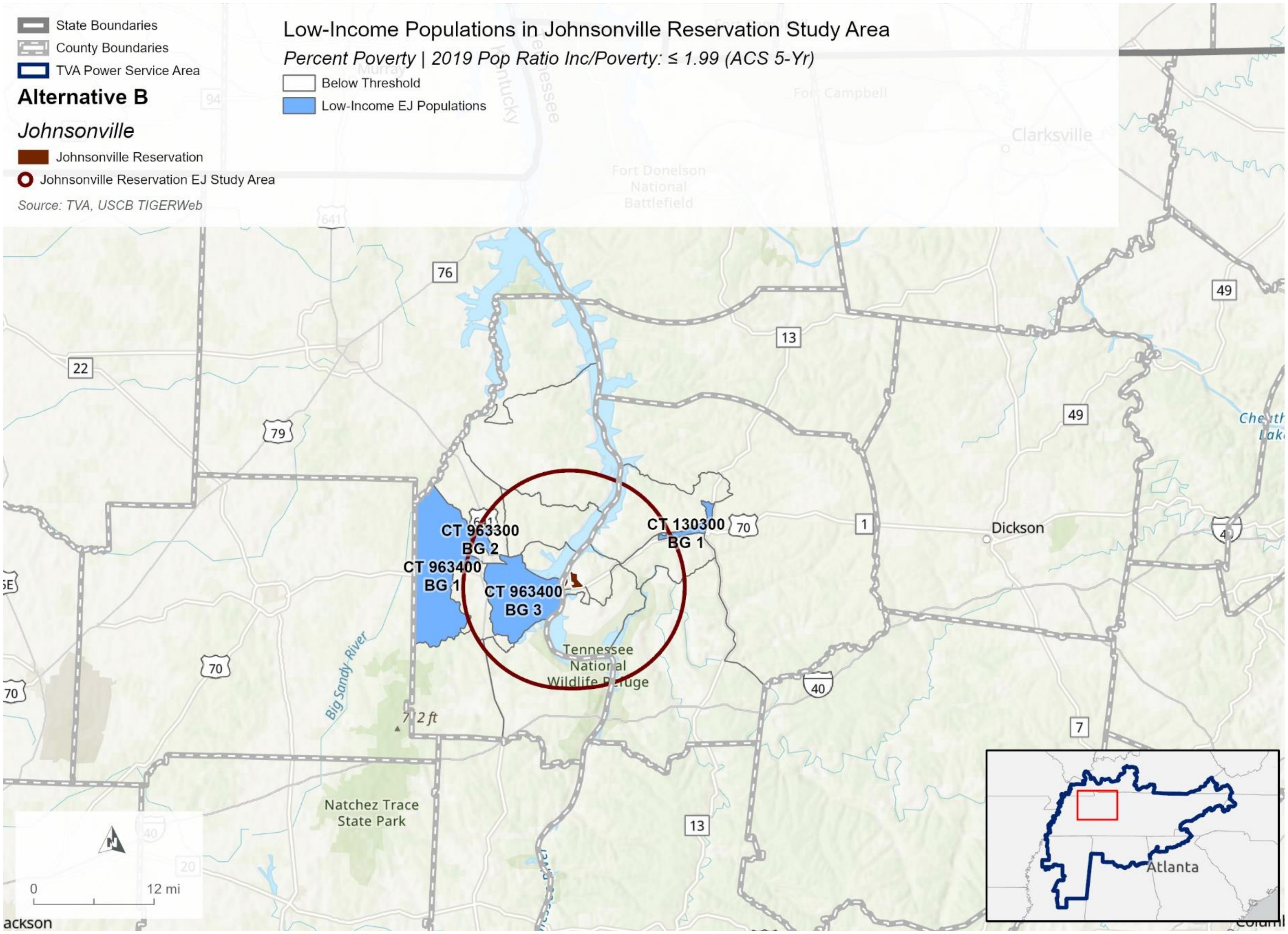

Figure 3.4-6. Low-Income Populations in Johnsonville Reservation Environmental Justice Study Area

3.4.1.3.1.3 Limited English Proficiency Populations
Of the 19 census block groups in the Johnsonville Reservation EJ study area, 18 had no individuals who reported speaking English less than well. However, one census block group, CT 9633 BG 3, had 19 individuals who reported speaking English less than well. All of these individuals were 65 years of age or older and categorized as not speaking English at all. This number represents 1.5 percent of the 1,251 persons aged five years and older living in the census block group. This identified LEP population does not constitute 1,000 individuals or five percent of the population aged five years or older. Therefore, the need for translation or interpreter services is not warranted unless requested.

3.4.1.3.2 Gleason Reservation
The 10-mile radius surrounding the Gleason Reservation, called the Gleason Reservation EJ study area, includes all or a portion of 15 census block groups (Figure 3.4-1). These block groups encompass portions of Weakley County, where the Gleason Reservation falls within CT 9685 BG 1, and Henry County, Tennessee.

3.4.1.3.2.1 Minority Populations
The census block group emboldened in Table 3.4-7 represents the one area with identified minority EJ populations. At the county level, a greater proportion of the populations of the two affected counties identified as non-minority than across Tennessee, based on the 2019 ACS. Correspondingly, the minority populations in these counties were generally smaller proportionally than statewide.

At the census block group level, based on the 2019 ACS, in the vicinity of the Gleason Reservation, 4.4 percent of people identified as minorities, a smaller proportion than across the study area and the state. While the overall study area had a lower minority percentage than the state, four of the 15 census block groups within the Gleason Reservation EJ study area had higher percentages of minorities in comparison with the overall study area percentage. One census block group had a minority percentage that was 10 percentage points or more above the study area average of 5.8 percent (Figure 3.4-7). This area, emboldened in Table 3.4-7, is considered a minority EJ population area, where the chance for disproportionate environmental and human health effects may be the greatest.

Table 3.4-7. Minority Percentages and Ethnicities in the Gleason Reservation EJ Study Area

Geography	% Minority	% White[1]	% Black / African American	% Am. Indian / Alaska Native	% Asian	% Native Hawaiian /Pacific Islander	% Some Other Race	Two or More Races	% Hispanic /Latino[2]
Study Area	5.8	94.2	3.7	0.2	0.2	0.0	0.7	1.0	1.8
Gleason Reservation	4.4	95.6	2.2	0.0	0.0	0.0	0.2	2.0	1.4
Tennessee	*20.4*	*79.6*	*17.9*	*0.9*	*2.2*	*0.1*	*1.6*	*2.0*	*5.4*
Weakley County	13.2	86.8	8.4	0.4	0.3	0.1	0.2	1.3	2.6
CT 9685 BG 1 (Gleason)	4.4	95.6	2.2	0.0	0.0	0.0	0.2	2.0	1.4
CT 9683 BG 2	13.6	86.4	11.0	0.0	0.8	0.0	0.0	1.8	0.0
CT 9684 BG 1	5.8	94.2	1.5	0.0	0.0	0.0	4.3	0.0	4.3
CT 9684 BG 2	**19.3**	80.7	19.3	0.0	0.0	0.0	0.0	0.0	0.0
CT 9684 BG 3	5.2	94.8	0.0	0.0	0.0	0.0	5.2	0.0	5.2
CT 9684 BG 4	4.6	95.4	4.2	0.3	0.0	0.0	0.0	0.0	0.0
CT 9684 BG 5	6.6	93.4	5.3	1.3	0.0	0.0	0.0	0.0	4.0
CT 9685 BG 2	4.2	95.8	1.5	0.4	0.3	0.0	0.0	2.0	0.0
CT 9685 BG 3	3.2	96.8	1.5	0.5	0.0	0.0	0.0	1.1	2.2
CT 9686 BG 2	3.9	96.1	3.1	0.0	0.5	0.0	0.0	0.4	2.4
CT 9686 BG 3	2.9	97.1	0.4	0.0	1.4	0.0	0.0	1.2	0.8
CT 9687 BG 1	2.9	97.1	0.6	0.0	0.0	0.0	2.4	0.0	0.0
CT 9687 BG 2	0.4	99.6	0.0	0.4	0.0	0.0	0.0	0.0	0.0
Henry County	12.7	87.3	8.2	0.3	0.4	0.0	0.0	1.3	2.6
CT 9692 BG 2	6.4	93.6	5.5	0.0	0.0	0.0	0.0	0.9	4.5
CT 9698 BG 1	3.8	96.2	1.2	0.0	0.0	0.0	0.0	2.6	3.1

Source: 2019 ACS

[1] Race percentages are provided for those reporting a particular race alone or in combination. Less than 3 percent of the US population reported two or more races in the 2010 Census; thus, these percentages are closely representative of the whole ethnic group population.

[2] This group is calculated separately from the other ethnicities and may include overlap from the other categories, as the USCB does not consider Hispanic or Latino a "race."

Note: Emboldened census block groups represent identified EJ populations as compared with the overall study area percentage.

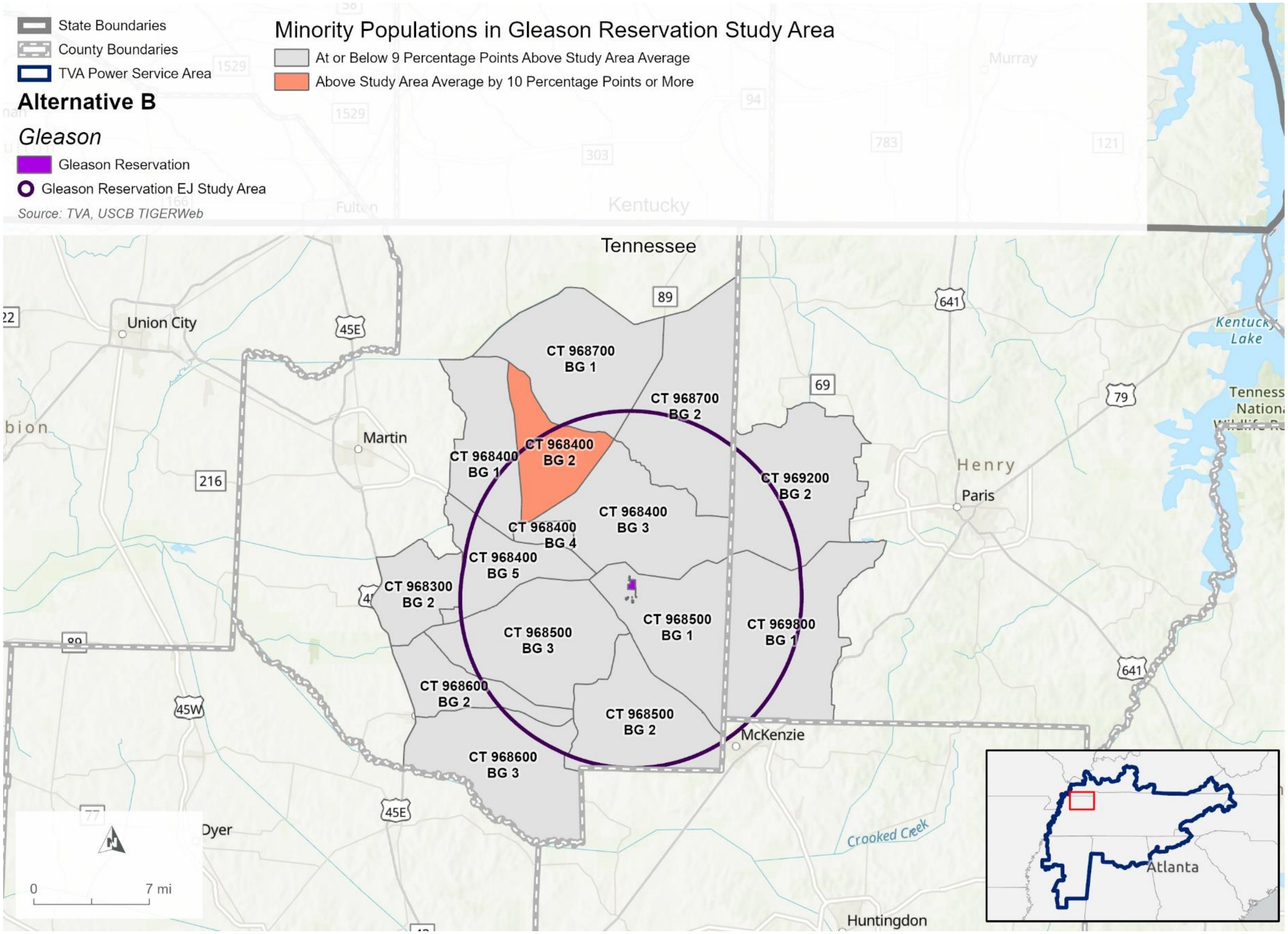

Figure 3.4-7. Minority Populations in Gleason Reservation Environmental Justice Study Area

3.4.1.3.2.2 Low-Income Populations

The census block groups emboldened in Table 3.4-8 represent areas with identified low-income EJ populations. Based on the 2019 SAIPE, a smaller proportion of the population of Weakley County was living in poverty when compared with the state as a whole. In Henry County, the proportion of the population living in poverty was higher than across Tennessee.

At the census block group level, based on the 2019 ACS, both the Gleason Reservation EJ study area and the immediate vicinity of the Gleason Reservation had higher poverty rates than the state. Likewise, nine of the 15 census block groups within the Gleason Reservation EJ study area had higher percentages of people living in poverty than across the study area. Four census block groups had poverty ratios that were 20 percentage points or more above the study area average of 42.2 percent and/or were at or above 50 percent (Figure 3.4-8). These areas, emboldened in Table 3.4-8, are considered low-income EJ populations, where the chance for disproportionate environmental and human health effects may be the greatest.

Table 3.4-8. Poverty Rates for the Gleason Reservation EJ Study Area

Geography	2019 SAIPE Poverty %*	2019 ACS Poverty %, Households	2019 ACS Poverty Ratio, Two Times US Threshold **
Study Area			42.2
Gleason Reservation			41.9
Tennessee	*13.8*	*13.2*	*34.9*
Weakley County	*13.1*		
CT 9685 BG 1 (Gleason)		13.4	41.9
CT 9683 BG 2		17.3	39.3
CT 9684 BG 1		16.7	40.6
CT 9684 BG 2		0.0	**56.3**
CT 9684 BG 3		0.0	18.9
CT 9684 BG 4		16.7	46.2
CT 9684 BG 5		10.9	32.7
CT 9685 BG 2		27.2	**56.0**
CT 9685 BG 3		13.7	46.4
CT 9686 BG 2		17.8	42.5
CT 9686 BG 3		22.1	32.5
CT 9687 BG 1		12.2	**57.0**
CT 9687 BG 2		16.2	40.7
Henry County	*18.3*		
CT 9692 BG 2		8.6	32.4
CT 9698 BG 1		20.9	**50.5**

*For the respective county in which the block group is located
**Calculated based on percent of population with a ratio of income to poverty threshold ≤1.99
Source: 2019 SAIPE, 2019 ACS
Note: Emboldened census block groups represent identified EJ populations as compared with the overall study area percentage.

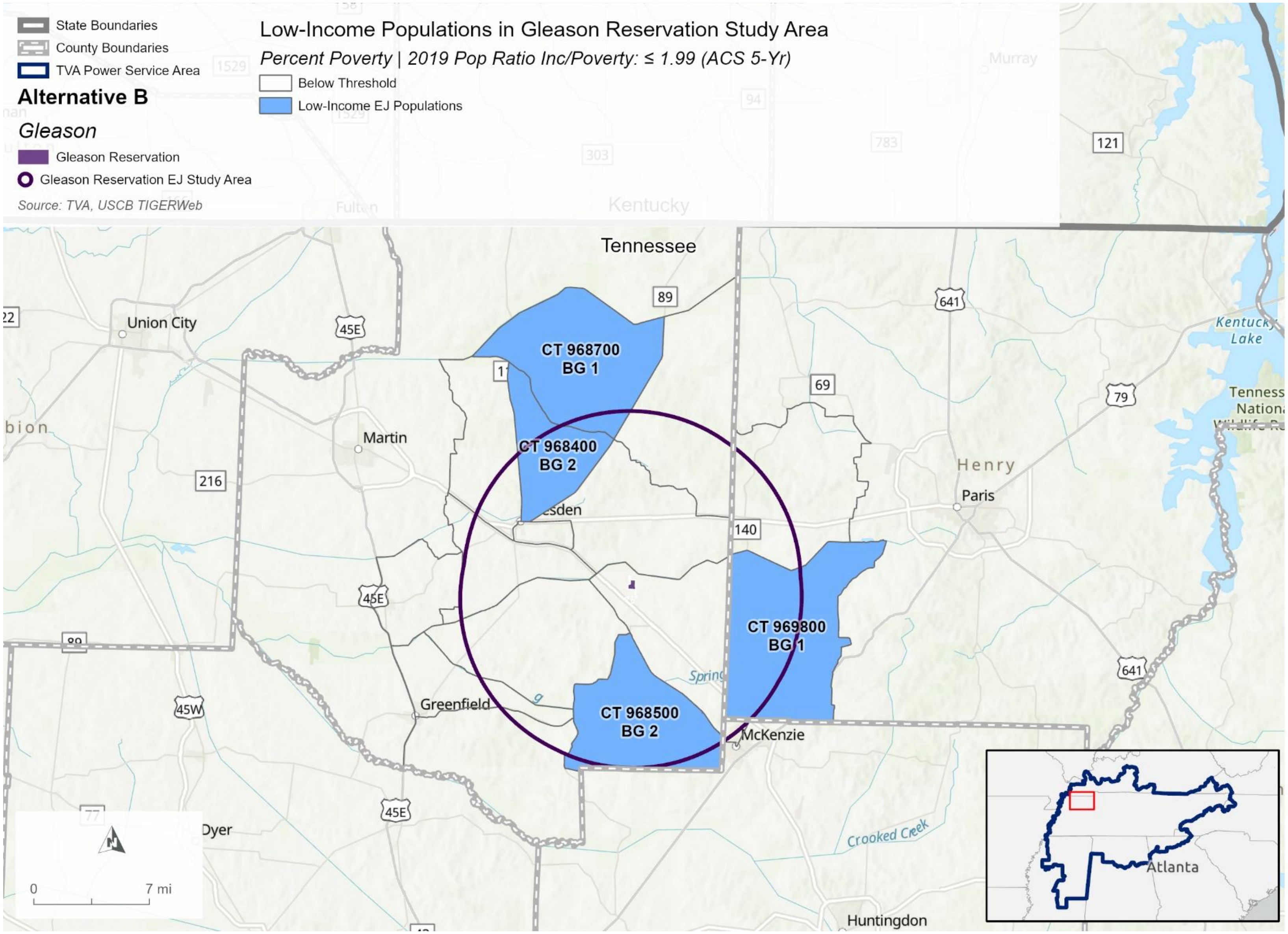

Figure 3.4-8. Low-Income Populations in Gleason Reservation Environmental Justice Study Area

3.4.1.3.2.3 Limited English Proficiency Populations

Of the 15 census block groups within the 10-mile radius of the Gleason Reservation, 13 had no individuals who reported speaking English less than well. Two of the census block groups did, however, have individuals speaking English less than well. Those census block groups were:

- CT 9683 BG 2 (Weakley County)
  - Six individuals (Spanish) out of 1,524 or less than one percent; and
- CT 9685 BG 3 (Weakley County)
  - 11 individuals (Spanish) out of 1,438 or less than one percent.

None of these LEP populations constitute 1,000 individuals or five percent of the population aged five years or older. Therefore, the need for translation or interpreter services is not warranted unless requested.

3.4.1.3.3 Transmission Corridor

The 40-mile 500-kV TL corridor proposed under Alternative B is within Weakley and Henry counties, where the minority percentages are below that of the state, as demonstrated on Table 3.4-7. Based on the 2019 SAIPE and as shown on Table 3.4-8, a smaller proportion of the population of Weakley County was living in poverty when compared with the state as a whole. In Henry County, the proportion of the population living in poverty was higher than across Tennessee.

3.4.1.4 Alternative C

3.4.1.4.1 Middle Tennessee TVA Power Service Area

The Alternative C EJ study area consists of the Middle Tennessee region, as based on regions in the TVA PSA defined by the TVA Economic Development team (TVA 2022d; Figure 3.4-2). The Alternative C EJ study area is separated into its 24 associated counties for evaluation purposes.

3.4.1.4.1.1 Minority Populations

The emboldened county in Table 3.4-9 represents a minority EJ population area within the Alternative C EJ study area. The overall study area and five of the 24 counties had higher minority percentages than the state. One county, Davidson County, had a minority percentage that was 10 percentage points or more above the study area average of 20.4 percent. This area, emboldened in Table 3.4-9, is considered a minority EJ population area, where the chance for disproportionate environmental and human health effects may be the greatest.

Table 3.4-9. Minority Percentages and Ethnicities in the EJ Study Area for Alternative C

Geography	% Minority	% White[1]	% Black/ African American	% Am Indian /Alaska Native	% Asian	% Native Hawaiian /Pacific Islander	% Some Other Race	% Hispanic /Latino[2]
Study Area	27.0	73.0	14.3	0.2	2.4	<0.1	0.3	7.2
Tennessee County	*20.4*	*79.6*	*17.9*	*0.9*	*2.2*	*0.1*	*1.6*	*5.4*
Bedford	23.2	76.8	7.9	0.2	0.2	0.0	0.6	12.4
Cheatham	7.5	92.5	1.6	0.4	0.4	0.0	0.3	3.0
Coffee	11.6	88.4	3.8	0.0	1.1	0.0	0.3	4.3
Davidson	**43.8**	56.2	26.9	0.2	3.6	0.1	0.4	10.2
Dickson	10.5	89.5	4.2	0.4	0.5	0.0	0.2	3.6
Franklin	11.6	88.4	4.5	0.0	0.4	0.1	0.3	3.4
Giles	15.9	84.1	9.7	0.3	0.2	0.0	0.5	2.5

Geography	% Minority	% White[1]	% Black/ African American	% Am Indian /Alaska Native	% Asian	% Native Hawaiian /Pacific Islander	% Some Other Race	% Hispanic /Latino[2]
Hickman	9.6	90.4	5.2	0.2	0.4	0.0	0.0	2.5
Houston	8.0	92.0	5.4	0.7	0.2	0.2	0.0	0.4
Humphreys	7.5	92.5	2.1	0.8	0.7	0.0	0.0	2.5
Lawrence	6.7	93.3	1.7	0.3	0.5	0.2	0.4	2.2
Lewis	6.7	93.3	1.8	0.0	1.4	0.0	0.1	2.3
Lincoln	13.2	86.8	7.1	0.2	0.5	0.0	0.0	3.5
Marshall	15.1	84.9	7.6	0.0	0.3	0.0	0.7	5.4
Maury	20.7	79.3	11.5	0.1	0.9	0.0	0.2	5.8
Montgomery	36.7	63.3	19.3	0.5	2.1	0.4	0.4	10.0
Moore	7.4	92.6	2.2	1.6	2.4	0.0	0.0	0.2
Perry	8.1	91.9	2.7	0.2	2.2	0.0	0.0	1.4
Robertson	16.7	83.3	7.2	0.2	0.6	0.1	0.1	6.9
Rutherford	29.2	70.8	14.5	0.2	3.4	0.0	0.1	8.0
Stewart	8.2	91.8	0.9	0.2	0.7	0.4	0.0	3.0
Sumner	15.9	84.1	7.3	0.3	1.4	0.0	0.1	4.9
Williamson	15.4	84.6	4.1	0.1	4.2	0.0	0.1	4.8
Wilson	15.0	85.0	7.1	0.3	1.6	0.0	0.2	4.2

Source: 2019 ACS
[1] Race percentages are provided for those reporting a particular race alone or in combination. Less than 3 percent of the US population reported two or more races in the 2010 Census; thus, these percentages are closely representative of the whole ethnic group population.
[2] This group is calculated separately from the other ethnicities and may include overlap from the other categories, as the USCB does not consider Hispanic or Latino a “race.”
Note: Emboldened census block groups represent identified EJ populations as compared with the overall study area percentage.

3.4.1.4.1.2 Low-Income Populations

Table 3.4-10 presents poverty ratios for the counties in the Alternative C EJ study area, along with those for the overall study area and state. While the overall study area has a lower poverty ratio than the state according to the 2019 ACS, 11 of the 24 counties had higher minority percentages than the state. No county had a poverty percentage that was 20 percentage points or more above the study area average (29.3) and/or above 50 percent based on the 2019 ACS (Table 3.4-10).

Table 3.4-10. Poverty Rates for the EJ Study Area for Alternative C

	2019 SAIPE	2019 ACS	
Geography	Poverty %	Poverty %, Households	Poverty Ratio, Two Times US Threshold **
Study Area	12.2	14.0	29.3
Tennessee	*13.8*	*13.2*	*34.9*
Bedford County	13.9	14.0	40.8
Cheatham County	9.6	9.5	27.1
Coffee County	14.4	13.9	37.4
Davidson County	12.6	13.0	32.9
Dickson County	10.1	12.7	34.0
Franklin County	13.9	15.8	35.6
Giles County	13.4	13.7	35.6

Geography	2019 SAIPE Poverty %	2019 ACS Poverty %, Households	2019 ACS Poverty Ratio, Two Times US Threshold **
Hickman County	16.3	16.0	42.8
Houston County	17.8	19.2	42.3
Humphreys County	13.1	17.0	36.3
Lawrence County	16.7	16.7	41.5
Lewis County	15.2	19.4	43.4
Lincoln County	12.8	14.2	37.1
Marshall County	13.1	18.9	37.5
Maury County	8.5	18.5	28.3
Montgomery County	12.0	13.5	33.9
Moore County	10.0	10.2	29.5
Perry County	14.4	24.8	49.1
Robertson County	10.5	11.1	29.0
Rutherford County	10.0	10.0	26.8
Stewart County	12.9	13.6	33.2
Sumner County	8.6	8.8	24.1
Williamson County	4.3	4.8	12.1
Wilson County	7.4	7.7	21.2

Source: 2019 SAIPE (USCB 2019), 2019 ACS (USCB 2020)

3.4.1.4.1.3 Limited English Proficiency Populations

Table 3.4-11 presents county counts and percentages for the population aged five years and older who live in LEP households. Davidson and Rutherford counties exceeded the study area-wide county average for numbers of LEP households. Davidson County also had an LEP household percentage that exceeded the overall study area average.

Table 3.4-11. Limited English Proficiency for the EJ Study Area for Alternative C

Geography	Population 5 Years and Over in Limited English Households (County Average)	Percent of Population Age 5 Years and Over in Limited English Households (County Average)
Study Area	2,629	2.8
Middle Tennessee County		
Bedford	1,495	3.1
Cheatham	199	0.5
Coffee	395	0.7
Davidson	41,893	6.1
Dickson	23	0.0
Franklin	189	0.5
Giles	192	0.7
Hickman	15	0.1
Houston	20	0.2
Humphreys	11	0.1
Lawrence	354	0.8
Lewis	110	0.9
Lincoln	27	0.1
Marshall	374	1.1
Maury	731	0.8

Geography	Population 5 Years and Over in Limited English Households (County Average)	Percent of Population Age 5 Years and Over in Limited English Households (County Average)
Montgomery	1,551	0.8
Moore	117	1.8
Perry	26	0.3
Robertson	1,114	1.6
Rutherford	8,652	2.7
Stewart	47	0.4
Sumner	1,474	0.8
Williamson	2,322	1.0
Wilson	1,774	1.3

Source: 2019 ACS (USCB 2020)

3.4.2 Environmental Consequences

3.4.2.1 The No Action Alternative

TVA would continue to operate and maintain the two CUF coal-fired units. Employment at CUF would continue to be an option in the labor market area, and contracts associated with CUF operations and maintenance and indirect and induced economic activities would continue to support the regional economy. However, in order for the existing CUF units to remain operational, repairs and maintenance would be necessary in order to maintain reliability. These maintenance costs, along with subsequent environmental compliance costs to meet requirements under new regulations, may have a minor adverse effect on ratepayers. Future rate increases to recoup these costs could affect low-income populations more than other populations. Low-income populations also have limited ability to participate in energy efficiency programs that could reduce their future power bills, as some costs must be incurred by program participants. However, TVA works with local power companies to implement programs benefiting low-income homeowners and renters, which may offset effects to EJ populations associated with rate increases (see the TVA IRP EIS for more details).

3.4.2.2 Retirement, Decommissioning, Decontamination, and Deconstruction of CUF Plant

The coal facilities at CUF would be retired between 2026 and 2033 and would transition to the D4 process detailed in Table 2.1-1. Routine plant deliveries would also be discontinued. All previously approved CCR projects would continue to be implemented.

There would be short-term beneficial economic effects from D4 activities associated with all Action Alternatives, including a temporary increase in employment and income and the purchase of materials, equipment, and services. This increase would be local or regional, depending on where the workers, goods, and services were obtained, and could positively affect EJ populations.

Because of the lack of significant environmental effects as described in the remaining sections of Chapter 3 and in Section 3.4.2, no disproportionate adverse effects to EJ populations are projected as a result of CUF closure effects. Where effects are anticipated, these effects would not be disproportionate on EJ populations since the same effects are anticipated for non-EJ populations. There would be short-term beneficial economic effects from D4 activities associated with all Action Alternatives, including a temporary increase in employment and income and the purchase of materials, equipment, and services. This increase would be local or regional, depending on where the workers, goods, and services were obtained, and could positively affect EJ populations.

3.4.2.3 Alternative A

Under Alternative A, the CUF coal facilities would be retired and demolished, as described in Section 2.1.3.1. The existing switchyard at CUF would be maintained temporarily for use in future operations associated with a proposed CC plant, and a new switchyard will be built with the CC plant. The CC plant would be constructed on the CUF Reservation in Stewart County, Tennessee. The new CC plant would require construction of approximately 32 miles of new 30-inch-diameter natural gas pipeline lateral and associated gas system infrastructure in Stewart, Houston, and Dickson counties, Tennessee.

Because of the lack of significant environmental effects as described in the remaining sections of Chapter 3 and in Section 3.4.2, no disproportionate adverse effects to EJ populations are projected as a result of the effects of the proposed CC plant, gas pipeline lateral, and transmission line activities. Where effects are anticipated, these effects would not be disproportionate on EJ populations since the same effects are anticipated for non-EJ populations. Table 3.4-12 summarizes the anticipated effects by resource area, including some beneficial effects, with detailed discussion of effects presented in the resource area-specific sections of Chapter 3.

Table 3.4-12. Summary of Environmental Justice Effects by Alternative and Resource Area

Resource Area	CUF Coal Retirement - CUF coal facility retirement and D4 activities	Alternative A - proposed CC plant (CUF), natural gas pipeline lateral, and transmission line activities	Alternative B - proposed CT facilities (JCT and Gleason) and transmission line activities	Alternative C - proposed solar facilities with battery storage and transmission line activities
Physical Characteristics	No effects or no disproportionate effects on EJ populations.	Effects to prime farmland resources as a result of construction of the natural gas pipeline lateral may have temporary adverse effects on populations that currently farm the corridor where the pipeline would be constructed. Such effects would occur where EJ populations and prime farmland soils co-exist. These effects would not be disproportionate on EJ populations, however.	Temporary or permanent loss of prime farmland resources as a result of construction of the transmission line activities, if new ROW is required, may have temporary effects on populations that currently farm the sites where the facilities would be constructed. Such effects would occur where EJ populations and prime farmland soils co-exist. These effects would not be disproportionate on EJ populations, however.	Temporary or permanent loss of prime farmland resources as a result of construction of the solar facilities and the transmission line activities, if new ROW is required, may have temporary effects on populations that currently farm the sites where the facilities would be constructed. These effects would not be disproportionate on EJ populations, however.
Water Resources	No adverse effects or no disproportionate effects on EJ populations. Beneficial effects from improved water quality in response to CUF operations.	No effects or no disproportionate effects on EJ populations.	No effects or no disproportionate effects on EJ populations.	No effects or no disproportionate effects on EJ populations.
Air Quality and GHGs	No negative effects or no disproportionate effects on EJ populations. CUF retirement will result in long-term, moderate beneficial effects to air quality and GHGs for EJ and other populations.	No effects or no disproportionate effects on EJ populations.	No effects or no disproportionate effects on EJ populations.	No effects or no disproportionate effects on EJ populations.
Biological Environment	The addition of wildlife into surrounding suitable habitat may be beneficial to EJ and other populations that utilize those habitats for subsistence and other purposes. This may be true if wildlife travel to nearby Lake Barkley Recreation Area or Cross Creeks National Wildlife Refuge, where people hunt for deer, turkey, waterfowl, and squirrel.	The addition of wildlife into surrounding suitable habitat may be beneficial to EJ and other populations that utilize those habitats for subsistence and other purposes. This may be true if wildlife travel to nearby Lake Barkley Recreation Area or Cross Creeks National Wildlife Refuge, where people hunt for deer, turkey, waterfowl, and squirrel. If indirect effects to aquatic life occur, these could in turn affect EJ populations and other populations that currently fish the affected waters. Such activities are known to occur in nearby Lake Barkley Recreation Area or Cross Creeks National Wildlife Refuge. These effects would not be disproportionate on EJ populations.	The addition of wildlife into surrounding suitable habitat may be beneficial to EJ and other populations that utilize those habitats for subsistence and other purposes, such as in nearby Camden Wildlife Management Area and Tennessee National Wildlife Refuge.	The addition of wildlife into surrounding suitable habitat may be beneficial to EJ and other populations that utilize those habitats for subsistence and other purposes.

Resource Area	CUF Coal Retirement - CUF coal facility retirement and D4 activities	Alternative A - proposed CC plant (CUF), natural gas pipeline lateral, and transmission line activities	Alternative B - proposed CT facilities (JCT and Gleason) and transmission line activities	Alternative C - proposed solar facilities with battery storage and transmission line activities
Natural Areas, Parks, and Recreation	If fishing and hunting on the CUF Reservation is temporarily limited or not allowed, this could in turn adversely affect EJ populations and other populations that currently fish and hunt at the Lake Barkley Recreation, portions of which are onsite on the CUF Reservation (USACE 2022). These effects would not be disproportionate on EJ populations.	If temporary closure of the Lake Barkley Recreation Area is necessary during construction, this could in turn affect EJ populations and other populations that currently utilize the recreation area. These effects would not be disproportionate on EJ populations. Completion of the upgrades to the existing barge unloading area (boat dock) will have beneficial effects for recreational users, including EJ populations.	If long-term effects occur to recreational activities within the Kentucky Reservoir, which is partially within the boundaries of the proposed CT plant, this could in turn adversely affect EJ populations and other populations that currently utilize the recreation area. These effects would not be disproportionate on EJ populations.	No effects or no disproportionate effects on EJ populations.
Land Use	No effects or no disproportionate effects on EJ populations.	Long-term effects associated with loss of forested areas in the pipeline corridor could in turn adversely affect EJ populations and other populations that currently utilize those areas. These effects would not be disproportionate on EJ populations.	Long-term adverse effects associated with changes in land use due to proposed 40-mile transmission line; however, areas currently in pasture or agricultural uses could be returned to former condition. These effects would not be disproportionate on EJ populations.	Potential for moderate adverse effects to land use through conversion of agricultural land, particularly cropland, to developed land with potential for later restoration of agricultural use. While effects to EJ populations may occur and, in future analyses, some solar facilities may be found to have disproportionate effects on EJ populations, overall, the effects of Alternative C would not be disproportionate on EJ populations.
Transportation	Transportation effects would be temporary, minor, and concentrated on public roads within a relatively small area around the TVA-owned CUF Reservation, where EJ populations are not prominent. No effects or no disproportionate effects on EJ populations.	Transportation effects would be temporary, minor, and concentrated on public roads within a relatively small area around the TVA-owned CUF Reservation, where EJ populations are not prominent. No effects or no disproportionate effects on EJ populations.	Transportation effects would be temporary, minor, and concentrated on public roads within a relatively small area around the TVA-owned JCT and Gleason Reservations and transmission lines. No disproportionate effects on EJ populations.	Transportation effects would be temporary, minor, and concentrated on public roads within a relatively small area around the project sites and transmission line activities, where EJ populations are not prominent. No effects or no disproportionate effects on EJ populations.
Utilities	Short-term outages would be minor and would occur in the immediate vicinity of the TVA-owned CUF Reservation, where EJ populations are limited. No disproportionate effects on EJ populations.	No effects or no disproportionate effects on EJ populations.	No effects or no disproportionate effects on EJ populations.	No effects or no disproportionate effects on EJ populations.
Cultural Resources	No effects or no disproportionate effects on EJ populations.	No effects or no disproportionate effects on EJ populations.	No effects or no disproportionate effects on EJ populations.	No effects or no disproportionate effects on EJ populations.
Solid and Hazardous Waste	No effects or no disproportionate effects on EJ populations.	No effects or no disproportionate effects on EJ populations.	No effects or no disproportionate effects on EJ populations.	No effects or no disproportionate effects on EJ populations.

Resource Area	CUF Coal Retirement - CUF coal facility retirement and D4 activities	Alternative A - proposed CC plant (CUF), natural gas pipeline lateral, and transmission line activities	Alternative B - proposed CT facilities (JCT and Gleason) and transmission line activities	Alternative C - proposed solar facilities with battery storage and transmission line activities
Safety	No effects or no disproportionate effects on EJ populations.	No effects or no disproportionate effects on EJ populations.	No effects or no disproportionate effects on EJ populations.	No effects or no disproportionate effects on EJ populations.
Socioeconomics	Due to the loss of direct and indirect employment associated with CUF, competition for employment in other fields in the CUF labor market area, such as manufacturing, educational services, health care, and construction, may increase. Such trends could lead EJ populations and other populations to relocate for work or follow recent depopulation trends and permanently relocate to different locations in Tennessee or beyond. These changes may affect familial and community relations among EJ and other populations in the CUF labor market area. These effects would not be disproportionate on EJ populations.	Temporary employment increases in the CUF labor market area would have a minor beneficial effect to area EJ and other populations. These effects would not be disproportionate on EJ populations.	Temporary employment increases in the JCT and Gleason labor market areas would have a minor beneficial effect to area EJ and other populations. These effects would not be disproportionate on EJ populations.	Temporary employment increases in the TVA PSA could potentially have a minor beneficial effect to EJ and other populations in the areas selected for the solar facilities. These effects would not be disproportionate on EJ populations.
Noise	No effects or no disproportionate effects on EJ populations.	No effects or no disproportionate effects on EJ populations.	No effects or no disproportionate effects on EJ populations.	No effects or no disproportionate effects on EJ populations.
Visual	No effects or no disproportionate effects on EJ populations.	No effects or no disproportionate effects on EJ populations.	No effects or no disproportionate effects on EJ populations.	No effects or no disproportionate effects on EJ populations.

3.4.2.4 Alternative B
Under Alternative B, TVA would replace the power generated by the existing CUF plant with CT facilities, as described in Section 2.1.4. The CT facilities would be constructed on the JCT and Gleason Reservations in Humphreys and Weakley counties, Tennessee, respectively. The new CT facilities would require construction of approximately 40 miles of new 500-kV TL from the existing Weakley 500-kV to a new station on the Marshall-Cumberland 500-kV TL.

Because of the lack of significant environmental effects as described in the remaining sections of Chapter 3 and Section 3.4.2, no disproportionate effects to EJ populations are projected as a result of effects from the proposed CT facilities and transmission line activities to other resource areas. Where effects are anticipated, they would not be disproportionate on EJ populations since the same effects are anticipated for non-EJ populations. Table 3.4-12 summarizes the anticipated effects by resource area, including some beneficial effects.

3.4.2.5 Alternative C
TVA anticipates that a portion of the solar facilities proposed under Alternative C will need to be physically located in the Middle Tennessee region in order to offset transmission system upgrades that may be required following the retirement of CUF. Power from these facilities would typically be delivered by direct connection to TVA's transmission system or via interconnections with local power companies that distribute power from TVA. As specific sites have not yet been determined for evaluation under this alternative, typical EJ effects associated with solar facilities are listed under Section 3.2. Based on a review of TVA's past solar facilities, no sites had disproportionate effects on EJ communities.

However, based on the number of solar sites that would be needed to replace generation at CUF, there is potential for moderate effects to land use through conversion of agricultural land, particularly cropland, to developed land with potential for later restoration of agricultural use. These land use conversions, should they occur, are not expected to have disproportionate effects on EJ populations, depending on the number and location of solar facilities. While focused analyses for each proposed solar site would determine whether the specific project effects would be disproportionate on EJ populations, generally such effects resulting from the replacement solar generation proposed for Alternative C would be the same for EJ populations and other populations in the vicinity.

Because of the lack of significant environmental effects as described in the remaining sections of Chapter 3 and Section 3.4.2, no disproportionate effects to EJ populations are projected as a result of effects from the proposed solar and storage facilities and transmission line activities to other resource areas. Where effects are anticipated, these effects would not be disproportionate on EJ populations since the same effects are anticipated for non-EJ populations. Table 3.4-12 summarizes the anticipated effects by resource area, including some beneficial effects.

3.5 Physical Characteristics

3.5.1 Geology, Soils, and Prime Farmland

3.5.1.1 Affected Environment
The TVA region encompasses portions of the following major physiographic provinces and physiographic sections (Figure 3.5-1) (Fenneman 1938, Miller 1974):

- Blue Ridge
- Valley and Ridge
- Interior Low Plateaus Province

  - Highland Rim
  - Nashville Basin
- Appalachian Plateaus Province
  - Cumberland Plateau
  - Cumberland Mountains
- Coastal Plain Province
  - East Gulf Coastal Plain
  - Mississippi Alluvial Plain

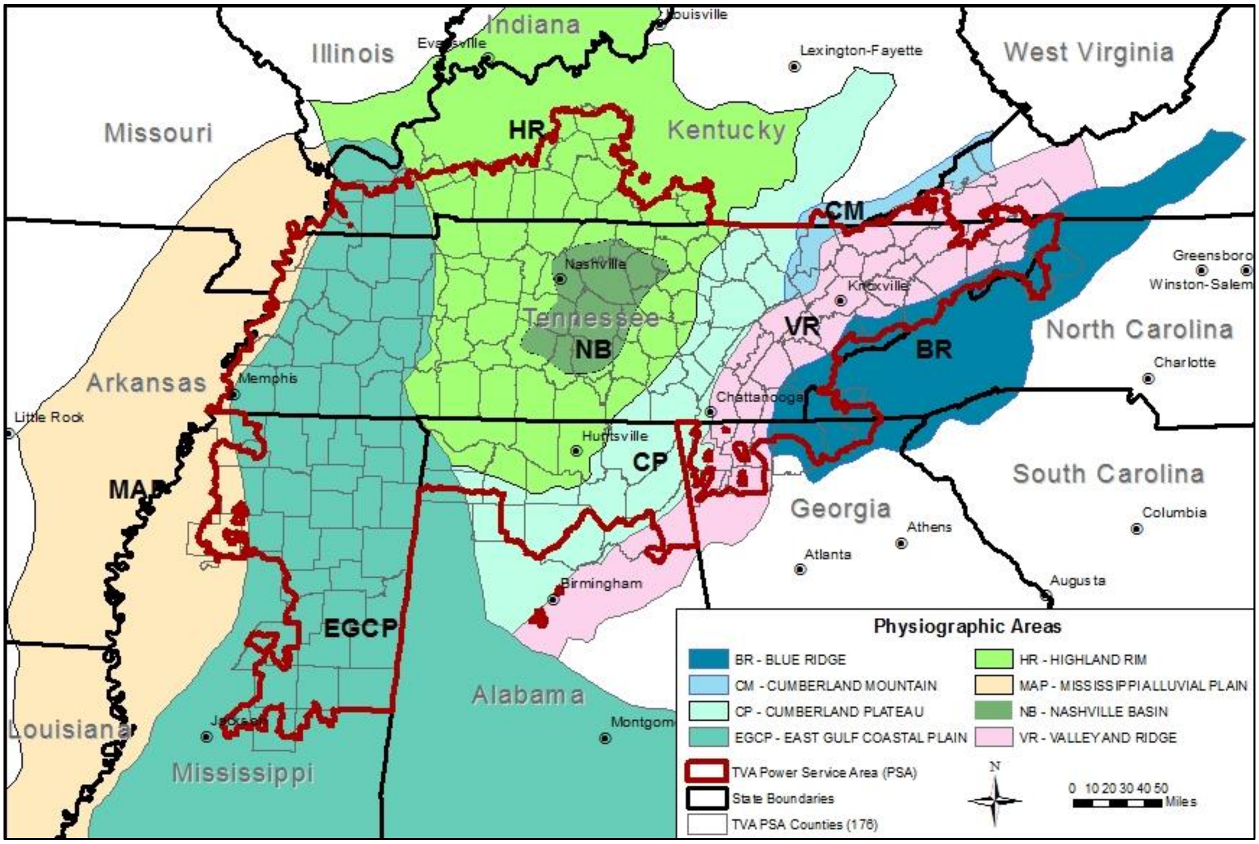

Figure 3.5-1. Physiographic areas of TVA region

3.5.1.1.1 CUF Reservation

Geology

The CUF Reservation lies in the Western Highland Rim Physiographic Province of Tennessee, which is characterized by rolling hills and incised valleys. Underlying bedrock of the region is chiefly Mississippian to Ordovician-age limestone, chert, shale, siltstone, and sandstone (Luther 2018; Griffith et al. 1997). The CUF Reservation is primarily underlain by the Wells Creek Dolomite and Knox Group formations. The Wells Creek Formation is up to 50 feet thick and characterized by gray limestone and dolomite with angular chert blocks and fragments and minor amounts of mottled red and green calcareous shale. The Knox Formation is up to 600 feet thick and is characterized by gray and cherty, fine- to medium-grained dolomite and limestone (Greene et al. 2000; Hardeman et al. 1966).

The geology, hydrogeology and surface water hydrology of the Wells Creek Basin are related to each other because of an event that occurred millions of years ago. According to a 1968 study, *Geology of the Wells Creek Structure, Tennessee, Bulletin 68, Tennessee Division of Geology* (Bulletin 68) (Wilson and Sterns 1968), the preferred explanation for the geologic characteristics of the Wells Creek Basin is a meteor impact, referred to as the Wells Creek Structure. The Wells Creek Structure is approximately eight miles in diameter and consists of a series of roughly circular concentric faults (Figure 3.5-2) surrounding a topographically low area with a central hill. The low area has been named the Wells Creek Basin, within which the CUF Reservation is located. In addition to the circular faults, radial faults emanate from the center of the basin.

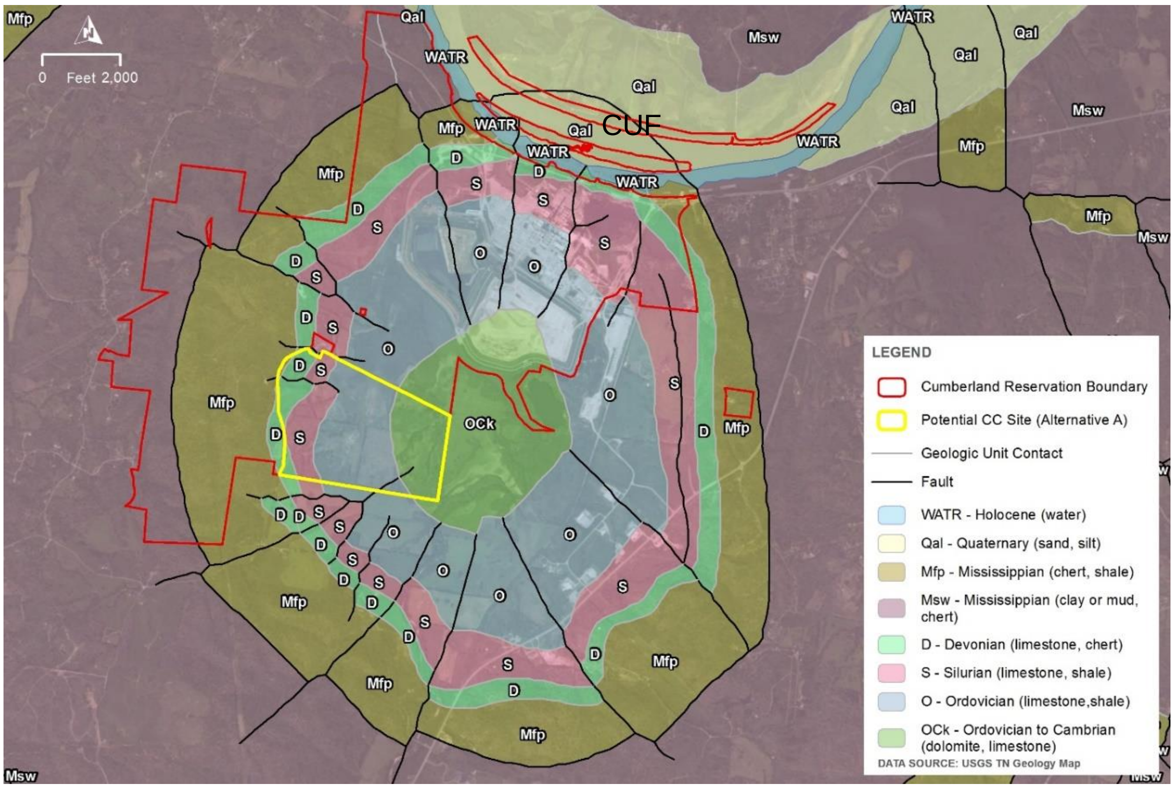

Figure 3.5-2. Regional topography, drainage, and mapped faults

Paleontology

During the Precambrian period, the area that is now current-day Tennessee was located in the southern hemisphere and was covered by a shallow, tropical sea that was home to diverse species of sea life. By the Paleozoic period, Tennessee was located along the southern border of present-day North America and was still covered by sea water. During the Late Carboniferous period, mountain building in the east caused soil erosion and deposition resulting in swampy deltas to form in central Tennessee. Western Tennessee continued to be underwater while the central and eastern portion of Tennessee was above sea level continued through the Mesozoic and Cenozoic periods (The Paleontology Portal 2021).

Geological Hazards

Geological hazards can include landslides, volcanoes, earthquakes/seismic activity, and subsidence/ sinkholes. The CUF Reservation is located on low undulating terrain. No significant slopes are present within several miles; therefore, landslides are not a potential risk. No volcanoes are present within several hundred miles of the CUF Reservation.

Sinkholes can occur where the rock below the land surface is a carbonate rock such as a limestone or dolomite, as well as in salt beds, and other rocks that can naturally be dissolved by groundwater circulating through them such as gypsum. The process typically can take many years to decades to form, and as the rock dissolves, spaces and caverns develop underground. Land over sinkholes may stay intact until there is not enough support for the land above the spaces. Then, a sudden collapse of the land surface can occur. These collapses can vary greatly in size and shape (Kaufmann 2007).

Because of the crater impact, referenced above, multiple fault lines are located in the vicinity of CUF Reservation. The presence of fault lines within the carbonate rocks can contribute to the formation of karst related features.

The Project site is located 85 miles from the New Madrid Seismic Zone, which is a 150-mile-long seismic zone extending from Illinois to Arkansas and into portions of five states (Figure 3.5-3). The largest seismic events in the area occurred between the years 1811 and 1812 (U.S. Geological Survey [USGS] 2021). Seismic instrumentation was installed in 1974 to monitor the area and since then, approximately 4,000 earthquakes have been recorded; however, they are typically too small to be felt. While the New Madrid Fault Line is considered a potential source of intraplate earthquakes in the region, the faults responsible for associated seismic activity are ancient (i.e., no recent faulting) and deep seated. Land movement along the fault system is minimal to none and GPS measurements from a recent study indicated that faults are moving less than 0.2 millimeters per year, which could indicate that the potential for larger earthquakes in the area has diminished (Gardner 2009).

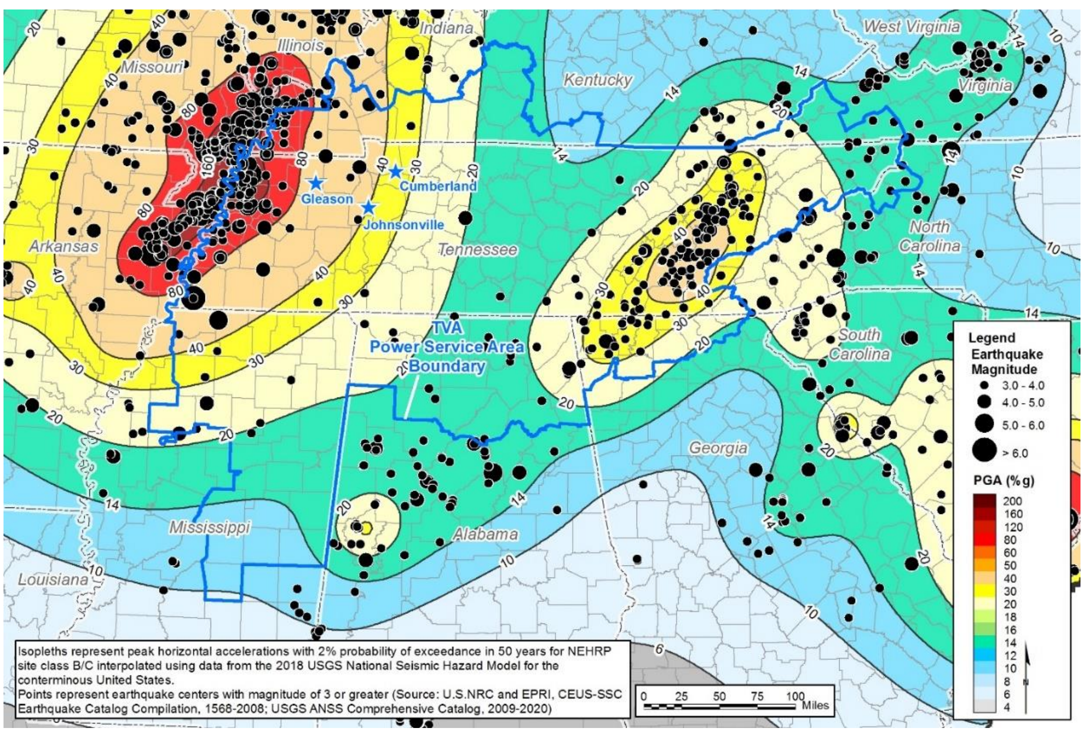

Figure 3.5-3. Seismic Hazards from the New Madrid Fault Line.

(Source: Modified after USGS 2018)

Soils

Thirty-nine soil types have been mapped on the CUF Reservation and the majority are composed of Bodine gravelly silt loam, 20 to 40 percent slopes (14.3 percent); Lindell silt loam, zero to two percent slopes, occasionally flooded (10.8 percent); Maury silty clay loam, five to 12 percent slopes, eroded (8.6 percent); Melvin silt loam, frequently flooded (7.8 percent); and Bodine gravelly silt loam, 12 to 20 percent slopes (6.9 percent); with other types of soil consisting of less than five percent each (U.S. Department of Agriculture [USDA] 2019a; Figure 3.5-4; Table 3.5-1). The Melvin silt loam, frequently flooded soil has a hydric rating of 100 percent and the Lindell silt loam, zero to two percent slopes, occasionally flooded and Taft silt loam, zero to two percent slopes soils have hydric ratings of one to 33 percent. Hydric soils are formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part. Hydric rating is an indicator of the percentage of a map unit that meets the criteria for hydric soils (USDA 2019a).

The Bodine series soils consist of very deep, somewhat excessively drained, gravelly soils that formed in residuum weathered from cherty limestone. These soils are on sharply dissected uplands with slopes ranging from five to 70 percent. These soils are primarily in forested areas, but small, cleared areas are used mostly for pasture. The Lindell series soils consist of very deep, moderately well drained soils that formed in loamy alluvium. These soils are on the floodplains of rivers, creeks, and smaller streams with slopes ranging from zero to three percent. These soils are used for growing corn, soybeans, hay, and pasture. The Maury series soils consist of very deep, well drained, moderately permeable soils that formed in silty material over residuum weathered from phosphatic limestone. These soils are on uplands with slopes commonly from zero to 12 percent but ranging to 20 percent. These soils are used for pasture and for crops such as burley tobacco, corn, small grains, and alfalfa. The Melvin series soils consist of very deep, poorly drained soils formed in silty alluvium. These soils are on floodplains and in upland depressions with slopes ranging from zero to two percent. These soils, where previously drained, are used for corn, sorghum, soybeans, and hay. Many areas are used for wetland wildlife habitat (USDA 2021).

Prime Farmland

The term “prime farmland” is assigned by the USDA to land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops, and is also available for such uses. The Farmland Protection Policy Act (FPPA; 7 U.S.C. § 4201 et seq.), requires federal agencies to consider the adverse effects of their actions on prime or unique farmland. Farmland subject to FPPA requirements does not have to be currently used for cropland. The land can be forested land, pastureland, cropland, or other land, but it cannot be water or urban built-up land. The purpose of the FPPA is “to minimize the extent to which federal programs contribute to the unnecessary and irreversible conversion of farmland to nonagricultural uses.” FPPA does not authorize federal agencies to regulate the use of private or non-federal land, or in any way affect the property rights of owners.

Based on soils data obtained from the USDA Web Soil Survey, approximately 587 acres (24.6 percent) of the CUF Reservation are designated as prime farmland, as illustrated in Figure 3.5-5. Table 3.5-2 describes the soil types, including those classified as prime farmland, located on the CUF Reservation.

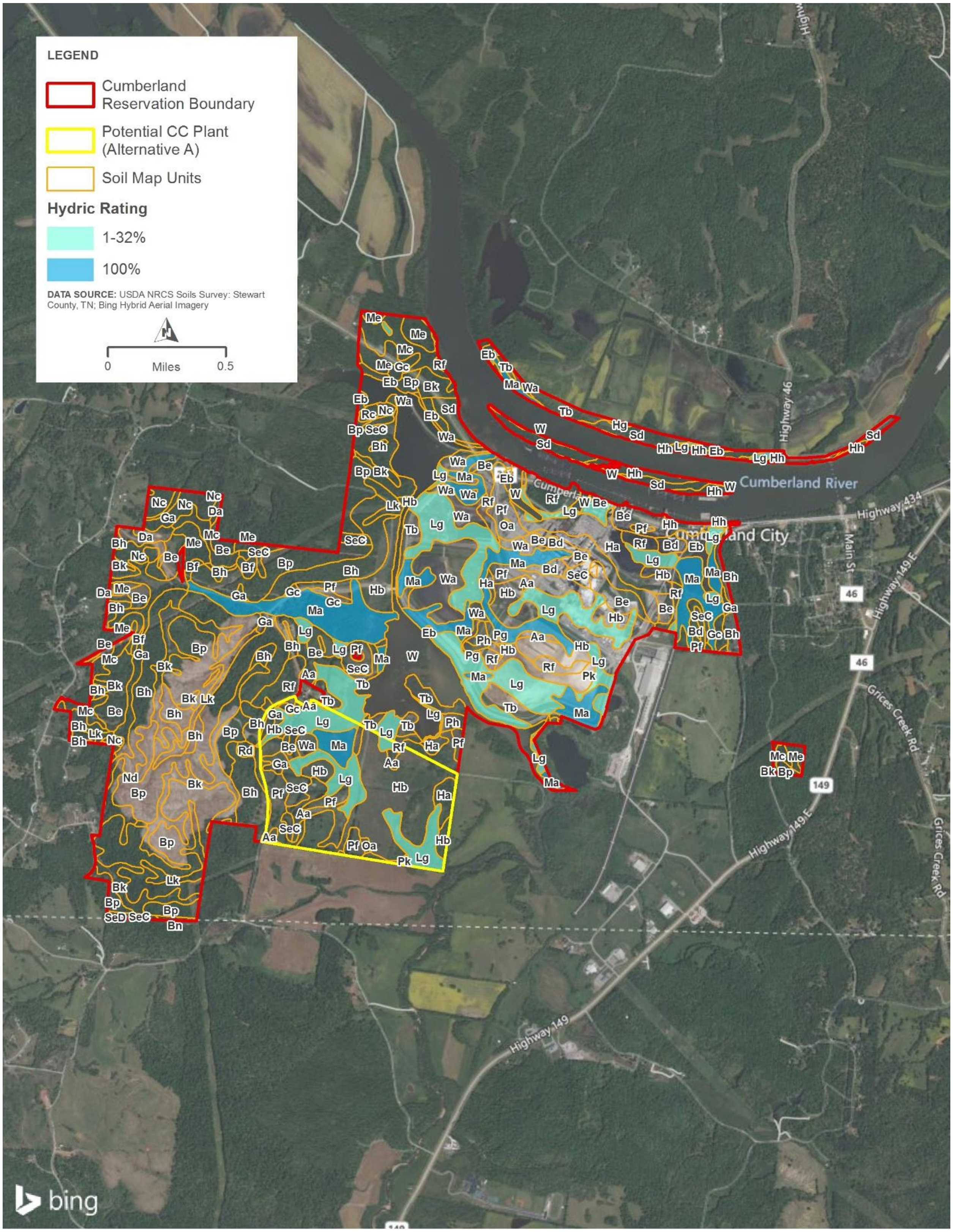

Figure 3.5-4. Soils on the CUF Reservation

Table 3.5-1. Soils on the CUF Reservation

Soil Map Unit Symbol	Soil type	Farmland classification	Hydric Rating	Area (acres)	Percentage of area
Aa	Nolin silt loam, occasionally ponded	All areas are prime farmland	0	34.0	1.4%
Bd	Sengtown gravelly silt loam, 12 to 20 percent slopes, severely eroded	Not prime farmland	0	16.7	0.7%
Be	Sengtown gravelly silt loam, 12 to 20 percent slopes	Not prime farmland	0	100.2	4.2%
Bf	Sengtown gravelly silt loam, 30 to 60 percent slopes	Not prime farmland	0	7.0	0.3%
Bh	Bodine gravelly silt loam, 12 to 20 percent slopes	Not prime farmland	0	164.0	6.9%
Bk	Bodine gravelly silt loam, 5 to 12 percent slopes	Not prime farmland	0	96.8	4.1%
Bn	Bodine gravelly silt loam, 20 to 40 percent slopes	Not prime farmland	0	1.5	0.1%
Bp	Bodine gravelly silt loam, 20 to 40 percent slopes	Not prime farmland	0	342.4	14.3%
Da	Dickson silt loam, 5 to 12 percent slopes	Not prime farmland	0	13.3	0.6%
Eb	Egam silty clay loam, occasionally flooded	All areas are prime farmland	0	27.9	1.2%
Ga	Greendale cherty silt loam, undulating phase	All areas are prime farmland	0	0.3	<0.1%
Ga	Humphreys gravelly silt loam, 2 to 5 percent slopes	All areas are prime farmland	0	43.3	1.8%
Gc	Trace silt loam, 2 to 5 percent slopes	All areas are prime farmland	0	12.0	0.5%
Ha	Maury silty clay loam, 12 to 20 percent slopes, eroded	Not prime farmland	0	53.0	2.2%
Hb	Maury silty clay loam, 5 to 12 percent slopes, eroded	Not prime farmland	0	205.4	8.6%
Hg	Sequatchie fine sandy loam, 2 to 5 percent slopes	All areas are prime farmland	0	0.9	<0.1%
Hh	Nolin silt loam, occasionally flooded	All areas are prime farmland	0	29.0	1.2%
Lg	Lindell silt loam, 0 to 2 percent slopes, occasionally flooded	All areas are prime farmland	4	258.4	10.8%
Lk	Lobelville silt loam, occasionally flooded	All areas are prime farmland	0	33.8	1.4%
Ma	Melvin silt loam, frequently flooded	Not prime farmland	100	186.1	7.8%
Mc	Mountview silt loam, 5 to 12 percent slopes, eroded	Not prime farmland	0	47.5	2.0%

Soil Map Unit Symbol	Soil type	Farmland classification	Hydric Rating	Area (acres)	Percentage of area
Me	Sengtown silt loam, 12 to 20 percent slopes	Not prime farmland	0	50.2	2.1%
Mf	Mountview silt loam, 5 to 12 percent slopes	Not prime farmland	0	0.6	<0.1%
Nc	Hawthorne gravelly silt loam, 12 to 20 percent slopes	Not prime farmland	0	43.5	1.8%
Nd	Sugargrove gravelly silt loam, 5 to 12 percent slopes	Not prime farmland	0	19.7	0.8%
Oa	Newark silt loam, occasionally ponded	Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season	0	3.8	0.2%
Pf	Byler silt loam, 5 to 12 percent slopes, eroded	Not prime farmland	0	84.6	3.5%
Pg	Armour silt loam, 12 to 20 percent slopes	Not prime farmland	0	4.4	0.2%
Ph	Armour silt loam, 5 to 12 percent slopes	Not prime farmland	0	8.6	0.4%
Pk	Armour silt loam, 2 to 5 percent slopes, eroded	All areas are prime farmland	0	18.6	0.8%
Rc	Sengtown-Gullied land complex, 12 to 20 percent slopes	Not prime farmland	0	3.1	0.1%
Rd	Dickson-Gullied land complex, 2 to 12 percent slopes	Not prime farmland	0	2.8	0.1%
Sd	Staser fine sandy loam, occasionally flooded	All areas are prime farmland	0	47.9	2.0%
SeC	Sengtown gravelly silt loam, 5 to 12 percent slopes	Not prime farmland	0	60.4	2.5%
SeD	Sengtown gravelly silt loam, 12 to 20 percent slopes	Not prime farmland	0	1.0	<0.1%
SeF	Sengtown gravelly silt loam, 30 to 60 percent slopes	Not prime farmland	0	0.1	<0.1%
Ta	Taft silt loam, 0 to 2 percent slopes	Not prime farmland	4	0.8	<0.1%
Tb	Gumdale silt loam, rarely flooded	Not prime farmland	0	62.0	2.6%
W	Water	Not prime farmland	0	162.7	6.8%
Wa	Wolftever silt loam, 1 to 5 percent slopes, occasionally flooded	All areas are prime farmland	0	77.1	3.2%
	Total Prime Farmland			587	24.6%

Source: USDA 2019b

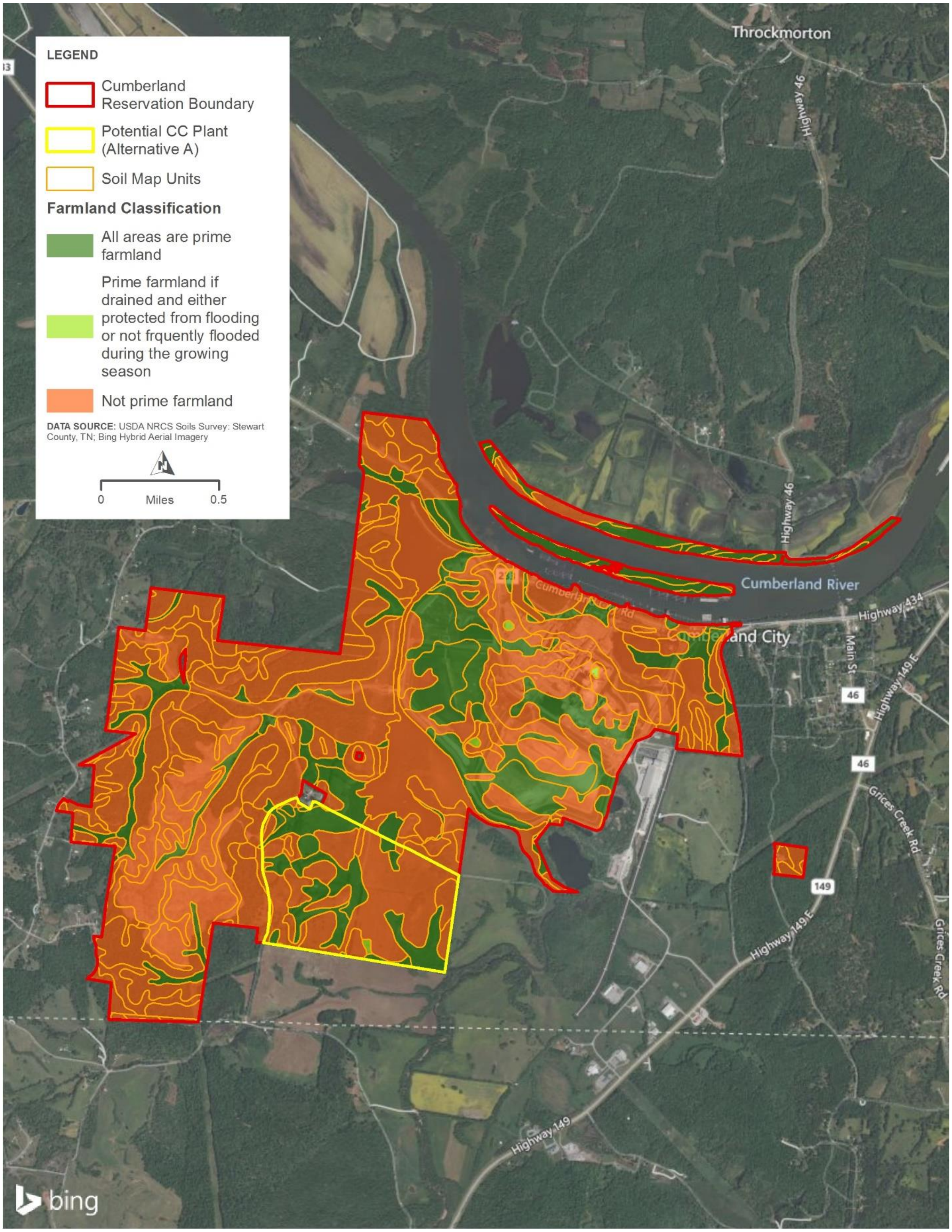

Figure 3.5-5. Soils classified as prime farmland on the CUF Reservation

3.5.1.1.2 Alternative A

3.5.1.1.2.1 Proposed CC Plant

The proposed CC plant site and transmission line corridors would be located within the CUF Reservation. Therefore, the affected environment for geology, soils, and farmlands is as described in Section 3.5.1.1.1.

3.5.1.1.2.2 Natural Gas Pipeline Lateral Corridor

TGP has identified an option to generally locate a new pipeline along an existing TVA transmission system corridor, which would result in fewer environmental effects than constructing on land that had not been previously disturbed. The potential corridor for the 32-mile-long new natural gas pipeline lateral is generally located adjacent to an existing TVA transmission line extending from Dickson County, Tennessee, through Houston County, and terminating at the proposed CC plant in Stewart County, Tennessee (Figure 2.1-6). The following descriptions of resources within the pipeline corridor are based on the assumption that the corridor is 200 feet wide. While typical pipeline corridors are 100-feet and 50-feet wide for construction and operation, respectively, TVA’s analysis uses a more conservative, 200-foot-wide corridor in this EIS.

Geology

The proposed natural gas pipeline lateral corridor lies in the Western Highland Rim Physiographic Province of Tennessee as described in Section 3.5.1.1.1.

Paleontology

The paleontology associated with the 32-mile pipeline corridor is generally the same as described in Section 3.5.1.1.1.

Geological Hazards

The geological hazards associated with the 32-mile pipeline corridor are generally the same as described in Section 3.5.1.1.1. The corridor is generally located on low undulating terrain. No significant slopes are present within several miles; therefore, landslides are not a potential risk.

Hazards resulting from geological conditions may be encountered in the case of sinkholes. Central Tennessee is predominantly located over limestone bedrock that is susceptible to erosion and the creation of sinkholes. Based on the finalized location of the natural gas pipeline lateral corridor, sinkholes could be a minimal to moderate risk.

Soils

Fifty-nine soil types have been mapped on the 1,124-acre natural gas pipeline lateral corridor and the majority are composed of Sengtown gravelly silt loam, 30 to 60 percent slopes (18.9 percent); Sengtown gravelly silt loam, five to 12 percent slopes (18.1 percent); Sengtown gravelly silt loam, 12 to 20 percent slopes (15.8 percent); and Hawthorne-Sulphura association, 20 to 60 percent slopes (7.8 percent); with other types of soil consisting of less than three percent each (USDA 2019a; Figure 3.5-6; Table 3.5-2). The Melvin silt loam frequently flooded and Robertsville silt loam soils have a hydric rating of 100 percent and the Lindell silt loam, zero to two percent slopes, occasionally flooded and Taft silt loam, zero to two percent slopes soils have hydric ratings of one to 33 percent.

The Sengtown series soils consist of very deep, well drained, moderately permeable soils that formed in residuum weathered from cherty limestone. These soils are on uplands with slopes ranging from two to 60 percent. These soils are used for pasture, hay, small grain, tobacco, and corn. The Hawthorne series soils consist of moderately deep, somewhat excessively drained soils that formed in residuum of interbedded siltstone and cherty limestone. These soils are on uplands with slopes ranging from five to 70 percent. These soils are used for pasture or hay. The Sulphura series soils consist of moderately deep, somewhat excessively drained soils that formed in residuum of interbedded siltstone, limestone, and shale. These soils are on highly dissected uplands with slopes ranging from five to 75 percent. These soils are used for pasture (USDA 2021).

Prime Farmland

Based on soils data obtained from the USDA Web Soil Survey, approximately 230.7 acres (20.5 percent) of the natural gas pipeline lateral corridor are designated as farmland of local importance and approximately 195.4 acres (17.4 percent) are designated as prime farmland, as illustrated in Figure 3.5-7. Table 3.5-2 describes the soil types, including those classified as prime farmland, located within the natural gas pipeline lateral corridor.

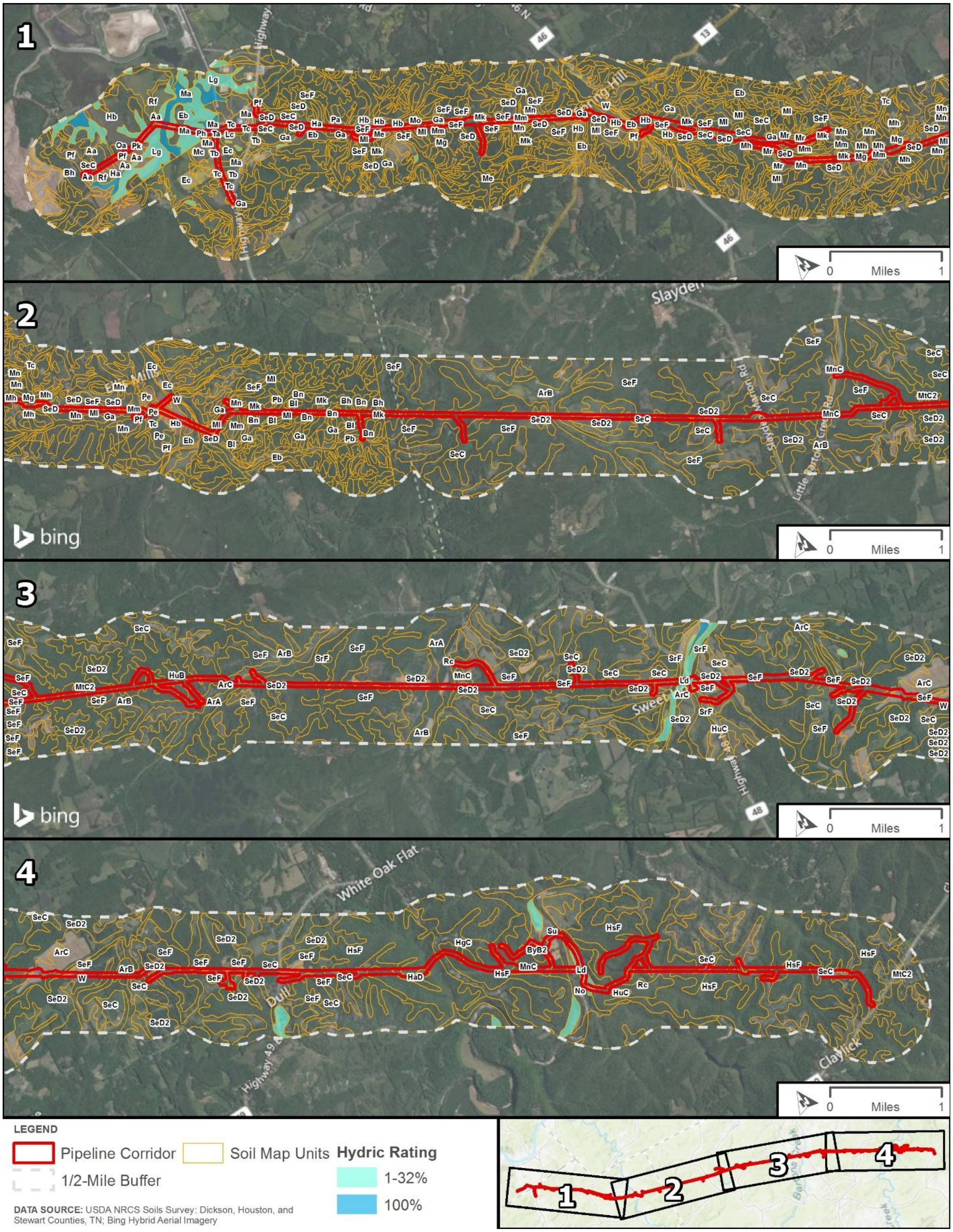

Figure 3.5-6. Soils on the Natural Gas Pipeline Corridor

Table 3.5-2. Soils on the Natural Gas Pipeline Corridor

Soil Map Unit Symbol	Soil type	Farmland classification	Hydric Rating	Area (acres)	Percentage of area
Aa	Nolin silt loam, occasionally ponded	All areas are prime farmland	0	2.4	0.2%
ArA	Armour silt loam, 0 to 2 percent slopes, gravelly substratum, occasionally flooded	All areas are prime farmland	0	10.6	0.9%
ArB	Armour silt loam, 2 to 5 percent slopes, gravelly substratum	All areas are prime farmland	0	24.9	2.2%
ArC	Armour silt loam, 5 to 12 percent slopes	Not prime farmland	0	16.5	1.5%
Bh	Bodine gravelly silt loam, 5 to 12 percent slopes	Not prime farmland	0	3.3	0.3%
Bl	Bodine gravelly silt loam, 12 to 20 percent slopes	Not prime farmland	0	7.6	0.7%
Bn	Bodine gravelly silt loam, 20 to 40 percent slopes	Not prime farmland	0	12.5	1.1%
ByB2	Byler silt loam, 2 to 5 percent slopes, eroded	All areas are prime farmland	0	10.3	0.9%
Eb	Egam silty clay loam, occasionally flooded	All areas are prime farmland	0	1.9	0.2%
Eb	Ennis cherty silt loam	All areas are prime farmland	0	8.8	0.8%
Ec	Ennis silt loam	All areas are prime farmland	0	10.0	0.9%
Ga	Greendale cherty silt loam, undulating phase	All areas are prime farmland	0	30.5	2.7%
Ha	Humphreys gravelly silt loam, 2 to 5 percent slopes	All areas are prime farmland	0	2.3	0.2%
Ha	Maury silty clay loam, 12 to 20 percent slopes, eroded	Not prime farmland	0	0.2	<0.1%

Soil Map Unit Symbol	Soil type	Farmland classification	Hydric Rating	Area (acres)	Percentage of area
HaD	Hawthorne gravelly silt loam, 12 to 20 percent slopes	Not prime farmland	0	6.4	0.6%
Hb	Humphreys silt loam	All areas are prime farmland	0	24.6	2.2%
Hb	Maury silty clay loam, 5 to 12 percent slopes, eroded	Not prime farmland	0	7.2	0.6%
HgC	Hawthorne-Sugargrove complex, 5 to 12 percent slopes	Not prime farmland	0	8.2	0.7%
HsF	Hawthorne-Sulphura association, 20 to 60 percent slopes	Not prime farmland	0	87.4	7.8%
HuB	Humphreys gravelly silt loam, 2 to 5 percent slopes	All areas are prime farmland	0	4.1	0.4%
HuC	Humphreys gravelly silt loam, 5 to 12 percent slopes	Not prime farmland	0	3.3	0.3%
Lc	Lobelville silt loam	All areas are prime farmland	0	0.2	<0.1%
Ld	Lindell silt loam, 0 to 2 percent slopes, occasionally flooded	All areas are prime farmland	4	21.1	1.8%
Ma	Maury silt loam, eroded rolling shallow phase	Not prime farmland	0	5.7	0.5%
Ma	Melvin silt loam, frequently flooded	Not prime farmland	100	6.5	0.6%
Mc	Mercer silt loam, eroded rolling phase	Not prime farmland	0	2.2	0.2%
Me	Mountview silt loam, 2 to 5 percent slopes	All areas are prime farmland	0	4.5	0.4%
Mf	Mountview silt loam, eroded undulating phase	All areas are prime farmland	0	0.3	<0.1%

Soil Map Unit Symbol	Soil type	Farmland classification	Hydric Rating	Area (acres)	Percentage of area
Mg	Mountview silt loam, 5 to 12 percent slopes	Not prime farmland	0	3.5	0.3%
Mh	Mountview silt loam, eroded rolling phase	Not prime farmland	0	6.8	0.6%
Mk	Mountview silt loam, rolling shallow phase	Not prime farmland	0	24.5	2.2%
Ml	Mountview silt loam, eroded, rolling shallow phase	Not prime farmland	0	24.7	2.2%
Mm	Mountview silt loam, hilly shallow phase	Not prime farmland	0	10.0	0.9%
Mn	Mountview silt loam, eroded hilly shallow phase	Not prime farmland	0	25.1	2.2%
MnC	Minvale gravelly silt loam, 5 to 12 percent slopes	Farmland of local importance	0	16.8	1.5%
Mo	Mountview silty clay loam, severely eroded rolling phase	Not prime farmland	0	1.5	0.1%
Mp	Mountview silty clay loam, severely eroded rolling shallow phase	Not prime farmland	0	1.5	0.1%
Mr	Mountview silty clay loam, severely eroded hilly shallow phase	Not prime farmland	0	5.8	0.5%
MtC2	Mountview silt loam, 5 to 12 percent slopes, eroded	Farmland of local importance	0	10.3	0.9%
No	Nolin silt loam, occasionally flooded	All areas are prime farmland	0	6.2	0.6%
Oa	Newark silt loam, occasionally ponded	Prime farmland if drained and either protected from flooding or not frequently flooded during	0	<0.1	<0.1%

Soil Map Unit Symbol	Soil type	Farmland classification	Hydric Rating	Area (acres)	Percentage of area
		the growing season			
Pa	Paden silt loam, eroded undulating phase	All areas are prime farmland	0	3.0	0.3%
Pb	Paden silt loam, eroded rolling phase	Not prime farmland	0	2.7	0.2%
Pd	Pickwick silt loam, undulating phase	All areas are prime farmland	0	4.0	0.4%
Pe	Pickwick silt loam, eroded undulating phase	All areas are prime farmland	0	6.7	0.6%
Pf	Byler silt loam, 5 to 12 percent slopes, eroded	Not prime farmland	0	4.3	0.4%
Pf	Pickwick silt loam, eroded rolling phase	All areas are prime farmland	0	6.4	0.6%
Pk	Armour silt loam, 2 to 5 percent slopes, eroded	All areas are prime farmland	0	3.5	0.3%
Ra	Robertsville silt loam	Not prime farmland	100	1.6	0.1%
Rc	Rock outcrop, very steep	Not prime farmland	0	5.5	0.5%
Rf	Sengtown-Rock outcrop complex, 20 to 60 percent slopes	Not prime farmland	0	4.6	0.4%
SeC	Sengtown gravelly silt loam, 5 to 12 percent slopes	Farmland of local importance	0	203.6	18.1%
SeC	Sengtown gravelly silt loam, 5 to 12 percent slopes	Not prime farmland	0	7.5	0.6%
SeD	Sengtown gravelly silt loam, 12 to 20 percent slopes	Not prime farmland	0	177.4	15.8%
SeF	Sengtown gravelly silt loam, 30 to 60 percent slopes	Not prime farmland	0	212.5	18.9%

Soil Map Unit Symbol	Soil type	Farmland classification	Hydric Rating	Area (acres)	Percentage of area
Su	Sullivan silt loam, occasionally flooded	All areas are prime farmland	0	4.6	0.4%
Ta	Taft silt loam, 0 to 2 percent slopes	All areas are prime farmland	4	0.8	0.1%
Tb	Talbott-Pickwick silt loam, eroded rolling phase	Not prime farmland	0	9.5	0.8%
Tc	Tigrett silt loam	All areas are prime farmland	0	3.7	0.3%
W	Water	Not prime farmland	0	1.6	0.1%
	Total Farmland of Local Importance			**230.7**	**20.5%**
	Total Prime Farmland			**195.4**	**17.4%**

Source: USDA 2019b

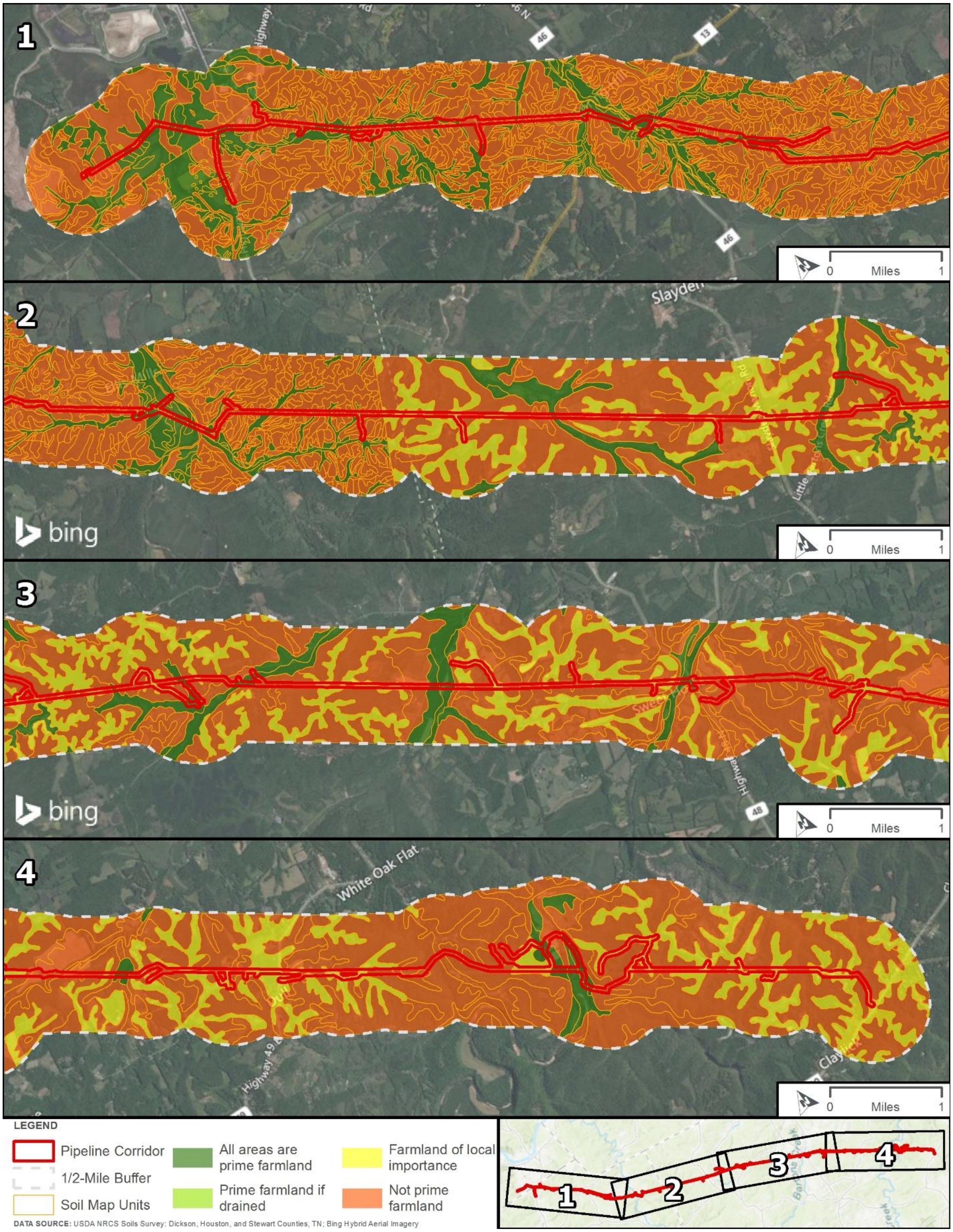

Figure 3.5-7. Soils classified as prime farmland on the proposed natural gas pipeline lateral corridor

3.5.1.1.3 Alternative B

3.5.1.1.3.1 Johnsonville Reservation

Geology

The Johnsonville Reservation lies in the Western Highland Rim Physiographic Province of Tennessee which is characterized by rolling hills and incised valleys. Underlying bedrock of the region is chiefly Mississippian to Ordovician-age limestone, chert, shale, siltstone and sandstone (Luther 2018; Griffith et al. 1997). The Project site is primarily underlain by alluvial deposits of the Tennessee River which are characterized by sand, silt, clay, and gravel between 20 and 60 feet thick. Portions of the Project site are underlain by the Fort Payne Formation and Chattanooga Shale. The Fort Payne Formation is characterized by bedded chert, calcareous, and dolomitic sandstone with minor lenses of limestone and shale with an average thickness of 250 feet. The Chattanooga Shale is characterized as black carbonaceous shale and fissile with an average thickness of 20 feet (Greene et al. 2000; Hardeman et al. 1966).

Paleontology

The paleontology associated with the Johnsonville Reservation is generally the same as described in Section 3.5.1.1.1.

Geological Hazards

The geological hazards associated with the Johnsonville Reservation are generally the same as described in Section 3.5.1.1.1. The site is currently developed and generally located on low undulating terrain. No significant slopes are present within several miles; therefore, landslides are not a potential risk. Hazards resulting from geological conditions may be encountered in the case of sinkholes. Central Tennessee is located over predominantly limestone bedrock that is susceptible to erosion and the creation of sinkholes; therefore, the Johnsonville Reservation has a minimal to moderate risk for sinkholes.

Soils

Four soil types have been mapped on the 106-acre proposed CT plant site on the Johnsonville Reservation and the majority are composed of Paden silt loam, eroded (79.1 percent) and Melvin silty clay loam (10.6 percent); and Paden silt loam (8.8 percent); with one other type of soil consisting of less than one percent (USDA 2019b), as summarized in Table 3.5-3 and illustrated in Figure 3.5-8. The Melvin silty clay loam soil has a hydric rating of 100 percent.

The Paden series soils consist of very deep, moderately well drained soils with a fragipan in the subsoil that formed in silty material and the underlying older alluvium or residuum. These soils are on stream terraces with slopes ranging from zero to 12 percent. These soils are used for growing cotton, corn, soybeans, hay, and pasture. The Melvin series soils consist of very deep, poorly drained soils formed in silty alluvium. These soils are on floodplains and in upland depressions with slopes ranging from zero to two percent. These soils, where previously drained, are used for corn, sorghum, soybeans, and hay. Many areas are used for wetland wildlife habitat (USDA 2021).

Prime Farmland

Based on soils data obtained from the USDA Web Soil Survey, approximately 10.1 acres (9.5 percent) of the proposed CT plant site are designated as prime farmland, as illustrated in Figure 3.5-9. However, it should be noted that these soils classified as prime farmland are previously disturbed and developed; therefore, they do not retain their original prime farmland characteristics. Table 3.5-3 describes the soil types, including those classified as prime farmland, located on the proposed CT plant site.

Table 3.5-3. Soils on the proposed CT plant site on the JCT Reservation

Soil Map Unit Symbol	Soil type	Farmland classification	Hydric Rating	Area (acres)	Percentage of area
Mc	Melvin silty clay loam	Not prime farmland	100	11.2	10.6%
Ps	Paden silt loam	All areas are prime farmland	0	9.4	8.8%
Psr	Paden silt loam, eroded	Not prime farmland	0	83.8	79.1%
W	Water	Not prime farmland	0	0.9	0.8%
Wcc	Wolftever silty clay loam, compact	All areas are prime farmland	0	0.7	0.7%
	Total Prime Farmland			**10.1**	**9.5%**

Source: USDA 2019b

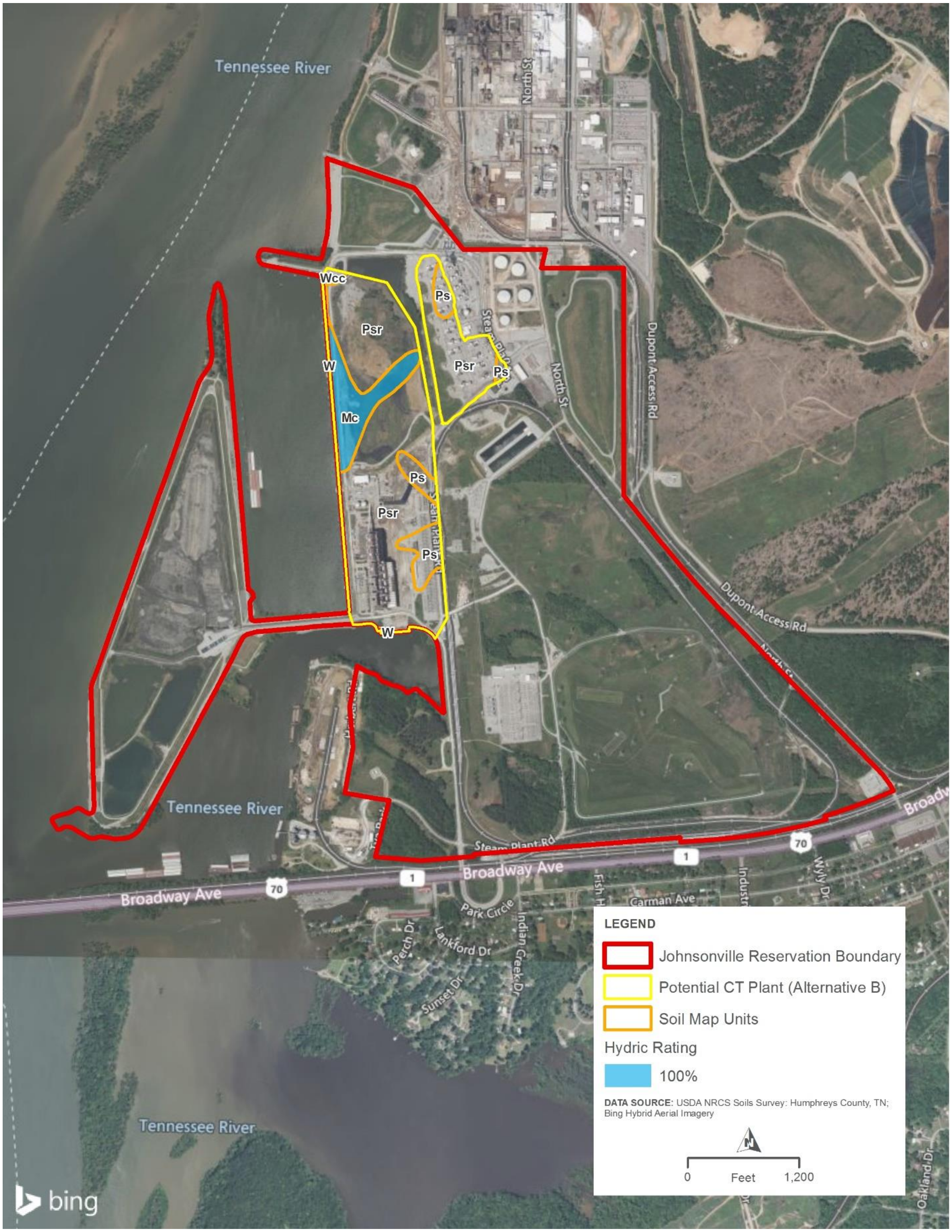

Figure 3.5-8. Soils on the proposed CT plant site on the Johnsonville Reservation

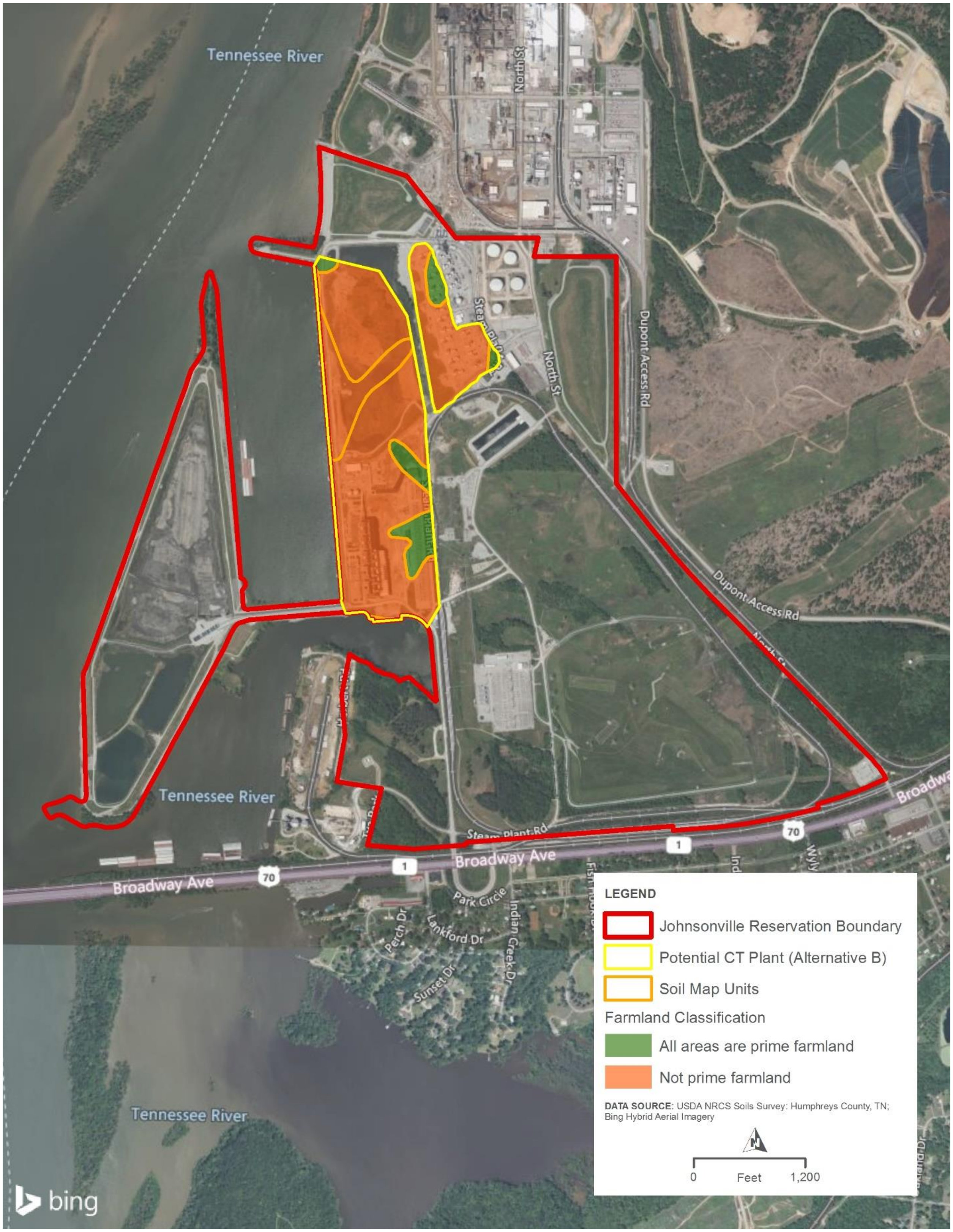

Figure 3.5-9. Soils classified as prime farmland on the proposed CT plant site on the Johnsonville Reservation

3.5.1.1.3.2 Gleason Reservation

Geology

The Project Site lies in the East Gulf Coastal Plain Physiographic Province of Tennessee which is characterized by Tertiary-age sand, silt, clay, and gravel. The Project Site is primarily underlain by loess of the Quaternary age which is characterized by gray to brown clayey and sandy silt with a maximum thickness of 100 feet (Greene et al. 2000; Hardeman et al. 1966).

Paleontology

The paleontology associated with the Gleason Reservation is generally the same as described in Section 3.5.1.1.1.

Geological Hazards

The geological hazards associated with the Gleason Reservation are generally the same as described in Section 3.5.1.1.1. The site is currently developed and generally located on low undulating terrain. No significant slopes are present within several miles; therefore, landslides are not a potential risk.

Hazards resulting from geological conditions may be encountered in the case of sinkholes. Central Tennessee is located over predominantly limestone bedrock that is susceptible to erosion and the creation of sinkholes. Based on the location of Gleason, sinkholes could be a minimal to moderate risk.

Soils

Four soil types have been mapped on the 61.6-acre proposed CT plant site on the Gleason Reservation and are composed of Waverly, Rosebloom silt loams and frequently flooded soils (48.4 percent); Routon silt loam, zero to two percent slopes (27.2 percent); Falaya silt loam, zero to two percent slopes, occasionally flooded, brief duration (24.4 percent); and Lexington silt loam, two to five percent slopes, moderately eroded (less than 0.1 percent) (USDA 2019a; Table 3.5-4; Figure 3.5-10). The Routon silt loam soil has a hydric rating of 100 percent, the Waverly, Rosebloom silt loams have a hydric rating of 66 to 99 percent, and the Falaya silt loam soil has a hydric rating of one to 33 percent.

The Waverly series soils consist of nearly level, very deep, poorly drained, moderately permeable soils that formed in silty alluvium derived from loess. These soils are on floodplains and alluvial fans with slopes ranging from zero to two percent. These soils are used for growing cotton, corn, soybeans, hay crops, or pasture. The Rosebloom series soils consist of deep, poorly drained soils that formed in silty alluvium. These soils are on floodplains with slopes ranging from zero to two percent. These soils are used for pasture or for growing soybeans, hay, or cotton. The Routon series soils consist of very deep, poorly drained, slowly permeable soils that formed in silty alluvium derived from loess. These soils are on low stream terraces and in depressions on uplands with slopes ranging from zero to three percent. These soils are used for pasture or for growing soybeans, corn, milo, and cotton. The Falaya series soils consist of very deep, somewhat poorly drained, moderately permeable soils that formed in silty alluvium from loess. These soils are on level to nearly level wide floodplains with slopes ranging from zero to two percent. These soils are used for growing corn, cotton, soybeans, small grains, pasture, and hay (USDA 2021).

Prime Farmland

Based on soils data obtained from the USDA Web Soil Survey, approximately 15.0 acres (24.4 percent) of the proposed CT plant site are designated as prime farmland, as illustrated in Figure 3.5-11. However, it should be noted that some of these soils classified as prime farmland are previously disturbed and developed; therefore, they do not retain their original prime farmland characteristics. Table 3.5-4 describes the soil types, including those classified as prime farmland, located on the proposed CT plant site.

Table 3.5-4. Soils on the proposed CT plant site on the Gleason Reservation

Soil Map Unit Symbol	Soil type	Farmland classification	Hydric Rating	Area (acres)	Percentage of area
Fb	Falaya silt loam, 0 to 2 percent slopes, occasionally flooded, brief duration	Prime farmland if drained	5	15.0	24.4%
LeB2	Lexington silt loam, 2 to 5 percent slopes, moderately eroded	All areas are prime farmland	0	<0.1	<0.1%
Rt	Routon silt loam, 0 to 2 percent slopes	Not prime farmland	100	16.8	27.2%
WR	Waverly, Rosebloom silt loams and frequently flooded soils	Not prime farmland	90	29.8	48.4%
	Total Prime Farmland			**15.0**	**24.4%**

Source: USDA 2019b

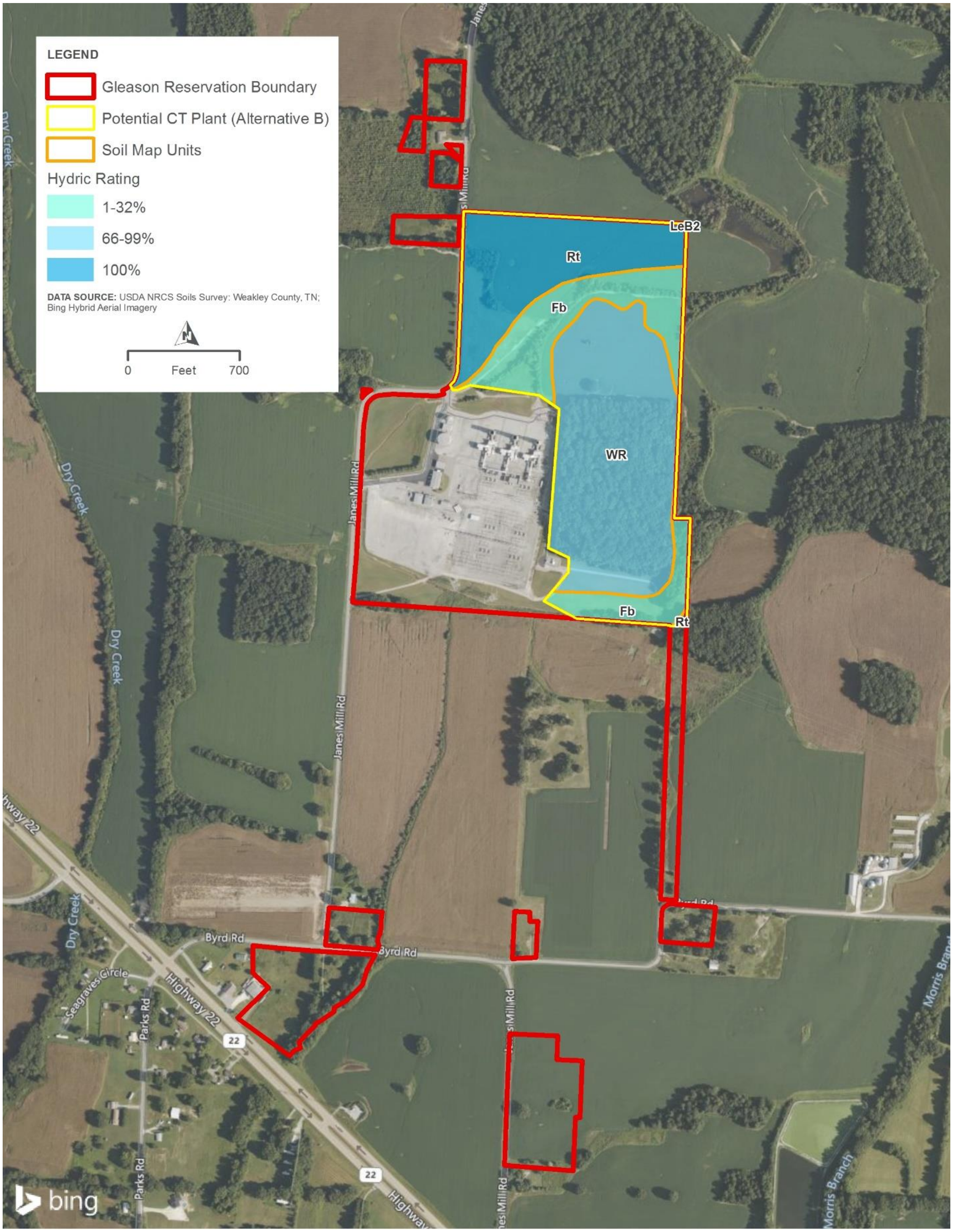

Figure 3.5-10. Soils on the proposed CT plant site on the Gleason Reservation

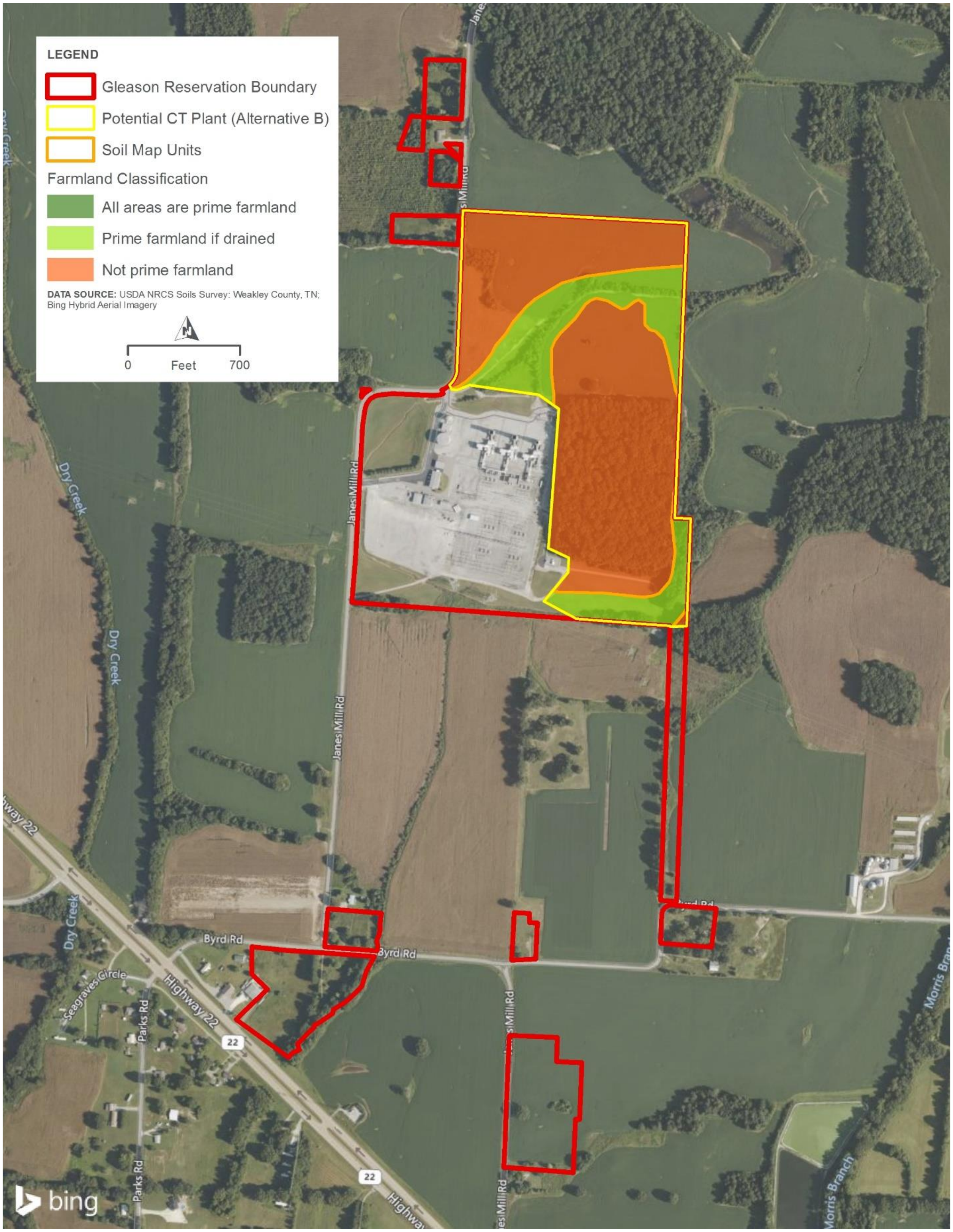

Figure 3.5-11. Soils classified as prime farmland on the proposed CT plant site on the Gleason Reservation

3.5.1.1.3.3 Transmission Corridors

TVA would construct a new approximately 40-mile, 500-kV TL from Weakley to a new station on the Marshall-Cumberland 500-kV TL. For a full list of transmission and electrical system components associated with Alternative B, see Table 2.1-4.

Geology

The transmission corridor lies in the East Gulf Coastal Plain Physiographic Province of Tennessee which is characterized by Tertiary-age sand, silt, clay, and gravel. The transmission corridor is primarily underlain by loess of the Quaternary age which is characterized by gray to brown clayey and sandy silt with a maximum thickness of 100 feet (Greene et al.. 2000; Hardeman et al. 1966).

Paleontology

The paleontology associated with the proposed 40-mile transmission corridor is generally the same as described in Section 3.5.1.1.1.

Geological Hazards

The proposed transmission corridor in Alternative B is located on low undulating terrain. No significant slopes are present within several miles; therefore, landslides are not a potential risk. No volcanoes are present within several hundred miles of the corridor. The transmission corridor is located near the New Madrid Seismic Zone as described in Section 3.5.1.1.1.

Hazards resulting from geological conditions may be encountered in the case of sinkholes. Central Tennessee is located over predominantly limestone bedrock that is susceptible to erosion and the creation of sinkholes. Based on the finalized location of the transmission corridor, sinkholes could be a minimal to moderate risk.

Soils

Based on soils data obtained from the USDA Web Soil Survey, the majority of the soils in the transmission corridor are mapped as Loring, Smithdale, Falaya, Feliciana, and Collins series soils. The Loring series soils consist of moderately well drained soils with a fragipan that formed in loess. These soils are on level to strongly sloping uplands and stream terraces with slopes ranging from zero to 20 percent. These soils are used for growing cotton, small grains, soybeans, hay, and pasture. The Smithdale series soils consist of very deep, well drained, moderately permeable soils that formed in thick beds of loamy marine sediments. These soils are on ridge tops and hill slopes in dissected uplands of the Southern Coastal Plain and in the Western Coastal Plain with slopes ranging from one to 60 percent. These soils are used for growing pasture and a few areas are cropped to corn, cotton, soybeans, and small grains. The Falaya series soils consist of very deep, somewhat poorly drained, moderately permeable soils that formed in silty alluvium from loess. These soils are on level to nearly level wide floodplains with slopes ranging from zero to two percent. These soils are used for growing corn, cotton, soybeans, small grains, pasture, and hay. The Feliciana series soils consist of very deep, well drained, moderately permeable soils that formed in the Peoria loess deposits more than 48 inches in thickness. These soils are on terraces and uplands of the Southern Coastal Plain with slopes ranging from zero to 40 percent. These soils are used for growing soybeans, small grains, hay, and pasture. The Collins series soils consist of very deep, moderately well drained, moderately permeable soils that formed in silty alluvium. These soils are on floodplains of streams in the Southern Mississippi Valley Silty Uplands with slopes ranging from zero to two percent. These soils are used for growing cotton, corn, soybeans, small grains, pasture, and hay crops (USDA 2021).

Prime Farmland

Based on soils data obtained from the USDA Web Soil Survey, approximately 350 acres (36 percent) of the transmission corridor are designated as prime farmland (USDA 2019b).

3.5.1.1.4 Alternative C

3.5.1.1.4.1 Middle Tennessee TVA Power Service Area

TVA anticipates that a portion of the solar facilities proposed under Alternative C will need to be physically located in the Middle Tennessee region in order to offset transmission system upgrades that may be required following the retirement of CUF. Power from these facilities would typically be delivered by direct connection to TVA's transmission system or via interconnections with local power companies that distribute power from TVA.

Geology

The Project Sites would be generally located within central Tennessee, which lies within the Cumberland Plateau, Highland Rim, and Nashville Basin Physiographic Provinces and Areas.

The Cumberland Plateau lies between the Ridge and Valley and Highland Rim and reaches elevations between 600 to 3,000 feet in elevation. It is comprised of Pennsylvania age conglomerate, sandstone, siltstone, and shale and Mississippian to Ordovician age limestone, dolomite, and shale.

The Highland Rim section is a plateau characterized by rolling hills to flat areas in the northwest and southeast which lies between the Cumberland Plateau and Gulf Coastal Plain. Bedrock in the area is Mississippian limestones, chert, shale and sandstone. Underlying bedrock of the region is chiefly Mississippian to Ordovician-age limestone, chert, shale, siltstone, and sandstone (Luther 2018; Griffith et al. 1997).

The Central Basin has an elevation of approximately 200 feet below the surrounding Highland Rim. Bedrock in the area is flat-lying limestone. Karst is well developed in parts of both the Highland Rim and the Nashville Basin (Greene et al. 2000; Hardeman et al. 1966).

Paleontology

The paleontology associated with central Tennessee is generally the same as described in Section 3.5.1.1.1.

Geological Hazards

Geological hazards can include landslides, volcanoes, earthquakes/seismic activity, and subsidence/sinkholes. No volcanoes are present within several hundred miles of central Tennessee.

Landslides have a higher likelihood in areas with increased slope and decreasing vegetative cover. Landslides can be initiated by rainfall, snowmelt, changes in water level, stream erosion, changes in groundwater, earthquakes, disturbance by human activities, or any combination of these activities.

Sinkholes can occur where the rock below the land surface is a carbonate rock such as a limestone or dolomite, as well as in salt beds, and other rocks that can naturally be dissolved by groundwater circulating through them, such as gypsum. The process typically can take many years to decades to form, and as the rock dissolves, spaces and caverns develop underground. Land over sinkholes may stay intact until there is not enough support for the land above the spaces. Then a sudden collapse of the land surface can occur. These collapses can vary greatly in size and shape (Kaufmann 2007). Alternative C would occur near the New Madrid Seismic Zone, as described in Section 3.5.1.1.1.

Soils

As specific sites have not yet been determined for evaluation under this alternative, typical effects of solar facility project activities on soils are described under Section 3.2.

Prime Farmland

Approximately 23 percent of the Middle Tennessee TVA PSA is classified as prime farmland (USDA 2019b). An additional one percent would be classified as prime farmland if drained or protected from flooding. Trends in recent decades show an increase in developed land, mostly through conversion of farmland. As specific sites have not yet been determined for evaluation under this alternative, typical effects of solar and transmission project activities on prime farmland are listed under Section 3.2 and 3.3.

3.5.1.2 Environmental Consequences

3.5.1.2.1 The No Action Alternative

Under the No Action Alternative, current operations would continue. TVA would implement the planned actions related to the current and future management and storage of CCRs at CUF, which have either been reviewed or will be in subsequent NEPA analysis. There would be no direct or indirect effects to geology, soils, or prime farmland.

3.5.1.2.2 Retirement, Decommissioning, Decontamination, and Deconstruction of CUF Plant

Under all Action Alternatives, TVA would retire, decommission, decontaminate, and deconstruct the CUF units and site. These activities would affect geology and soil resources. Removal of the fossil plant and associated structures with controlled explosives would result in vibrations at the surface in the immediate vicinity of the facility when they are felled. Buildings within the deconstruction boundary would be deconstructed and decontaminated to a depth of three feet below grade, which would generate vibrations throughout the course of deconstruction of the buildings and grading and backfilling of the facility. Due to the small size of the subsurface disturbances and existing industrial development of the site, only minor direct effects to potential subsurface geological resources are anticipated.

3.5.1.2.2.1 Environmental Justice Considerations

Effects to geology and soil resources that would occur as a result of CUF coal facility retirement and D4 activities are not anticipated to have disproportionate and adverse environmental and human health effects on EJ populations in the CUF Reservation EJ study area. These effects would be minor and limited to the TVA-owned CUF Reservation, where no populations are present and EJ populations are removed by some distance (Figure 3.4-3).

3.5.1.2.3 Alternative A

3.5.1.2.3.1 Construction and Operation of CC Plant at CUF

Geology and Paleontology

Under Alternative A, minor effects to geology could occur. Foundations for equipment anticipated for the proposed CC Plant would be excavated. Transmission structures are typically driven or drilled into the ground to shallow depths. Due to the small size of the subsurface disturbances, only minor direct effects to potential subsurface geological resources are anticipated. Should paleontological resources be exposed during site construction (i.e., grading, directional drilling, trenching, and foundation placement) or operation activities, a paleontological expert would be consulted to determine the nature of the paleontological resources, recover these resources, analyze the potential for additional effects, and develop and implement a recovery plan/mitigation strategy.

Geologic Hazards
Based on regional data, the potential for minor seismic activity exists due to Alternative A's proximity to the New Madrid Seismic Zone. The facilities would be designed to comply with applicable seismic standards. In the unlikely event of seismic activity, it would likely cause minor effects to the Project site and equipment on the site based on construction activities meeting state and federal earthquake/seismic guidelines. No other geologic hazards are anticipated.

Soils
Vegetation clearing, grading and other site preparation activities associated with the construction of the CC plant have the potential to disturb soil stability and increase erosion. The CC plant would occupy approximately 30 acres, and an additional 10 to 20 acres on site would be used for equipment laydown and mobilization. Subsurface piles or other deep foundation system would be installed to support foundations for plant components, as required.

TL upgrades may require improvements to existing access roads and may also require replacing TL structures. 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 to minimize the potential for increased soil erosion and runoff.

Effects to soils associated with grading and site preparation activities would be temporary and mitigated through BMPs identified in Section 2.3. Stockpiled soils from the area where vegetation clearing and grading occurs, including topsoil, would be appropriately replaced following cut-and-fill activities to the extent practical and, therefore, would likely not require any off-site or on-site hauling of soils. However, some minimal off-site or on-site hauling may be necessary.

Although not anticipated, should borrow material be required for project site activities, small quantities of sand and gravel aggregate may be obtained from local, permitted, off-site sources. The creation of new impervious surface, in the form of the CC plant facility and associated components, would result in a minor increase in stormwater runoff and potential increase in soil erosion. Operation of the CC plant would not affect soils.

Prime Farmland
Based on soils data obtained from the USDA Web Soil Survey, there are a total of approximately 97.4 acres of prime farmland with the potential to be impacted by the proposed CC plant. Within a five-mile radius of the CC plant site, approximately 12,562.1 acres (21.3 percent) have soils classified as prime farmland. Any minor loss of on-site prime farmland soils is not significant when compared to the amount of prime farmland within the surrounding region. Effects on prime farmland soils would be reduced using appropriate BMPs to control erosion and limit sediment and soil from leaving the CC plant site.

The Alternative A transmission line upgrade activities could result in minor effects to prime farmland. Upgrades are typically performed to increase the electrical capacity of the existing TLs and would include the items listed in Section 2.1.3.2.2. 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 to minimize the potential for increased soil erosion and runoff. Areas such as pasture, agricultural fields, or lawns would be returned to their former condition. Since the exact locations and acreage of the TL upgrade activities are not known at this time, TVA compiled a list of typical effects from construction activities related to transmission projects in the 2019 IRP EIS (TVA 2019b). A total of 298 projects were included in the review. The review determined that TL construction did not result in prime farmland conversion while 64 percent of new substation and switching station construction resulted in prime farmland conversion. TL upgrade activities resulted in no prime farmland conversions and an average of 6.9 acres (ranging from zero to 29.1 acres) of prime farmland were used for new substation and switching stations.

3.5.1.2.3.2 Construction and Operation of Natural Gas Pipeline

Geology and Paleontology

Under Alternative A, minor effects to geology could occur. The 32-mile natural gas pipeline lateral would be buried through a combination of trenching, boring, and directional drilling. Minor direct effects to potential subsurface geological resources are anticipated. Should paleontological resources be exposed during site construction (i.e., grading, directional drilling, trenching, and foundation placement) or operation activities, TGP will follow an Unanticipated Discoveries Plan submitted to FERC that establishes procedures if previously unidentified cultural resources, such as archaeological sites, historic features, or human remains, are encountered during Project construction.

Geologic Hazards

Based on regional data, the potential for minor seismic activity exists due to the proposed pipeline's proximity to the New Madrid Seismic Zone. The pipeline would be designed to comply with applicable seismic standards. In the unlikely event of seismic activity, it would likely cause minor effects to the Project site and equipment on the site based on construction compliance with state and federal earthquake/seismic guidelines. Since the pipeline will be located underground, the risk of seismic effects affecting the pipeline are minimal. Karst terrain could affect portions of the pipeline but is unlikely to affect the entire corridor. No other geologic hazards are anticipated.

Soils

Construction activities associated with the natural gas pipeline lateral such as clearing, grading, trench excavation, installation, backfilling, and the movement of construction equipment along its route have the potential to disturb soil stability and increase erosion.

Effects to soils associated with grading and site preparation activities would be temporary and mitigated through BMPs identified in Section 2.3. Stockpiled soils from the area where vegetation clearing and grading occurs, including topsoil, would be appropriately replaced following cut-and-fill activities to the extent practical and, therefore, will likely not require any off-site or on-site hauling of soils. However, some minimal off-site or on-site hauling may be necessary. Operation of the pipeline would not affect soils.

Prime Farmland

Based on soils data obtained from the USDA Web Soil Survey, there are a total of approximately 230.7 acres of farmland of local importance and approximately 195.4 acres of prime farmland with the potential to be impacted by the proposed natural gas pipeline lateral. Within a five-mile radius of the natural gas pipeline lateral corridor, approximately 37,076.4 acres (14.7 percent) have soils classified as farmland of local importance and approximately 38,600 acres (15.3 percent) have soils classified as prime farmland. Any minor loss of on-site prime farmland soils is not significant when compared to the amount of prime farmland within the surrounding region. Effects on prime farmland soils would be reduced using appropriate BMPs to control erosion and limit sediment and soil from leaving the project sites.

3.5.1.2.3.3 Environmental Justice Considerations

Effects to geology and soil resources that would occur as a result of the proposed CC plant, natural gas pipeline lateral, and transmission line activities are not anticipated to have disproportionate and adverse human health or environmental effects on EJ populations in the CUF Reservation or pipeline corridor EJ study areas. Minor geologic hazards, such as those presented by karst features, are distributed across the pipeline corridor EJ study area and would not pose a particular risk to EJ populations. Effects to soils would be minor, with some effects occurring within a TVA-owned reservation, where no populations exist and EJ populations are removed (Figure 3.4-3). Effects occurring as a result of pipeline activities, while still minor, would be outside of TVA-owned reservations. Runoff and erosion may increase, but these effects would be experienced by both EJ and other populations; as such, these effects are not anticipated to be disproportionate.

Permanent or temporary loss of prime farmland resources as a result of construction of the natural gas pipeline lateral may have effects on EJ populations that currently farm the corridor where the pipeline would be constructed. Such effects would occur where EJ populations and prime farmland soils co-exist. These effects are not anticipated to be disproportionate on EJ populations, however, as the same effects would occur to other farming populations along the pipeline corridor.

3.5.1.2.4 Alternative B

3.5.1.2.4.1 Construction and Operation of CT Plant at Johnsonville Reservation

Geology and Paleontology

Under Alternative B, minor effects to geology could occur. Foundations for equipment anticipated for the CT plant at JCT would be excavated. Transmission structures are typically driven or drilled into the ground to shallow depths. Minor excavations would also be required for construction of a substation and other transmission components. Due to the small sizes of the subsurface disturbances, only minor direct effects to potential subsurface geological resources are anticipated.

Should paleontological resources be exposed during site construction (i.e., grading and foundation placement) or operation activities, a paleontological expert would be consulted to determine the nature of the paleontological resources, recover these resources, analyze the potential for additional effects, and develop and implement a recovery plan/mitigation strategy.

Geologic Hazards

Based on regional data, the potential for minor seismic activity exists due to the proximity of the CT plant to the New Madrid Seismic Zone. The CT plant at JCT would be designed to comply with applicable seismic standards. In the unlikely event of seismic activity, it would likely cause minor effects to the sites. No other geologic hazards are anticipated.

Hazards resulting from geological conditions may be encountered in the case of sinkholes. Central Tennessee is located over limestone bedrock that is susceptible to erosion and the creation of sinkholes. Based on the finalized location of the transmission corridor, sinkholes could be a minimal to moderate risk.

Soils

Grading and site preparation activities associated with the construction of the CT plant have the potential to disturb soil stability and increase erosion. The CT plant would occupy less than 10 acres. Approximately 33 acres from previous projects, inclusive of temporary use area, could be designated for light uses such as trailer placement or light vehicle parking during construction. While this area would be newly disturbed, when construction is complete, it would be allowed to revert to its original use.

Effects to soils associated with grading and site preparation activities would be temporary and mitigated through BMPs identified in Section 2.3. Any stockpiled soils from the area where vegetation clearing and grading occurs, including topsoil, would be appropriately replaced following cut-and-fill activities to the extent practical and, therefore, will likely not require any off-site or on-site hauling of soils. However, some minimal off-site or on-site hauling may be necessary.

Although not anticipated, should borrow material be required for project site activities, small amounts of sand and gravel aggregate may be obtained from local, off-site sources. The creation of new impervious surface, in the form of the CT plant facility and associated components, would result in a minor increase in stormwater runoff and potential increase in soil erosion. Operation of the CT plant would not affect soils.

Prime Farmland

Based on soils data obtained from the USDA Web Soil Survey, there are a total of approximately 10.1 acres of prime farmland within the proposed CT plant site. However, the proposed CT plant site is currently disturbed and developed land. Within a five-mile radius of the CT plant site, approximately 12,746.5 acres (22.5 percent) have soils classified as prime farmland. Any minor loss of on-site prime farmland soils is not significant when compared to the amount of prime farmland within the surrounding region and it should be noted that these on-site soils classified as prime farmland are previously disturbed and developed; therefore, they do not retain their original prime farmland characteristics. Therefore, the construction and operation of the CT plant under Alternative B would result in negligible effects to prime farmland. Effects on prime farmland soils would be reduced using appropriate BMPs and properly engineered storm water management to control erosion and limit sediment and soil from leaving the CT plant site.

3.5.1.2.4.2 Construction and Operation of CT Plant at Gleason Reservation

Geology and Paleontology

Under Alternative B, minor effects to geology could occur at Gleason and would be comparable to those described for the JCT Reservation in Section 3.5.1.2.4.1.

Geologic Hazards

Under Alternative B, the potential for minor seismic activity exists at Gleason and would be comparable to those described for the JCT Reservation in Section 3.5.1.2.4.2.

Soils

Grading and site preparation activities associated with the construction of the CT plant have the potential to disturb soil stability and increase erosion. The CT plant would occupy less than 10 acres. There are 60 acres available on the Gleason site for laydown and temporary use areas that are currently undeveloped. While this area would be newly disturbed, when construction is complete, it would be allowed to revert to its original use.

Effects to soils associated with grading and site preparation activities would be temporary and mitigated through BMPs identified in Section 2.3. Any stockpiled soils from the area where vegetation clearing and grading occurs, including topsoil, would be appropriately replaced following cut-and-fill activities to the extent practical and, therefore, will likely not require any off-site or on-site hauling of soils. However, some minimal off-site or on-site hauling may be necessary.

Although not anticipated, should borrow material be required for project site activities, small quantities of sand and gravel aggregate may be obtained from local, off-site sources. The creation of new impervious surface, in the form of the CT plant facility and associated components, would result in a minor increase in stormwater runoff and potential increase in soil erosion. Operation of the CT plant would not affect soils.

Prime Farmland
Based on soils data obtained from the USDA Web Soil Survey, there are a total of approximately 15.0 acres of prime farmland with the potential to be impacted by the proposed CT plant. Within a five-mile radius of the CT plant site, approximately 22,838.6 acres (41.7 percent) have soils classified as prime farmland. Any minor loss of on-site prime farmland soils is not significant when compared to the amount of prime farmland within the surrounding region and it should be noted that these on-site soils classified as prime farmland are previously disturbed and developed; therefore, they do not retain their original prime farmland characteristics. Therefore, the construction and operation of the CT plant under Alternative B would result in negligible effects to prime farmland. Effects on prime farmland soils would be reduced using appropriate BMPs to control erosion and limit sediment and soil from leaving the CT plant site.

3.5.1.2.4.3 Transmission and Other Components

Geology and Paleontology
Under Alternative B, minor effects to geology could occur. Transmission structures are typically driven or drilled into the ground to shallow depths. Minor excavations would also be required for construction of a substation and other transmission components. Due to the small sizes of the subsurface disturbances, only minor direct effects to potential subsurface geological resources are anticipated.

Should paleontological resources be exposed during site construction (i.e., grading and foundation placement) or operation activities, a paleontological expert would be consulted to determine the nature of the paleontological resources, recover these resources, analyze the potential for additional effects, and develop and implement a recovery plan/mitigation strategy.

Geologic Hazards
Based on regional data, the potential for minor seismic activity exists due to the proximity of the 40-mile transmission line to the New Madrid Seismic Zone. The transmission line would be designed to comply with applicable seismic standards. In the unlikely event of seismic activity, it would likely cause minor effects the sites. No other geologic hazards are anticipated.

Hazards resulting from geological conditions may be encountered in the case of sinkholes. Central Tennessee is located over limestone bedrock that is susceptible to erosion and the creation of sinkholes. Based on the finalized location of the transmission corridor, sinkholes could be a minimal to moderate risk.

Soils

A 40-mile transmission line would have minor effects on soils. While an exact route is not known, minimal ground disturbance is expected in these areas and the area would be revegetated using native, low-growing plant species after required TL work is completed to minimize the potential for increased soil erosion and runoff. Areas such as pasture, agricultural fields, or lawns would be returned to their former condition. Since the exact locations and acreage of the TL route is not known at this time, TVA compiled a list of typical effects from construction activities related to transmission projects in the 2019 IRP EIS (TVA 2019b). A total of 298 projects were included in the review. The review determined that an average of 13.1 acres were used per TL mile, and an average of 10.8 acres were used for new substations and switching stations. Effects to soils associated with TL upgrades would be temporary and mitigated through BMPs identified in Section 2.3.

Prime Farmland

A 40-mile transmission line would have minimal permanent effects on prime farmland. While an exact route is not known, minimal ground disturbance is expected in these areas and the area would be revegetated using native, low-growing plant species after required TL work is completed to minimize the potential for increased soil erosion and runoff. Areas such as pasture, agricultural fields, or lawns would be returned to their former condition. Since the exact locations and acreage of the TL route is not known at this time, TVA compiled a list of typical effects from construction activities related to transmission projects in the 2019 IRP EIS (TVA 2019b). A total of 298 projects were included in the review. The review determined that TL construction did not result in prime farmland conversion.

3.5.1.2.4.4 Environmental Justice Considerations

Effects to geology, soil, and prime farmland resources that would occur as a result of the proposed CT facilities and transmission line activities are not anticipated to have disproportionate and adverse human health or environmental and human health effects on EJ populations. Geology, soil, and prime farmland effects that would occur as a result of the proposed CT facilities on the TVA-owned reservations would be minor and limited to the TVA-owned reservations, where no populations are settled. Thus, no effects would occur to EJ populations.

Minor effects to geology, soil, and prime farmland resources may occur as a result of off-site transmission line activities, where effects would occur to EJ and non-EJ populations. Minor geologic hazards such as presented by karst features are distributed across middle Tennessee , non-EJ farming populations along the TL corridor.

3.5.1.2.5 Alternative C

3.5.1.2.5.1 Construction and Operation of Solar and Storage Facilities

Geology and Paleontology

Under Alternative C, minor effects to geology could occur from the construction of solar and storage facilities. The solar arrays would be supported by steel piles, which would either be driven or drilled into the ground to a depth of seven to 15 feet. If needed, on-site sedimentation basins would be shallow and, to the extent feasible, utilize the existing terrain without requiring extensive excavation. The PV panels would be connected with underground wiring placed in trenches approximately three- to four-feet deep. Minor excavations would also be required for construction of the facility substations, each medium voltage transformer, and the concrete pads for the storage systems.

Geologic Hazards

Landslides are possible in areas of increased slopes and decreased vegetative cover. Landslide potential will be evaluated prior to construction of Alternative C, and its components will not be built in areas subject to landslides. Hazards resulting from geological conditions may be encountered in the case of sinkholes. Central Tennessee is located over limestone bedrock that is susceptible to erosion and the creation of sinkholes. Based on the finalized location of the solar and storage facilities and associated transmission lines, sinkholes could be a minimal to moderate risk.

Based on regional data, the potential for minor seismic activity exists due to Alternative C's proximity to the New Madrid Seismic Zone. The solar and storage facilities and transmission lines would be designed to comply with applicable seismic standards. In the unlikely event of seismic activity, it would likely cause only minor effects to the Project sites and equipment on the sites based on construction compliance with state and federal earthquake/seismic guidelines.

Soils

Under Alternative C, the construction and operation of 3,000 MW of solar and 1,700 MW of battery storage at various sites largely within the Middle Tennessee region would result in minor effects to soils. Since the exact project locations for solar and/or storage projects are not known at this time, according to the analysis described in Section 3.2, an average of 7.3 acres (ranging from 2.00 to 17.95 acres per MW) were required for PV projects. Based on this average acreage requirement, the 3,000 MW of solar generating capacity would occupy about 21,900 acres. Approximately 10 to 15 acres per 40 MW would be required for the storage facilities. Based on this requirement, the 1,700 MW of battery storage would occupy about 425 to 638 acres.

Grading and clearing activities associated with the construction of the solar and battery storage facilities would cause minor, localized increases in erosion and sedimentation, resulting in minor effects to soils. Effects to soils associated with grading and clearing activities would be temporary and mitigated through BMPs identified in Section 2.3. Soils would be temporarily affected due to construction activities and tree-trimming and other maintenance activities during operation. Any stockpiled soils from the area where vegetation clearing and grading occurs, including topsoil, would be appropriately replaced following cut-and-fill activities to the extent practical and, therefore, will likely not require any off-site or on-site hauling of soils. However, some minimal off-site or on-site hauling may be necessary.

Although not anticipated, should borrow material be required for project site activities, small amounts of sand and gravel aggregate may be obtained either from established local, off-site sources. The creation of new impervious surface, in the form of the foundations for the central inverters, BESS, and other associated components, would result in a minor increase in stormwater runoff and potential increase in soil erosion. Planting of native and/or non-invasive vegetation, including plants attractive to pollinators, within the limits of disturbance, along with use of BMPs identified in Section 2.3 would minimize the potential for increased soil erosion and runoff. Following construction, implementation of soil stabilization and vegetation management measures would reduce the potential for erosion effects during site operations.

During operation and maintenance of the solar facilities, minor disturbance could occur to soils. Routine maintenance would include periodic motor replacement; inverter air filter replacement; fence repair; vegetation control; and periodic PV array inspection, repairs, and maintenance. The individual solar facilities could utilize mowing or grazing sheep to manage vegetation within portions of the fenced-in, developed areas not limited by other constraints. Additional fencing for the sheep would be used to limit their movement and manage vegetation growth. Selective spot applications of herbicides may be employed around facilities and structures to control weeds. Herbicides would be applied by a professional contractor or a qualified project technician. These maintenance activities would not result in any adverse effects to soils on the project sites during operations.

Prime Farmland

Under Alternative C, the construction and operation of 3,000 MW of solar and 1,700 MW of battery storage largely at sites within the Middle Tennessee region could result in temporary moderate effects to prime farmland. Following decommissioning of the solar facilities, the majority of the sites could be returned to agricultural use with little reduction in soil productivity or affect to prime farmland/farmland of statewide importance. As effects to this resource are temporary and reversible, they are not expected to be significant. Since the exact project locations for solar and/or storage projects are not known at this time, TVA has compiled a list of typical effects associated with the construction and operation of solar PV facilities within the TVA PSA. This list was compiled by reviewing the EAs and EISs for PV projects, ranging from community scale to utility scale, over the past several years, 2014 through 2021. A total of 31 projects were included in the review. The review determined that 81 percent of PV projects resulted in prime farmland conversion.

Approximately 23 percent of the Middle Tennessee TVA PSA is classified as prime farmland (USDA 2019b). An additional one percent would be classified as prime farmland if drained or protected from flooding. Minor loss of on-site prime farmland soils is not significant when compared to the amount of prime farmland within the surrounding region. However, the loss of farmland may result in moderate effects at a more local or county level. Most ground-mounted PV facilities have been constructed on previously cleared, frequently pasture, hayfield, or crop land, and most have required little grading to smooth or level the site. Although construction and operation of the PV facility usually eliminates agricultural production on the site, it typically does not adversely affect soil productivity or the ability to resume agricultural production once the PV facilities are removed. In some cases, the solar site is grazed by sheep or other livestock as a means of managing vegetation growth and is therefore maintained in agriculture. Effects on prime farmland soils would be reduced using appropriate BMPs to control erosion and limit sediment and soil from leaving the project sites. When project locations for solar and/or storage projects are determined, site-specific analyses would consider the potential effects on prime farmland and would be included in future NEPA reviews.

3.5.1.2.5.2 Transmission and Other Components

Geology and Paleontology

Under Alternative C transmission corridor installation, minor effects to geology could occur. Transmission structures associated with Alternative C are similar to those transmission lines constructed for Alternative B, although interconnection for solar facilities would be typically shorter. Due to the small sizes of the subsurface disturbances, only minor direct effects to potential subsurface geological resources are anticipated.

Should paleontological resources be exposed during site construction (i.e., grading and foundation placement) or operation activities, a paleontological expert would be consulted to determine the nature of the paleontological resources, recover these resources, analyze the potential for additional effects, and develop and implement a recovery plan/mitigation strategy.

Soils

Under Alternative C, the transmission line upgrade activities would also result in minor effects to soils. 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 to minimize the potential for increased soil erosion and runoff. Since the exact project locations for solar and/or storage projects and associated TL upgrade activities are not known at this time, according to the analysis described in Section 2.1.5.2.4, an average of 17.73 acres could be impacted due to transmission and electrical system components per solar site. However, effects to soils associated with TL upgrades would be temporary and mitigated through BMPs identified in Section 2.3.

Prime Farmland

Under Alternative C, the transmission line upgrade activities could result in minor effects to prime farmland. Since the exact project locations for solar and/or storage projects and associated TL upgrade activities are not known at this time, TVA compiled a list of typical effects from construction activities related to transmission projects in the 2019 IRP EIS. A total of 298 projects were included in the review. The review determined that TL construction did not result in prime farmland conversion while 64 percent of new substation and switching station construction resulted in prime farmland conversion. TL upgrade activities resulted in no prime farmland conversions and an average of 6.9 acres (ranging from zero to 29.1 acres) of prime farmland were used for new substation and switching stations.

3.5.1.2.5.3 Environmental Justice Considerations

Effects to geology and soil resources that would occur as a result of the proposed solar facilities and transmission line activities are not anticipated to have disproportionate and adverse human health or environmental effects on EJ populations in the EJ study area for Alternative C, as these effects would be minor and limited to the immediate project sites and transmission line corridors. Temporary or permanent loss of prime farmland resources as a result of construction of the solar facilities and the transmission line activities, if new ROW is required, may have effects on EJ populations that currently farm the sites where the facilities would be constructed. Such effects would occur where EJ populations and prime farmland soils co-exist. These effects are not anticipated to be disproportionate on EJ populations, however, as the same effects would occur to other populations currently farming the affected areas where the facilities would be constructed.

3.5.2 Floodplains

3.5.2.1 Regulatory Framework for Floodplains

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 effects 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. The U.S. Water Resources Council defines "critical actions" as "any activity for which even a slight chance of flooding would be too great" (U.S. Water Resources Council 1978). Critical actions can include facilities producing hazardous materials (such as liquefied natural gas terminals), facilities whose occupants may be unable to evacuate quickly (such as schools and nursing homes), and facilities containing or providing essential and irreplaceable records, utilities, and/or emergency services (such as large power-generating facilities, data centers, museums, hospitals, or emergency operations centers) (TVA 2019b).

EO 13690, *Establishing a Federal Flood Risk Management Standard and a Process for Further Soliciting and Considering Stakeholder Input* was reinstated in May 2021. However, implementation of EO 13690 is still in development at the national level. TVA is working with other federal agencies to develop consistent implementing plans for these EO requirements. When those implementing plans are finalized, TVA would incorporate floodplain analysis with respect to EO 13690, in addition to EO 11988. Depending upon the results of these inter-agency efforts, TVA may update the floodplain implementing plan in subsequent NEPA analysis.

3.5.2.2 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 1 percent chance of flooding in any given year is normally called the 100-year floodplain.

3.5.2.2.1 CUF Reservation

CUF is located along the left descending bank of the Cumberland River between approximately River Mile (RM) 102.5 and RM 104.0, adjacent to Wells Creek from its mouth to about creek mile 2.6. Scott Branch is a tributary of Wells Creek at about Wells Creek mile 1.5.

The 100-year flood elevation at Cumberland River Mile (CRM) 102.8 would be 379.6 feet (TVA 2016a). The drainage area of Wells Creek is approximately 57 square miles (USGS 2017). Because the drainage area of the Cumberland River at Wells Creek is far greater than the drainage area of Wells Creek or Scott Branch, the 100-year flood elevations on the Cumberland River would govern water surface elevations in a 100-year flood. The 100- and 500-year flood elevations on Wells Creek and Scott Branch in the vicinity of CUF would be 379.6 and 385.3 feet, respectively. Portions of the northern part of the demolition boundary (Figure 3.5-12) would be within the 100-year floodplain of the Cumberland River.

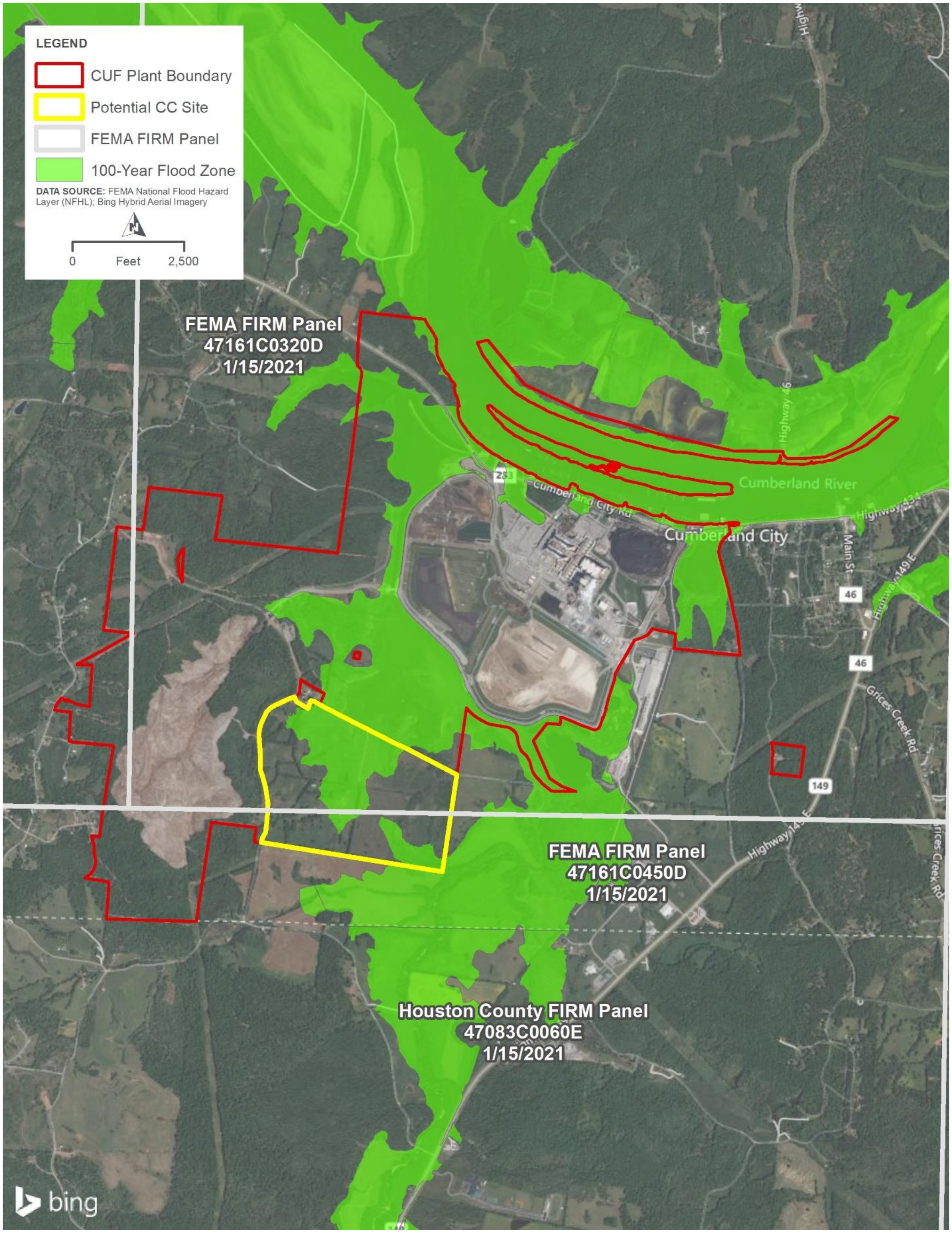

Figure 3.5-12. Flood zones in the vicinity of the CUF Reservation

3.5.2.2.2 Alternative A

3.5.2.2.2.1 Proposed CC Plant Site

Based on GIS mapping, about one-third of the CC plant site would be located within the 100-year floodplain of Wells Creek (Figure 3.5-12). Transmission corridors associated with Alternative A would be located within the CUF Reservation and would cross floodplains associated with Wells Creek and the Cumberland River.

3.5.2.2.2.2 Natural Gas Pipeline Corridor

Based on desktop mapping, the proposed gas pipeline lateral corridor would cross the 100-year floodplains of several streams (Figure 3.5-13). Moving from west to southeast, those streams are listed below:

- 25.8 acres associated with Wells Creek
- 5.1 acres associated with Guices Creek
- 16.2 acres associated with Yellow Creek
- 1.6 acres associated with Little Bartons Creek
- 3.5 acres associated with Dry Hollow Branch
- 2.8 acres associated with Furnace Creek
- 2.5 acres associated with Bartons Creek
- 44.1 acres associated with Jones Creek

TGP is providing detailed mapping of floodplains as part of their Environmental Report to be submitted with their certificate application that will be filed with the FERC for the proposed pipeline. TVA will supplement its analysis as necessary based on this information.

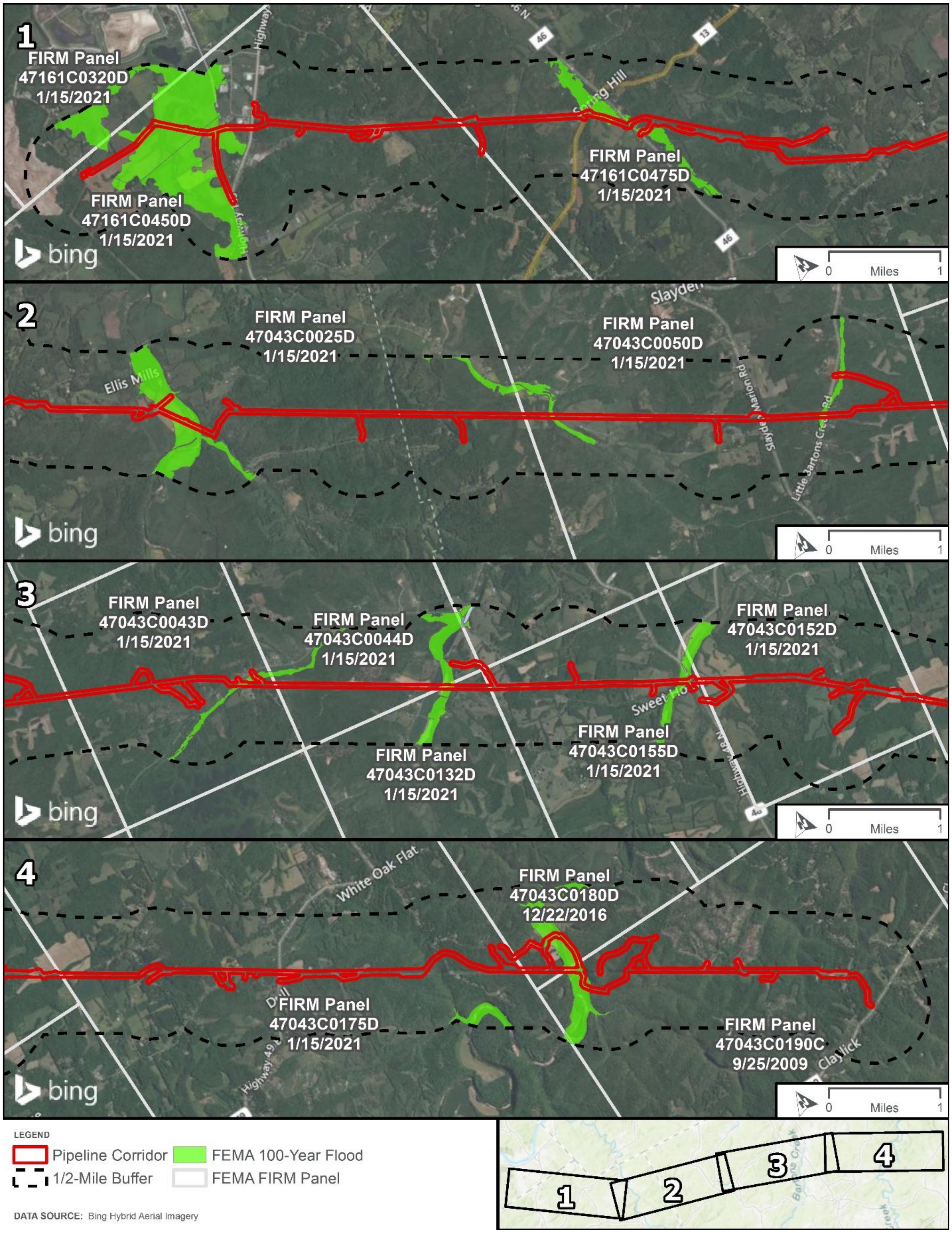

Figure 3.5-13. Flood zones within the proposed natural gas pipeline lateral corridor

3.5.2.2.3 Alternative B

3.5.2.2.3.1 Johnsonville Reservation

The JCT is located on the eastern bank of the Tennessee River, at about Tennessee River Mile 99. At this location, the 100-year flood elevation would be 375.0 feet. Although portions of the land parcel encompassing Ash Impoundment 2 are shown within the 100-year floodplain of the Tennessee River, the ash impoundment itself is protected from Tennessee River flooding up to and exceeding the 500-year flood by the ash pond dike, which has a low crest elevation of about 388 feet (internal TVA data) (Figure 3.5-14). The CT plant site would be located outside the 100-year floodplain of the Tennessee River.

Figure 3.5-14. Flood zones in the vicinity of the JCT Reservation

3.5.2.2.3.2 Gleason Reservation

Gleason is located approximately 0.3 miles south of the Middle Fork Obion River. Approximately 12.3 acres of the northern portion of the proposed CT plant site would be located in the Middle Fork Obion River 100-year floodplain (Figure 3.5-15).

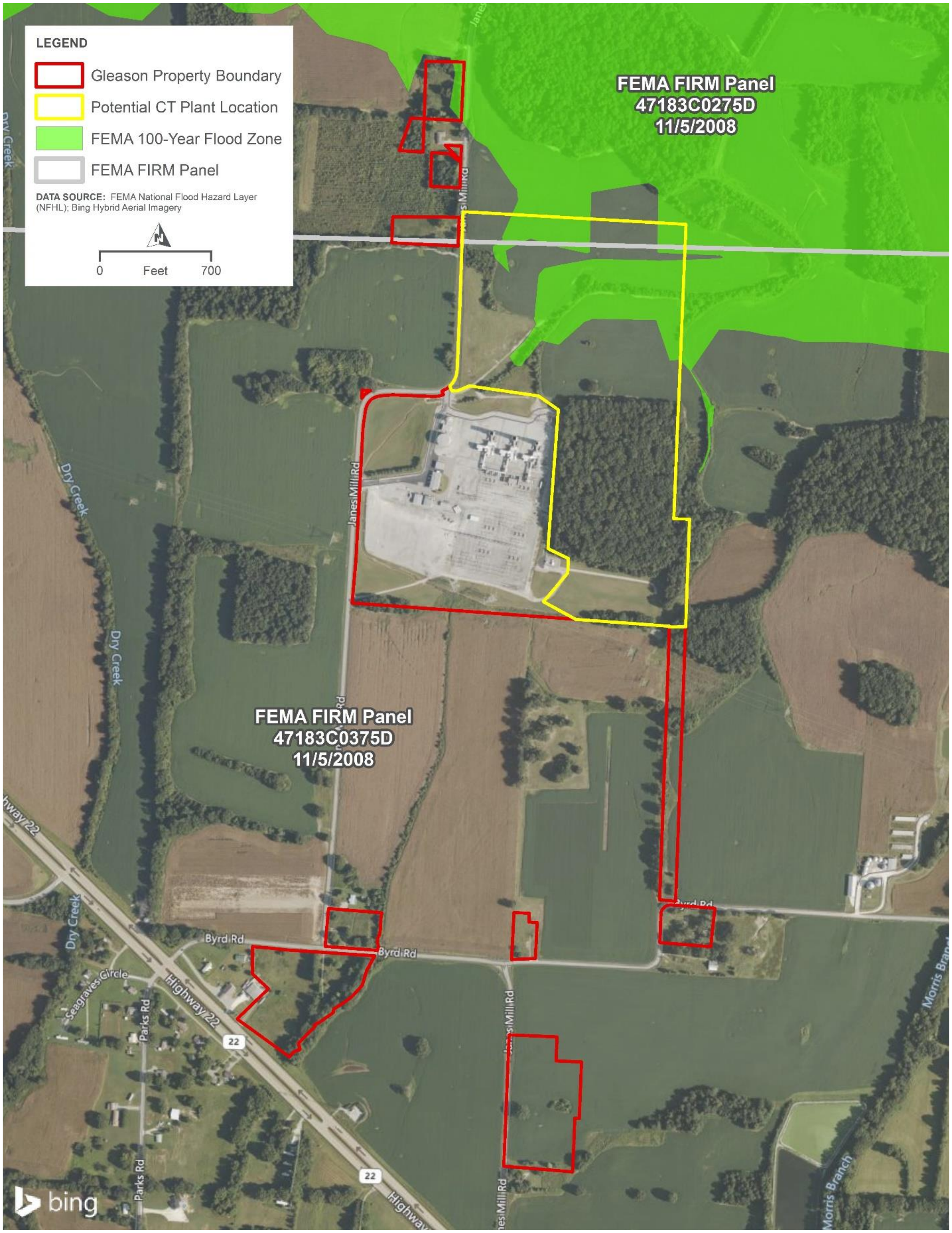

Figure 3.5-15. Flood zones in the vicinity of the Gleason Reservation

3.5.2.2.3.3 Transmission Corridors

Under Alternative B, TVA would construct an approximately 40-mile, 500-kV TL from Weakley to a new station on the Marshall-Cumberland 500 kV TL. The route may encounter the floodplains associated with the following streams and their tributaries: Mud Creek, Cypress Creek, Thompson Creek, and Cane Creek Branch, in Weakley County, Tennessee; as well as Old Town Creek, Walnut Fork Creek, Spring Hill Creek, Bird Creek, North Fork Obion River, Holly Fork Creek, and South Fork Eagle Creek, in Henry County, Tennessee.

3.5.2.2.4 Alternative C

3.5.2.2.4.1 Middle Tennessee TVA Power Service Area

TVA anticipates that a portion of the solar facilities proposed under Alternative C would be located in Middle Tennessee in order to offset transmission system upgrades that may be required following the retirement of CUF as described in further detail in Section 2.1.5. The Tennessee and Cumberland rivers are the two main streams in Middle Tennessee. Major tributaries of the Tennessee River in Middle Tennessee include the Buffalo, Duck and Elk rivers. Major tributaries of the Cumberland River in Middle Tennessee include the Caney Fork, Collins, Harpeth, Obey, Red, South Fork Cumberland, and Stones rivers.

3.5.2.3 Environmental Consequences

3.5.2.3.1 The No Action Alternative

Under the No Action Alternative, TVA would continue current plant operations. TVA would implement all of the planned actions related to the current and future management and storage of CCRs, which have either been reviewed or will be in subsequent NEPA analysis. There would be no direct or indirect effects to floodplains because there would be no physical changes to the current conditions. Flood events greater than the 100-year flood could occur that could inundate the northern portions of the CUF site, including the barge facilities, transfer station B, and silo filling house.

3.5.2.3.2 Retirement, Decommissioning, Decontamination, and Deconstruction of CUF Plant

Most of the CUF Reservation where the existing plant would be decommissioned, decontaminated and deconstructed is located outside of the 100-year floodplain. Portions of CUF in the northern portions of the site, including the barge facilities, are located within the Cumberland River floodplain. Structures and facilities such as laydown areas, haul roads, and staging areas would be constructed and sited, where practicable, outside of the 100-year floodplain. If decommissioning and deconstruction activities or structures must be located in floodplains, these activities would be considered temporary uses of the 100-year flood zone and, therefore, would have no permanent effects on floodplains or floodplain resources. Also, standard BMPs would be employed in order to minimize adverse effects during construction activities. To further minimize adverse effects, decommissioning and deconstruction debris would be disposed of outside 100-year floodplains. Additionally, any flood-damageable equipment or materials located within the 100-year floodplain would be relocated outside the floodplain in advance of a predicted flood. No cumulative effects to floodplains would occur, as RFFA anticipated for CCR management activities on the CUF Reservation would avoid and minimize effects to floodplains and adhere to federal and local floodplain management guidelines.

3.5.2.3.2.1 Environmental Justice Considerations

Effects to floodplains that would occur as a result of CUF coal facility retirement and D4 activities are not anticipated to have disproportionate adverse human health or environmental effects on EJ populations in the CUF Reservation EJ study area. These effects would be minor to moderate and limited to the TVA-owned CUF Reservation. For effects that may be experienced offsite, these would likely not have a disproportionate effect on EJ populations given the distance of the identified low-income populations from the TVA-owned reservation (Figure 3.4-3) and because other populations nearby would experience similar effects.

3.5.2.3.3 Alternative A

3.5.2.3.3.1 Construction and Operation of CC Plant at CUF

The proposed CC Plant construction site includes 102.8 acres of 100-year floodplains (Figure 3.5-12); however, the CC Plant footprint and plant construction is being planned to avoid the 100 year floodplain. Structures and facilities such as laydown areas, haul roads, and staging areas would be constructed and sited, where practicable, outside of the 100-year floodplain. If these activities must be located in the floodplain, they would be considered temporary uses of the 100-year floodplain and, therefore, would have no permanent effects on floodplains or floodplain resources. Also, standard BMPs will be employed in order to minimize adverse effects during construction activities. Additionally, any flood-damageable equipment or materials located within the 100-year floodplain would be relocated outside the floodplain during a flood. No cumulative effects to floodplains would occur.

3.5.2.3.3.2 Construction and Operation of Natural Gas Pipeline

As shown in Figure 3.5-13, the pipeline corridor would cross 100-year floodplains in several places, with potential to affect up to 102 acres within the 100-year floodplain. EO 11988 states that if the only practicable alternative requires siting in a floodplain, the agency shall, prior to taking action, design or modify its action to minimize potential harm to or within the floodplain, and all new construction shall be designed to reduce the risk of flood loss and to minimize the effect of floods on human safety, health, and welfare. Consistent with EO 11988, gas pipeline laterals are considered to be repetitive actions in the 100-year floodplain that should result in minor effects (TVA 1981). The pipeline would be installed through trenching or directional drilling. To minimize adverse effects, any excess fill resulting from this would be disposed of outside 100-year floodplains. Short-term effects may occur as the construction area is restored and re-vegetated. The project would have no significant long-term effect on floodplains or their natural and beneficial values. If a heavy rain event were predicted, special precautions would be taken within the floodplain to minimize effects. Such precautions may include, but are not limited to, removing large construction equipment from the floodplain, temporary stabilization measures where soils are exposed, and maintaining any soil stockpiles outside the boundaries of the floodplain. TGP’s Environmental Report to be submitted with their FERC certificate application will include a detailed analysis of potential floodplain effects associated with the proposed pipeline. This information would be updated in the final EIS and the NEPA review would be supplemented if necessary.

While past/present and RFFAs would occur in proximity to the proposed pipeline, no cumulative effects to floodplains would occur.

3.5.2.3.3.3 Transmission and Other Components

A portion of the area in which the new, short TLs and other transmission system components would be built is within the 100-year floodplain (Figure 3.5-12). Consistent with EO 11988, TLs are considered to be repetitive actions in the 100-year floodplain that should result in minor effects (TVA 1981). The conducting wires of the transmission line would be located well above the 100-year flood elevation. The support structures for the transmission line would not be expected to result in any increase in flood hazard from increased flood elevations or from 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 transmission line location in floodplains are followed.

A new switchyard will be constructed but will be located outside of floodplains, as such, no effects would occur in 100-year floodplains.

3.5.2.3.3.4 Environmental Justice Considerations

Effects to floodplains that would occur as a result of the proposed CC plant, natural gas pipeline lateral, and transmission line activities are not anticipated to have disproportionate adverse human health or environmental effects on EJ populations in the CUF Reservation or pipeline lateral corridor EJ study areas. These effects would be minor, with some effects occurring on a TVA-owned reservation, where no populations exist and EJ populations are removed (Figure 3.4-3). For CC plant- and transmission line-related floodplains effects that may be experienced offsite, these would likely not have a disproportionate effect on EJ populations given the distance of the identified low-income populations from the TVA-owned reservation and because other populations nearby would experience the same effects. Effects occurring as a result of pipeline activities, while still minor, would be outside of TVA-owned reservations. These effects would occur in areas of both EJ and other populations, given the distribution of floodplains and human populations, and as such, these effects are not anticipated to be disproportionate on EJ populations.

3.5.2.3.4 Alternative B

3.5.2.3.4.1 Construction and Operation of CT Plant at JCT Reservation

Consistent with EO 11988, the proposed CT plant site at JCT is located outside of the 100-year floodplains (Figure 3.1.18) and therefore the construction and operation of the CT plant would not affect floodplains. No cumulative effects to floodplains would occur.

3.5.2.3.4.2 Construction and Operation of CT Plant at Gleason Reservation

A portion of the potential CT plant site is within the 100-year floodplain (Figure 3.5-14). Structures and facilities such as laydown areas, haul roads, and staging areas would be constructed, and portions of them could be located within 100-year floodplains. These activities would be considered temporary uses of the 100-year floodplain and, therefore, would have no permanent effects on floodplains or floodplain resources. Also, standard BMPs will be employed in order to minimize adverse effects during construction activities. Additionally, any flood-damageable equipment or materials located within the 100-year floodplain would be relocated outside the floodplain during a flood. No cumulative effects to floodplains would occur.

3.5.2.3.4.3 Transmission and Other Components

The final transmission route has not been determined; however, the TL would avoid 100-year floodplains to the extent possible. would likely cross 100-year floodplains. Consistent with EO 11988, TLs and related support structures are considered to be repetitive actions in the 100-year floodplain that should result in minor effects. The conducting wires of the transmission line would be located well above the 100-year flood elevation. The support structures for the TLs would not be expected to result in any increase in flood hazard from increased flood elevations or from 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 transmission lines located in floodplains are followed.

For any access roads proposed within 100-year floodplains but not floodways, the roads would be constructed such that flood elevations would not increase more than 1.0 foot. For any roads proposed within 100-year floodways, and 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.

A new switchyard will be constructed but will be located outside of floodplains, as such, no effects would occur in 100-year floodplains.

3.5.2.3.4.4 Environmental Justice Considerations

Effects to floodplains that would occur as a result of the proposed CT facilities and transmission line activities are not anticipated to have disproportionate adverse human health or environmental effects on EJ populations. Floodplains effects at the Gleason Reservation would be minor and minimized, as described above, and EJ populations are well removed from the immediate Gleason vicinity (Figure 3.4-7 and Figure 3.4-8) and generally limited in the Gleason Reservation EJ study area (four out of 15 census block groups are low-income and/or minority EJ populations).

Effects to floodplains occurring as a result of transmission line activities, while still minor, would be outside of TVA-owned reservations. Such effects would occur where EJ populations and floodplains co-exist. However, these effects would be temporary and minimized and are not anticipated to be disproportionate on EJ populations, as similar effects would occur where other populations and floodplains co-exist. As such, these effects are not anticipated to be disproportionate.

3.5.2.3.5 Alternative C

3.5.2.3.5.1 Construction and Operation of Solar and Storage Facilities

Under the Proposed Action Alternative C, CUF would be retired and demolished, and a combination of solar and storage facilities would replace the first CUF unit. As specific sites have not yet been determined for evaluation under this alternative, typical effects of solar projects have been listed in Table 3.2-1. The solar and storage facilities would be sited in a manner to avoid floodplains to the extent feasible. If avoidance is not feasible, the flood-damageable components of the solar panels, as well as other flood-damageable structures and facilities sited in floodplains would be located at least one foot above the 100-year flood elevation at that location, and otherwise consistent with local floodplain regulations. Based on a review of typical effects of solar facility construction activities, approximately 0.02 acre of floodplains are impacted per MW of solar facilities, with a range of 0 to 1.8 acres per MW (Table 3.2-1). The addition of 3,000 MW of solar under Alternative C could therefore result in an average of 60 acres of floodplain effects. Floodplain effects are not anticipated for storage facilities as they are typically sited to avoid floodplains. For any roads proposed within 100-year floodplains but not floodways, the roads would be constructed such that flood elevations would not increase more than 1.0 foot. For any roads proposed within 100-year floodways, and 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. If other structures are proposed within 100-year floodplains, they would need to be analyzed in a subsequent environmental review.

Cumulative effects to floodplains may occur under Alternative C with the addition of 10,000 MW of solar identified in the 2019 IRP throughout the TVA PSA. Based on the average of 0.02 linear feet of impact per MW, this would result in 200 acres of additional floodplain effects within the

TVA PSA. Cumulative effects to floodplains would be minimized through proper siting of solar facilities and the use of BMPs, and adherence to local floodplain regulations.

3.5.2.3.5.2 Transmission and Other Components

The final transmission route has not been determined; however, the TL would likely cross 100-year floodplains. Consistent with EO 11988, transmission lines and related support structures are considered to be repetitive actions in the 100-year floodplain that should result in minor effects. The conducting wires of the transmission line would be located well above the 100-year flood elevation. The support structures for the transmission line would not be expected to result in any increase in flood hazard from increased flood elevations or from 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 transmission line location in floodplains are followed.

For any access roads proposed within 100-year floodplains but not floodways, the roads would be constructed such that flood elevations would not increase more than 1.0 foot. For any roads proposed within 100-year floodways, and 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.

Any new switchyards would, to the extent feasible, be located outside of 100-year floodplains. For switchyards proposed within 100-year floodplains, TVA would evaluate the site(s) under the Floodplain No Practicable Alternative analysis and either alter plans to avoid the floodplain or determine that there would be no practicable alternative to locating within the floodplain. If TVA determines that there would be no practicable alternative to locating the facility within the 100-year floodplain, adverse effects will need to be minimized. To minimize adverse effects, the switchyard(s) would be located a minimum of one foot above the 100-year flood elevation at that location for a regular action as well as be consistent with local floodplain regulations.

Cumulative effects to floodplains may occur under Alternative C with the addition of 10,000 MW of solar identified in the 2019 IRP throughout the TVA PSA. Transmission lines associated with this expansion would likely result in floodplain crossings. Cumulative effects to floodplains would be minimized through proper siting of transmission lines, consistency with EO 11988 provided by adhering to the TVA subclass review criteria, and adherence to local floodplain regulations.

3.5.2.3.5.3 Environmental Justice Considerations

Effects to 100-year floodplains that would occur as a result of the proposed solar facilities and transmission line activities are not anticipated to have disproportionate adverse human health or environmental effects on EJ populations in the EJ study area for Alternative C, as these effects would be minor and limited to the immediate project sites and transmission line corridors.

3.6 Water Resources

3.6.1 Groundwater

The Safe Drinking Water Act of 1974 established the sole source aquifer protection program, which 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. This act also established both the Wellhead Protection Program, a pollution prevention and management program used to protect underground sources of drinking water, and the Underground Injection

Control Program to protect underground sources of drinking water from contamination by fluids injected into wells. Several other environmental laws contain provisions aimed at protecting groundwater, including the Resource Conservation and Recovery Act (RCRA), the Comprehensive Environmental Response, Compensation, and Liability Act and the Federal Insecticide, Fungicide, and Rodenticide Act. On April 17, 2015, the USEPA published the Disposal of Coal Combustion Residuals from Electric Utilities final rule (CCR Rule) in the *Federal Register* to provide a comprehensive set of requirements for the safe disposal of CCRs from coal-fired power plants. The CCR Rule addresses the risks of coal ash contaminants migrating into groundwater. The CCR Rule was revised on August 29, 2018 (USEPA 2018).

3.6.1.1 Affected Environment

3.6.1.1.1 CUF Reservation

CUF is located just to the north of the center of the Wells Creek Impact Structure. The center of the impact structure to the south of the plant is mostly overlain by the Wells Creek Embayment. This embayment is low lying and drains into the Cumberland River to the north. Wells Creek drains from the south to the north and borders the southern and western portion of CUF. The potentiometric groundwater surface at the facility appears to be oriented to the south and west towards Wells Creek (TVA 2016b). Most of the soils are fill material around the plant or alluvial soils deposited by Wells Creek and the Cumberland River. The alluvial soils range from 5 to 43 feet in thickness (Law Engineering 1992). Based on the 1992 report, groundwater is present within the alluvial material. The alluvial aquifer consists of water-bearing sand and gravel deposits associated with streams and floodplains.

Bedrock of carbonate formations of the Highland Rim is generally slightly alkaline and high in dissolved solids and hardness. The quality of groundwater from shallow bedrock aquifers is generally soft to moderately hard but may contain elevated concentrations of iron. Most groundwater from the alluvium along the Cumberland River is generally harder and contains more iron than groundwater derived from the bedrock aquifers. TVA, as part of adhering to the Tennessee Division of Solid Waste Management Regulations, has monitored existing onsite wells around the CUF wastewater treatment ponds. Since 2012, monitoring well concentrations have not exceeded groundwater protection standards.

According to USGS, the CUF Reservation overlies the Mississippian carbonate aquifer system. Groundwater within this limestone and dolomite aquifer is confined to partly confined near land surface and may be confined at depth. Water within the aquifer occurs in solution-enlarged openings (fractures, bedding plains, small to large caves). The Ste. Genevieve, Monteagle, St. Louis, and Warsaw Limestones and the Fort Payne Formation are the principal water bearing formations of the Mississippian carbonate aquifer. Approximately 16.63 million gallons per day of water is withdrawn from the Mississippian aquifer for public use. Water obtained from the aquifer contains high levels of calcium carbonate, iron, and sulfate (Burchett and Hollyday 1974; Brahana and Bradley 1986).

Groundwater in the area can be affected by agricultural pumping and local surface water bodies but either flows north toward the Cumberland River or south and west to Wells Creek. Wells Creek ultimately discharges to the Cumberland River. Groundwater levels near the CUF Reservation are largely controlled by the Cumberland River where the surrounding groundwater discharges.

A study conducted in 1990 found that the water table beneath the CUF Reservation ranges from 0 to 40 feet deep with a soil thickness of 0 to 33 feet. The center of the plant overlays karst terrain with a shallow depth to water. Ten water supply wells are located within a one-mile radius of the CUF Reservation. Additionally, one well is located within the CUF Reservation (Foust and Beard 1990). TVA conducts regular groundwater sampling of wells located on the reservation. The most recent sampling event was conducted in July 2021 and TDEC MCL exceedances of arsenic, cobalt, lithium, molybdenum, nickel, radium 226 + radium 228, sulfate, total dissolved solids (TDS), and zinc were detected in at least one well.

3.6.1.1.2 Alternative A

According to USGS, the proposed CC plant site, natural gas pipeline lateral corridor, and transmission structures overlies the Mississippian carbonate aquifer system, as described in Section 3.6.1.1.3.3.

3.6.1.1.3 Alternative B

3.6.1.1.3.1 Johnsonville Reservation

According to USGS, the JCT Reservation overlies the Cretaceous sand aquifer system which consists of the McNairy and Coffee Sands and the Tuscaloosa Formation. Groundwater within this sand aquifer is unconfined in the outcrop area in the vicinity of JCT. Approximately 7 million gallons per day of water is withdrawn from the Cretaceous sand aquifer for public use. Water obtained from the aquifer contains high levels of iron in some areas (Brahana et al. 1986). Groundwater in the area can be affected by agricultural pumping and local surface water bodies, but it is expected to flow west to the Tennessee River.

3.6.1.1.3.2 Gleason Reservation

According to USGS, the Gleason Reservation overlies the Tertiary sand aquifer system. The Tertiary sand aquifer consists of interbedded sand and clay with a thickness range of 100 to 2,000 feet and includes the Jackson, Claiborne, and Wilcox aquifer formations. Groundwater within this aquifer is confined near the Mississippi River and unconfined further east. Approximately 188 million gallons per day of water is withdrawn from the Tertiary sand aquifer for public use (Brahana et al. 1986).

General groundwater quality of the Tertiary aquifer is good to excellent and is classified as an underground drinking water source as defined by the EPA. Groundwater recharge for the aquifer is through rainfall on the outcrops of the aquifer. Groundwater located in the alluvium and terrace deposits overlain by thick loess is generally hard and has high iron and dissolved solid concentrations, while groundwater in the terrace deposit overlain by gravel and thin loess is soft and has low iron and dissolved solid concentrations (Brahana et al. 1986). Groundwater in the area can be affected by agricultural pumping and local surface water bodies but is expected to flow north to the Middle Fork Obion River.

3.6.1.1.3.3 Transmission Corridor

According to USGS, the Alternative B transmission corridor overlies either the Mississippian carbonate aquifer system, the Cretaceous sand aquifer system, or the Tertiary sand aquifer system, depending on location. Groundwater within the Mississippian limestone and dolomite aquifer is the same as described for the CUF Reservation in Section 3.6.1.1.1.

The Cretaceous sand aquifer system consists of the McNairy and Coffee Sands and the Eutaw and Tuscaloosa Formations. Groundwater within this sand aquifer is unconfined in the outcrop area in the vicinity of Johnsonville. Approximately 7 million gallons per day of water is withdrawn from the Cretaceous sand aquifer for public use (Brahana et al. 1986).

General groundwater quality of the Cretaceous aquifer is good within the outcrops and upper parts of the aquifer with more mineralized water in the lower confined part of the aquifer to the west and southwest. Water quality within the McNairy sand unit is typically a bicarbonate water type with high iron concentrations and low dissolved solids. Water quality within the Coffee sand unit is typically a calcium bicarbonate water type with high iron and low dissolved solids with higher sulfate and lower chloride than the Eutaw formation. Water quality within the Eutaw formation is typically a sodium bicarbonate water type with low dissolved solids. Water quality within the Tuscaloosa formation is typically a sodium or calcium bicarbonate water type with low dissolved solids (Brahana et al. 1986).

The Tertiary sand aquifer conditions are the same as described for the Gleason Reservation in Section 3.6.1.1.3.2. Groundwater in the area can be affected by agricultural pumping and local surface water bodies.

3.6.1.1.4 Alternative C

3.6.1.1.4.1 Middle Tennessee TVA Power Service Area

The project area overlays the Alluvial aquifer, Tertiary sand aquifer, Cretaceous sand aquifer, the Pennsylvanian sandstone aquifer, Mississippian carbonate aquifer system, the Ordovician carbonate aquifer, Knox aquifer, Cambrian-Ordovician carbonate aquifer, or Crystalline rock aquifers, depending on location.

The alluvial aquifer underlies the Mississippi River and its tributaries and consists of sand and gravel with interbeds of clay. In 2015, the aquifer supplied 1.9 mgd for public supplies and in 2000, the aquifer supplied 1.34 mgd of water for irrigation (Maupin and Barber 2005). The water quality within the aquifer is generally good but can contain high iron concentrations in some areas. Water from the alluvial aquifer is used primarily for rural-domestic supplies and some irrigation (Bradley and Hollyday 1985).

The Tertiary sand aquifer conditions are the same as described for the Gleason Reservation in Section 3.6.1.1.3.2. The Cretaceous sand aquifer system conditions are the same as described for the Alternative B transmission corridors in Section 3.6.1.1.3.3. Groundwater within the Mississippian limestone and dolomite aquifer is the same as described for the CUF reservation in Section 3.6.1.1.1.

The Pennsylvanian sandstone aquifer includes sandstone and conglomerate with fractures, faults and bedding-plane openings within the rock units bearing the majoring of the water produced. Approximately 0.37 million gallons per day of water is withdrawn from the Mississippian aquifer for public use. The groundwater production within this area is highly variable (Brahana et al. 1986; Bradley and Hollyday 1985).

General groundwater quality within the Pennsylvanian aquifer is good to excellent and typically has high iron content and some hydrogen sulfide. Water is typically bicarbonate within the aquifer (Brahana et al. 1986).

The Ordovician carbonate aquifer system is composed of limestone and dolomite. Water occurs in solution-enlarged openings within the Bigsby, Carters, Ridley and Murfreesboro Limestones, which are the principal water-bearing units within the aquifer. Water is unconfined or partly confined near the surface but may be confined at depth. Approximately 2.4 million gallons per day of water is withdrawn from the Mississippian aquifer for public use. The Ordovician aquifer is connected to the land surface in many areas due to karst features (sinkholes, disappearing streams, and caves) so groundwater in the aquifer can contain high concentrations of nutrients and bacteria (Brahana and Bradley 1985; Bradley and Hileman 2006).

General groundwater quality of the Ordovician aquifer is often suitable for drinking water supply, but a wide range of conditions can occur. Areal and stratigraphic variations in water quality have been observed within the aquifer because the system is highly anisotropic and flow within formations is localized (Brahana and Bradley 1986).

Water within the Knox aquifer flows through interconnected solution opening and along bedding planes in the upper two formations of the Knox Group. The Knox aquifer is not utilized for public water supply but is used for domestic water supply where other shallow aquifers do not provide sufficient groundwater. The groundwater quality of the Knox aquifer can be affected by fluoride, sulfate, sulfide gases, and dissolved solids (Brahana and Bradley 1985).

The Cambrian-Ordovician aquifer system is comprised of extensively faulted limestone, dolomite, sandstone, and shales. The primary aquifers are the limestone and dolomite formations, and the principal water-bearing units are carbonate rocks of the Chickamauga Limestone, the Knox Group, and the Honaker Dolomite of the Conasauga Group (Brahana et al. 1986). In 2015, 39 mgd of groundwater from the aquifer was utilized for public water supply systems. The water quality is affected by calcium-carbonate, and brines are present at depths below 3,000 feet.

The crystalline rock aquifer consists of fractured igneous, metamorphic, and metasedimentary rocks with dolomite and limestone present in karst valleys and covers. In 2015, 0.2 mgd of groundwater was utilized from the aquifer for public water systems. Iron and low pH can affect groundwater quality within the crystalline rock aquifer.

3.6.1.2 Environmental Consequences

3.6.1.2.1 The No Action Alternative

Under the No Action Alternative, current operations would continue. TVA would implement the planned actions related to the current and future management and storage of CCRs at each plant, which have either been reviewed or will be in subsequent NEPA analysis. Groundwater monitoring of CCR impoundments would continue. TVA would continue to work with the state to obtain and evaluate groundwater quality associated with the CCR management facilities.

TVA would implement supplemental mitigation measures required pursuant to the Administrative Order issued by TDEC in August 2015, as well as the closure plan approved by TDEC, which could include additional monitoring, assessment, corrective action programs, or other actions deemed appropriate as specified in the Environmental Investigation Plan (TVA 2017c). The No Action Alternative would result in no change to current groundwater conditions; as a result, no project-related environmental effects with respect to groundwater would occur under this alternative.

3.6.1.2.2 Retirement, Decommissioning, Decontamination, and Deconstruction of CUF Plant

Buildings within the deconstruction boundary would be deconstructed and decontaminated to a depth of three feet below grade, which would generate vibrations throughout the course of deconstruction of the buildings and grading and backfilling of the facility. There would be no effects anticipated to the existing groundwater flow pattern. The deconstruction and demolition activities have the potential to release pollutants into the underlying soil and shallow groundwater table. Deconstruction and decontamination activities would be performed in accordance with applicable state regulations and TVA BMPs to limit potential effects to the soil and groundwater. Once deconstruction and decontamination activities are complete, there would be a beneficial effect to the groundwater system because fewer potential contamination sources would remain onsite.

With ongoing CCR management activities on the CUF Reservation, there would be a potential for cumulative effects to groundwater because of the multiple construction projects and associated vehicles in the area. There would be a small potential for spills to cause cumulative groundwater effects. Such effects would be considered unlikely as the various projects would employ BMPs such as those detailed in spill prevention, control, and countermeasure plans to control for and clean up any spills of chemicals or hazardous materials that could occur. Therefore, potential cumulative effects associated with groundwater are anticipated to be minor.

3.6.1.2.2.1 Environmental Justice Considerations

Effects to groundwater that would occur as a result of CUF coal facility retirement and D4 activities would be minimized and limited to the TVA-owned CUF Reservation, where no populations are present. For effects that may be experienced offsite, these would likely not have a disproportionate effect on EJ populations given the distance of the identified low-income populations from the TVA-owned reservation (Figure 3.4-3) and because other populations nearby would experience similar effects.

3.6.1.2.3 Alternative A

Proposed construction of a new CC plant and associated equipment may require excavation below the existing ground surface to establish a sub-base and foundation. Potential sources of groundwater effects may exist from the demolition of the existing coal site and the construction of a new CC plant. These potential effects can likely be sufficiently mitigated with the use of appropriate BMPs. The effects of this alternative on groundwater resources are expected to be minor.

3.6.1.2.3.1 Construction and Operation of CC Plant at CUF Plant Site

Water and sewer treatment services are anticipated as on-site needs during construction. Both water and sewer services are currently available at the CUF Reservation. Construction-related water use would support site preparation (including dust control) and grading activities. During earthwork for the grading of access roads, foundations, equipment pads, transmission lines, and other components, the primary use of water would be for compaction and dust control. Smaller quantities would be required for preparation of the equipment pads and other minor uses.

Project activities could potentially cause erosion resulting in the movement of sediment into groundwater infiltration zones. BMPs, such as those described in TVA's *A Guide for Environmental Protection and Best Management Practices for Tennessee Valley Authority Construction and Maintenance Activities* (TVA 2017a), would be used to avoid contamination of groundwater from construction activities. The use of BMPs and a SWPPP would reduce the possibility of any on-site hazardous materials reaching the groundwater during construction and operation. Overall, effects to groundwater are not anticipated.

Water would be utilized for bathrooms for on-site staff. Equipment washing and any potential dust control discharges would be handled in accordance with BMPs for water-only cleaning. Water needs for dust control and bathrooms would not adversely affect groundwater resources based on the anticipated withdrawal rate for the Mississippian carbonate aquifer.

With ongoing CCR management activities on the CUF Reservation, there would be a potential for cumulative effects to groundwater because of the multiple construction projects and associated vehicles in the area. There would be a small potential for spills to cause cumulative groundwater effects. Such effects would be considered unlikely as the various projects would employ BMPs such as spill prevention, control, and countermeasure plans to control for and clean up any spills of hazardous materials that could occur. Therefore, potential cumulative effects associated with groundwater are anticipated to be minor.

3.6.1.2.3.2 Construction and Operation of Natural Gas Pipeline Lateral

Water and sewer treatment services are currently not available along the natural gas pipeline lateral. However, both are anticipated as on-site needs during construction. Construction-related water use would support site preparation (including dust control), hydrostatic testing, and grading activities. During earthwork for the grading of access roads and construction of the natural gas pipeline lateral, the primary use of water would be for compaction and dust control.

Water used during construction would be provided by delivery via water trucks and via water uptake from surface waterbodies. If determined necessary, sewer treatment would be accomplished through use of a pump-out septic holding tank. If installed, the septic holding tank would be appropriately permitted and constructed to avoid effects to groundwater. None of the proposed options for water and water-related needs would adversely affect available groundwater resources.

Project activities could potentially cause erosion resulting in the movement of sediment into groundwater infiltration zones. As the gas pipeline lateral will be buried, there is a potential that it may come into contact with groundwater. The use of BMPs and a SWPPP would reduce the possibility of any on-site sediment, chemicals and hazardous materials reaching the groundwater during construction and operation. Overall, effects to groundwater are not anticipated.

The primary uses of water during operation and maintenance-related activities would be for possible dust control and hydrostatic testing. The internal access roads would not be heavily traveled during normal operations, and consequently, water use for dust control is not expected. Water needs during operations and maintenance would be provided by delivery via water trucks and via water uptake from surface waterbodies, and would not adversely affect groundwater resources. TGP will provide a detailed analysis of groundwater effects, which will be part of the Environmental Report to be submitted with their certificate application that will be filed with FERC for the proposed pipeline. This information would be updated in the final EIS and NEPA would be supplemented if necessary.

With RFFAs in proximity to the proposed pipeline, there would be a potential for cumulative effects to groundwater because of the multiple construction projects and associated vehicles in the area. There would be a small potential for spills to cause cumulative groundwater effects. Such effects would be considered unlikely as the various projects would employ BMPs such as spill prevention, control, and countermeasure plans to control for and clean up potential spills of chemicals or hazardous materials that could occur. Therefore, potential cumulative effects associated with groundwater are anticipated to be minor.

3.6.1.2.3.3 Transmission and Other Components

Effects to water resources within the CUF Reservation for transmission improvements would be the same as those listed in Section 3.6.1.2.3.1.

3.6.1.2.3.4 Environmental Justice Considerations
Effects to groundwater that would occur as a result of proposed CC plant, natural gas pipeline lateral, and transmission line activities would be minimized with implementation of BMPs and generally limited to the TVA-owned CUF Reservation, where no populations are present. For effects that may be experienced offsite, these would likely not have a disproportionate effect on EJ populations given the distance of the identified low-income populations from the TVA-owned reservation (Figure 3.4-3) and because other populations nearby would experience similar effects.

3.6.1.2.4 Alternative B
Under the Proposed Action Alternative B, CUF would be retired and demolished as with Alternative A.

3.6.1.2.4.1 Construction and Operation of CT Plant at JCT Reservation
Water and sewer treatment services would be required onsite during construction. Both water and sewer services are currently available at the JCT Reservation. Construction employees would require port-a-potties within the construction site, which would be serviced by a third-party contractor for off-site disposal. Construction-related water use would support site preparation (including dust control) and grading activities. During earthwork for the grading of access roads, foundations, equipment pads, and other components, the primary use of water would be for compaction and dust control. Smaller quantities would be required for preparation of the equipment pads and other minor uses.

Project activities could potentially cause erosion resulting in the movement of sediment into groundwater infiltration zones. TVA's BMPs (TVA 2017a) would be used to avoid contamination of groundwater from Project activities. The use of BMPs and a SWPPP would reduce the possibility of any on-site hazardous materials reaching the groundwater during construction and operation. Overall, effects to groundwater are not anticipated.

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

No cumulative effects to groundwater are anticipated associated with the adjacent Aeroderivative CT project. With the use of proper BMPs, indirect or cumulative effects to groundwater would be temporary and minor.

3.6.1.2.4.2 Construction and Operation of CT Plant at Gleason Reservation
Construction-related water needs for the CT plant would be the same as those described for the CT plant at JCT in Section 3.6.1.2.4.1. Demineralized water currently available at the Gleason Reservation would be used for the proposed CTs. Potable water would be obtained from the existing public supply. Therefore, no effects to groundwater associated with operation of the CT plant are anticipated.

3.6.1.2.4.3 Transmission and Other Components
Shallow excavation may be required for the proposed transmission line. If groundwater is encountered, dewatering activities would be used to control groundwater infiltration into the excavation site and all state and federal requirements relating to groundwater protection would be followed. However, because such activities and their effects to groundwater patterns or availability are localized and generally limited to the construction phase, effects from construction are expected to be minor. During revegetation and maintenance activities, effects

to groundwater would be minor and mitigated through use of BMPs (TVA 2017a). As such, effects to groundwater associated with the transmission line would be minor.

3.6.1.2.5 Alternative C

3.6.1.2.5.1 Construction and Operation of Solar and Storage Facilities

Water and sewer treatment services are currently not available at many of the possible solar and storage facility locations. However, both are anticipated as on-site needs during construction. Construction-related water use would support site preparation (including dust control) and grading activities. During earthwork for the grading of access roads and construction of the transmission corridor, the primary use of water would be for compaction and dust control.

Water used during construction would be delivered by water trucks. If determined necessary, sewer treatment would be accomplished through use of a pump-out septic holding tank. If installed, the septic holding tank would be appropriately permitted and constructed to avoid effects to groundwater. The proposed options for water and water-related needs would not be likely to adversely affect available groundwater resources.

Project activities could potentially cause erosion resulting in the movement of sediment into groundwater infiltration zones. TVA's BMPs (TVA 2017a) would be used to avoid contamination of groundwater from Project activities. The use of BMPs and a SWPPP would reduce the possibility of any on-site hazardous materials reaching the groundwater during construction and operation. Overall, effects to groundwater are not anticipated.

The primary uses of water during operation and maintenance-related activities would be for onsite maintenance facilities. Precipitation in the area is typically adequate to minimize the buildup of dust and other matter on the PV panels that would reduce energy production; therefore, no regular panel washing is anticipated. Battery storage sites may require water for sprinkler facilities for fire suppression. Water needs during operations and maintenance would be provided either via the proposed Project wells also used during construction or by delivery via water trucks and would not adversely affect groundwater resources.

Cumulative effects to groundwater associated with the expansion of solar facilities under the 2019 IRP are not anticipated with the use of BMPs.

3.6.1.2.5.2 Transmission and Other Components

Transmission lines associated with solar and BESS facilities would have the same effect on groundwater as described in Section 3.6.2.2.4.3.

3.6.2 Surface Water and Water Quality

The Federal Water Pollution Control Act, commonly known as the CWA, is the primary law that governs surface waters and water quality. It establishes standards for the quality of surface waters and prohibits the discharge of pollutants from point sources unless a NPDES permit is obtained. NPDES permits also address CWA Section 316(b) requirements for the design, location, construction and capacity of cooling water intakes to reflect the best technology available for minimizing environmental impact as well as Section 316(a) requirements for effluent limitations on thermal discharges to assure maintenance of a balanced indigenous population of fish and wildlife. Section 404 of the CWA further prohibits the discharge of dredge and fill material to waters of the United States, which include many wetlands, unless authorized by a permit issued by the USACE. Certification from Tennessee would also be sought to verify that the permitted discharges comply with the state's applicable effluent limitations, antidegradation, and water quality standards. If approved, the TDEC Division of Water Resources will issue this Section 401 water quality certification in the form of an ARAP.

The seven states in the TVA power service area have enacted laws regulating water quality and implementing the CWA. As part of this implementation, the states classify water bodies according to their uses and establish water quality criteria specific to these uses. Each state has also issued an antidegradation statement containing specific conditions for regulated actions and designed to maintain and protect current uses and water quality conditions.

Surface water is any water that flows above ground and includes, but is not limited to, streams, ponds, lakes, and wetlands. Streams can be further classified as perennial, intermittent, or ephemeral based on the occurrence of surface flow. Surface waters with certain physical and hydrologic characteristics (defined bed and bank, ordinary high-water mark, or specific hydrologic, soil, and vegetation criteria) are considered Waters of the U.S. [also known as jurisdictional waters] and are under the regulatory jurisdiction of the USACE. Wetlands are discussed in Section 3.6.3.

3.6.2.1 Affected Environment

3.6.2.1.1 CUF Reservation

Field surveys for surface waters were conducted by TVA and its contractors in July and August 2021 (Appendix A). In addition to the Cumberland River, a total of 8 perennial streams (totaling 12,592 linear feet [lf]), 5 intermittent streams (totaling 7,332 lf), 4 ponds, 9 wetlands, and 14 ephemeral streams (totaling 10,485 lf) were documented. Figure 3.6-1 depicts the delineated surface waters, which are discussed in the sections below. Named waterbodies and their use classifications are also provided.

The CWA requires all states to identify 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 USEPA with these data. The term "303(d) list" refers to the list of impaired and threatened streams and water bodies identified by the state. The Cumberland River is not listed as impaired or threatened in Tennessee (TDEC 2022).

Wells Creek borders the south and west sides of the CUF plant and bisects the study area. This stretch of Wells Creek was added to Tennessee's list of impaired waters in 2020 due to high bacterial load (*Escherichia coli* [*E. coli*]) from sanitary sewer overflows (TDEC 2020), and remains on the 303(d) list as of the draft list for 2022. The majority of wetlands within the CUF study area likely provide water quality improvement services to this impaired reach of Wells Creek.

The Lower Cumberland River from the Kentucky-Tennessee line (Cumberland River Mile [CRM] 74.6, approximately 28 miles upstream of CUF) to Cummings Creek (CRM 118.3, approximately 15 miles downstream of CUF) is classified for use for domestic and industrial water supply, fish and aquatic life, recreation, livestock watering and wildlife, and irrigation. The entire length of Wells Creek is classified for use for fish and aquatic life, recreation, livestock watering and wildlife, and irrigation (TDEC 2019). No Nationwide Rivers Inventory streams or Wild and Scenic

Rivers[5] are located near the CUF Reservation. Scott Branch adjacent to CUF has not been assessed; per the TDEC Use Classifications for Surface Waters, all other surface waters that have not been specifically noted shall be classified for aquatic life, recreation, livestock watering and wildlife, and irrigation (TDEC 2019).

The Cumberland River downstream of CUF is subject to the influence of the thermal discharges from the coal units' condenser cooling system. Under normal conditions, the Cumberland River flow near CUF is primarily dependent upon releases from the USACE Cheatham Dam located approximately 46 miles upstream, and to a lesser extent by downstream releases from Barkley Dam and tributary inflows upstream of the plant.

CUF is drained by permitted storm water outfalls, wet weather conveyances, the condenser cooling water (CCW) discharge (Outfall 002), and process and storm water discharges from the Main Ash Impoundment (Internal Monitoring Point [IMP]) 001. The CCW Outfall 002 discharges to the Cumberland River at CRM 102.8. The plant intake is located approximately at CRM 103.2 and withdraws water for cooling and process purposes (TDEC 2008).

An average of 2,096 MGD of CCW is withdrawn through a surface water intake structure from the Cumberland River. Approximately 98 percent of the 2,096 MGD of CCW withdrawals are used for cooling purposes and approximately 2 percent for plant process water uses (e.g., sluice water, fire protection, boiler feed water, safety eye wash and showers, and miscellaneous wash water) before being returned to the river after appropriate treatment and in compliance with CUF's NPDES permit.

The IMP 001 discharge to the CCW channel has an average flow of 21.7 MGD and details tiered compliance, with Tier 1 having limits and reporting of discharges from existing CCR impoundments and during CCR impoundment dewatering and Tier 2 details discharges from lined process water basin(s). TVA is required under NPDES Permit No. TN0005789 to meet pH, total suspended solids (TSS), and oil and grease limits at this discharge. The NPDES permit also requires that IMP 001 be monitored for a series of total metals and ammonia, such as nitrogen. These monitored total metals for Tier 1 include antimony, aluminum, arsenic, barium, beryllium, boron, calcium, cadmium, chromium, cobalt, copper, lead, lithium, mercury (Hg), molybdenum, nickel iron, manganese selenium, silver thallium and zinc. Total dissolved solids, total ammonia as N, chloride, sulfate, radium 228 and radium 229 and fluoride must also be sampled, analyzed, and reported for IMP 001 (TDEC 2018). Tier 2 has the same requirements as Tier 1 except removes the requirements to monitor some total metals including boron, calcium, cobalt, lithium, and molybdenum. Total dissolved solids, chloride, sulfate, radium 228 and radium 229 and fluoride requirements were also removed.

[5] Nationwide Rivers Inventory is a listing of more than 3,200 free-flowing river segments that are believed to possess one or more "outstandingly remarkable" natural or cultural values judged to be at least regionally significant. Rivers included in the Nationwide Rivers Inventory are candidates for Wilde and Scenic Rivers, which are protected under the National Wild and Scenic Rivers System created by Congress in 1968 with the goal of "preserving certain rivers with outstanding natural, cultural, and recreational values in a free-flowing condition for the enjoyment of present and future generations."

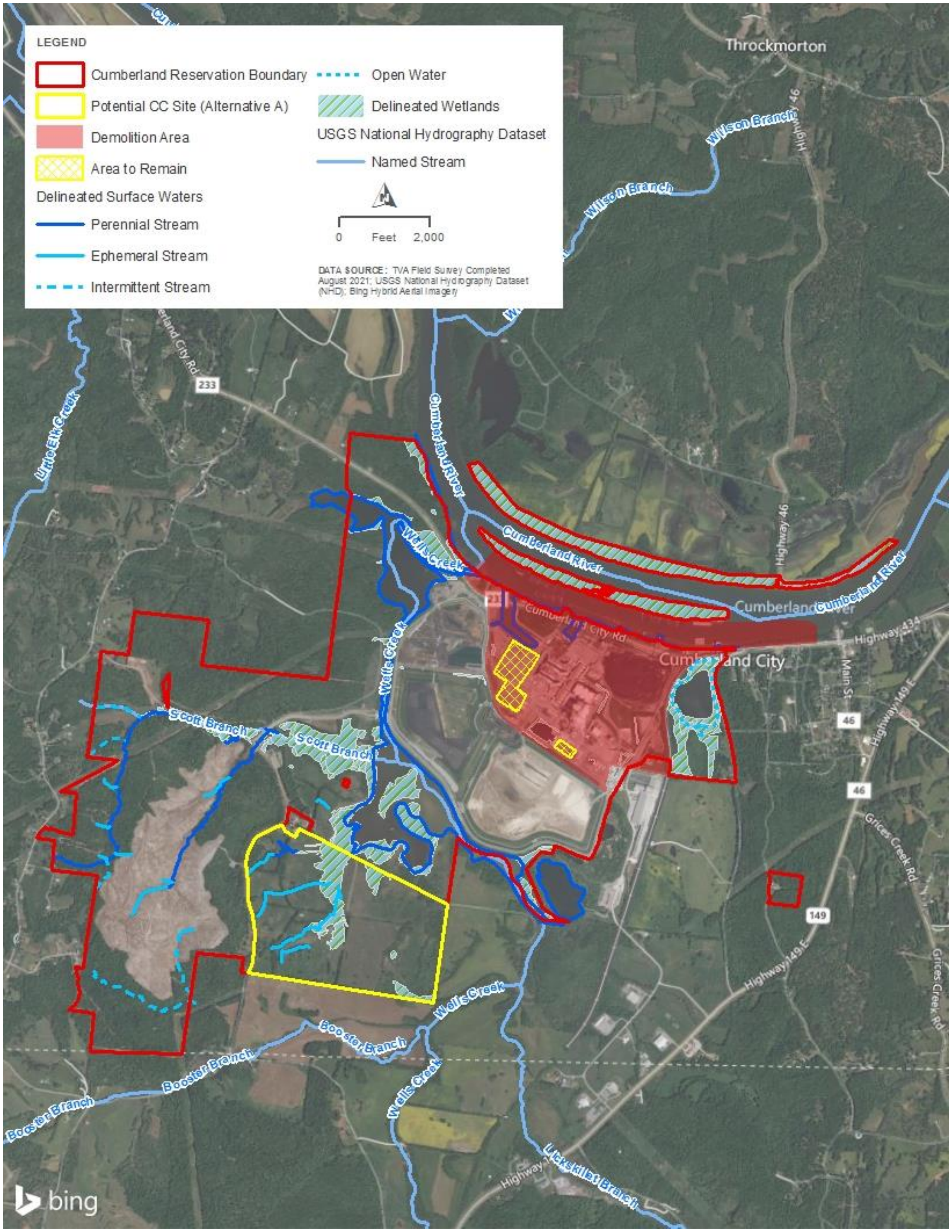

Figure 3.6-1. Surface Water and Wetland Features of the Cumberland Fossil Plant Area

3.6.2.1.2 Alternative A

3.6.2.1.2.1 Proposed CC Plant

A review of the data collected during July and August 2021 for the proposed CC Plant identified two perennial streams and five ephemeral streams on the proposed CC plant site (Figure 3.6-1). The two perennial streams are tributaries to Scott Branch and total 922 lf. The ephemeral streams total 6,317 lf on the proposed CC plant site. Like Scott Branch, the perennial tributaries are also not listed on TDEC's Use Classifications for Surface Waters (TDEC 2019) and therefore are classified for fish and aquatic life, recreation, livestock watering and wildlife, and irrigation. Neither Scott Branch nor tributaries to Scott Branch are listed on the draft 2022 303(d) list of impaired and threatened waters (TDEC 2022).

A portion of Wells Creek also falls within the transmission corridor boundary for Alternative A. As discussed above, Wells Creek was added to Tennessee's list of impaired waters in 2020 due to high bacterial load (*E. coli*) from sanitary sewer overflows (TDEC 2020) and remains on the 303(d) list as of the draft list for 2022.

3.6.2.1.2.2 Natural Gas Pipeline Lateral Corridor

The natural gas pipeline lateral corridor crosses Dickson, Houston, and Stewart counties. A desktop review of the National Hydrology Dataset (NHD) identified 19 named streams and 24 unnamed tributaries totaling 11,620 lf that cross the natural gas pipeline lateral corridor. The named streams and designated uses are listed in Table 3.6-1 and depicted on Figure 3.6-2. TGP will be conducting delineations of surface waters within the pipeline corridor, which will be part of the Environmental Report to be submitted with their certificate application that will be filed with the FERC for the proposed pipeline. This information would be updated in the final EIS and NEPA would be supplemented if necessary.

Jones Creek, which crosses the natural gas pipeline lateral corridor in Dickson County, and Wells Creek, which crosses the corridor in Stewart and Houston counties, are both listed as impaired in these locations (Table 3.6-2) (TDEC 2022). Jones Creek is listed for several causes and potential sources. Wells Creek is listed for *E. coli* due to sanitary sewer overflows in both Stewart and Houston counties.

Table 3.6-1. Designated Use Classifications for Streams in the Vicinity of the Alternative A Natural Gas Pipeline Corridor

Stream	Use Classification[1]						
	FAL	REC	LWW	IRR	TS	IWS	NRTS
Barton's Creek	X	X	X	X			
Dry Hollow Branch	X	X	X	X			
Furnace Creek	X	X	X	X			X
Gafford Creek	X	X	X	X			
Guices Creek	X	X	X	X			
Harris Creek	X	X	X	X			
Indian Creek	X	X	X	X			
Johnson Creek	X	X	X	X			
Jones Creek	X	X	X	X		X	
Jordan Branch	X	X	X	X			
Lickskillet Branch	X	X	X	X			
Little Bartons Creek	X	X	X	X			
Nesbitt Branch	X	X	X	X			

Stream	Use Classification[1]						
	FAL	REC	LWW	IRR	TS	IWS	NRTS
Porter Branch	X	X	X	X	X		
Wells Creek	X	X	X	X			
Yellow Creek	X	X	X	X	X		

Source: TDEC 2019

[1] Codes: FAL= Fish and Aquatic Life; REC = Recreation; LWW = Livestock Watering and Wildlife; IRR= Irrigation; TS= Trout Stream; IWS= Industrial Water Supply; and NRTS= Naturally Reproducing Trout Stream

Table 3.6-2. Streams in the Vicinity of the Alternative A Natural Gas Pipeline Lateral Corridor included on the USEPA Approved List of Impaired Waters

Stream	County	Cause for Listing	Potential Source
Jones Creek	Dickson	*E. coli*	Grazing in riparian or shoreline zones Municipal point source discharges
		Nitrate/Nitrite	Grazing in riparian or shoreline zones Municipal point source discharges
		Total Phosphorus	Grazing in riparian or shoreline zones Municipal point source discharges
		Sedimentation/Siltation	Site clearance (land development)
		Alteration in Stream-side or Littoral Vegetative Covers	Site clearance (land development)
		Nutrients	Grazing in riparian or shoreline zones Site clearance (land development)
Wells Creek	Stewart	*E. coli*	Sanitary sewer overflows
	Houston	*E. coli*	Sanitary sewer overflows

Source: TDEC 2022

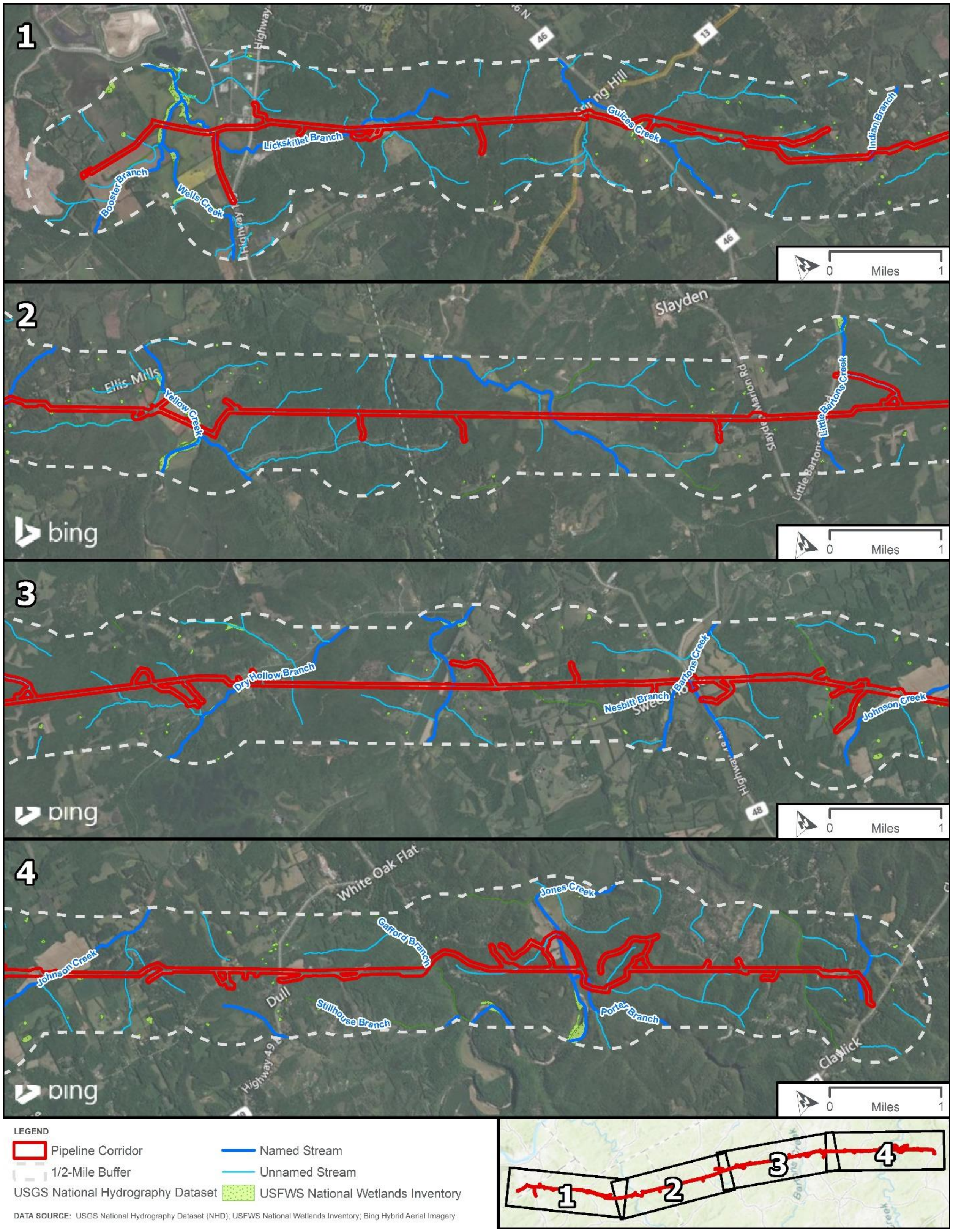

Figure 3.6-2. Potential Surface Waters and Wetlands and Wetlands within the Proposed Natural Gas Pipeline Corridor

3.6.2.1.3 Alternative B

3.6.2.1.3.1 Johnsonville Reservation

The JCT Reservation is located on the east bank of the Kentucky Reservoir of the Tennessee River. Kentucky Reservoir is included on Tennessee's list of impaired waters, under Section 303(d) of the CWA due to low dissolved oxygen (DO) from upstream impoundment (TDEC 2022). No streams occur on the proposed CT plant site (Figure 3.6-3).

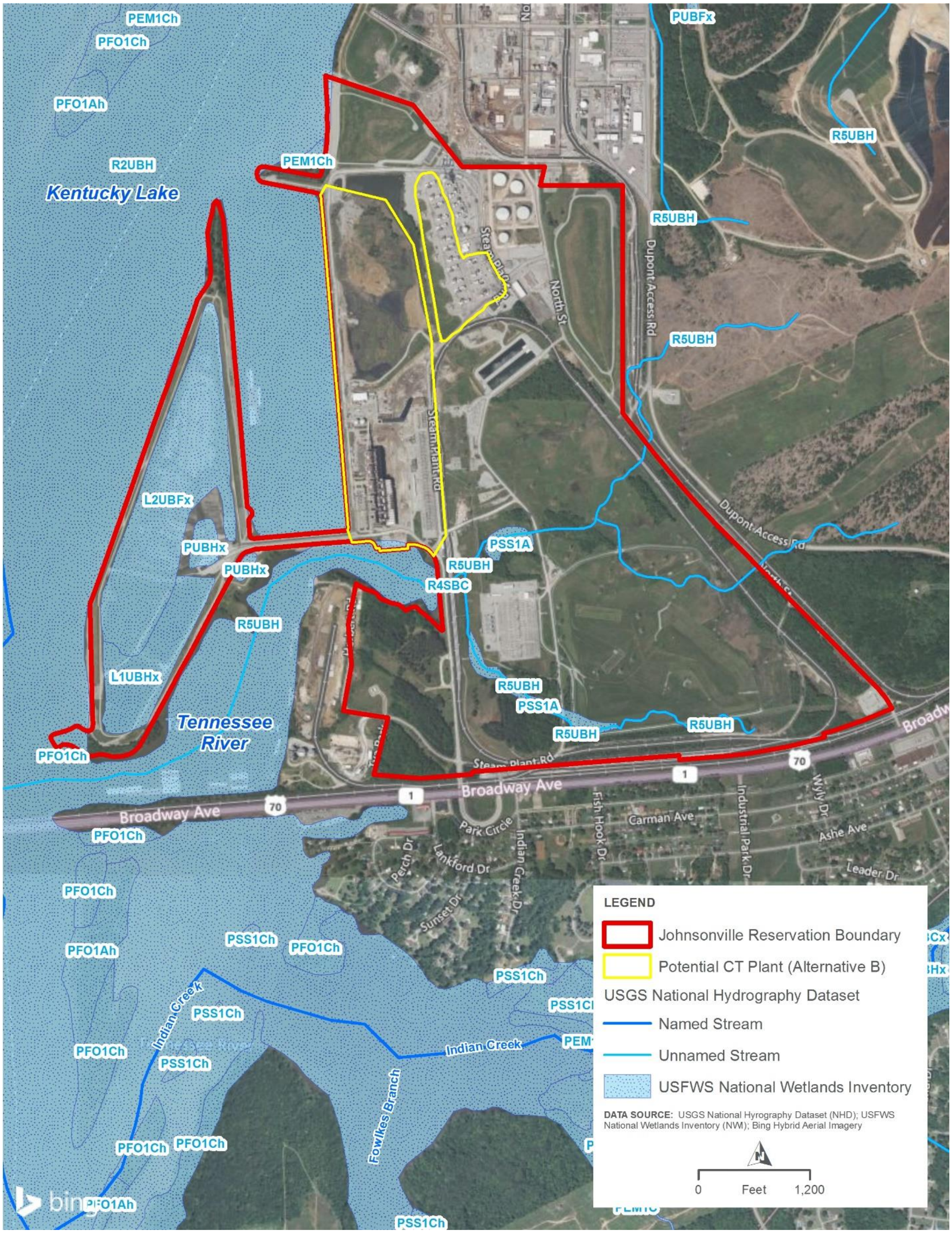

Figure 3.6-3. Surface Waters on and in the vicinity of the Johnsonville Reservation

3.6.2.1.3.2 Gleason Reservation

Based on the NHD, one intermittent stream crosses the Gleason Reservation and ultimately flows to the Middle Fork Obion River (Figure 3.6-4). About 1,618 lf of this intermittent stream is on the potential CT plant site.

Gleason is in the Southeastern Plains ecoregion. Streams in this ecoregion have higher gradients as compared to the loess plain and primarily sandy substrates (Etnier and Starnes 1993). Extensive agricultural practices over the past several decades have channelized the nearby Middle Fork Obion River and surrounding tributaries, resulting in little natural habitat for aquatic species. The nearby Middle Fork Obion River is currently listed on the TDEC 303(d) list for impairment due to physical substrate habitat alterations, sedimentation/siltation, *E. coli*, nitrate/nitrite, and total phosphorus related to river channelization, crop production, municipal point sources and non-point sources (TDEC 2022). The Middle Fork Obion River is classified for use for fish and aquatic life, recreation, livestock watering and wildlife, and irrigation (TDEC 2019).

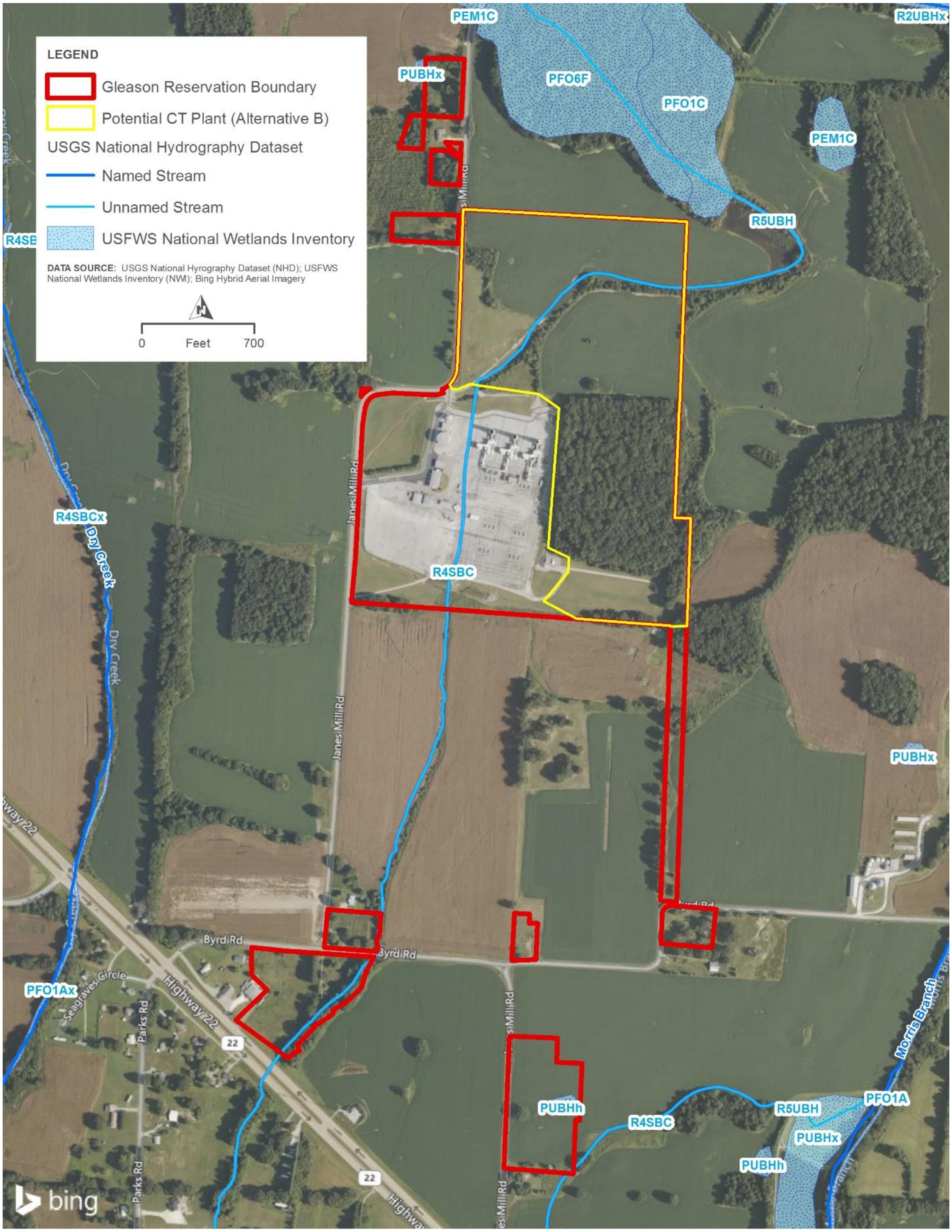

Figure 3.6-4. Surface Water Features of the Proposed CT Plant Site within Gleason Reservation

3.6.2.1.3.3 Transmission Corridors

The transmission line corridor crosses Weakley and Henry counties. A desktop review of the NHD identified eight streams and tributaries crossing the transmission corridor. These are Cane Creek, Chestnut Branch, Cypress Creek, East Fork Clarks River, Holly Fork Creek, Little Cane Creek, Mayo Branch, and North Fork Obion River. The named streams and designated uses are listed in Table 3.6-3 Of the named streams, Cane Creek, Cypress Creek, East Fork Clarks River, Mayo Branch, and North Fork Obion River are listed on the USEPA 303(d) list of impaired and threatened waters (TDEC 2022) for Weakley and Henry counties. Causes for listing and potential sources are provided in Table 3.6-4.

Table 3.6-3. Designated Uses of Streams in the Vicinity of the Alternative B Transmission Corridor

Stream	Use Classification[1]				
	FAL	REC	LWW	IRR	NRTS
Cane Creek	X	X	X	X	
Chestnut Branch	X	X	X	X	X
Cypress Creek	X	X	X	X	
East Fork Clarks River	X	X	X	X	
Holly Fork Creek	X	X	X	X	
Little Cane Creek	X	X	X	X	
Mayo Branch	X	X	X	X	
North Fork Obion River	X	X	X	X	

[1] Codes: FAL= Fish and Aquatic Life ; REC = Recreation; LWW = Livestock Watering and Wildlife; IRR= Irrigation; TS= Trout Stream; IWS= Industrial Water Supply; and NRTS= Naturally Reproducing Trout Stream

Table 3.6-4. Streams in the Vicinity of the Alternative B Transmission Corridor included on the USEPA Approved List of Impaired Waters

Stream	County	Cause for Listing	Potential Source
Cane Creek	Weakley	Sedimentation/Siltation	Surface mining
			Grazing in riparian or shoreline zones
		Nitrate/Nitrite	Crop production (non-irrigated)
			Municipal point source discharges
		Total Phosphorus	Municipal point source discharges
			Crop production (non-irrigated)
		Physical Substrate Habitat Alterations	Municipal (urbanized high-density area)
		E. coli	Municipal (urbanized high-density area)
Cypress Creek	Weakley	Physical Substrate Habitat Alterations	Channelization
			Crop production (non-irrigated)
		Nitrate/Nitrite	Grazing in riparian or shoreline zones
		Alteration in Stream-side or Littoral Vegetative Covers	Crop production (non-irrigated) Grazing in riparian or shoreline zone
		Dissolved Oxygen	Crop production (non-irrigated)

Stream	County	Cause for Listing	Potential Source
		Total Phosphorus	Crop production (non-irrigated) Grazing in riparian or shoreline zones
		E. coli	Grazing in riparian or shoreline zones
East Fork Clarks River	Henry	Physical Substrate Habitat Alterations	Crop production (non-irrigated)
Mayo Branch	Weakley	Alteration in Stream-side or Littoral Vegetative Covers	Crop production (non-irrigated)
		Physical Substrate Habitat Alterations	Crop production (non-irrigated)
North Fork Obion River	Weakley	*E. coli*	Municipal (urbanized high-density area)
			Source unknown
		Sedimentation/Siltation	Crop production (non-irrigated)
			Channelization
		Physical Substrate Habitat Alterations	Channelization
		Total Phosphorus	Municipal (urbanized high-density area)
			Industrial point source discharge
			Crop production (non-irrigated)
			Municipal point source discharges

Source: TDEC 2022

3.6.2.1.4 Alternative C

3.6.2.1.4.1 Middle Tennessee TVA PSA

Major watersheds in the TVA region include the Tennessee River basin, most of the Cumberland River basin, and portions of the Green River basin. Fresh water abounds in much of this area and generally supports most beneficial uses, including fish and aquatic life, public and industrial water supply, waste assimilation, agriculture, and water-contact recreation, such as swimming.

Tennessee River Basin

The Tennessee River basin contains all except one of TVA’s dams and covers about half of the TVA PSA. A series of nine locks and dams built mostly in the 1930s and 1940s regulates the entire length of the Tennessee River and allows navigation from the Ohio River upstream to Knoxville (TVA 2004). Almost all the major tributaries have at least one dam, creating 14 multi-purpose storage reservoirs and seven single-purpose power reservoirs. The construction of the TVA dam and reservoir system fundamentally altered both the water quality and physical environment of the Tennessee River and its tributaries. While dams promote navigation, flood damage reduction, power generation, water supply, water quality, and river-based recreation by moderating the flow effects of floods and droughts throughout the year, they also disrupt the daily, seasonal and annual flow patterns characteristic of a river. This system of dams and their operation is the most significant factor affecting water quality and aquatic habitats in the Tennessee River and its major tributaries. Portions of several rivers downstream of dams are included on state CWA Section 303(d) lists of impaired waters (TDEC 2020) due to low DO levels, flow modifications and thermal modifications as a result of impoundment. TVA has undertaken several major efforts (e.g., TVA's Lake Improvement Plan, Reservoir Release Improvement Plans, and Reservoir Operations Study (TVA 2004) to mitigate some of these effects on aquatic habitats and organisms. While these actions have resulted in improvements to water quality and habitat conditions in the Tennessee River basin, the Tennessee River and its tributaries remain substantially altered by human activity. Major water quality concerns within the Tennessee River drainage basin include point and nonpoint sources of pollution that degrade water quality at several locations on mainstream reservoirs and tributary rivers and reservoirs.

Cumberland River Basin

In addition to the Tennessee River basin, the Cumberland River basin drains a significant portion of Middle Tennessee (Figure 3.6-5) and has a total drainage area of over 18,000 square miles (University of Tennessee Press 2021). It is formed by the confluence of Poor and Clover forks in southern Kentucky, loops through middle Tennessee and joins the Ohio River in western Kentucky (Britannica 2019). TVA has created a series of lakes on the Cumberland River or its major tributaries, including the development of Wolf Creek Dam (for flood control and power), Dale Hollow Dam on the Obey River, Center Hill Dam on Caney Fork, Old Hickory Dam, Cheatham Dam, and Barkley Dam. The Cumberland River is navigable year-round from Nashville to Smithland, Kentucky (192 river miles) and continues to be used for the transportation of coal, oil, and gravel. Approximately 27,688 miles of streams and rivers flow through the Cumberland River basin (KDOW 2000), with water quality closely related to land use activities. Headwaters of the Cumberland River contain old oil and gas wells, abandoned coal mines, and poorly logged areas, which can contribute to brine, acidity, and silt (respectively). The middle portion of the basin is a mixture of urban, forest, and agriculture, and the lower portion primarily agricultural lands with row crops and livestock, contributing to sedimentation and fecal contamination. Stormwater runoff from urban areas contains automotive oils, sediment, particulates, nutrients, and other urban contaminates.

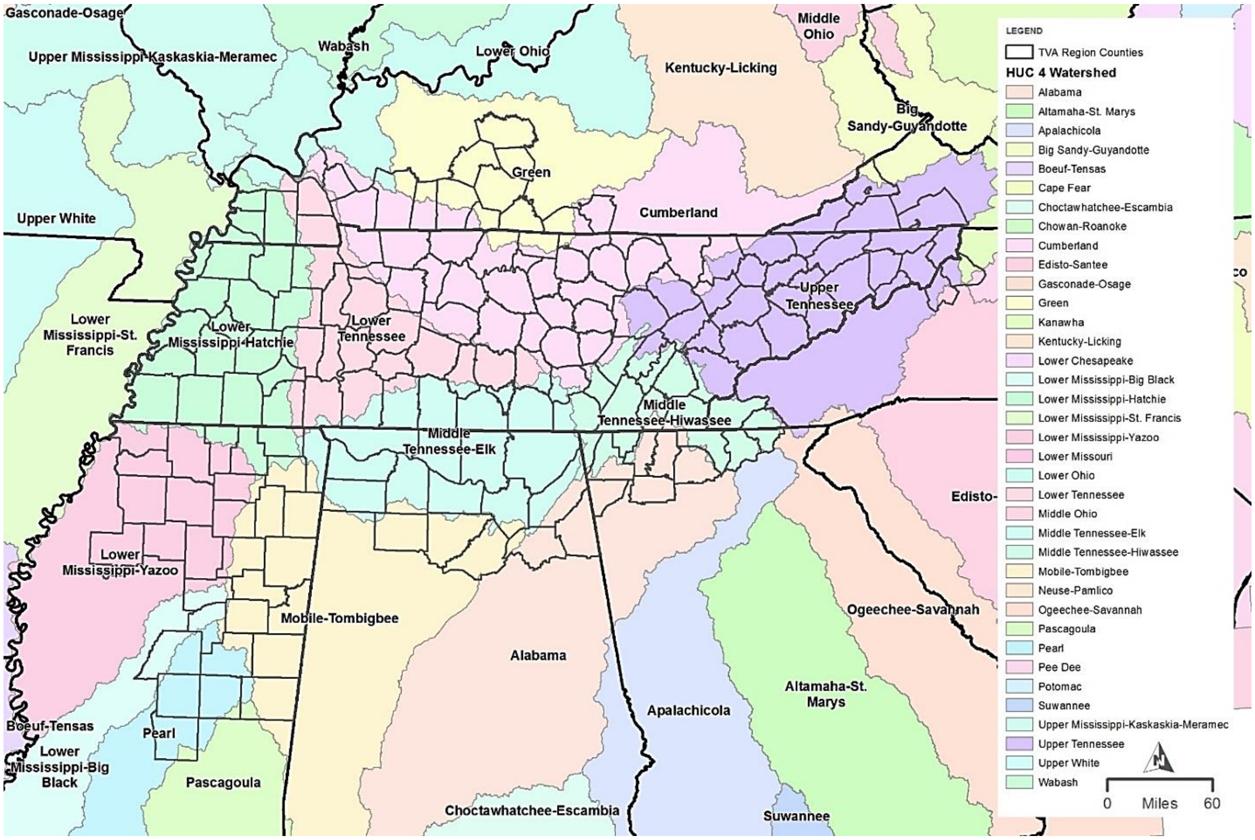

Figure 3.6-5. Major watersheds within TVA region

3.6.2.2 Environmental Consequences

3.6.2.2.1 The No Action Alternative

Under the No Action Alternative, CUF would continue operating and TVA would not construct the proposed new facilities. The existing wastewater streams would continue as authorized under NPDES Permit TN0005789. Discharges would continue to comply with all applicable permit limits, and therefore, surface water quality adjacent to CUF should remain approximately the same. TVA would implement all the planned actions related to the current and future management and storage of CCRs and requirements under the EPA’s Steam Electric ELGs at the sites, which have either been reviewed or will be in subsequent NEPA analyses. Continued operations at CUF under the No Action Alternative would not be expected to cause any additional direct or indirect effects to local surface water resources and therefore, would not change existing conditions.

3.6.2.2.2 Retirement, Decommissioning, Decontamination, and Deconstruction of CUF Plant

Under the following action alternatives, CUF would be retired. TVA would implement the planned actions related to the current and future management and storage of CCRs at CUF, which have either been reviewed or will be in subsequent NEPA analyses. Indirect effects may be associated with storm water runoff due to demolition and temporary construction activities. Erosion and sediment control BMPs would be implemented to minimize potential effects.

Under retirement of CUF, current operations would cease and surface water withdrawals would be eliminated. Wastewater discharges would be significantly reduced. The existing wastewater streams would continue to be authorized under NPDES Permit TN0005789. The CCR at the facility would follow requirements detailed in the USEPA Disposal of Coal Combustion Residuals from Electric Utilities final rule (80 FR 21301). The remaining discharge flows would come from fire protection water, main station sumps, storm water flow, and from ponds until closed. Surface water discharges would be expected to have direct and indirect beneficial effects due to the decrease in loading of metals as a result of ceasing operations. The termination of withdrawals and discharges of cooling water would eliminate impingement and entrainment effects and have other beneficial effects from reduced water consumption.

Demolition of the existing fossil plant and barge unloading dock (which includes removal of existing concrete surface, expanding footprint, and replacing with improved concrete surface) and mooring cells would have the potential to temporarily affect surface water via fugitive emissions, debris and stormwater runoff. TVA would comply with appropriate state and federal permit requirements. TVA would obtain a Construction Storm Water Permit prior to beginning demolition. Surface water effects resulting from disturbance during selective demolition would be mitigated by the use of stormwater pollution prevention BMPs to minimize the extent of disturbance and erosion. Stormwater would discharge via either NPDES permitted discharge points or the designated construction stormwater outfalls. Silt fences, sediment basins, and/or other sediment and erosion control measures, as described in *A Guide for Environmental Protection and Best Management Practices for TVA Construction and Maintenance Activities, Revision 3* (2017a), would be installed, inspected, and maintained for the duration of demolition as needed to avoid contamination of surface water adjacent to the project area. Therefore, no significant effects to surface water would be expected due to surface water runoff from the construction site. 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.

Currently active industrial stormwater outfalls are monitored, every six months or annually, depending on the NPDES requirements. This monitoring would continue throughout the demolition process, with modifications as directed by the construction BMP plan. Following demolition, permits may be modified or reduced based on the change in operation at the facility. Permit modification requests would be negotiated with TDEC, as necessary, throughout the demolition process.

Stack demolition has the potential to release fugitive dust, fill, and residual ash to adjacent surface water during demolition, due to the uncontrolled nature of the dropping of the stack in a single, brief action. This action would result in the generation of fugitive dust and debris, which would then be subject to potential erosion and transport to adjacent surface waters. Following shut-down of the units, stacks would be washed to remove as much ash and dust as possible to reduce potential effects to surface waters during demolition. These demolition activities would be designed in a way to minimize any effects to adjacent waters; however, mitigation measures, such as turbidity curtains in adjacent waters, would be considered to help mitigate any incidental discharge of ash, soil, or sediment to receiving streams. With mitigation measures and BMPs in place, incidental discharges to the Cumberland River due to these activities would be minimized.

Deconstruction of intake/discharge structure facilities (intake and discharge condenser circulating water tunnels [bulkheading] and removal of the intake pump station, fish screens, etc.), and the demolition of the mooring cells has the potential for effects to surface waters through conveyance of sediment as part of the removal process. BMPs would be implemented to reduce these potential effects. To conduct this work, USACE and TDEC permits would be required. Anticipated effects to Waters of the State or United States associated with the proposed project would be mitigated with the use of BMPs and implementation of a maintenance program. In the event a permit is required, any mitigation would be identified through the USACE Section 404 and TDEC Section 401 permitting process, providing for compensation for the loss of wetlands or stream reaches. Potential surface water effects during demolition would be mitigated, and the effects would be minor with the implementation of BMPs as well as compliance with the requirements of the USACE and TDEC permitting process. Logistical measures for demolition activities would be taken, including portable toilets for the construction workforce with appropriate maintenance measures to avoid contamination of nearby waters and equipment washing and dust control, which would be handled in accordance with BMPs and TVAs NPDES permit.

With the implementation of appropriate BMPs, no significant effects to surrounding surface waters are expected from demolition activities. Cumulative effects to surface water may occur with the proximity of CCR management activities as RFFAs in the CUF Reservation. With the use of proper BMPs and compliance with all federal, state, and local regulations and guidelines, cumulative surface water effects are expected to be temporary and minor.

3.6.2.2.2.1 Environmental Justice Considerations

Negative effects to surface water and water quality that would occur as a result of CUF coal facility retirement and D4 activities would be temporary, minimized, or mitigated, and generally limited to the TVA-owned CUF Reservation, where no populations are present and EJ populations are removed (Figure 3.4-3). Over time, there would be beneficial effects to EJ and other populations using nearby waters or waters on the CUF Reservation due to the positive effects to water quality from ceasing CUF operations.

3.6.2.2.3 Alternative A

3.6.2.2.3.1 Construction and Operation of CC Plant at CUF Plant Site

Construction of a CC Plant may directly and/or indirectly affect approximately 922 lf of perennial stream and 6,317 lf of ephemeral stream contained within the proposed CC site boundary (Figure 3.6-1). Potential effects to the intermittent stream due to re-routing or piping would include loss of instream habitat, increased erosion and siltation and alteration of stream banks and stream bottoms by heavy equipment. The proposed CC Plant would be an air cooled system and would not require cooling water withdrawals from the Cumberland River or other surface waters. Service water would be obtained from potable water sources and not from surface waters on site. Minor discharges from the operation of the CC Plant would require with a site-specific NPDES permit and compliance with all applicable regulations and conditions.

Construction of a new TL has the potential to affect surface waters. The new TLs will be sited to avoid surface waters, to the extent possible, and any surface water effects would be permitted as required. To further minimize affects, Wells Creek would be spanned by the new, short TL connecting the new CC plant to the existing transmission substation and switchyard. Structures would not be placed within surface waters, and effects would be minimized by crossing surface waters at a perpendicular angle where practicable. With the use of proper BMPs, CWA Section 404 and 401 permitting, and compliance with all federal, state, and local regulations and guidelines, surface water effects are expected to be minor.

Minor, temporary effects to the Cumberland River would occur during the upgrades to the barge facilities. Applicable USACE Section 404 and Section 10 permits and TDEC ARAP (401 Water Quality Certification) would be obtained for upgrades to the barge facilities and for necessary stream alterations, and the terms and conditions of these permits could require mitigation for the proposed activities. Erosion and sediment control BMPs would be implemented as a condition of a NDPES General Construction Storm Water permit.

Cumulative effects to surface water may occur with the proximity of CCR management activities as RFFAs in the CUF Reservation. With the use of proper BMPs, CWA Section 404 and 401 permitting, and compliance with all federal, state, and local regulations and guidelines, cumulative surface water effects are expected to be minor.

3.6.2.2.3.2 Construction and Operation of Natural Gas Pipeline Lateral

Based on GIS analysis of the NHD, approximately 11,620 lf of surface waters are located within the proposed natural gas pipeline lateral corridor and have the potential to be directly or indirectly impacted. During the construction of the pipeline, surface water effects may occur from trenching the pipeline. Horizontal directional drilling (HDD) may be used under some surface waters to minimize effects. Erosion and sediment control BMPs would be deployed and USACE and TDEC permits would be obtained, where required. TGP will provide a detailed analysis of surface water effects in the Environmental Report to be submitted with their certificate application that will be filed with the FERC for the proposed pipeline.

Cumulative effects to surface water may occur given proximity of past/present and RFFAs near the pipeline. Cumulative effects to surface waters would be minimized and mitigated through proper siting of these facilities, the use of BMPs, and adherence to mitigation requirements in applicable CWA Section 404 and 401 permits.

3.6.2.2.3.3 Environmental Justice Considerations

Effects to surface water and water quality that would occur as a result of the proposed CC plant, natural gas pipeline lateral, and transmission line activities would be minor and minimized, or mitigated through CWA 404, 401, and 402 (NPDES) permitting, as described above, with some effects occurring on a TVA-owned reservation, where no populations are settled and EJ populations are removed by some distance (Figure 3.4-3). Effects to CUF-area surface waters and water quality that may in turn adversely affect aquatic life that are utilized by EJ populations are addressed in Section 3.8.3. Effects occurring as a result of pipeline activities, while still minor, would be outside of TVA-owned reservations. These effects would be distributed across areas where non-EJ populations are more prominent (nine out of 10 census block groups are non-EJ populations). While EJ populations do exist at the far eastern extreme of the pipeline corridor EJ study area (Figure 3.4-4), these effects would be similarly experienced by these populations and are, therefore, not anticipated to be disproportionate.

3.6.2.2.4 Alternative B

3.6.2.2.4.1 Construction and Operation of CT Plant at JCT Reservation

No surface waters occur within the proposed JCT site footprint on the Johnsonville Reservation based on the NHD and aerial imagery; therefore, no effects to surface waters would occur due to construction of the CT plant (Figure 3.6-3). No surface water withdrawals will be needed for operation of the CT plant; however, the plant would require potable water which would be obtained from the existing public water supply. During construction, TVA would comply with all appropriate state and federal permit requirements. BMPs would be followed to address construction-related effects, 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.

Equipment washing and dust control discharges would be handled in accordance with BMPs required by the site's NPDES permit to minimize construction effects to surface waters. Equipment washing and dust control discharges associated with construction activities would be handled in accordance with BMPs described in the SWPPP for water-only cleaning. Hydrostatic testing for the JCT plant will use available non-potable water and the activity would be covered under the current NPDES Permit.

After construction, storm water BMPs would continue to be implemented so that surface water runoff from parking lots and industrial use 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 distillate-oil storage tanks, would be directed to an oil/water separator with subsequent discharge to a process pond. Oil collected in the oil/water separator would be periodically removed and trucked off site to an approved, waste oil recycling facility.

Restroom facilities to support the workforce at JCT would be properly installed and permitted per local, state, and federal regulatory requirements. Some water treatment may be required to support the operation of the JCT plant. The plant would require potable water, which would be obtained from existing public supply. Up to 130 GPM at JCT would be used for inlet air evaporative cooling in summer ambient temperatures. Potable water for domestic use and safety showers would be obtained from the existing public supply.

Cumulative effects to surface waters at JCT are not anticipated, as the adjacent Aeroderivative CT project would adhere to comparable BMPs.

3.6.2.2.4.2 Construction and Operation of CT Plant at Gleason Reservation

Construction of a CT plant at Gleason has the potential to directly affect one intermittent stream that crosses the CT plant site (as indicated by the NHD). During siting of the plant, TVA would avoid and minimize effects to surface waters as practicable. Erosion and sediment control BMPs would be deployed and USACE and TDEC permits would be obtained if effects cannot be avoided.

Similar effects as described for the potential JCT plant would be expected at Gleason, except that up to 100 GPM at Gleason would be needed for inlet air evaporative cooling in summer ambient temperatures. Other BMP descriptions and potable water requirements as described for JCT would also be expected at Gleason. No cumulative effects to surface waters are anticipated with the RFFAs at Gleason.

3.6.2.2.4.3 Transmission and Other Components

The proposed 40-mile transmission line would cross surface waters, including Chestnut Branch, North Fork Obion River, East Fork Clarks River, Holly Fork Creek, Cane Creek, Little Cane Creek, Mayo Branch, and Cypress Creek, and likely other unnamed streams. Based on typical effects for transmission lines as shown in Table 3.3-1, there are an estimated 2.9 stream crossings per mile of new transmission line (with a range of 0 to 50 crossings); for the 40-mile transmission line, this equates to an average of 116 stream crossings (range 0 to 2,000). Standard practice requires that TVA would avoid and minimize effects to surface waters by limiting use of temporary or permanent fill and prioritizing crossing surface waters at a perpendicular angle where practicable. Erosion and sediment control BMPs would be deployed and USACE and TDEC permits would be obtained. Permanent stream crossings for access roads that cannot be avoided would be designed to not impede runoff patterns and the natural movement of aquatic fauna. Temporary stream crossings and other construction and maintenance activities associated with the TLs would comply with appropriate state permit requirements and TVA requirements as described in TVA's BMP manual (TVA 2017a).

3.6.2.2.4.4 Environmental Justice Considerations

Effects to surface water and water quality that would occur as a result of the proposed CT facilities and transmission line activities would be limited to the immediate TVA-owned reservations, where no populations are settled, and the transmission line corridor, where both EJ and non-EJ populations occur. Moreover, the effects would generally be minimized or mitigated, as described above, and, thus, not generally impactful to human populations.

If effects to the Tennessee River occur due to cooling water for the CT facilities at JCT, these could in turn affect EJ populations that utilize the river for subsistence or other purposes, such as in nearby Camden Wildlife Management Area and Tennessee National Wildlife Refuge. These effects are not anticipated to be disproportionate on EJ populations, however, as the same effects would occur to other populations currently utilizing the river for fishing.

3.6.2.2.5 Alternative C

3.6.2.2.5.1 Construction and Operation of Solar and Storage Facilities

Alternative C would result in construction activities that have the potential to permanently affect streams and/or temporarily affect surface water via stormwater runoff. As noted in Table 3.2-1, TVA has evaluated typical effects associated with the development of solar facilities. Solar facilities average approximately 8.7 lf of stream effects per MW, with a range from 0 to 41 lf. Based on the addition of 3,000 MW of solar facilities in Alternative C, an average of 26,100 lf of stream would be impacted, with up to 123,000 lf of stream effects possible. Forested stream effects are typically avoided. TVA and solar developers would minimize effects to surface waters by siting facilities on lands with few surface water resources, configuring the solar arrays, access roads, and other infrastructure to avoid surface waters, and establishing and maintaining buffers around surface waters. BESS sites are typically small enough to be sited to avoid surface water effects. Applicable CWA Section 404 and 401 permits would be obtained from USACE and TDEC and necessary mitigation credits purchased if surface water effects cannot be avoided.

Soil erosion and sedimentation can clog small streams and threaten aquatic life. As noted in the IRP EIS (TVA 2019b), the conversion of the site to a solar facility, with a permanent grass and herbaceous vegetative cover, can reduce the runoff of silt and agricultural chemicals that often occurs from cropland. Appropriate BMPs would be installed, 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. A general construction stormwater permit would be needed for the proposed solar and BESS facilities since more than one acre would be disturbed. This permit requires the development and implementation of a SWPPP which would identify specific BMPs to address construction-related activities that would be adopted to minimize stormwater effects.

Cumulative effects to surface water may occur under Alternative C with the addition of 10,000 MW of solar identified in the 2019 IRP throughout the TVA PSA. Based on the average of 8.7 lf of effect per MW, this would result in 87,000 lf of additional stream effects within the TVA PSA. Cumulative effects to surface waters would be minimized and mitigated through proper siting of solar facilities, the use of BMPs, and adherence to mitigation requirements in applicable CWA Section 404 and 401 permits.

3.6.2.2.5.2 Transmission and Other Components

As noted in Table 3.3-1, transmission lines typically result in the construction of an average of 1.7 miles of new transmission line per solar facility and an average of 2.9 stream crossings per mile of new line. These statistics indicate that approximately five surface water crossings may occur for each facility. TVA and solar developers would avoid placing structures within surface waters, and effects would be minimized by crossing surface waters at a perpendicular angle where practicable. Erosion and sediment control BMPs would be deployed and USACE and TDEC permits would be obtained. Associated substations and/or switching stations would be sited to avoid surface waters to the maximum extent practicable. With the use of BMPs and adherence to all permit conditions, effects are expected to be minimal.

Cumulative effects to surface water may occur under Alternative C with the addition of 10,000 MW of solar identified in the 2019 IRP throughout the TVA PSA. Transmission lines associated with this expansion would likely result in stream crossings and effects. Cumulative effects to surface waters would be minimized and mitigated through proper siting of transmission lines, the use of BMPs, and adherence to mitigation requirements in applicable CWA Section 404 and 401 permits.

3.6.2.2.5.3 Environmental Justice Considerations

Effects to surface water and water quality that would occur as a result of the proposed solar facilities and transmission line activities are not anticipated to have disproportionate and adverse human health or environmental effects on EJ populations in the EJ study area for Alternative C, as these effects would be minimized or mitigated and limited to the immediate project sites and transmission line corridors.

3.6.3 Wetlands

The USACE regulates the discharge of fill material into waters of the United States, including wetlands, pursuant to Section 404 of the CWA (33 USC 1344). Additionally, EO 11990 (Protection of Wetlands) requires federal agencies to avoid, to the extent possible, adverse effects to wetlands and to preserve and enhance their natural and beneficial values. Wetlands are also protected by state regulations (e.g., Tennessee's Aquatic Resources Alteration Permit program). As defined in regulations implementing Section 404 of the CWA (45 FR 85346), wetlands are those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. 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.

3.6.3.1 Affected Environment

3.6.3.1.1 CUF Reservation

Field reviews were completed in July and August 2021 to determine wetland presence, extent, and condition within the CUF Reservation (TVA 2021e) (Appendix B). Wetland determinations were performed according to the USACE standards, which require documentation of wetland hydrology, hydric soil, and hydrophytic vegetation (Environmental Laboratory 1987; USACE 2012).

Forty-one wetland complexes totaling approximately 173.2 acres were delineated and assessed during the field reconnaissance (TVA 2021e). An additional 95.3 acres of wetlands were estimated through a desktop analysis of areas unable to be reached by the field team during the study (i.e., on islands in the Cumberland River or across the river from CUF Reservation). Wetlands are depicted on Figure 3.6-1 and summarized in Table 3.6-5.

The CUF Reservation contains an array of wetland features offering minimal to moderate wetland functions within the surrounding watershed. Wetlands occur on nearly 10 percent of the CUF Reservation and are primarily located within the confluence of the Scott Creek and Wells Creek floodplains. All wetlands on site function in flood storage, stormwater impediment, toxin absorption, and sediment retention. Because the associated reach of Wells Creek has been identified as impaired, the importance of wetland functions and values in the Wells Creek watershed is amplified. Similarly, these wetlands contain a variety of plant communities as indicated by the different wetland types, exhibiting a diversity in species composition that supports a diversity of wildlife.

Table 3.6-5. Summary of Wetlands on the CUF Reservation project area

Wetland Type	Acres
Delineated Wetlands	
Forested	100.9
Emergent	29.1
Emergent/Scrub-Shrub/Forested	18.8
Scrub-Shrub	17.5
Emergent/Forested	3.0
Scrub-Shrub/Forested	1.5
Aquatic Bed	1.5
Emergent/Scrub-Shrub	0.7
Total	**173.2**
Desktop Analysis	
Forested	59.1
Emergent/Scrub-Shrub/Forested	36.1
Total	*95.3*
Grand Total	**268.4**

Wetland condition was evaluated using the Tennessee Rapid Assessment Method (TRAM) for wetlands, which quantifies wetland function and classifies wetlands into three categories: low, moderate quality, or exceptional resource value (TVA 2021e). Low quality wetlands are degraded aquatic resources that may exhibit low species diversity, minimal hydrologic input and connectivity, recent or on-going disturbance regimes, and/or predominance of non-native species. These wetlands provide low functionality and are considered low value. Moderate quality wetlands provide functions at a greater value due to a lesser degree of degradation and/or due to their habitat, landscape position, or hydrologic input. Moderate quality wetlands are considered healthy water resources of value. Disturbance to hydrology, substrate and/or vegetation may be present to a degree at which valuable functional capacity is sustained. Wetlands with exceptional resource value provide high functions and values within a watershed or are of regional/statewide concern. Those wetlands would exhibit little, if any, recent disturbance, provide essential and/or large-scale stormwater storage, sediment retention, and toxin absorption, contain mature vegetation communities, and/or offer habitat to rare species. TRAM wetland conditions for wetlands visited during the field study on the CUF Reservation are summarized in Table 3.6-6.

Table 3.6-6. Wetland Condition Categories for Delineated Wetland on the CUF Reservation

Wetland Condition TRAM Category[1]	Acres	Percent
Low Quality	8.27	4.8
Moderate Quality	164.88	95.2
Hight Quality	0	0

[1]TRAM = scores wetland quality by functional capacity

3.6.3.1.2 Alternative A

3.6.3.1.2.1 Proposed CC Plant

The site of the proposed CC plant is within the boundaries of the CUF Reservation and was reviewed during field investigations in July and August 2021. Of the wetlands delineated, six wetland complexes totaling approximately 29.4 acres fall within the boundaries of the CC plant site, with an additional 49.7 acres of wetlands falling within the transmission line corridor (Figure 3.6-1). Wetland habitat types and TRAM quality are presented in Table 3.6-7 and Table 3.6-8.

Table 3.6-7. Summary of Wetlands on the Proposed CC Plant Site

Wetland Habitat Type	CC Plant Site (acres)	Transmission Corridor (acres)
Emergent	3.58	10.2
Emergent/Forested	--	0.68
Emergent/Scrub-Shrub/Forested	18.8	--
Forested	3.43	30.5
Scrub-Shrub	3.55	6.89
Scrub-Shrub/Forested	--	1.42
Total	**29.4**	**49.7**

Table 3.6-8. Wetland Condition Categories for Delineated Wetlands on the Proposed CC Plant Site

Wetland Condition TRAM Category[1]	CC Plant Site (acres)	Transmission Corridor (acres)
Low Quality	0.39	1.15
Moderate Quality	29.08	48.6
High Quality	0.0	0.0

[1]TRAM = scores wetland quality by functional capacity

3.6.3.1.2.2 Natural Gas Pipeline Corridor

National Wetland Inventory data were used to estimate wetland extent in the natural gas pipeline lateral corridor. The review identified 12 wetland features, together encompassing approximately 4.71 acres (Figure 3.6-2, Table 3.6-9). The review also identified 9 freshwater pond features that fell within the natural gas pipeline lateral corridor. TGP will conduct wetland delineations of the proposed pipeline corridor which will be included in the Environmental Report to be submitted with their certificate application that will be filed with the FERC for the proposed pipeline

Table 3.6-9. Wetlands on the Project Site located with the Cumberland River Drainage Basin

Wetland Habitat Type	Acres
Palustrine Forested Wetland/ Palustrine Scrub Shrub	4.71
Freshwater Pond	1.52

3.6.3.1.3 Alternative B

3.6.3.1.3.1 Johnsonville Reservation

The Johnsonville Reservation is located on the east bank of the Kentucky Reservoir of the Tennessee River. The proposed JCT would be located on previously developed portions of the Johnsonville Reservation which do not contain wetlands.

3.6.3.1.3.2 Gleason Reservation

A desktop review of the NWI data suggests no wetlands exist on the proposed CT plant site.

3.6.3.1.3.3 Transmission Corridors

The proposed 40-mile transmission line would cross surface waters, including Chestnut Branch, North Fork Obion River, East Fork Clarks River, Holly Fork Creek, Cane Creek, Little Cane Creek, Mayo Branch, and Cypress Creek, that likely contain associated wetlands. As noted in Table 3.3-1 transmission lines typically result in an average of 0.9 acre (range of 0 to 22.2 acres) of wetland effects per mile of new line. The proposed 40-mile transmission line could contain approximately 36 acres (range of 0 to 888 acres) of wetlands.

3.6.3.1.4 Alternative C

3.6.3.1.4.1 Middle Tennessee TVA Power Service Area

Wetlands occur across the TVA region and are most extensive in the south and west where they comprise 5 percent or more of the landscape (USGS 2016). Wetlands in the TVA region consist of two main systems: (1) palustrine wetlands such as marshes, swamps and bottomland forests dominated by trees, shrubs, and persistent emergent vegetation, and (2) lacustrine wetlands associated with lakes, such as aquatic bed wetlands (Cowardin et al. 1979). Riverine wetlands associated with moving water within a stream channel are also present but relatively uncommon. Almost 200,000 acres of wetlands are associated with the TVA reservoir system, where they are more prevalent on mainstem reservoirs and tailwaters than tributary reservoirs and tailwaters (TVA 2004). Almost half of this area is forested wetlands; other types include aquatic beds and flats, ponds, scrub/shrub wetlands and emergent wetlands.

3.6.3.2 Environmental Consequences

3.6.3.2.1 The No Action Alternative

Under the No Action Alternative, TVA would continue current plant operations until the scheduled retirement, and no work would be conducted that would result in a change to existing conditions. Therefore, there would be no direct or indirect effects to wetlands because there would be no physical changes to the current conditions.

3.6.3.2.2 Retirement, Decommissioning, Decontamination, and Deconstruction of CUF Plant

Under the following action alternatives, CUF would be retired and ultimately deconstructed. No direct, indirect, or cumulative effects to wetlands are expected since no wetlands are currently present within the existing plant footprint.

3.6.3.2.3 Alternative A

3.6.3.2.3.1 Construction and Operation of CC Plant at CUF

Under Alternative A, the CC plant would be constructed and CUF would be retired. TVA would implement the planned actions related to the current and future management and storage of CCRs at CUF, which have either been reviewed or will be in subsequent NEPA analysis. Approximately 29.4 acres of wetlands are within the proposed plant site and may be directly or indirectly effected by construction of the plant. During the design of the plant, TVA would avoid and minimize effects to wetlands as practicable.

Wetlands would be crossed by transmission lines connecting the new CC plant to the existing transmission substation and switchyard. Structures would not be placed within wetlands, where practicable. Where necessary, wetlands may be converted from forested to scrub-shrub or herbaceous to maintain the transmission line corridor. Approximately 30.5 acres of wetlands were classified as forested during wetlands surveys in 2021, which may be permanently converted to scrub-shrub or emergent wetlands if necessary to assure the safe and reliable operation of the transmission facilities. Stumps, root wads, and root systems of trees in wetland areas cleared for the transmission line would be left in place.

Applicable CWA Section 404 and 401 permits would be obtained from USACE and TDEC and necessary mitigation credits purchased in the event that wetlands cannot be avoided. Erosion and sediment control BMPs would be used to minimize indirect effects to wetlands (TVA 2017a).

Cumulative effects to wetlands may occur with the proximity of CCR management activities as RFFAs in the CUF Reservation. With the use of proper BMPs, CWA Section 404 and 401 permitting, and compliance with all federal, state, and local regulations and guidelines, cumulative wetland effects are expected to be minor.

3.6.3.2.3.2 Construction and Operation of Natural Gas Pipeline

Based on desktop mapping, approximately 4.7 acres of wetlands and 1.5 acres of freshwater pond are located within the proposed natural gas pipeline lateral corridor and have the potential to be directly or indirectly impacted. During the construction of the pipeline, wetland effects may occur from trenching the pipeline, although horizontal directional drilling may be used to avoid wetland effects. If vegetation clearing and maintenance is necessary for the pipeline easement, conversion of wetlands from forested to herbaceous may occur; however, a large portion of the pipeline easement aligns with existing rights-of-way and is therefore already maintained for low vegetative cover. Erosion and sediment control BMPs would be deployed and USACE and TDEC permits would be obtained and necessary mitigation credits purchased. TGP will be providing a detailed analysis of wetland effects in the Environmental Report to be submitted with their certificate application that will be filed with the FERC for the proposed pipeline.

Cumulative effects to wetlands may occur with the proximity of past/present and RFFAs in proximity to the pipeline. Cumulative effects to wetlands would be minimized and mitigated through proper siting of these facilities, the use of BMPs, and adherence to mitigation requirements in applicable CWA Section 404 and 401 permits.

3.6.3.2.3.3 Environmental Justice Considerations

Effects to wetlands that would occur as a result of the proposed CC plant, natural gas pipeline lateral, and transmission line activities would be minimized or mitigated through BMPs and CWA 404 and 401 permitting, as described above, with some effects occurring on a TVA-owned reservation, where no populations are settled and EJ populations are removed (Figure 3.4-3). Effects occurring as a result of pipeline activities, while still minor, would be outside of TVA-owned reservations in areas that are settled more prominently by non-EJ populations (nine out of 10 census block groups are non-EJ populations). While EJ populations do exist at the far eastern extreme of the pipeline corridor EJ study area (Figure 3.4-3), these effects would not be disproportionate on EJ populations, as they would be similarly experienced by both EJ and other populations.

3.6.3.2.4 Alternative B

3.6.3.2.4.1 Construction and Operation of CT Plant at Johnsonville Reservation

Based on desktop survey, construction of the JCT on the Johnsonville Reservation would not affect wetlands because there are likely no wetlands located within the proposed plant site. No cumulative effects to wetlands would occur.

3.6.3.2.4.2 Construction and Operation of CT Plant at Gleason Reservation

A desktop review of the NWI did not identify the presence of wetlands on the Gleason Reservation and therefore, wetland effects are not likely to result from construction and operation of the plant and no cumulative effects to wetlands would occur. However, should this alternative be selected, a wetland assessment would be performed at Gleason and project-related effects to wetlands (if identified) would be avoided, mitigated, and/or permitted as required prior to commencement of construction activities.

3.6.3.2.4.3 Transmission and Other Components

Based on a desktop survey, construction of the 40-mile TL would result in direct and indirect effects to wetlands. As noted in Table 3.3-1, transmission lines typically result in an average of 0.9 acres of wetland effects per mile of new line, which is approximately 36 acres for a 40-mile line. TVA would avoid placing structures within wetlands where practicable. The transmission line may require clearing of forested wetlands, which would convert forested systems to emergent, maintained wetlands. Access across wetlands located in the ROW would be conducted in accordance with wetland BMPs to minimize soil compaction and ensure only temporary effects result (TVA 2017a). This includes use of low ground pressure equipment, wetland mats, and dry season work scheduling. Erosion and sediment control BMPs would be deployed and USACE and TDEC permits would be obtained and necessary mitigation credits purchased.

3.6.3.2.4.4 Environmental Justice Considerations

Effects to wetlands that would occur as a result of the activities proposed for Alternative B are not anticipated to have disproportionate adverse environmental and human health effects on EJ populations. These effects would be minimized or mitigated through used of BMPs and adherence to CWA 404 and 401 permit conditions.

3.6.3.2.5 Alternative C

3.6.3.2.5.1 Construction and Operation of Solar and Storage Facilities

Alternative C would result in construction activities that have the potential to permanently affect wetlands and/or temporarily affect wetlands via stormwater runoff. As noted in Table 3.2-1, TVA has evaluated typical effects associated with the development of solar facilities. Solar facilities average approximately 0.003 acre of wetland effects per MW, with a range of 0 to 0.1 acre.

Solar facilities average approximately 0.01 acre of forested wetland clearing per MW, with a range of 0 to 0.1 acres. Construction of 3,000 MW of solar facilities would average 9 acres and up to 300 acres of wetland effects, in addition to an average of 30 acres and up to 300 acres of forested wetland clearing. TVA and solar developers would minimize effects to wetlands by siting facilities on land with few wetland resources, configuring the solar arrays, access roads, and other infrastructure to avoid wetlands, and establishing and maintaining buffers around wetlands. BESS sites are typically small enough to be sited to avoid wetland effects. Appropriate BMPs would be installed, 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 wetlands would be minimized.

Cumulative effects to wetlands may occur under Alternative C with the addition of 10,000 MW of solar identified in the 2019 IRP throughout the TVA PSA. Based on the average of 0.003 acres of effect per MW, this would result in 30 acres of additional wetland effects within the TVA PSA. Cumulative effects to wetlands would be minimized and mitigated through proper siting of solar facilities, the use of BMPs, and adherence to mitigation requirements in applicable CWA Section 404 and 401 permits.

3.6.3.2.5.2 Transmission and Other Components

As noted in Table 3.3-1, transmission lines typically result in an average of 0.9 acres of wetland effects per mile of new line. Based on TVA's evaluation, approximately 1.7 miles of new transmission line are needed for solar facilities, which indicates that approximately 1.5 acres of wetlands may be impacted for each facility. TVA would avoid placing structures within wetlands where practicable. The transmission line may require clearing of forested wetlands, which would convert forested systems to emergent, maintained wetlands. Access across wetlands located in the ROW would be conducted in accordance with wetland BMPs to minimize soil compaction and ensure only temporary effects result (TVA 2017a). This includes use of low ground pressure equipment, wetland mats, and dry season work scheduling. Erosion and sediment control BMPs would be deployed and USACE and TDEC permits would be obtained and necessary mitigation credits purchased.

Cumulative effects to wetlands may occur under Alternative C with the addition of 10,000 MW of solar identified in the 2019 IRP throughout the TVA PSA. Transmission lines associated with this expansion would likely result in wetland crossings and conversion of forested wetlands to maintained wetlands. Cumulative effects to wetlands would be minimized and mitigated through proper siting of transmission lines, the use of BMPs, and adherence to mitigation requirements in applicable CWA Section 404 and 401 permits.

3.6.3.2.5.3 Environmental Justice Considerations

Effects to wetlands that would occur as a result of the proposed solar facilities and transmission line activities are not anticipated to have disproportionate and adverse human health or environmental effects on EJ populations in the EJ study area for Alternative C, as these effects would be minimized or mitigated and limited to the immediate project sites and transmission line corridors.

3.7 Air Quality and Greenhouse Gases/Climate Change

Air pollution is defined as the presence in the outdoor atmosphere of one or more air contaminants in sufficient quantities and of such characteristics and duration as to be injurious to human, plant, or animal life, or to property, or which unreasonably interfere with the enjoyment of life and property [Rules of TDEC, Division of Air Pollution Control, Chapter 1200-03-02-.01(d)]. Air quality, as a resource, incorporates several components that describe the levels of overall air pollution within a region, sources of air emissions, and regulations governing air emissions. The National Ambient Air Quality Standards (NAAQS), state level ambient air quality standards, local ambient air quality, and the air quality requirements for stationary sources in the areas affected by the alternative actions are discussed further below.

Greenhouse gases (GHG) in the atmosphere, primarily carbon dioxide (CO_2), nitrous oxide (N_2O), methane (CH_4), and other fluorine-containing compounds, absorb heat that is radiated from the Earth's surface. Increased atmospheric concentrations of GHG have been widely considered to be a cause for warming of the Earth by trapping more heat, resulting in what is referred to as global warming which is considered to result in climate change. The majority of human-generated, i.e., anthropogenic, GHG emissions are from combustion of fossil fuels in both stationary sources (e.g., power plants, industrial facilities, boilers) and mobile sources (e.g., on-road and off-road motor vehicles and construction equipment, rail, and marine transportation). Additional GHGs that contribute to climate change include methane and nitrous oxide from agricultural sources, hydrofluorocarbons used in refrigerant equipment, and sulfur hexafluoride used as a gaseous dielectric medium for high-voltage circuit breakers, switchgears, and other electrical equipment. Emissions of hydrofluorocarbons and sulfur hexafluoride would be from equipment seal leaks, particularly from older equipment, as well as during manufacturing, installation, servicing, and disposal. However, relative to combustion-related GHG emissions, such leaks are generally considered to be minimal within the TVA system.

General TVA-wide information regarding GHG emissions and the climate conditions in the TVA region are described further below in the Affected Environment section. In addition, alternative-specific GHG emissions are also described further below.

3.7.1 Affected Environment

3.7.1.1 Air Quality and Associated Laws/Regulations

The CAA of 1970, as amended in 1977 and 1990, is the comprehensive law that forms the basis of regulating emissions of air pollutants from stationary sources (such as power plants and industrial plants) and mobile sources (such as motor vehicles, locomotives, marine vessels). It requires USEPA to establish and update NAAQS for ubiquitous air pollutants and directs states to develop State Implementation Plans to achieve these standards. This is accomplished through air quality construction and operating permitting programs that establish emissions limits, installation of emissions control technologies, and work practice requirements applicable to various sources. The CAA also requires USEPA to set standards for emissions of specific hazardous air pollutants (HAPs).

The study area for air quality is defined as the counties where the proposed facilities are located. While power plant air emissions disperse across county and state lines and contribute to effects in areas far downwind, these long-distance effects are expected to be minimal from any one facility or set of facilities such as those assessed in this document. The study area for GHG emissions is effectively the global atmosphere.

3.7.1.1.1 Ambient Air Quality Standards

Air quality is measured primarily by the concentrations of six criteria pollutants within a region. Those six criteria air pollutants are subject to NAAQS that were developed by the USEPA Office of Air Quality Planning and Standards and were chosen because they are the predominant air pollutants of concern for the environment and public health. The criteria pollutants are ozone (O_3), carbon monoxide (CO), nitrogen dioxide (NO_2), lead (Pb), sulfur dioxide (SO_2), and particulate matter (PM), which includes two subcategories: particles less than 10 microns in diameter (PM_{10}) and particles less than 2.5 microns in diameter ($PM_{2.5}$).[6] The NAAQS are summarized in Table 3.7-1. States and U.S. territories with delegated authority for regulating air quality have the option to impose stricter ambient air quality standards than the NAAQS. The Tennessee Ambient Air Quality Standards (TN AAQS) are included in Table 3.7-1 where they differ from the NAAQS.

USEPA designates compliance status for the NAAQS through a formal rulemaking process involving publication of proposed and final rules in the *Federal Register*. For each pollutant for which there is a NAAQS, USEPA designates an area as attainment, nonattainment, or maintenance. An attainment area meets the NAAQS. A nonattainment area does not meet the NAAQS but has a state implementation plan for establishing requirements to restrict emissions to achieve attainment status. A maintenance area (or maintenance/attainment area) is one that was designated as nonattainment within the prior 20 years and has come into attainment with the NAAQS. Part of the redesignation process requires that the state or local agency with responsibility for managing air quality in the area must submit for USEPA approval a plan to maintain compliance with the NAAQS for which the area was in nonattainment status. After the 20-year maintenance period ends and compliance is still maintained, this area defaults to "normal" attainment area status. Strategies remain after the 20-year period to maintain compliance unless the delegated regulatory agency demonstrates to the USEPA that such measures are no longer needed.

Table 3.7-1. National and Tennessee Ambient Air Quality Standards

Pollutant	Averaging Times	Primary NAAQS and TN AAQS	Secondary NAAQS and TN AAQS
CO	8-hour (a)	9 ppm (10 mg/m^3)	None; TN – Same as Primary
	1-hour (a)	35 ppm (40 mg/m^3)	None; TN – Same as Primary
Pb	Rolling 3-Month Average	0.15 µg/ m^3; TN - None	Same as Primary; TN - None
	Quarterly Average	1.5 µg/ m^3	Same as Primary
NO_2	Annual (Arithmetic Mean)	0.053 ppm (100 µg/m^3)	Same as Primary
	1-hour (f)	0.100 ppm (188 ug/m^3); TN - None	None
PM_{10}	24-hour (b)	150 µg/m^3	Same as Primary
	Annual (Arithmetic Mean)	None; TN – 50 µg/m^3	None; TN – Same as Primary
$PM_{2.5}$	Annual (c) (Arithmetic Mean)	12.0 µg/m^3; TN - None	15.0 µg/m^3; TN - None
	24-hour (d)	35 µg/m^3; TN - None	Same as Primary; TN - None
O_3	8-hour (e)	0.075 ppm (2008 std.)	Same as Primary

[6] Ozone is not directly emitted from the emissions sources in this Proposed Action, but it is formed in the lower atmosphere through photochemical reactions between direct emissions of nitrogen oxides (NO_x) and volatile organic compounds (VOCs) and sunlight.

Pollutant	Averaging Times	Primary NAAQS and TN AAQS	Secondary NAAQS and TN AAQS
	8-hour [(e)]	0.070 ppm (2015 std.)	Same as Primary
	1-hour	None; TN – 0.12 ppm	None; TN – 0.12 ppm
SO_2	3-hour [(a)]	none	0.5 ppm (1300 µg/m^3)
	1-hour [(g)]	0.075 ppm (196 ug/m^3)	Same as Primary

Sources: 40 CFR part 50, USEPA 2021a; Chapter 1200-3-3-.03, https://publications.tnsosfiles.com/rules/1200/1200-03/1200-03.htm (TDEC 2021).

[a] Not to be exceeded more than once per year.

[b] Not to be exceeded more than once per year on average over 3 years.

[c] To attain these standards, the 3-year average at any monitor must not exceed 12.0 µg/m^3 for the primary standard and 15.0 µg/m^3 for the secondary standard.

[d] To attain this standard, the 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor within an area must not exceed 35 µg/m^3.

[e] To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average O_3 concentrations measured at each monitor within an area over each year must not exceed the standard. While both the 2008 and 2015 standards are still in place, the 2015 standard is the controlling one, given its greater stringency.

[f] Standard is attained when the 3-year average of the eighth-highest daily maximum 1-hour average NO_2 concentration does not exceed 0.100 parts per million (ppm) or 100 parts per billion (ppb).

[g] Standard is attained when the 3-year average of the fourth-highest daily maximum 1-hour average SO_2 concentration does not exceed 0.075 ppm (196 ppb).

3.7.1.1.2 Hazardous Air Pollutants

Other air pollutants that have caused concern due to their harmful health and/or environmental effects and known or suspected potential for causing cancer include HAPs. The CAA identifies 187 pollutants as HAPs, some of which are emitted from power plants. The most notable HAPs regarding coal and oil-fired plants include heavy metals such as mercury, cadmium, lead, and arsenic, and hydrogen chloride, hydrogen fluoride, and various hydrocarbons. The emissions of most HAPs from coal-fired power plants are much greater than from natural gas-fired power plants, on a pounds per million British Thermal Unit (lb/MMBtu) of fuel basis, due to higher concentrations of pollutant-forming compounds in coal.

The USEPA has singled-out mercury as a special pollutant of concern regarding oil and coal-fired power plants. In 2011, the USEPA promulgated the Mercury and Air Toxics Standards (MATS) [Title 40, CFR, Part63, Subpart UUUUU] to reduce mercury and other toxic air pollutants from such plants. TVA has significantly reduced mercury emissions since 2000 due to retirement of coal-fired units and replacement with natural-gas fired units, and installation of emissions controls on most remaining units (e.g., flue gas desulfurization and selective catalytic reduction, and activated carbon injection systems).

The USEPA has also promulgated National Emissions Standard for Hazardous Air Pollutants (NESHAP) for Stationary Combustion Turbines under 40 CFR 63, Subpart YYYY that are major sources of HAPs, i.e., 10 tons per year (tpy) or more of any individual HAP or 25 tpy or more of all HAPs combined. Generally, the requirements include emissions limitations for formaldehyde and operational limitations including operating parameter limits; performance testing; operations and maintenance requirements; and recordkeeping and reporting requirements. The CC plant under Alternative A is possibly a HAP major source; however, that will depend on the manufacturer provided emissions guarantees.

Another NESHAP that applies to existing reciprocating internal combustion engines (RICE) at CUF and any proposed RICE under Alternatives A and B is 40 CFR 63, Subpart ZZZZ. In general, this rule has operational requirements for maintaining RICE and tracking their operating run time. For new emergency RICE at a major HAP source or new emergency/non-emergency RICE at a non-major HAP source, additional requirements might include complying with the applicable RICE New Source Performance Standard described in the following section. For new non-emergency RICE at a major HAP source, additional requirements might include emissions controls to reduce formaldehyde or carbon monoxide emissions.

3.7.1.1.3 New Source Performance Standards (NSPS)

The USEPA has promulgated standards of performance for various emissions source categories with more significant emissions potential. These standards require new units to meet more stringent emissions limits and/or operational requirements than their older counterparts. The CC plant proposed at CUF and the CT plant option proposed at the Johnsonville and Gleason sites will be subject to 40 CFR 60, Subpart KKKK. This NSPS applies to stationary combustion turbines, both the combustion turbine engine and any associated heat recovery steam generator, for units that commenced construction after February 18, 2005. The key pollutants USEPA regulates from these sources includes NO_x and SO_2. The effects of this rule are discussed further in Section 3.7.2.

A NSPS for fossil fuel-fired electric utility steam generating units is outlined in 40 CFR Part 60 Subpart Da. Subpart Da covers fossil fuel-fired electric utility steam generating units that commenced construction after September 18, 1978 and are boilers capable of combusting over 250 MMBtu/hr of fossil fuel. These include units were also constructed for the purpose of supplying more than one-third of their potential electric output capacity and more than 25 MW electrical output to any utility power distribution system for sale. The key pollutants USEPA regulates from these sources includes PM, NO_x, and SO_2. This rule does not apply to the proposed CT plants but could apply to the proposed CC plant at CUF, because Subpart Da states that a facility meeting the applicability criteria of 40 CFR 60, Subpart KKKK, must meet the emission standards under that rule instead. In addition, Subpart KKKK states that a heat recovery steam generator or duct burner subject to Subpart KKKK is exempt from Subpart Da. However, the only pollutant of significant concern would be NOx which would be expected to be subject to a more stringent Best Available Control Technology (BACT) limitation than the applicable NOx limit in this rule. In addition, TDEC has a comparable NSPS rule to the old Subpart Da under TDEC Chapter 1200-03-16-.03 with emissions limits for these same three pollutants that would apply to the proposed CC plant. The older TDEC version of the federal Subpart Da does not have the exemption for units that are subject to Subpart KKKK, and thus, the TDEC NSPS (equivalent of the old federal Subpart Da) still applies to the proposed CC plant. However, the newer federally-applicable Subpart KKKK limiting BACT will likely be as stringent or more stringent than the state Da limits.

Another NSPS that applies to fossil-fueled power plants, including the proposed CC and CT plants, is 40 CFR 60, Subpart TTTT. This 2015 final rule sets standards for GHG emissions from new (after January 8, 2014), modified, and reconstructed (after June 1, 2014) fossil fuel-fired power plants. For natural gas-fired CC plants (e.g., base load or intermediate load units), the rule has a CO_2 emissions limit of 1,000 lbs./MWh. The main requirement in this rule that applies to the proposed CTs (effectively peaking units) is a CO_2 emissions limit of 120 pounds per Million British Thermal Units (lbs./MMBtu) of natural gas heat input. To maintain compliance with "lbs./MMBtu" limit, a CT unit must adopt an annual generation restriction, which is based upon the unit's thermal efficiency. This essentially limits the annual capacity factors to the percent efficiency of the units. For CC plants (effectively base load or intermediate load units), the rule has a CO_2 emissions limit of 1,000 lb/MWh. The effects of this rule are discussed further in sections 3.7.2.3.1 and 3.7.2.4.1.

There are additional NSPS that apply to ancillary less significant emission sources found at natural gas-fired CC and CT power plants, such as those proposed at CUF and other locations. Ancillary sources may include auxiliary boilers, gas heaters, and RICE, both the compression ignition (CI) type and spark ignition (SI) type. Auxiliary boilers with heat input ratings between 10-100 MMBtu/hr would be subject to the NSPS under 40 CFR 60, Subpart Dc. However, for units that are fired with only pipeline quality natural gas, no emissions standards would apply under Subpart Dc. Instead, such units would be subject to reporting and recordkeeping requirements. Subpart Dc would also apply to dewpoint heaters rated at 10 MMBtu/hr or greater heat input. As with auxiliary boilers, dewpoint heaters > 10 MMBtu/hr that are fired with only pipeline quality natural gas would have no emissions standards under Subpart Dc, but would instead be subject to reporting and recordkeeping requirements. Auxiliary boiler units that are rated at 100 MMBtu/hr or greater would be subject to the NSPS under 40 CFR 60, Subpart Db. If such units are fired on only natural gas, the only applicable emission limit would be for NOx under Subpart Db. Usually, low-NOx burners and/or flue-gas recirculation technology are sufficient to meet Subpart Db limits without post-combustion emission controls.

The RICE at CC and CT plants include emergency generators, black start generators, or emergency fire pump engines. The CI type are typically diesel fuel-fired and SI type are natural gas- or gasoline fired-engines. The NSPS requirements that apply are dependent on various design characteristics of the engines, when construction of the engines commenced, and whether they are for emergency or non-emergency purposes. In general, these NSPS requirements require either purchasing a USEPA-certified engine that meets specific emissions standards or installing, configuring, operating and maintaining the engine per the manufacturer's instructions. The second option may require emissions performance testing.

3.7.1.1.4 Visibility Impairment and Regional Haze

Air pollution affects visibility which is of particular importance within national parks and wilderness areas when pollutants are converted into visible particulates. The CAA designated national parks greater than 6,000 acres and wilderness areas greater than 5,000 acres as Class I protected areas to maintain their air quality. There are eight Class I areas in the vicinity of the TVA region: Great Smoky Mountains National Park, Mammoth Cave National Park and the Joyce Kilmer, Shining Rock, Linville Gorge, Cohutta, Sipsey, and Upper Buffalo Wilderness Areas. The Great Smoky Mountains National Park is the largest Class I area in the TVA region.

Visibility is determined by the ability of particles to scatter and absorb light and is expressed in units of inverse mega-meters or deciviews. Visibility thresholds have been established under 40 CFR 51, Appendix Y which determine whether modeled visibility effects from a source are large enough to require installation of Best Available Retrofit Technology. These requirements, in addition to other regulatory programs, have resulted in significant progress towards attaining natural visibility conditions in the TVA region and nationwide.

The USEPA promulgated the Regional Haze Rule in 1999 to improve visibility in Class I protected areas with the goal to achieve natural background visibility by 2064. Significant improvements have occurred from 1990 through 2016 within the Great Smoky Mountains;

between 44 and 47 percent improvement for best days and worst days, respectively (TVA 2019b).

Emissions of visibility impairing pollutants (e.g., ammonium sulfate from SO_2 emissions and particulate emissions) are significantly greater from coal-fired power plants compared to natural gas-fired power plants. TVA's program to retire coal-fired power plants and replace them with natural gas-fired power plants is contributing to visibility improvements in TVA's service territory.

3.7.1.1.5 Acid Deposition

Acid deposition is primarily caused by SO_2 and NO_x emissions which are transformed into sulfate (SO_4) and nitrate (NO_3) aerosols, then deposited onto surface waters through precipitation (rain, snow, or fog). This precipitation can cause acidification of these surface waters which can adversely affect aquatic life, especially within sensitive ecosystems.

In 1990, CAA Amendments established the Acid Rain Program with the goal to reduce SO_2 and NO_x emissions from the power sector and the resulting acid deposition. Since regulations were implemented in 1995, significant reductions in these and other pollutants have occurred along with significant reductions in sulfate and nitrate deposition in surface waters. TVA's SO_2 emissions in Tennessee have decreased by 97 percent since 1990 and its NO_x emissions in the state have decreased by 95 percent from a peak in 1997 (TVA 2019b). The retirement of TVA coal-fired power plants has contributed to reductions in acid deposition and is expected to continue to further reduce acid deposition in TVA's service territory. Emissions of SO_2 from natural gas-fired power plants are significantly less than from coal-fired power plants due to natural gas having a much lower sulfur content. NO_x emissions from modern natural gas-fired combustion turbines are easily controllable to levels lower than with coal combustion. Meeting the NSPS and BACT limitations, if applicable, for natural gas-fired combustion turbines and ancillary natural gas-fired emission units, will generally result in substantially lower plantwide NO_x emissions compared to a coal-fired facility of similar electric generating capacity.

3.7.1.1.6 General Conformity

The USEPA requires federal non-transportation projects to undergo an air quality conformity analysis to ensure federal actions conform to the state or federal Implementation Plans. These requirements were promulgated on November 30, 1993 within 40 CFR 51 and 93 and were updated effective March 24, 2010. These General Conformity requirements only apply to federal actions within nonattainment and maintenance areas. Because all Alternatives under this Proposed Action occur in attainment areas, the General Conformity rule does not apply.

3.7.1.1.7 Air Quality Permitting for Construction and Operation

TDEC implements programs for permitting the construction and operation of new or modified stationary sources of air emissions in Tennessee that emit regulated pollutants. The TDEC rules for construction and operating permits are contained within the TDEC Division of Air Pollution Control Rules, Chapter 1200-03-09. Depending on the type and size of the emissions units and levels of regulated pollutants emitted, TDEC determines the applicable emission standards and associated requirements for inclusion in the issued construction permit.

The air quality permitting process begins with the application for a construction permit. Each proposed alternative, except the No Action alternative and likely Alternative C, would require a permit to construct in one form or another. TDEC can issue four types of air quality construction permits for the construction and temporary operation of new or modified emissions sources that are potentially applicable to each proposed alternative (listed in order of highest complexity, stringency, and typical time to process):

- Prevention of Significant Deterioration (PSD) Permit (or PSD Permit Modification) in Attainment Area; Major Source permit
- Owner Requested Limit (ORL) Permit (synthetic minor permit to voluntarily limit emissions below PSD permit triggers or operating permit triggers)
- Minor Source permit
- Permit by Rule (applicability dependent on source type, size, and/or emissions from the source)

Issuance of the above construction permits by TDEC would establish federal and state air quality requirements applicable to each alternative. If these requirements are complied with, the construction permitting process would ensure compliance with the State Implementation Plan and ambient air quality standards.

Title V of the CAA requires states to establish an air operating permit program for stationary sources that exceed major source thresholds, which are dependent on the attainment status of the area (e.g., 100 tons per year (tpy) of any criteria pollutant in an attainment area). A Title V operating permit is also required for sources with potential to emit 10 tpy of any individual HAP, or 25 tpy of all HAPs combined. The requirements of Title V are outlined in the federal regulations in 40 CFR Part 70 and in the TDEC, Division of Air Pollution Control regulations within Section 1200-03-09-02. The permits required by these regulations are often referred to as Title V or Part 70 permits.

3.7.1.1.8 Greenhouse Gases and Climate

<u>Greenhouse Gas Emissions</u>

The Earth's temperature is dependent on the balance between the amount of energy incoming from the sun and the amount reflected and radiated into space by the Earth's surface, clouds, gases, and small particles in the atmosphere. The primary GHG of concern, carbon dioxide (CO_2), is naturally exchanged between the atmosphere, plants, and animals through photosynthesis, respiration and decomposition, and between the atmosphere and oceans through gas exchange. Each year, billions of tons of CO_2 are absorbed by oceans and living biomass and emitted to the atmosphere through natural and human processes. GHGs in the atmosphere absorb heat that is radiated from the Earth's surface. An increase in the atmospheric concentration of GHGs results in trapping more heat and causing the Earth to warm (TVA 2019b). Atmospheric levels of CO_2 have increased from below 300 ppm in 1900 to a global average of 412.5 ppm in 2020 (NOAA 2021), which is higher than scientists believe the Earth has experienced in over a million years. GHGs can remain in the atmosphere for differing periods of time, ranging from several years to thousands of years. Each GHG is assigned a global warming potential (GWP) which is an estimate of the relative amount of infrared radiation it absorbs in comparison to CO_2 on a pound-for-pound basis, projected over a one-hundred year period. The main GHG pollutants that apply to TVA operations and their GWPs are CO_2 GWP = 1; CH_4 (methane) GWP = 25; N_2O (nitrous oxide) GWP = 298; and SF6 (sulfur hexafluoride) = 22,800 (40 CFR 98, Table A-1). For example, 1 pound of methane emissions is considered equivalent to 25 pounds of CO_2 emissions or CO_2-e.

Emissions of anthropogenic, i.e., human caused, GHGs are estimated annually by the USEPA for the U.S. and each state for several sectors of the economy. In 2019, the transportation industry accounted for approximately 29 percent, electricity production accounted for 25 percent, industrial activities accounted for 23 percent, with commercial, residential and agricultural activities accounting for the remaining 23 percent of U.S. total GHG emissions. In 2019, total gross U.S. GHG emissions were 6,558.3 million metric tons of carbon dioxide equivalents (MMT CO_2-e) and net emissions (including land-based sinks)[7] were 5,769.1 MMT CO_2-e. The net emissions decreased 1.7 percent compared to 2018 and decreased 13 percent from 2005. (USEPA 2021b). Emissions of CO_2 from TVA power plants decreased by 51 percent between 1995 and 2017. This trend is mainly due to retirement of coal-fired plants and replacement with natural gas-fired plants and nuclear power generation, which has no CO_2 emissions (TVA 2019b).

Climate Status and Projections

The climate in the TVA region is affected by a transition area between a humid continental climate to the north and a humid subtropical climate to the south. This results in temperatures that are generally mild with plenty of rainfall for agricultural and water uses. There is some vegetation-killing freezing from mid-autumn through early spring, occasional severe thunderstorms, infrequent snow and infrequent effects from tropical storms. The seasonal climate changes cause a peak power demand in both the summer for cooling and winter for heating. Rainfall varies throughout the year but peaks in late winter/early spring and again in summer. Winds are strongest during winter and early spring and lightest between late summer and early autumn (TVA 2019b).

The TVA region, i.e., Tennessee area, average monthly temperature trends over a 30-year period from 1981 to 2010 show an overall warming trend of 0.4 to 0.5 degrees Fahrenheit per decade. The annual average trend for a 100+-year period from 1895 to 2015, based on least squares regression analysis, indicates a slight increase of 0.24 degrees Fahrenheit per 100 years with the annual average winter temperature increasing 0.67 degrees Fahrenheit per 100 years and the annual average summer temperature decreasing 0.09 degrees Fahrenheit per 100 years (TVA 2019b).

The TVA region precipitation trend over a 30-year period from 1981 to 2010 is not discernable as there is significant year-to-year variability. Annual average precipitation in the region was 49.92 inches, with monthly averages ranging between 2.6 inches in October to 4.73 inches in December, for this 30-year period. The annual average snowfall in most of the region is between 5 and 25 inches, with up to 100 inches in the higher elevations of the southern Appalachians in North Carolina and Tennessee. The annual total precipitation trend for the 100+-year period between 1895 and 2017 increased at an average annual rate of 8 percent, based on a linear regression analysis. The majority of this increase occurred prior to 1970 with no significant trend since that time (TVA 2019b).

Under a low GHG emissions increase scenario, the forecasted climate trends from the Fourth National Climate Assessment published in 2018 by the U.S. Global Change Research Program (USGCRP) predict higher average annual temperatures in the Southeast U.S. by 3.4 degrees Fahrenheit in 2050 and 4.4 degrees Fahrenheit higher by late century. However, the report notes that the temperatures in the southeast over the last century have not increased as much as the climate model projections anticipated from increases in atmospheric GHG concentrations that have already occurred. Additional higher emissions scenarios also show some deviations from observed trends that have occurred over the past century. Projections for changes in

[7] The ocean sinks do not appear to be included in this data. Oceans are estimated to absorb approximately a relatively constant 31 percent of CO_2 emissions (https://www.ncei.noaa.gov/news/global-ocean-absorbing-more-carbon).

seasonal precipitation in the Southeast are generally within the range of natural variability, except for slightly greater winter precipitation predicted for much of the TVA region (TVA 2019b).

Potential climate change effects include more frequent and intense heat waves, increased damages from floods and major storm events, changes in precipitation patterns, damage from thawing permafrost and sea ice, reduced availability of freshwater during dry seasons, and harm to water resources, agriculture, wildlife, and ecosystems. Climate shifts could influence operational decisions to generate more or less power in the cold and warm seasons, but such changes would not appreciably affect how efficiently the TVA-wide power system operates or result in system failures, over all alternatives (USGCRP 2018).

GHG and Climate Assessment Methodology

For purposes of climate assessment, the study area for this EIS is the counties where the power plants are located with respect to local climate conditions, and with respect to GHG emissions, the study area is the global environment. This climate assessment study area more specifically includes the entire TVA power plant system.

An analysis of projected TVA system-wide GHG emissions due to the proposed actions is presented in the Environmental Consequences section for each alternative. Alternative A is estimated to indirectly reduce GHG emissions from other TVA coal plants as their load factors will likely decrease due to increased efficiency of the new CUF CC plant compared to the existing CUF coal plant. Direct GHG operational emissions will also be presented in terms of a comparison of existing GHG operational emissions to proposed GHG operational emissions at the specific sites under each alternative. GHG and other pollutant emissions from construction activities would be temporary. Since the types, quantities, and activity levels of construction equipment are not known at this early stage, construction emissions are discussed in a qualitative manner.

Global and regional climate models have substantial variation in output, and do not have the ability to accurately measure or predict the actual incremental effects from a specific project's GHG emissions on the environment. Therefore, this EIS uses the proxy method of GHG emissions analysis to assess climate effects and compares the net change in GHG emissions for each alternative as a percent of State of Tennessee, U.S. and global GHG emissions. In addition, the relative difference between GHG emissions for each Alternative is compared to the No Action Alternative.

This EIS also includes a supplemental GHG analysis through information on the social cost of carbon (SCC). The SCC is an estimate of monetized damages (or benefits) associated with incremental increases (or decreases) in GHG emissions, such as human health effects, property damage from increased flood risk, and the value of ecosystem services. While governmental and non-governmental stakeholders have an interest in the costs and effects of carbon emissions resulting from decisions, there is much uncertainty, controversy, and legal contention surrounding the use of any specific SCC price and associated escalation. The most significant points of controversy include:

- The economic discount rate that should be used when accounting for future effects as there is a significant variation in outputs depending on the rate selected.
- Whether global effects, as opposed to only domestic, should be included.

- The SCC metric does not measure the actual incremental effects of an individual project due to both scale and complexity.

- There are no established criteria identifying the monetized SCC values considered significant for NEPA purposes.

Due to the legal uncertainty regarding SCC values, the SCC supplemental analysis presented in this EIS provides an SCC range at what is considered both the lower and upper bound rates based on federal government published SCC documents with a statutory/regulatory basis (e.g., USEPA policy or Executive Order); Trump Administration rate of $1 per metric ton at 7 percent discount rate, and Biden Administration rate of $51 per metric ton at 3 percent discount rate. These SCC values are for comparative purposes only. The SCC results for TVA system-wide effects essentially show that all the alternatives are very close regarding their overall GHG effects; therefore, due to the purpose/need of this project, the SCC outcome was not determinative for the Preferred Alternative decision. There are also established social costs of other greenhouse gases from fossil-fuel combustion, i.e., methane and nitrous oxide; however, they are not provided in this EIS because they are a fraction of the social costs of direct emissions of carbon dioxide from each alternative.

This EIS analysis does not attempt to quantify the GHG emissions from upstream exploration/mining, processing, or transport, i.e., GHG life cycle emissions analysis (LCEA), of the various fuels (coal, natural gas) and materials of construction (e.g., solar panels, batteries, CTs, etc.) under each alternative. This exclusion refers to GHG emissions from energy use (stationary and mobile sources), electricity use, and releases/leaks of methane from the coal life cycles (coal mining methane and abandoned mine methane), and solar panel and lithium battery life cycles. Power plant combustion emissions will be the most significant of the total GHG emissions (much greater than exploration/mining, processing, and transport) for both the coal and natural gas alternatives. Methane leaks from the natural gas life cycle are briefly discussed below due to their recent attention in the media. However, upstream effects from methane leaks are extremely minor and results of a complete and consistent LCEA for each alternative would not provide value to the information presented on the alternatives and their relative comparisons regarding GHG emissions. Lastly, the solar and storage alternative option is not GHG-neutral under a LCEA and each alternative has somewhat off-setting GHG emissions from upstream sources.

Methane emissions from leaks in the natural gas production and transport sectors are being addressed in the natural gas industry. The company that will be constructing the natural gas pipeline for Alternative A, TGP (as a Kinder Morgan company), has joined the USEPA Methane Challenge Program as a ONE Future commitment option Partner. Members in this program commit to methane reduction goals and providing transparency by reporting annual methane emissions reductions to the USEPA. Kinder Morgan, including TGP, is currently at 0.02 percent methane emissions intensity which is well below its 2025 goal of methane emissions intensity of 0.32 percent for transportation and storage. This means their methane leaks have been limited to 0.02 percent of total natural gas throughput. This leak rate would result in approximately less than 2 percent of the net change in CO_2-e emissions from operational emissions due to Alternative A. In addition, the overall Methane Challenge Program leak rate for all members in 2020 was less than 0.5 percent of total natural gas flow for its entire life cycle (USEPA 2022). Based on analysis of EPA data, the American Gas Association indicates that methane fugitive emissions across the entire natural gas supply chain (wellhead-transportation-storage-combustion) are typically around 1.0%, and leakage rates previously estimated by EPA are around 1.4%. Both estimates are far below a level that would nullify the environmental benefit of replacing coal with gas, and the Methane Challenge Program members' actual methane leak performance rate is even well below this EPA data. Additionally, there are numerous ongoing industry and government efforts to further reduce methane leakage throughout the natural gas supply chain. In fact, total methane emissions from natural gas systems have declined 16 percent from 1990 to 2019, largely due to new control technologies, investments in lower-emitting equipment and infrastructure, and better industry operating and maintenance practices, even as gross natural gas withdrawals have climbed 90 percent.

3.7.1.2 CUF Reservation

The CUF Reservation is located in Stewart County, Tennessee which is an attainment area for all criteria pollutants (USEPA 2021c). Table 3.7-2 summarizes monitoring data for ozone, PM_{10}, and SO_2 (USEPA 2021d), the only three pollutants for which monitoring data are available for recent years within approximately 30 miles of CUF. The monitoring site for ozone is located at 5720 Old Dover Rd, Cadiz, Kentucky, approximately 28 miles northwest of the plant. The monitoring sites for PM_{10} and SO_2 are located at 2093 Ussery Rd S, Clarksville, Tennessee, and at latitude/longitude coordinates 36.520298 west, -87.395500 north (WGS84), approximately 16 miles northeast of the power plant. The ambient monitor data indicate compliance with the NAAQS based on three-year averages, which is the basis for USEPA attainment/nonattainment designations.

Table 3.7-2. Monitored Air Quality in Region of CUF

Pollutant	Averaging Period	Monitored Design Concentrations [a]							
		Units	2014	2015	2016	2018	2019	2020	NAAQS
Ozone	8-hour	ppm	-	-	-	0.062	0.061	0.060	**0.070**
SO_2	1-hour	ppb	17	27	32	-	-	-	**75**
PM_{10}	24-hour	µg/m³	26	29	19	-	-	-	**150**

[a] The design concentration is the monitored (ranked or percentile basis) concentration that would be used to assess compliance with the NAAQS.

Based on its potential to emit (PTE), the CUF currently operates under the conditions stipulated by Tennessee Air Pollution Control Board, (Title V) Operating Permit No. 577855 (June 30, 2026 expiration). This permit includes all applicable federal and state air quality requirements and includes the following emission sources: two main coal-fired power plant units (limited alternate fuel oil/used oil and wood allowed); two auxiliary oil-fired boiler units; material handling fugitive particulate emissions from handling/processing coal, limestone, hydrated lime for dust suppression, process additives, ash, and a gypsum by-product. In addition, air quality in Tennessee is protected by the suite of TDEC, Division of Air Pollution Control regulations within Chapter 1200-03.

3.7.1.3 Alternative A

The proposed CC Plant and short transmission lines and associated equipment would be located on the CUF Reservation. The air quality affected environment and existing conditions described above for the CUF Reservation in Section 3.7.1.2 apply to this plant and transmission corridor.

3.7.1.3.1 Natural Gas Pipeline Lateral Corridor

The proposed 32-mile natural gas pipeline lateral would pass through Dickson, Houston, and Stewart counties. All three counties are currently in attainment for all criteria pollutants. There is no available air monitoring data for these counties in the USEPA air monitoring database or the TDEC air monitoring network.

3.7.1.4 Alternative B

3.7.1.4.1 JCT Reservation

The Johnsonville Reservation is located within Humphreys County, Tennessee which is in attainment for all criteria pollutants. The area around the reservation was a maintenance area for SO_2 between 1998 and 2018, when it returned to attainment status. According to USEPA air monitoring data, there are no air monitoring stations in Humphreys County or adjacent counties for any criteria pollutants (USEPA 2021d). In addition, there are no available air monitoring data for Humphreys County in the TDEC air monitoring network (TDEC 2021b).

The Johnsonville Reservation is a PSD major source and has been through a PSD construction permitting process for the existing CT units and associated equipment. Based on PTE, JCT is currently subject to Tennessee Air Pollution Control Board, Operating Permit No. 5728833 (November 25, 2023 expiration). This permit includes all applicable federal and state air quality requirements and includes the following emission sources: 20 natural gas or No. 2 fuel oil CT units totaling over 18,000 MMBtu/hr heat input capacity; four natural gas fired heaters totaling over (35 MMBtu/hr heat input capacity; two emergency diesel engines; coal ash handling facility (historical coal use and handling of combustion residuals); and a historical ash disposal area for an ash settling pond.

3.7.1.4.2 Gleason Reservation

The Gleason Reservation is located within Weakley County, Tennessee which is in attainment for all criteria pollutants. According to USEPA air monitoring data, there are no air monitoring stations in Weakley County or adjacent counties for any criteria pollutants (USEPA 2021d). In addition, there is no available air monitoring data for Weakley County in the TDEC air monitoring network. (TDEC 2021b)

The Gleason Reservation recently obtained a PSD New Source Review construction permit (Tennessee Air Pollution Control Board, PSD Permit No. 975023; June 1, 2020 expiration) to modify its existing CTs to allow unlimited hours of operation. These modifications have been completed; however, TDEC is in the process of incorporating this permit into the renewal of the existing Gleason Reservation Title V air operating permit (Tennessee Air Pollution Control Board, Operating Permit No. 562669, November 13, 2016 expiration). This permit includes applicable federal and state air quality requirements and includes the following emission sources: 3 CT units at 5,836 MMBtu/hr total heat input capacity; one natural gas fired heater (8 MMBtu/hr heat input capacity); and one emergency diesel fire water pump engines rated at 130 hp.

3.7.1.4.3 Transmission Corridors

As part of Alternative B, TVA would construct a 40-mile 500 kV transmission line from a Weakley, Tennessee substation to a new substation on the Marshall-Cumberland 500 kV transmission line. This transmission line would pass through Henry and Weakley counties in Tennessee. Henry County is currently in attainment for all criteria pollutants as is Weakley County. According to USEPA air monitoring data, there are no air monitoring stations in Henry County or adjacent counties for any criteria pollutants (TDEC 2021c). In addition, there is no available air monitoring data for Henry County in the TDEC air monitoring network (TDEC 2021b).

3.7.1.5 Alternative C

3.7.1.5.1 Middle Tennessee TVA Power Service Area

Although - locations of the proposed solar and storage facilities are not known, a large proportion of them would likely be in Middle Tennessee. All of Middle Tennessee is in attainment with all ambient air quality standards.

3.7.2 Environmental Consequences

3.7.2.1 The No Action Alternative

Under the No Action Alternative, TVA would continue to operate the CUF coal-fired power plant. Criteria and HAP pollutant emissions from the continued operation of the plant would include emissions from the plant's boiler stacks, as well as associated emissions such as those from coal mining, handling and transportation activities, additive handling and transportation, and ash handling, disposal, and dust control. Emissions rates from CUF would be expected to remain similar to current levels. For example, the last 3-year average for SO_2, NO_x, and PM_{10} emissions were 7,000+ tons/year, 4,000+ tons/year, and 1,400+ tons/year, respectively. Pollutants such as sulfuric acid, hydrogen fluoride, and hydrogen chloride would continue to be emitted in significant quantities as compared to no or minimal emissions of these pollutants under the other alternatives. CUF utilization may decrease if competing cleaner fuels such as natural gas continue to be cost competitive and renewable energy sources become more cost competitive. For the existing coal-fired units to remain operational, additional repairs and maintenance would be necessary to maintain reliability.

TVA System-Wide Comparison of NAA GHG Effects to all Alternatives

A model analysis for the entire TVA-wide power system was performed and includes a comparison of the CO_2 effects under each alternative over a 20-year period. Model analysis includes emissions across the entire TVA system for each year and represents the expected evolution of the TVA system over time based on TVA's Asset Strategy (TVA's Asset Strategy is further explained in Section 1.1). The differences between each alternative are specific to the decision to retire or not retire Cumberland Fossil Plant and the associated replacement generation outlined in each alternative. Model results represent TVA's current forecast for electric load, asset performance, and commodity prices, among other things. Differences in any of these forecasts could result in higher or lower carbon emissions. Model results also represent TVA's current practice of reliably meeting electric load at the lowest possible dispatch cost, without a penalty applied to unit carbon emissions. Future regulatory requirements would likely result in lower emissions, depending on the structure of the requirements and TVA's fleet composition at the time. Gas additions included in Alternatives A and B would not necessarily prevent higher levels of solar additions above and beyond the currently planned 10,000 MW by 2035. A regulatory environment that places limits on carbon emissions, or carbon-emitting generation, is likely to make renewable resources more economically viable, even if higher volumes of renewable resources result in curtailments during periods of low electric load.

In order to provide stakeholders with a range of carbon cost effects, two different carbon cost valuations are provided: an upper bound using Biden Administration carbon cost rates and a lower bound using Trump Administration carbon cost rates. As shown by the variability of results, it is difficult for the SCC metric to provide meaningful results at an absolute level; therefore, these carbon cost estimates are provided strictly for comparative purposes and transparency. Table 3.7-3 below illustrates system-wide carbon costs, and relative alternative reductions, when using the SCC values from the Biden Administration's Interagency Working Group (IWG) interim guidance, February 2021 (IWG 2021). This table uses SCC estimates at an average 3% discount rate and features the highest overall estimates for carbon costs for the two valuations provided. Table 3.7-4 below illustrates system-wide carbon costs, and relative reductions, when using the SCC values from the Trump Administration's Regulatory Impact Analysis for the Repeal of the Clean Power Plan, and the Emission Guidelines for Greenhouse Gas Emissions from Existing Electric Utility Generating Units (USEPA 2019). This table uses SCC estimates at a 7% discount rate and features the lowest overall estimates for carbon costs of the two valuations provided. As shown in these tables, the No Action Alternative has the highest carbon cost over the 20-year period and the highest Net Present Value in 2021 dollars of all the alternatives, regardless of the carbon cost valuation used. Additionally, the rank-order of action alternatives remains the same with Alternative C featuring the lowest system-wide carbon cost, followed closely by Alternative A and then Alternative B. These SCC values and the assumptions described above make the No Action Alternative environmentally undesirable in comparison to the alternatives selected for comparison.

Table 3.7-3. TVA-Wide CO_2 Emissions and SCC Over 20-Years - Biden Administration Interagency Working Group Interim SCC (3% Average Discount Rate, Feb. 2021)

CY, system CO_2 Emissions (kTons):	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**	**2033**	**2034**	**2035**	**2036**	**2037**	**2038**	**2039**	**2040**	**2041**
No Action Alternative	43,232	41,595	40,829	37,978	39,750	38,410	35,452	35,956	36,195	34,733	37,986	37,520	34,502	35,000	35,943	35,155	36,100	36,223	36,686	36,459
Alternative A: Cumberland CC	43,307	41,587	40,856	37,976	39,750	33,846	31,487	27,767	28,282	26,879	27,899	28,004	24,304	24,194	24,942	24,100	24,928	25,151	25,382	25,182
Alternative B: Gleason and J'ville CTs	43,249	41,583	40,847	37,996	39,753	35,556	32,951	29,101	29,517	27,507	28,730	28,919	25,002	25,224	26,175	25,321	26,208	26,456	26,682	26,465
Alternative C: Solar and Storage	43,263	41,598	40,866	36,861	37,436	32,363	30,109	26,290	26,970	25,462	26,873	27,097	23,186	23,039	23,513	22,616	23,518	23,715	23,905	23,653

SCC cost ($/metric ton, nominal)	$55	$58	$60	$62	$65	$67	$70	$73	$75	$78	$81	$84	$88	$91	$94	$98	$101	$105	$109	$113
SCC cost ($/short ton, nominal)	$50	$52	$54	$57	$59	$61	$63	$66	$68	$71	$74	$77	$79	$82	$85	$89	$92	$95	$99	$102

CY, system SCC cost ($M):	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**	**2033**	**2034**	**2035**	**2036**	**2037**	**2038**	**2039**	**2040**	**2041**
No Action Alternative	$ 2,172	$2,174	$2,219	$2,146	$2,335	$2,344	$2,247	$2,366	$2,472	$2,465	$2,799	$2,871	$2,740	$2,884	$3,072	$3,116	$3,317	$3,450	$3,620	$3,727
Alternative A: Cumberland CC	$ 2,175	$2,173	$2,221	$2,146	$2,335	$2,065	$1,996	$1,827	$1,932	$1,907	$2,056	$2,143	$1,930	$1,993	$2,132	$2,136	$2,291	$2,395	$2,505	$2,574
Alternative B: Gleason and J'ville CTs	$ 2,172	$2,173	$2,220	$2,147	$2,335	$2,170	$2,088	$1,915	$2,016	$1,952	$2,117	$2,213	$1,985	$2,078	$2,237	$2,244	$2,408	$2,519	$2,633	$2,705
Alternative C: Solar and Storage	$ 2,173	$2,174	$2,221	$2,083	$2,199	$1,975	$1,908	$1,730	$1,842	$1,807	$1,980	$2,073	$1,841	$1,898	$2,010	$2,004	$2,161	$2,259	$2,359	$2,418

Discount Rate	0.07		
CY, system SCC NPV and Delta($	**NPV (20-yr, 2021$)**	**Delta**	**Delta %**
No Action Alternative	$27,041		
Alternative A: Cumberland CC	$22,539	($4,502)	-17%
Alternative B: Gleason and J'ville CTs	$23,118	($3,924)	-15%
Alternative C: Solar and Storage	$21,730	($5,311)	-20%

kTons = Thousand short-tons; $M = Million dollars

Table 3.7-4. TVA-Wide CO_2 Emissions and SCC Over 20-Years – Trump Administration's Environmental Protection Agency, Regulatory Impact Analysis for the Repeal of the Clean Power Plan, and the Emission Guidelines for GHG Emissions from Existing Electric Utility Generating Units (SCC at 7% Average Discount Rate, June 2019)

CY, system CO_2 Emissions (kTons):	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041
No Action Alternative	43,232	41,595	40,829	37,978	39,750	38,410	35,452	35,956	36,195	34,733	37,986	37,520	34,502	35,000	35,943	35,155	36,100	36,223	36,686	36,459
Alternative A: Cumberland CC	43,307	41,587	40,856	37,976	39,750	33,846	31,487	27,767	28,282	26,879	27,899	28,004	24,304	24,194	24,942	24,100	24,928	25,151	25,382	25,182
Alternative B: Gleason and J'ville CTs	43,249	41,583	40,847	37,996	39,753	35,556	32,951	29,101	29,517	27,507	28,730	28,919	25,002	25,224	26,175	25,321	26,208	26,456	26,682	26,465
Alternative C: Solar and Storage	43,263	41,598	40,866	36,861	37,436	32,363	30,109	26,290	26,970	25,462	26,873	27,097	23,186	23,039	23,513	22,616	23,518	23,715	23,905	23,653

2019 EPA SCC, 7% DR ($/metric ton, nominal)	$1	$1	$1	$1	$2	$2	$2	$2	$2	$2	$2	$2	$2	$2	$2	$2	$2	$3	$3	$3
2019 EPA SCC, 7% DR ($/short ton, nominal)	$1	$1	$1	$1	$1	$1	$1	$2	$2	$2	$2	$2	$2	$2	$2	$2	$2	$2	$2	$3

CY, system SCC cost ($M):	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041
No Action Alternative	$ 50	$ 50	$ 52	$ 50	$ 55	$ 55	$ 53	$ 56	$ 59	$ 59	$ 67	$ 69	$ 66	$ 70	$ 75	$ 76	$ 82	$ 85	$ 90	$ 93
Alternative A: Cumberland CC	$ 50	$ 50	$ 52	$ 50	$ 55	$ 49	$ 47	$ 43	$ 46	$ 45	$ 49	$ 51	$ 47	$ 48	$ 52	$ 52	$ 56	$ 59	$ 62	$ 65
Alternative B: Gleason and J'ville CTs	$ 50	$ 50	$ 52	$ 50	$ 55	$ 51	$ 49	$ 45	$ 48	$ 47	$ 51	$ 53	$ 48	$ 50	$ 55	$ 55	$ 59	$ 62	$ 66	$ 68
Alternative C: Solar and Storage	$ 50	$ 50	$ 52	$ 49	$ 51	$ 46	$ 45	$ 41	$ 44	$ 43	$ 47	$ 50	$ 44	$ 46	$ 49	$ 49	$ 53	$ 56	$ 59	$ 61

Discount Rate	0.07		
CY, system SCC NPV and Delta($M):	**NPV (20-yr, 2021$)**	**Delta**	**Delta %**
No Action Alternative	$645		
Alternative A: Cumberland CC	$536	($109)	-17%
Alternative B: Gleason and J'ville CTs	$550	($95)	-15%
Alternative C: Solar and Storage	$516	($129)	-20%

kTons = Thousand short-tons; $M = Million dollars

3.7.2.2 Retirement, Decommissioning, Decontamination, and Deconstruction of CUF Plant

This section describes environmental consequences from the retirement, decommissioning, decontamination, and deconstruction of the CUF plant. These activities and effects are expected to occur over a three-year period under all action alternatives.

Most buildings and structures at the CUF facility, approximately 2 million square feet in size, would be decontaminated (where needed) and demolished down to grade or just below grade level. The area would then be backfilled and provided with proper drainage. Short-term, direct contaminant and GHG emissions would occur due to the generation of fugitive dust and use of vehicles and off-road equipment in the decontamination and demolition process, transport of demolition debris and wastes to off-site recycling and disposal facilities, and movement and transport of fill materials and landscaping materials to restore portions of disturbed land that will not be redeveloped. TVA would implement the planned actions related to the current and future management and storage of CCRs.

Fugitive particulate emissions from demolition activities typically produce particles that are mainly deposited on the property where the demolition occurs. The potential drift distance of particles is governed by the initial injection height of the particle, the terminal settling velocity of the particle, and the degree of atmospheric turbulence. Theoretical drift distance, as a function of particle diameter and mean wind speed, has been computed by the EPA for fugitive dust emissions. For a typical mean wind speed of 16 kilometers per hour (10 miles per hour) particles larger than about 100 micrometers (µm) are likely to settle out within 6 to 9 meters (20 to 30 feet) from the point of emission. Particles that are 30 to 100 µm in diameter are likely to settle within a few hundred feet from the point of emission. Smaller particles, particularly PM_{10}, and particulate matter less than 2.5 microns in diameter ($PM_{2.5}$) have much slower gravitational settling velocities and are much more likely to have their settling rate retarded by atmospheric turbulence, and thus be transported offsite (USEPA 2006). Site preparation and vehicular traffic over paved and unpaved roads at the site would also result in the emission of fugitive dust PM_{10} during active deconstruction or demolition debris removal. The largest fraction (greater than 95 percent by weight) of fugitive dust emissions would be deposited within the demolition site boundaries. The remaining fraction of the dust would be subject to transport beyond the property boundary.

Most of the neighboring property around the CUF plant is either undeveloped, small farmland, or limited industrial use. The closest residence to the decontamination and deconstruction project area is located approximately 0.65 miles to the east. Considering the distance from the plant, this location and more distant receptors would not be significantly impacted by fugitive dust emissions. There would also be the potential for an intense, short-term release of fugitive dust associated with the removal of the stacks or other larger structures by dropping with explosives. Fugitive dust would be released in an uncontrolled manner and would likely be released within several minutes, after which these emissions would cease. Dropping the stacks or structures via explosives would likely produce the most particulate matter of any site activity, with the highest potential to travel off the demolition site. The distance the particulate matter could travel would be dependent on the height of the dust column generated from demolition and wind and weather conditions during demolition.

To minimize potential fugitive dust mobilization associated with explosive demolition, the demolition contractor would be required, to the extent practical, to remove ash from the facilities proposed for deconstruction and demolition, prior to removal of that facility and implement dust control measures during demolition to prevent the spread of dust, dirt, and debris. These methods may include wetting equipment and demolition areas, covering waste or debris piles, using covered containers to haul waste and debris, and wetting unpaved vehicle access routes during hauling. Wet suppression can reduce fugitive dust emissions from roadways and unpaved areas. TVA also requires onsite contractors to maintain engines and equipment in good working order (TVA 2021f).

Site preparation and vehicular traffic over paved and unpaved roads at the site would result in the emission of fugitive dust during active deconstruction, demolition debris removal, and restoration activities. The largest fraction of fugitive dust emissions would be deposited onsite within the demolition site boundaries. TVA and its contractors would comply with TDEC Air Pollution Control Rule 1200-3-8, which requires reasonable precautions to prevent PM from becoming airborne. If necessary, emissions from open demolition areas and paved/unpaved roads could be mitigated by spraying water on the work areas and roadways to reduce fugitive dust emissions (TVA 2021f).

Combustion of gasoline and diesel fuels by internal combustion engines (vehicles, generators, demolition equipment, etc.) would generate local emissions of particulate matter, CO, NO_x, SO_2, volatile organic compounds (VOCs), and CO_2 during the site preparation, demolition, and restoration periods. However, new emission control technologies and fuel mixtures have significantly reduced vehicle and equipment emissions. These vehicles and equipment would comply with the USEPA mobile source regulations in 40 CFR Part 85 for on-road engines and 40 CFR Part 1039 for non-road engines. These regulations include requiring a maximum sulfur content in diesel fuel of 15 ppm. Additionally, it is expected that all vehicles would be properly maintained, which would also reduce emissions (TVA 2021f).

Demolition debris and any scrap metal would be transported to an offsite vendor, landfill, or recycling facility by truck. Transport of these materials would occur along existing roadways in the vicinity of CUF and would result in increased emissions for the duration of the deconstruction process. Mitigation measures, including implementing BMPs for controlling fugitive dust and proper maintenance of vehicles for controlling emissions, would help to minimize effects (TVA 2021f).

The use of vehicles and demolition equipment in the activities associated with this alternative, including offsite vehicle operations (such as debris disposal and workforce transportation), would result in a minor temporary increase in CO_2 emissions. There would also be a small risk of a release of pollutants and/or GHGs with high global warming potentials associated with handling and removal of refrigeration and electrical equipment during decontamination and deconstruction activities. Routine capture and recycling procedures are followed for these gaseous materials; therefore, most of these pollutants would not be released to the atmosphere. Additionally, such emission levels are expected to be de minimis in comparison to the total GHG emissions from each alternative and certainly regional and world-wide volumes of GHG emissions. Given the temporary nature of deconstruction activities, local and regional GHG emission levels would not be adversely impacted over the long term by emissions from decontamination and deconstruction activities (TVA 2021f).

Overall, these decontamination and deconstruction activities are expected to have short-term, localized, and minor effects on air quality and no appreciable direct or indirect effect on regional climate change. The effects from elimination of the CUF coal plant operational emissions are discussed below under Alternatives A, B, and C.

Under all Action Alternatives, potential emissions of greenhouse gasses and fugitive dust could occur as a result of the deconstruction and construction activities. Similar emissions could be anticipated from the other projects in the area as a result of construction activities. One example is the proposed JCT Aeroderivative project. The combined projects could cause cumulative minor, temporary effects to air quality in the area, which is discussed further in Section 3.7.2.4.3. Such effects would be mitigated through the use of best management practices such as water suppression for dust control and regular inspections and maintenance of construction vehicles.

3.7.2.2.1 Environmental Justice Considerations

Effects to air quality that would occur as a result of CUF coal facility retirement and D4 activities are not anticipated to have disproportionate environmental and human health effects on EJ populations in the CUF Reservation EJ study area. These effects would be short-term, minor, and generally limited to the TVA-owned CUF Reservation. Moreover, the immediate CUF Reservation vicinity, where fugitive dust emissions have some likelihood of becoming air borne, has low percentages of EJ populations (one out of 10 census block groups are considered EJ across the study area; also see Figure 3.4-3). Minor positive effects to EJ and other populations utilizing areas near or on the CUF Reservation may occur due to beneficial changes to local air quality from CUF retirement.

3.7.2.3 Alternative A

3.7.2.3.1 Construction and Operation of CC Plant at CUF Reservation

Under Alternative A, this Proposed Action component includes construction and operation of a 1,450 MW capacity natural gas CC plant on the CUF Reservation. The main plant components include two combustion turbines, two HRSGs, an auxiliary boiler, an air-cooling system, and an electric and diesel emergency fire water pump.

<u>Construction Effects</u>

Prior to construction of the CC Plant, an air quality construction permit would be applied for through the TDEC to complete construction and begin operations. An air construction permit approval and compliance with its terms and conditions, in combination with compliance with other requirements detailed below, minimize the risk of significant air quality effects.

The plant construction is expected to occur over 30 acres with an additional 10 to 20 acres used for equipment laydown and mobilization. Large equipment could be delivered by rail or barge with smaller items arriving by truck. Improvements to the current barge unloading facilities would consist of grading and creation of dirt/rock ramping to the nose of the barge as well as potential concrete resurfacing and widening. Emissions from material delivery and unloading by rail and barge would consist of fugitive dust and particulate matter, including CO, NO_x, SO_2, VOCs, and CO_2 emissions from combustion of fuels for material transport. These emissions are expected to be minor, and the rail and barge mobile sources would follow the applicable USEPA emissions standards for locomotive engines and marine diesel engines, respectively.

Construction of the CC plant will include use of on-road construction vehicles/trucks and off-road construction equipment for transporting the smaller building/equipment materials to the Reservation and erecting the facilities. Limited land clearing, i.e., clearing and grubbing of trees in one area and clearing of fence rows with trees, and grading activities would occur. Construction emissions are expected from gasoline and diesel fuel combustion within internal combustion engines for on-road vehicles/trucks and off-road equipment. These engines would generate local emissions of particulate matter, including CO, NO_x, SO_2, VOCs, and CO_2, during their operation. New emission control technologies and fuel mixtures have significantly reduced vehicle and construction equipment emissions. These vehicles and equipment would comply with the USEPA mobile source regulations in 40 CFR Part 85 for on-road engines and 40 CFR Part 1039 for non-road engines. These regulations include requiring a maximum sulfur content in diesel fuel of 15 ppm. A maximum of 600 workers would be employed on-site during peak construction activity. Their commuting vehicle emissions would be negligible compared to the other construction activity emissions.

Fugitive dust/particulate emissions would be generated during soil excavation and disturbance and truck traffic over paved and unpaved roads/areas. The largest fraction of fugitive dust emissions would be deposited in the immediate vicinity of the construction area. The smaller particulates would travel a little farther from the immediate construction area; however, those emissions are expected to be minor. The closest residence to the nearest location for the CC plant construction area, i.e., option A2, is located approximately 4,200 feet to the west-northwest. TVA and its contractors would comply with TDEC Air Pollution Control Rule 1200-3-8, which requires reasonable precautions to prevent PM from becoming airborne. In addition, dust control actions including application of wetting agents or soil stabilization products on exposed soils and unpaved roads/travel areas would be implemented to reduce fugitive dust/particulate emissions. Considering the distances from the proposed CC plant construction activities, the residential receptors would not be significantly impacted by fugitive dust emissions.

Stewart County is at least 140 kilometers from a federal Class I protected area or national forest. The expected combined emissions of SO_2, NO_x, and PM_{10} from the proposed CC plant in conjunction with this distance would result in visibility effects that do not exceed the regional haze screening criteria. Therefore, no regional haze requirements or PSD Class I effects analyses would apply under the permitting for construction of the new CC plant (AQ TVA 2021d).

Overall, the CC Plant construction activities are expected to have short-term, localized, and minor effects on air quality and no appreciable direct or indirect effect on regional climate change. Emissions will occur in an attainment area where current ambient levels of criteria pollutants are below ambient air quality standards and are not expected to appreciably change due to construction activities.

Operations Effects

The replacement of CUF coal-fired plant operations with natural gas-fired CC plant operations are expected to have long-term, moderate, beneficial effects on local air quality and on regional climate change in comparison to the No Action Alternative. The decrease in SO_2, NO_x, CO, PM, PM_{10}, and $PM_{2.5}$ operational emissions at the CUF facility are estimated at 7,000+ tons/year, 3,600+ tons/year, 840+ tons/year, 124+ tons/year, 1,100+ tons/year, and 1,000+ tons/year, respectively. There would also be elimination of hydrogen fluoride and hydrogen chloride emissions and significant reductions in mercury and lead emissions along with reductions in other HAP emissions. Table 3.7-5 provides a comparison of estimated pollutant operational emissions for each alternative, both before and after implementation, and the net change and comparison to PSD permit modification thresholds.

Table 3.7-5. CUF Coal Retirement/Replacement EIS - Operational Air Emissions Comparisons - Only Direct Effects to TVA Facilities

Pollutant	(Abbrev.)	CUF 3-Year Avg. Annual Emissions (2018-2020) (tons/yr)	Johnsonville 3-Year Avg. Annual Emissions (2018-2020) (tons/yr)	Gleason 3-Year Avg. Annual Emissions (2018-2020) (tons/yr)	Proposed CCs at CUF - Alternative A Emissions (tons/yr)	Proposed CTs at Johnsonville - Alternative B Emissions (tons/yr)	Proposed CTs at Gleason - Alternative B Emissions (tons/yr)	Net Change CUF Emissions - Alternative A (tons/yr)	Net Change Johnsonville Emissions - Alternative B (tons/yr) [1]	Net Change Gleason Emissions - Alternative B (tons/yr) [1]	Net Change Emissions - Alternative C - Solar/Battery Storage (tons/yr)	PSD Permit Modification Threshold (tons/yr)
Particulate Matter/ Total Suspended Particulate (Filterable only)	PM/TSP	318.7	20.4	14.0	194.3	43.7	32.8	-124.4	**43.7**	**32.8**	-318.7	**25**
Total PM<10 microns (Filterable + Condensible)	PM_{10}	1,413.3	26.7	26.4	308.4	40.5	30.4	-1,104.9	**40.5**	**30.4**	-1,413.3	**15**
Total PM<2.5 microns (Filterable + Condensible)	$PM_{2.5}$	1,313.3	26.7	26.4	308.4	40.5	30.4	-1,004.9	**40.5**	**30.4**	-1,313.3	**10**
Sulfur Dioxide	SO_2	7,266.7	2.8	1.6	155.3	17.9	13.5	-7,111.4	17.9	13.5	-7,266.7	40
Nitrogen Oxides	NOx	4,050.0	135.1	188.7	353.7	178.1	133.6	-3,696.3	**178.1**	**133.6**	-4,050.0	**40**
Carbon Monoxide	CO	1,083.3	75.4	60.3	234.1	112.2	84.1	-849.2	**112.2**	84.1	-1,083.3	**100**
Volatile Organic Compounds	VOC	128.7	18.2	8.0	308.1	35.7	26.8	**179.4**	35.7	26.8	-128.7	**40**
Sulfuric Acid	H_2SO_4	1,025.3	0.0	0.1	0.0	0.0	0.0	-1,025.3	0.0	0.0	-1,025.3	7
Ammonia	NH_3	4.0	2.3	0.0	310.7	0.0	0.0	306.7	0.0	0.0	-4.0	NA
Carbon Dioxide	CO_2	10,500,000.0	476,000.0	315,000.0	5,517,048.0	640,250.9	480,188.2	-4,982,952.0	-4,609,749.1	-4,769,811.8	-10,500,000.0	NA
Methane	CH_4	114.0	8.7	5.8	393.2	45.4	34.1	279.2	-11.6	-22.9	-114.0	NA
Nitrous Oxide	N_2O	179.3	0.9	0.6	137.1	15.8	11.9	-42.2	-73.8	-77.8	-179.3	NA
CO_2 equivalent (GHGs)	CO_2-e	10,566,666.7	478,000.0	315,666.7	5,567,733.1	646,107.5	484,580.7	-4,998,933.6	-4,637,225.8	-4,798,752.7	-10,566,666.7	75,000
Mercury	Hg	7.8E-03	1.6E-04	2.6E-06	No Data	No Data	No Data	-7.8E-03	-1.6E-04	-2.6E-06	-7.8E-03	NA
Lead	Pb	1.0E-01	No Data	No Data	No Data	No Data	No Data	-1.0E-01	No Data	No Data	-1.0E-01	0.6

[1] = The Net Change in GHG operational emissions for Alternative B accounts for GHG emissions reductions from CUF coal retirement, due to GHG emissions having global impact, and those reductions are considered split evenly between Johnsonville and Gleason. Criteria/HAP pollutant emissions reductions from CUF coal retirement only have a more local region of influence and are not included in Alternative B Net Change in operational emissions.
Additional hazardous air pollutants are emitted but in negligible quantities, except for hydrogen fluoride (HF) and hydrogen chloride (HCl). HF and HCl emissions from coal burning would be eliminated with the switch to natural gas combustion turbines.
NA = Not Applicable

Emissions presented are only due to directly impacted TVA facilities under each alternative. Emission calculations for the CCs were based on the following:

- Expected operational limits similar to BACT established for other, comparable CC units and associated equipment. (e.g., those established and published under the USEPA Reasonably Available Control Technology (RACT)/BACT/Lowest Achievable Emission Rate (LAER) Clearinghouse (RBLC) database).

- USEPA AP-42 Emission Factor for SO_2 emissions.

Where the RBLC database was used, the lowest and highest limits were eliminated, and remaining limits were averaged; detailed emissions calculations are provided in Appendix C.

Due to NSPS requirements, more specifically 40 CFR 60 Subparts KKKK and TTTT, the new CCs would require emissions controls for NO_x and CO, and emissions limitations for SO_2 and CO_2 emissions. In addition, these rules would have emissions monitoring and/or performance testing requirements, fuel and fuel sulfur monitoring requirements, maintenance, recordkeeping, and reporting requirements. Reduction of NO_x emissions from the CTs (HRSG bypass operations) would be achieved through dry low- NO_x combustion systems. The CC plant would use a Selective Catalytic Reduction (SCR) system located within the HRSGs for additional NO_x reduction. Reduction of CO emissions would be achieved using a separate catalyst layer specifically for that pollutant. The new exhaust stacks would be equipped with continuous emissions monitoring systems.

After the CC plant begins operation, the existing Title V operating permit will require revisions to incorporate the new plant and associated air quality requirements and remove conditions regarding the existing coal-fired power plant.

Additional beneficial air quality effects from Alternative A include the following[8]:

- Elimination of mercury emissions by switching from coal to natural gas combustion, further enhancing compliance with the MATS rule.

- Reduction in acid precipitation deposition due to significant SO_2 and NO_x emissions reductions.

- Visibility impairment reductions due to significantly reduced PM, PM_{10}, $PM_{2.5}$, NO_x, and SO_2 emissions from coal combustion, handling, and transport.

GHG Effects

The decrease in CO_2-e operational emissions at the CUF facility from implementation of Alternative A would be 4,998,934 tons in the first full year when the CC plant would begin operation (anticipated in 2027). Commercial operation is scheduled to begin approximately June 2026 with final acceptance in December 2026; however, the highest annual CO_2-e emissions reductions begin in 2027. Similar annual reductions in CO_2-e operational emissions would be experienced from that point forward.

[8] These air quality benefits would also be realized under Alternatives B and C but only at the CUF Reservation.

For purposes of a GHG proxy analysis, emissions of CO_2 from energy consumption are being used as that data is most readily available and consistent across state, U.S. and global data sources. Based on the most recent estimates of CO_2 emissions for the state of Tennessee by the U.S. Energy Information Administration (USEIA), total emissions of CO_2 for the state in 2018 were 94.7 million metric tons (USEIA 2021). The most recent total U.S. CO_2 emissions due to energy consumption were 4,576.3 million metric tons from USEIA data for 2020. (USEIA 2022). The most recent total global CO_2 emissions due to energy consumption were 31,500 million metric tons from IE) data for 2020 (USIEA 2021). Therefore, the net decrease in emissions of 4.5 million metric tons of CO_2 per year associated with implementation of Alternative A would represent approximately 4.8 percent of total statewide emissions in 2018, approximately 0.1 percent of the total U.S. emissions in 2020, and 0.01 percent of the total global GHG emissions for 2020. As such, the operation of Alternative A would represent a small benefit to climate change as a less than significant reduction in state, national, and global GHG emissions.

Using the Biden Administration's 2021 SCC dollar per metric ton values, adjusted for inflation, the estimated social cost benefit of carbon emissions reductions from implementing Alternative A in 2027 would be $306,449,081 for direct CO_2 effects. Table 3.7-6 provides the Biden Administration's social cost benefit, in dollars, of direct effect CO_2 operational emissions reductions for each alternative in 2027, when full year operations would begin. Using the Trump Administration's 2019 SCC dollar per metric ton values, adjusted for inflation, the estimated social cost benefit of carbon emissions reductions from implementing Alternative A in 2027 would be $4,982,952 for direct CO_2 effects. Table 3.7-7 provides the Trump Administration's social cost benefit, in dollars, of direct effect CO_2 operational emissions reductions for each alternative in 2027, when full year operations would begin. For both scenarios, beyond 2027 and at least through 2050, the social cost benefit of CO_2 emissions reductions would increase year over year based on the increase in SCC rates ($/ton) between 2020 and 2050.

Table 3.7-3 and Table 3.7-4 show the social cost of carbon model analysis results for Alternative A considering direct and indirect CO_2 operational emissions from the entire TVA-wide power system under two scenarios. The analysis results for the Biden Administration SCC scenario in Table 3.7-3 shows a total 20-year SCC of $42,932 million dollars. The analysis results for the Trump Administration SCC scenario in Table 3.7-4 shows a total 20-year SCC of $1,030 million dollars. The net present value (NPV, 20-year, 2021 dollars) for Alternative A in the Biden Administration SCC scenario is $22,539 million dollars and $536 million dollars for the Trump Administration SCC scenario. The Biden Administration SCC scenario results show Alternative A has a 17 percent reduction in NPV over the No Action Alternative. This is between the highest and lowest percent reduction compared to Alternatives B and C which are 15 and 20 percent, respectively. The Trump Administration SCC scenario results show Alternative A also has a 17 percent reduction in NPV over the No Action Alternative. This is again between the highest and lowest percent reduction compared to Alternatives B and C which are 15 and 20 percent, respectively.

The CC Plant would also be subject to annual reporting to the USEPA regarding emissions of GHG. The plant would exceed the 25,000 metric tons annual threshold for reporting.

Climate Change Effects on Alternative A

Increases in ambient temperatures due to climate change would negatively affect combustion turbine efficiency; although the efficiency drop is estimated at 0.06 percent per degree Celsius rise above 15 degrees Celsius, or 59 degrees Fahrenheit. This could slightly increase the turbine emissions, but that increase is expected to be minimal assuming climate change results in an overall 1.5-degree Celsius rise by 2050 (Fernandez et al. 2021). These climate change increased temperature effects on Alternative A are the same for Alternatives B and C; therefore, they are not repeated under the comparable subsections for Alternatives B and C.

One-third of the available area where the new CC plant will reside is within a 100-year flood plain; however, the CC plant infrastructure will be located outside of the 100-year floodplain, where possible. Otherwise, flood damageable facilities will be constructed one foot above the 100-year floodplain. The natural gas pipeline under Alternative A crosses the 100-year floodplain of several streams; however, operational effects due to flooding are not expected to be significant.

Drought conditions, should they occur, would not be expected to have an effect on the physical infrastructure or operations for all alternatives as they are not dependent on significant water resources. TVA has developed a Climate Action Adaptation and Resiliency Plan to identify risks associated with and plan for climate change effects.

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Table 3.7-6. CUF Coal Retirement/Replacement EIS - Social Cost Benefit of GHG Operational Emissions Reductions for Alternatives A, B, and C - Only Direct Effects to TVA Facilities (2027) – Biden Administration SCC Rates

GHG Pollutant	(Abbrev.)	Nominal SCC Rate ($/mt) (2027)	Nominal SCC Rate ($/ton) (2027)	Net SCC Benefit - Alternative A (2027, Dollars)	Net SCC Benefit - Alternative B - Johnsonville (2027, Dollars)	Net SCC Benefit - Alternative B - Gleason (2027, Dollars)	Net SCC Benefit - Alternative B - Total (2027, Dollars)	Net SCC Benefit - Alternative C (2027, Dollars)
Carbon Dioxide	CO_2	$ 68	$ 61	**$ (306,449,081)**	**$ (283,497,289)**	**$ (293,341,067)**	**$ (576,838,355)**	**$ (645,744,801.37)**

Notes: 2027 SCC is presented as this is the first full year that Alternatives A and B are planned to begin operation. 3% discount rate used. Costs based on global impacts.
Social cost of Methane and Nitrous Oxide values are not presented because they are insignificant, with regard to direct combustion emissions from all alternatives, when compared to the social cost of carbon, i.e., CO_2.

$ = U.S. Dollars; mt = metric tons; SCC = Social Cost of Carbon

Table 3.7-7. CUF Coal Retirement/Replacement EIS - Social Cost of Carbon (SCC) Benefit from Operational Emissions Reductions for Alternatives A, B, and C - Only Direct Effects to TVA Facilities (2027) - Trump Administration SCC Rates

GHG Pollutant	(Abbrev.)	Nominal SCC Rate ($/mt) (2027)	Nominal SCC Rate ($/ton) (2027)	Net SCC Benefit - Alternative A (2027, Dollars)	Net SCC Benefit - Alternative B - Johnsonville (2027, Dollars)	Net SCC Benefit - Alternative B - Gleason (2027, Dollars)	Net SCC Benefit - Alternative B - Total (2027, Dollars)	Net SCC Benefit - Alternative C (2027, Dollars)
Carbon Dioxide	CO_2	$ 1	$ 1	**$ (4,982,952)**	**$ (4,609,749)**	**$ (4,769,812)**	**$ (9,379,561)**	**$ (10,500,000.00)**

Notes: 2027 SCC is presented as this is the first full year that Alternatives A and B are planned to begin operation. 7% discount rate used. Costs based on U.S. impacts only.
Social cost of Methane and Nitrous Oxide values are not presented because they are insignificant, with regard to direct combustion emissions from all alternatives, when compared to the social cost of carbon, i.e., CO_2.

$ = U.S. Dollars; mt = metric tons; SCC = Social Cost of Carbon

3.7.2.3.2 Construction and Operation of Natural Gas Pipeline

Under Alternative A, this Proposed Action component includes construction and operation of approximately 32 miles of new natural gas pipeline and gas system infrastructure to supply fuel for the CC plant. No natural gas compression or heating is anticipated for this new pipeline. Compression at the CC plant site will be needed but it will use electric-driven motors. Any fugitive emission releases of natural gas and its constituents (mainly methane and CO_2) from the pipeline and from compression during operations are expected to be minimal compared to CO_2-e emissions from natural gas combustion.

Construction of the pipeline will include use of on-road construction vehicles/trucks and off-road construction equipment (e.g., bulldozers, backhoes, welders, generators, etc.) for transporting the piping to the construction areas and digging, stringing, welding, and burying the pipeline. Limited land clearing activities and associated equipment are expected as most of the pipeline will be located adjacent to an existing electrical transmission line right-of-way. There may be some deep valley stream crossings that will require more land clearing; however, it is not expected to be significant enough to cause air quality issues. Emissions from pipe welding are expected to be minimal and widely distributed over the 32-mile pipeline based on the nature of the pipeline welding process and equipment, especially when compared to other construction emissions.

Construction emissions are expected from gasoline and diesel fuel combustion within internal combustion engines for on-road vehicles/trucks and off-road equipment. These engines would generate local emissions of particulate matter, including CO, NO_x, SO_2, VOCs, and CO_2, during their operation and would be widely distributed across the 32-mile pipeline area. New emission control technologies and fuel mixtures have significantly reduced vehicle and construction equipment emissions. These vehicles and equipment would comply with the USEPA mobile source regulations in 40 CFR Part 85 for on-road engines and 40 CFR Part 1039 for non-road engines. These regulations include requiring a maximum sulfur content in diesel fuel of 15 ppm. Additionally, it is expected that all vehicles would be properly maintained, which would also minimize emissions.

Fugitive dust/particulate emissions would be generated during soil excavation, disturbance, and covering activities and truck traffic over paved and unpaved roads/areas. The largest fraction of fugitive dust emissions would be deposited in the immediate vicinity of the construction area. The smaller particulates would travel a little farther from the immediate construction area; however, those emissions are expected to be minor and widely distributed over the entire 32-mile pipeline. TDEC Air Pollution Control Rule 1200-3-8 requiring the use of reasonable precautions to prevent particulate matter from becoming airborne will help minimize fugitive particulate emissions. Dust control actions, including application of wetting agents or soil stabilization products on exposed soils and unpaved roads/travel areas would be implemented to reduce fugitive dust/particulate emissions.

Overall, the pipeline construction activities are expected to have short-term, localized, and minor effects on air quality and no appreciable direct or indirect effect on regional climate change. Emissions will occur in attainment areas across the entire 32-mile pipeline where current ambient levels of criteria pollutants are below ambient air quality standards and not expected to appreciably change due to construction activities.

3.7.2.3.3 Transmission and Other Components

Alternative A includes construction activities to connect existing electrical transmission lines to the proposed CCs and to upgrade certain on-site and off-site transmission line equipment to accommodate the new plant. The affected area on the CUF reservation includes up to four new 500kV transmission lines with a length of approximately one mile each and an overall width of approximately 300 feet. The off-site affected area consists of approximately six miles of new fiber optic lines along an existing 500 kV transmission line. These activities would occur on and adjacent to the CUF plant property and would generate temporary and minor amounts of fugitive dust from vehicular and equipment travel over paved and unpaved roads. In addition, temporary and minor helicopter and fugitive dust emissions would occur to install the fiber optic lines. TDEC Air Pollution Control Rule 1200-3-8, which requires reasonable precautions to prevent particulate matter from becoming airborne, would apply to minimize fugitive emissions. Fugitive dust control actions would be implemented including application of wetting agents or soil stabilization products on exposed soils and unpaved roads/travel areas.

Highway vehicles, off-road mobile equipment, and helicopters would generate minor amounts of combustion emissions including particulate matter, such as CO, NO_x, SO_2, VOCs, and CO_2 from diesel, gasoline, and aviation fuel for internal combustion and turbine engines. New emission control technologies and fuel mixtures have significantly reduced vehicle and construction equipment emissions. These vehicles and equipment would comply with the USEPA mobile source regulations in 40 CFR Part 85 for on-road engines and 40 CFR Part 1039 for non-road engines. These regulations include requiring a maximum sulfur content in diesel fuel of 15 ppm. Additionally, it is expected that all vehicles would be properly maintained, which would also reduce emissions. Helicopters would comply with applicable aircraft or rotary-wing engine emissions standards.

There are typically no operational emissions from the transmission lines and associated electrical equipment. If some electrical equipment contains the GHG sulfur hexafluoride gas (e.g., electrical switchgear, circuit breakers), there could be minor leaks, mostly associated with maintenance or long-term equipment degradation. However, their emissions are expected to be minimal or negligible. The expectation is that minimal equipment is anticipated to contain sulfur hexafluoride and the quantities should be very small. In addition, due to newer equipment, more efficient operation and maintenance techniques, and leak detection, these features would minimize sulfur hexafluoride emissions.

Overall, these transmission line construction and upgrade activities are expected to have short-term, minimal effects on air quality and no appreciable direct or indirect effect on regional climate change. The operation of the transmission lines and associated equipment is expected to have long-term, minimal effects on air quality and no appreciable direct or indirect effect on regional climate change.

3.7.2.3.4 Environmental Justice Considerations

Effects to air quality that would occur as a result of the proposed CC plant and transmission line activities are not anticipated to have disproportionate and adverse human health or environmental effects on EJ populations in the CUF Reservation EJ study area. These effects would be reduced in comparison with existing conditions and minimized through permitting and monitoring, as described above. Moreover, these would be generally limited to the immediate CUF vicinity, where fugitive dust and particulate emissions have some but low likelihood of becoming air borne and low percentages of EJ populations are settled (one out of 10 census block groups are low-income EJ populations; also see Figure 3.4-3).

Effects to air quality that would occur as a result of the proposed natural gas pipeline are not anticipated to have disproportionate and adverse human health or environmental effects on EJ populations in the pipeline lateral corridor EJ study area, as these effects would be minor and generally limited to the immediate pipeline corridor. The immediate pipeline corridor vicinity, where fugitive dust and particulate emissions have some but low likelihood of becoming air borne, has varying percentages of both EJ and non-EJ populations, with the majority consisting of more non-EJ (nine out of 10 census block groups are non-EJ populations; also see Figure 3.4-4). Thus, any emissions effects, if they do occur, are not anticipated to be disproportionate on EJ populations, as similar effects would occur to non-EJ populations along the pipeline corridor.

3.7.2.4 Alternative B

3.7.2.4.1 Construction and Operation of CT Plants at JCT and Gleason Reservations

Under Alternative B, TVA would construct and operate CT plants with a total heat input capacity of 3,005 MMBtu/hr on the JCT reservation and 2,254 MMBtu/hr on the Gleason Reservation. The main plant components on the JCT reservation include four CTs and four natural gas dew point heaters at 10 MMBtu/hr each, and an electric-driven gas compressor. The main plant components on the Gleason Reservation include three CTs and three natural gas dew point heaters at 10 MMBtu/hr each, and possibly an electric-driven gas compressor. This alternative also includes the retirement, decommissioning, decontamination, and deconstruction of the CUF Plant previously discussed above.

Construction Effects

The main plant construction on both Reservations is expected to occur on up to 10 acres with as much as 33 to 60 acres available for equipment laydown, mobilization, and parking; 33 for JCT and 60 for Gleason. Large equipment would be delivered by rail with smaller items arriving by truck. Emissions from material delivery and unloading by rail would consist of fugitive dust and particulate matter, including CO, NO_x, SO_2, VOCs, and CO_2 emissions from combustion of fuels for material transport. These emissions are expected to be minor, and the rail mobile sources would follow the applicable USEPA emissions standards for locomotive engines.

Construction of the CT plants will include use of on-road construction vehicles/trucks and off-road construction equipment for transporting building/equipment materials to the Reservations, excavating and ground disturbance, and erecting the facilities. No land clearing would occur as the sites are largely cleared and grading would be minimized. Construction emissions are expected from gasoline and diesel fuel combustion within internal combustion engines for on-road vehicles/trucks and off-road equipment. These engines would generate local emissions of particulate matter, including CO, NO_x, SO_2, VOCs, and CO_2, during their operation. New emission control technologies and fuel mixtures have significantly reduced vehicle and construction equipment emissions. These vehicles and equipment would comply with the USEPA mobile source regulations in 40 CFR Part 85 for on-road engines and 40 CFR Part 1039 for non-road engines. These regulations include requiring a maximum sulfur content in diesel fuel of 15 ppm. A maximum of 180 workers would be employed at each Reservation during peak construction activity. Their commuting vehicle emissions would be negligible compared to the other construction activity emissions.

Fugitive dust/particulate emissions would be generated during soil excavation and disturbance and truck traffic over paved and unpaved roads/areas. The largest fraction of fugitive dust emissions would be deposited in the immediate vicinity of the construction areas. The smaller particulates would travel a little farther from the immediate construction area; however, those emissions are expected to be minor. The closest residence to the JCT reservation is located approximately 1,000 feet to the south. The closest residence to the Gleason Reservation property is located approximately 0.6 miles to the south. Considering these distances from the new CT plants construction activities and their minor extent, these receptor locations and more distant receptors would not be significantly impacted by fugitive dust emissions. TVA and its contractors would comply with TDEC Air Pollution Control Rule 1200-3-8, which requires reasonable precautions to prevent particulate matter from becoming airborne, would help minimize fugitive dust emissions. Dust control actions including application of wetting agents or soil stabilization products on exposed soils and unpaved roads/travel areas would be implemented to reduce fugitive dust/particulate emissions.

Prior to construction of the CT plants, air quality construction permits would be required through the TDEC to complete construction and begin operations. Based on initial estimates of a significant increase in emissions, it is expected a PSD permit modification would be required for each of the new plants at each Reservation. Applicable BACT will be included in and implemented through permit conditions, where required by PSD requirements. Compliance with the PSD permit terms and conditions assures air quality effects will not be significant.

For the JCT reservation, Humphreys County is over 160 kilometers from of a federal Class I protected area or national forest. The expected combined emissions of SO_2, NO_x, and PM_{10} from the proposed CT plant in conjunction with this distance would not result in visibility effects that exceed the regional haze screening criteria. Therefore, no regional haze requirements or PSD Class I effects analyses would apply under the construction permitting of the new CT plant (USEPA 2021e).

For the Gleason Reservation, Weakley County is at least 120 kilometers from a federal Class I protected area or national forest. The expected combined emissions of SO_2, NO_x, and PM_{10} from the proposed CT plant in conjunction with this distance would not result in visibility effects that exceed the regional haze screening criteria. Therefore, no regional haze requirements or PSD Class I effects analyses would apply under the construction permitting of the new CT plant (USEPA 2021e).

Overall, the CT construction activities at both the JCT and Gleason reservations are expected to have short-term, localized, and minor effects on air quality and no appreciable direct or indirect effect on regional climate change. Emissions would occur in attainment areas where current ambient levels of criteria pollutants are below ambient air quality standards and are not expected to appreciably change due to construction activities.

Operations Effects

The addition of natural gas CT plant operations at the JCT reservation and Gleason reservation are expected to have long-term, minor effects on local air quality. These additions, along with the CUF plant retirement, are expected to have long-term, moderate, beneficial effects on regional climate change in comparison to the No Action Alternative. The net change (increases) in SO_2, NO_x, CO, PM, PM_{10}, $PM_{2.5}$, and VOC operational emissions at the JCT reservation are estimated at 17+ tons/year, 178+ tons/year, 112+ tons/year, 43+ tons/year, 40+ tons/year, 40+ tons/year, and 35+ tons/year, respectively. The net change (increase) in SO_2, NO_x, CO, PM, PM_{10}, $PM_{2.5}$, and VOC operational emissions at the Gleason Reservation are estimated at 13+ tons/year, 133+ tons/year, 84+ tons/year, 32+ tons/year, 30+ tons/year, 30+ tons/year, and 26+ tons/year, respectively. Table 3.7-5 provides a comparison of estimated pollutant operational emissions for each alternative both before and after implementation of alternatives, and the net change and comparison to PSD permit modification thresholds. Emissions presented are only due to directly impacted TVA facilities under each alternative. Emission calculations for the CTs were based on the following:

- Expected operational limits similar to BACT established for other, comparable CC units and associated equipment. (e.g., those established and published under the USEPA Reasonably Available Control Technology (RACT)/BACT/Lowest Achievable Emission Rate (LAER) Clearinghouse (RBLC) database).

- USEPA AP-42 Emission Factor for SO_2 emissions.

Where the RBLC database was used, the lowest and highest limits were eliminated, and the remaining limits were averaged. The detailed emissions calculations are provided in Appendix C. Reduction of NO_x emissions from the CTs would be achieved through dry low- NO_x (DLN) combustion systems.

Due to NSPS requirements, more specifically 40 CFR 60 Subparts KKKK and TTTT, the new CTs would also require emissions controls to limit NO_x emissions. The SO_2 and CO_2 emission limitations under these rules would be met based on the use of pipeline quality natural gas. In addition, these rules would have emissions monitoring and/or performance testing requirements, fuel and fuel sulfur monitoring requirements, maintenance, recordkeeping, and reporting requirements. After the CT Plants begin operation, the existing Title V operating permits will require revisions to incorporate the new plants and associated air quality requirements.

GHG Effects

The decrease in CO_2-e operational emissions based on the net changes at CUF and JCT and the net changes at the CUF and Gleason from implementation of Alternative B would be 4,637,226 tons and 4,798,753, respectively, in the first full year (2027) when the CT plants would be expected to operate. Commercial operation is scheduled to begin approximately June 2026 with final acceptance in December 2026; however, the maximum annual CO_2-e emissions reductions begin in 2027. Similar annual reductions in CO_2-e operational emissions would be experienced from that point forward.

For the GHG proxy analysis, the net decrease in emissions of 8.5 million metric tons of CO_2 per year associated with implementation of Alternative B would represent approximately 9 percent of total statewide emissions in 2018, approximately 0.19 percent of the total U.S. emissions in 2020, and 0.03 percent of the total global GHG emissions for 2020. As such, the operation of Alternative B would represent a small benefit to climate change as a less than significant reduction in state, national, and global GHG emissions.

Using the Biden administration's 2021 SCC dollar per metric ton values, adjusted for inflation, the estimated social cost benefit of carbon emissions reductions from implementing Alternative B at JCT and Gleason in 2027 would be $283,497,289 and $293,341,067, respectively, for direct CO_2 effects. Table 3.7-6 provides the Biden Administration's social cost benefit, in dollars, of direct effect CO_2 operational emissions reductions for each alternative in 2027, when full year operations would begin. Using the Trump Administration's 2019 SCC dollar per metric ton values, adjusted for inflation, the estimated social cost benefit of CO_2 emissions reductions from implementing Alternative B at JCT and Gleason in 2027 would be $4,609,749 and $4,769,812, respectively, for direct CO_2 effects. Table 3.7-7 provides the Trump Administration's social cost benefit, in dollars, of direct effect CO_2 operational emissions reductions for each alternative in 2027, when full year operations would begin. For both scenarios, beyond 2027 and at least through 2050, the social cost benefit of CO_2 emissions reductions would increase year over year based on the increase in SCC rates ($/ton) between 2020 and 2050.

Table 3.7-3 and Table 3.7-4 show the social cost of carbon model analysis results for Alternative B (both JCT and Gleason) considering direct and indirect CO_2 operational emissions from the entire TVA-wide power system under two scenarios. The analysis results for the Biden Administration SCC scenario in Table 3.7-3 shows a total 20-year SCC of $44,330 million dollars. The analysis results for the Trump Administration SCC scenario in Table 3.7-4 shows a total 20-year SCC of $1,064 million dollars. The net present value (NPV, 20-year, 2021 dollars) for Alternative B in the Biden Administration SCC scenario is $23,118 million dollars and $550 million dollars for the Trump Administration SCC scenario. The Biden Administration SCC scenario results show Alternative B has a 15 percent reduction in NPV over the No Action Alternative. This is the lowest percent reduction compared to Alternatives A and C which are 17 and 20 percent, respectively. The Trump Administration SCC scenario results show Alternative B also has a 15 percent reduction in NPV over the No Action Alternative. This is again the lowest percent reduction compared to Alternatives A and C which are 17 and 20 percent, respectively.

The CT plants would also be subject to annual reporting to the USEPA regarding emissions of GHG. The plants would exceed the 25,000 metric tons annual threshold for reporting.

Climate Change Effects on Alternative B

Increases in flooding events and severity is not expected to have an appreciable effect on the physical infrastructure or operations for Alternative B. The Johnsonville CT plant under Alternative B will be located adjacent to the Tennessee River; however, it will be outside of a 100-year floodplain. The Gleason CT plant under Alternative B will be located 0.3 miles south of Middle Fork Obion River, where approximately 12 acres of the northern portion of the Gleason CT plant site would be within the 100-year floodplain. However, the CT plant infrastructure will be located outside of the 100-year floodplain, where possible. Otherwise, flood damageable facilities will be constructed one foot above the 100-year floodplain.

Drought conditions, should they occur, would not be expected to have an effect on the physical infrastructure or operations for all alternatives as they are not dependent on significant water resources. TVA has developed a Climate Action Adaptation and Resiliency Plan to identify risks associated with and plan for climate change effects.

3.7.2.4.2 Transmission and Other Components

Alternative B includes construction activities to connect existing electrical TLs to the proposed CTs and to upgrade local TL equipment to accommodate the new plant. These activities would include adding and/or expanding circuit breakers and constructing new switchyards and substations with associated electrical equipment. In addition, a new 40-mile TL would be constructed from Weakley, Tennessee, to a substation on the Marshall-Cumberland 500 kV transmission line. Upgrades to off-site TLs servicing the CT plants would include various reconstruction activities. As part of these upgrades, existing access roads may require modifications such as brush clearing or tree trimming to allow for passage of equipment and bucket trucks.

Fugitive dust/particulate emissions would be generated during soil disturbance activities and truck traffic over paved and unpaved roads/areas. The largest fraction of fugitive dust emissions would be deposited in the immediate vicinity of the construction area. The smaller particulates would travel a little farther from the immediate construction area; however, those emissions are expected to be minor and widely distributed over the entire 40-mile TL. TDEC Air Pollution Control Rule 1200-3-8, which requires reasonable precautions to prevent PM from becoming airborne, would help minimize fugitive emissions. Dust control actions including application of wetting agents or soil stabilization products on exposed soils and unpaved roads/travel areas would be implemented to reduce fugitive dust/particulate emissions.

Highway vehicles and off-road construction equipment (e.g., bulldozers, backhoes, bucket trucks, boom trucks, forklifts) would generate minor amounts of combustion emissions including particulate matter, such as CO, NO_x, SO_2, VOCs, and CO_2 from diesel- and gasoline-fueled internal combustion engines. These emissions would be widely distributed over the 40-mile TL. New emission control technologies and fuel mixtures have significantly reduced vehicle and construction equipment emissions. These vehicles and equipment would comply with the USEPA mobile source regulations in 40 CFR Part 85 for on-road engines and 40 CFR Part 1039 for non-road engines. These regulations include requiring a maximum sulfur content in diesel fuel of 15 ppm. Additionally, it is expected that all vehicles would be properly maintained, which would also reduce emissions.

There are typically no operational emissions from the transmission lines and associated electrical equipment. If some electrical equipment contains the GHG sulfur hexafluoride gas (e.g., electrical switchgear, circuit breakers), there could be minor leaks, mostly associated with maintenance or long-term equipment degradation. However, their emissions are expected to be minimal or negligible. The expectation is that minimal equipment is anticipated to contain sulfur hexafluoride and the quantities should be very small. In addition, due to newer equipment, more efficient operation and maintenance techniques, and leak detection, these features would minimize sulfur hexafluoride emissions.

Overall, these transmission line construction and upgrade activities are expected to have short-term, minimal effects on air quality and no appreciable direct or indirect effect on regional climate change. Construction emissions will occur in attainment areas across the entire 40-mile TL where current ambient levels of criteria pollutants are below ambient air quality standards and are not expected to appreciably change due to construction activities. The operation of the transmission lines and associated equipment is expected to have long-term, minimal, or negligible effects on air quality and no appreciable direct or indirect effect on regional climate change.

3.7.2.4.3 Environmental Justice Considerations

Effects to air quality that would occur as a result of the proposed CT facilities and transmission line activities would generally be limited to the immediate vicinity of the TVA-owned reservations and the transmission line corridor and nearby public roads. While there are no EJ populations in the immediate vicinity of the Gleason Reservation, minority EJ populations are present in the immediate vicinity of the JCT. Effects on air quality from construction of the CT facilities would be short-term, localized, and minor, and would affect EJ populations given their proximity to the JCT. As non-EJ populations are adjacent to the plant vicinity on the west and south sides, the negative effects from construction are not anticipated to be disproportionate on EJ populations.

Similar emissions from the proposed CT facilities at JCT could be anticipated from other projects in the area as a result of construction activities and operations. One example is the proposed JCT Aeroderivative project. The combined projects could cause cumulative minor, temporary effects to air quality in the area during construction. Such effects would be mitigated through the use of BMPs such as water suppression for dust control and regular inspections and maintenance of construction vehicles. EJ populations, like the non-EJ populations also nearby, may experience cumulative effects from implementation of Alternative B.

Cumulative air quality effects at JCT from the operation of the JCT Aeroderivative project (550 MW) would be offset by the retirement of 16 existing CTs at JCT (approximately 1,000 MW). The Aeroderivative project CTs will be more efficient than the existing CTs and are already going through a PSD permitting process which requires implementing BACT to reduce emissions and demonstration of meeting ambient air quality standards in the vicinity of JCT. These Aeroderivative CTs also enhance TVA-system wide flexibility and integrate increasing renewable power capacity, which increases overall TVA system-wide efficiency and reduces system-wide emissions.

Air quality effects from transmission line construction and upgrade activities are expected to be short-term and minimal. Thus, minimal to no effects are anticipated on EJ populations. Since EJ and non-EJ populations would experience these effects, they are not anticipated to be disproportionate on EJ populations.

3.7.2.5 Alternative C

3.7.2.5.1 Construction and Operation of Solar and Storage Facilities

Alternative C includes construction and operation of 3,000 MW of solar facilities and 1,700 MW of storage capacity at multiple locations with a large portion in the Middle Tennessee region. This would be expected to utilize an average of 7.3 acres per MW based on previous solar construction projects, for a total of 21,900 acres. The solar facilities include ground-mounted photovoltaic panels. The BESS facilities would consist of placing modular battery system containers, power inverters, transformers, and switchgear over concrete slabs. The battery containers are of steel construction, equipped with lithium-ion battery cells contacted together and placed in racks. They would contain an auxiliary system, HVAC system, fire protection system, auxiliary distribution board, and a lighting arrangement. The storage facilities would utilize about 15 acres per 40 MW based on TVA pilot projects, which would result in about 638 acres for 1,700 MW.

<u>Construction Effects</u>

Construction of the solar and storage facilities will include use of on-road construction vehicles/trucks and off-road construction equipment for transporting the solar panels, battery modules, electrical transmission lines, concrete, and supporting mechanical and electrical infrastructure to the construction areas and erecting the facilities. Limited land clearing and grading activities would occur as construction is expected on cropland or heavily disturbed land, where the amount of clearing and grading required to prepare the site is low relative to other land types.

Construction emissions are expected from gasoline and diesel fuel combustion within internal combustion engines for on-road vehicles/trucks and off-road equipment. These engines would generate local emissions of particulate matter, including CO, NO_x, SO_2, VOCs, and CO_2, during their operation. New emission control technologies and fuel mixtures have significantly reduced vehicle and construction equipment emissions. These vehicles and equipment would comply with the USEPA mobile source regulations in 40 CFR Part 85 for on-road engines and 40 CFR Part 1039 for non-road engines. These regulations include requiring a maximum sulfur content in diesel fuel of 15 ppm.

Fugitive dust/particulate emissions would be generated during soil excavation and disturbance and truck traffic over paved and unpaved roads/areas. The largest fraction of fugitive dust emissions would be deposited in the immediate vicinity of the construction area. The smaller particulates would travel a little farther from the immediate construction area; however, those emissions are expected to be minor and widely distributed over the multiple facility sites. TVA and its contractors would comply with TDEC Air Pollution Control Rule 1200-3-8, which requires reasonable precautions to prevent PM from becoming airborne. In addition, dust control actions, including application of wetting agents or soil stabilization products on exposed soils and unpaved roads/travel areas, would be implemented to reduce fugitive dust/particulate emissions.

Overall, the solar and storage facility construction activities are expected to have short-term, localized, and minor effects on air quality and no appreciable direct or indirect effect on regional climate change. Emissions are expected to occur in attainment areas across the Middle Tennessee region where current ambient levels of criteria pollutants are below ambient air quality standards and are not expected to appreciably change due to construction activities.

Operations Effects

Operation of the solar and storage facilities are not expected to produce any appreciable emissions. There may be some heating requirements for some of the ancillary structures or the battery system structures; however, the heaters are expected to have no emissions, as they would be electric. The solar and storage facilities are not expected to require emergency generators or other stationary internal combustion engines for emergency or non-emergency purposes. If some electrical equipment contains the GHG sulfur hexafluoride gas, there could be minor leaks, mostly associated with maintenance or long-term equipment degradation. However, their emissions are expected to be minimal or negligible. The expectation is that minimal equipment is anticipated to contain sulfur hexafluoride and the quantities should be very small. In addition, due to newer equipment, more efficient operation and maintenance techniques, and leak detection, these features would minimize sulfur hexafluoride emissions.

The solar and storage facility operations are expected to have long-term, moderate, beneficial effects on air quality and on regional climate change in comparison to the No Action Alternative. The decrease in SO_2, NO_x, CO, PM, PM_{10}, $PM_{2.5}$, and VOC operational emissions at the CUF facility are estimated at 7,200+ tons/year, 4,000+ tons/year, 1,000+ tons/year, 300+ tons/year, 1,400+ tons/year, 1,300+ tons/year, and 120+ tons/year, respectively. There would also be elimination of hydrogen fluoride, and hydrogen chloride emissions, mercury, and lead emissions, along with other HAP emissions. The detailed emissions calculations are provided in Appendix C.

The solar and storage facilities are not expected to require an air construction or operating permit for stationary sources of emissions.

GHG Effects

The decrease in CO_2-e operational emissions at the CUF facility from implementation of Alternative C would be 10,566,667 tons in the first full year when all solar and storage facilities would begin operation (anticipated in 2027). For modeling purposes, it was assumed that commercial operation would begin approximately June 2026 (with final acceptance in December 2026 and the maximum annual CO_2-e emissions reductions beginning in 2027). Similar annual reductions in CO_2-e operational emissions would be experienced from that point forward. However, new solar facilities could not be built and operational within the modeled timeframe and would require additional time for completion of permitting, design, and construction phases.

For the GHG proxy analysis, the net decrease in emissions of 9.5 million metric tons of CO_2 per year associated with implementation of Alternative C would represent approximately 10.1 percent of total statewide emissions in 2018, approximately 0.21 percent of the total U.S. emissions in 2020, and 0.03 percent of the total global GHG emissions for 2020. As such, the operation of Alternative C would represent a small benefit to climate change as a less than significant reduction in state, national, and global GHG emissions.

Using the Biden administration's 2021 SCC dollar per metric ton values, adjusted for inflation, the estimated social cost benefit of carbon emissions reductions from implementing Alternative C in 2027 would be $645,744,801 for direct CO_2 effects. Table 3.7-6 provides the Biden Administration's social cost benefit, in dollars, of direct effect CO_2 operational emissions reductions for each alternative in 2027, when full year operations would begin. Using the Trump Administration's 2019 SCC dollar per metric ton values, adjusted for inflation, the estimated social cost benefit of carbon emissions reductions from implementing Alternative C in 2027 would be $10,500,000 for direct CO_2 effects. Table 3.7-7 provides the Trump Administration's social cost benefit, in dollars, of direct effect CO_2 operational emissions reductions for each alternative in 2027, when full year operations would begin. Beyond 2027 and at least through 2050, the social cost benefit of CO_2 emissions reductions would increase year over year based on the increase in SCC rates ($/ton) between 2020 and 2050.

Table 3.7-3 and Table 3.7-4 show the social cost of carbon model analysis results for Alternative C considering direct and indirect CO_2 operational emissions from the entire TVA-wide power system under two scenarios. The analysis results for the Biden Administration SCC scenario in Table 3.7-3 shows a total 20-year SCC of $41,116 million dollars. The analysis results for the Trump Administration SCC scenario in Table 3.7-4 shows a total 20-year SCC of $986 million dollars. The net present value (NPV, 20-year, 2021 dollars) for Alternative C in the Biden Administration SCC scenario is $21,730 million dollars and $516 million dollars for the Trump Administration SCC scenario. The net present value (NPV, 20-year, 2021 dollars) for Alternative C in the Biden Administration SCC scenario is $21,730 million dollars and $516 million dollars for the Trump Administration SCC scenario. The Biden Administration SCC scenario results show Alternative C has a 20 percent reduction in NPV over the No Action Alternative. This is the largest percent reduction compared to Alternatives A and B which are 17 and 15 percent, respectively. The Trump Administration SCC scenario results show Alternative C also has a 20 percent reduction in NPV over the No Action Alternative. This is also the largest percent reduction compared to Alternatives A and B which are 17 and 15 percent, respectively..

Climate Change Effects on Alternative C

Increases in flooding events and severity is not expected to have an appreciable effect on the physical infrastructure or operations for Alternative C. Solar/storage facilities will be located to avoid 100-year flood plains, where possible, or constructed at least one foot above the 100-year flood plain level for components that are flood-damageable.

Drought conditions, should they occur, would not be expected to have an effect on the physical infrastructure or operations for all alternatives as they are not dependent on significant water resources. TVA has developed a Climate Action Adaptation and Resiliency Plan to identify risks associated with and plan for climate change effects.

3.7.2.5.2 Transmission and Other Components

Alternative C includes construction activities to connect existing electrical transmission lines to the multiple solar and battery storage facilities and to upgrade local transmission line equipment to accommodate the new facilities. These activities would mainly occur in Middle Tennessee and are assumed to occur in attainment areas. Based on past TVA solar projects, new transmission interconnection lines, to each solar and storage facility are expected to be short and the new lines and other transmission system upgrades would occupy limited acreage.

Fugitive dust/particulate emissions would be generated during soil disturbance activities and vehicle/truck traffic over paved and unpaved roads/areas. The largest fraction of fugitive dust emissions would be deposited in the immediate vicinity of the construction area. The smaller particulates would travel a little farther from the immediate construction area; however, those emissions are expected to be minor and widely distributed over the entire Middle Tennessee area. TVA and its contractors would comply with TDEC Air Pollution Control Rule 1200-3-8, which requires reasonable precautions to prevent PM from becoming airborne. In addition, dust control actions including application of wetting agents or soil stabilization products on exposed soils and unpaved roads/travel areas, would be implemented to reduce fugitive dust/particulate emissions.

Highway vehicles and off-road construction equipment (e.g., bulldozers, backhoes, bucket trucks, boom trucks, forklifts, trenching equipment) would generate minor amounts of combustion emissions including particulate matter, such as CO, NO_x, SO_2, VOCs, and CO_2 from diesel and gasoline fueled internal combustion engines. These emissions would be widely distributed over the entire Middle Tennessee area. New emission control technologies and fuel mixtures have significantly reduced vehicle and construction equipment emissions. These vehicles and equipment would comply with the USEPA mobile source regulations in 40 CFR Part 85 for on-road engines and 40 CFR Part 1039 for non-road engines. These regulations include requiring a maximum sulfur content in diesel fuel of 15 ppm. Additionally, it is expected that all vehicles would be properly maintained, which would also reduce emissions.

There are typically no operational emissions from the transmission lines and associated electrical equipment. If some electrical equipment contains the GHG sulfur hexafluoride gas (e.g., electrical switchgear, circuit breakers), there could be minor leaks, mostly associated with maintenance or long-term equipment degradation. However, their emissions are expected to be minimal or negligible. The expectation is that minimal equipment is anticipated to contain sulfur hexafluoride and the quantities should be very small. In addition, due to newer equipment, more efficient operation and maintenance techniques, and leak detection, these features would minimize sulfur hexafluoride emissions.

Overall, these transmission line construction and upgrade activities are expected to have short-term, minimal effects on air quality and no appreciable direct or indirect effect on regional climate change. Construction emissions are expected to occur in attainment areas across the Middle Tennessee area where current ambient levels of criteria pollutants are below ambient air quality standards and are not expected to appreciably change due to construction activities. The operation of the solar and battery storage transmission lines and associated equipment does not generate any continuous emissions. Their operation is expected to have long-term, minimal, or negligible effects on air quality and no appreciable direct or indirect effect on regional climate change.

3.7.2.5.3 Environmental Justice Considerations

Effects to air quality that would occur as a result of the proposed solar and storage facilities are not anticipated to have disproportionate and adverse human health or environmental effects on EJ populations in the EJ study area for Alternative C. These effects would be minimal to negligible or mitigated and limited to the immediate project sites and transmission line corridors.

3.8 Biological Environment

3.8.1 Vegetation

Vegetation in the form of young or mature trees, shrubs, vines, and herbaceous cover provides habitat and food resources for birds, mammals, reptiles, amphibians, and insects. Vegetation supports soil and nutrient cycles and provides ecosystem services such as food, fresh water, fuel, fiber, and medicines to human populations (MSU, n.d.). Vegetative communities can help control flooding, disease outbreaks, pests, and climate effects, as well as serve as an important cultural role to Native American communities.

3.8.1.1 Affected Environment

3.8.1.1.1 CUF Reservation

CUF and surrounding areas are located within the Western Highland Rim, a subregion of the Interior Plateau Ecoregion. This region is characterized by rolling hills with a geologic base of limestone, chert, and shale. The original oak-hickory forests were mostly removed in the 1800s in association with iron-ore mining; however, the region is once again heavily forested (Griffith et al. 1997).

TVA performed a survey of terrestrial plant communities and botanical resources of the CUF Reservation in September 2021 (TVA 2021g) (Figure 3.8-1). Most of the CUF site is forested with deciduous plant communities (58.9 percent) or disturbed (formerly agricultural) fields (32.4 percent). The remaining 8.7 percent of the site consists of mixed evergreen forest, open areas, or existing ROW. A majority of these forests have experienced extensive previous disturbance and are degraded by non-native species infestations. A small percentage of deciduous forested stands represent mature, relatively undisturbed plant communities populated primarily by native species. Heavily disturbed developed areas, pastures/hayfields, and transmission line ROW account for a majority of the herbaceous vegetation which is dominated by non-native plant species and possesses little conservation value. Small sections of transmission line ROW support a flora indicative of a native grassland and support a number of native species.

Common overstory trees within deciduous forests on the CUF Reservation include American beech, black cherry, northern red oak, pignut hickory, sassafras, shagbark hickory, slippery elm, southern red oak, sugar maple, tulip poplar, white ash, and white oak with and understory of American hophornbeam, common greenbrier, coralberry, eastern redbud, flowering dogwood, northern spicebush, pawpaw, Virginia creeper, and winged elm (TVA 2021g). Broach beechfern, spotted wintergreen, Christmas fern, ebony spleenwort, Indian tobacco, Japanese stiltgrass, licorice bedstraw, and wild comfrey are common in the herb layer. Species identified in the deciduous forests on site vary depending on whether the area is drier or mesic. Mesic or bottomland deciduous forests constituted 9.8 percent of the deciduous forest on site. Common species in these areas include American sycamore, green ash, southern hackberry, swamp chestnut oak, sweetgum, bald cypress, black willow, box elder, red maple, Osage orange, sugar maple, white oak, Carolina buckthorn, Chinese privet, American beech, black walnut, grape, and poison ivy.

The disturbed areas (pasture/hay fields) support a majority of herbaceous vegetation present on site (TVA 2021g). Common species in these areas include Johnson grass and sericea lespedeza along with other common native and non-native herbaceous species. Early successional vegetation in the TL ROW consists mainly of annual ragweed, beefsteak plant, brown eyed Susan, late-flowering thoroughwort, gray goldenrod, purple passionflower, sawtooth blackberry, sericea lespedeza, wild bergamot, and wrinkle leaf goldenrod.

Further details of the various plant communities found on the CUF Reservation is provided in the Terrestrial Plant Communities and Botanical Resources Survey Report attached as Appendix D.

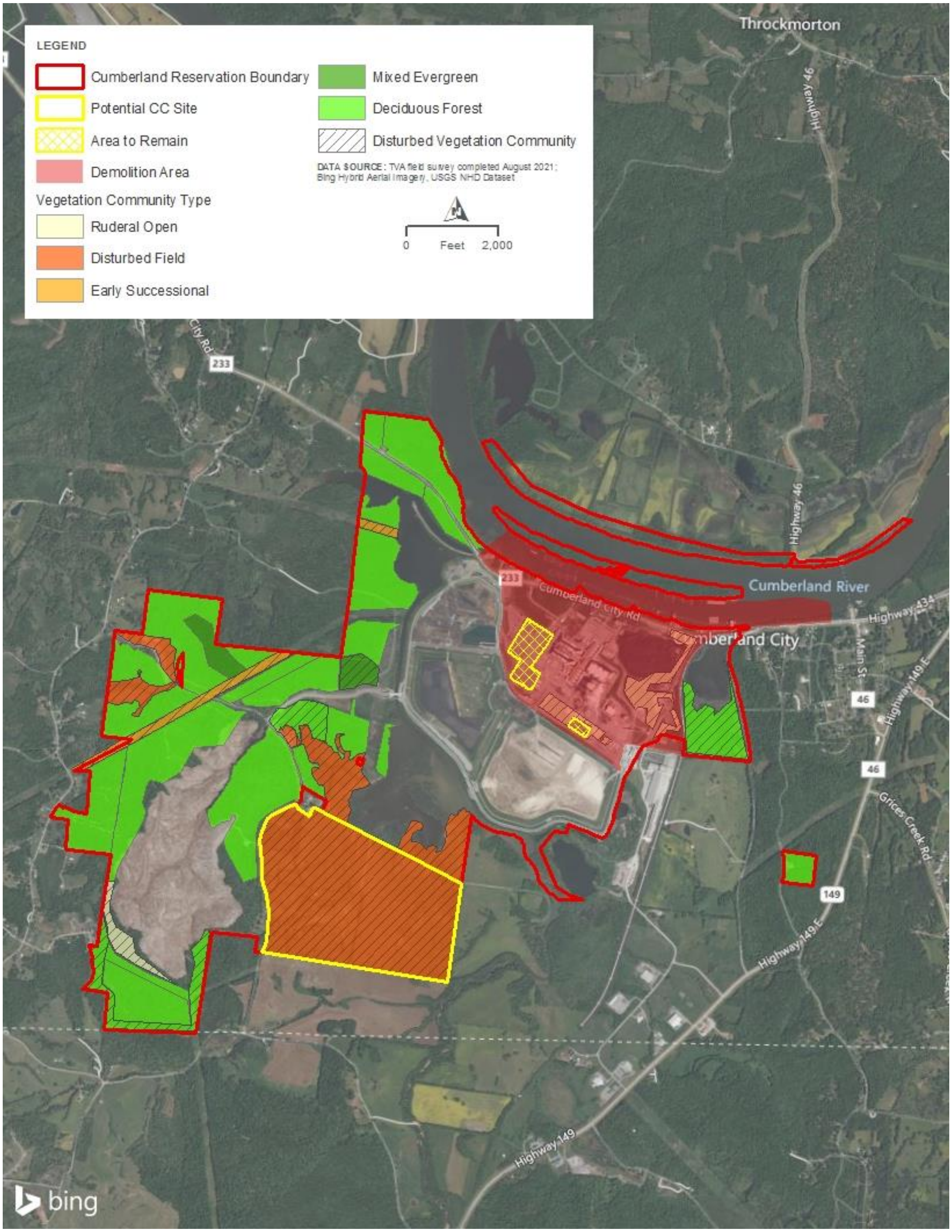

Figure 3.8-1. Vegetation Communities Observed on the Cumberland Reservation

3.8.1.1.2 Alternative A

3.8.1.1.2.1 Proposed CC Plant

Based on the survey completed in September 2021, the site for the proposed CC plant consists entirely of disturbed field with common species such as Johnson grass, sericea lespedeza, and other common native and non-native herbaceous species (TVA 2021g) (Figure 3.8-1). Thickets of honey locust are also present across the approximately 277-acre site. Fragmented forest strips supporting species seen in other deciduous forest stands on site are found across this area, as well. Additionally, a review of wetland data forms completed during the 2021 wetland surveys show that wetland complexes (approximately 29.4 acres total) on the site are primarily herbaceous habitats with *Carex* spp., redtop panicgrass, and tickseed sunflower, calico aster, virgin's bower, Virginia wildrye, and Japanese stiltgrass, among others. Forested wetlands have tree or sapling stratums with American sycamore, American elm, swamp chestnut oak, pin oak, ash-leaf maple, common pawpaw, green ash, black willow, and honey locust.

Vegetation within the transmission corridor area consists primarily of disturbed field (186.2 acres, 71 percent) and deciduous forest (68.4 acres, 26 percent). The deciduous forests within the transmission line corridor includes dry, open, rocky areas (8.0 acres, 12 percent), typical upland deciduous woods (44.1 acres, 65 percent), and bottomland hardwood forests (16.2 acres, 24 percent). As described in Section 3.8.1.1.1, the bottomland forests have common tree species such as American sycamore, green ash, bald cypress, southern hackberry, swamp chestnut oak, sweetgum, black willow, box elder, and red maple. Drier deciduous forests exhibit other common species such as white oak, blackjack oak, southern red oak, sugar maple, shagbark hickory, American beech, chinkapin oak, mockernut hickory, northern red oak, tulip poplar, white ash, pawpaw, honey locust, sassafras, and spicebush.

3.8.1.1.2.2 Natural Gas Pipeline Lateral Corridor

A desktop survey was conducted using aerial and topographic imagery to describe vegetation communities within the pipeline lateral corridor. TGP is conducting detailed field surveys of vegetation communities that will be discussed in the Environmental Report to be filed with the FERC for the proposed pipeline. The natural gas pipeline lateral corridor and surrounding areas are located within the Western Highland Rim, a subregion of the Interior Plateau Ecoregion. According to the National Land Cover Database (NLCD), the natural gas pipeline lateral corridor comprises a mixture of forested (primarily deciduous) land (694 acres, 61.7 percent), fields (i.e., pasture/hay, cultivated crop, or herbaceous vegetation; 359 acres, 32.0 percent), and developed land (5.3 percent). The remaining portion of the natural gas pipeline lateral corridor (totaling 10.9 acres, 1.9 percent) consists of shrub/scrub habitat and wetlands or open water. The plant species in these habitats are likely similar to those identified on the CUF Reservation given the same region (see Section 3.8.1.1.1).

Additional land use information, including a figure depicting the NLCD for the natural gas pipeline lateral corridor is provided in Section 3.10.2.2.1.

3.8.1.1.2.3 Transmission Corridors

These corridors would be contained within the CUF Reservation and would cross vegetation communities discussed in Section 3.8.1.1.1.

3.8.1.1.3 Alternative B

3.8.1.1.3.1 Johnsonville Reservation

Like the CUF Reservation, the JCT Reservation is located in the Western Highland Rim, a subregion of the Interior Plateau Ecoregion characterized by rolling hills and oak-hickory dominated forests (Griffith et al. 1997).

A large proportion of the JCT Reservation site has been heavily disturbed by the construction, operation, and maintenance of the generation and transmission infrastructure present there. Land use on the JCT Reservation is almost entirely classified as medium- or high-intensity developed space (Figure 3.10-5). The proposed CT plant would be constructed on a previously disturbed portion of the site. The most heavily disturbed and most degraded habitats exhibit herbaceous vegetation dominated by non-native plant species with little conservation value.

3.8.1.1.3.2 Gleason Reservation

The Gleason Reservation is located in the Southeastern Plains and Hills, a subdivision of the Southeastern Plains Ecoregion (Griffith et al. 1997). This ecoregion is comprised of irregular plains made up of a mosaic of cropland, pasture, woodland, and oak-hickory-pine forest.

Based on the NLCD, the Gleason Reservation comprises 62.1 percent of “cultivated crops” (former agricultural fields), 32.9 percent “woody wetlands” (the forested area on the southern half of the site), and small amounts of developed and mixed forest areas. Although the NLCD identified woody wetlands (see Figure 3.10-7 in Section 3.10.2.3.2), the NWI identified only a single stream on site and no palustrine wetlands present (Figure 3.5-1).

Based on 2008 field visits to areas on or near the Gleason Reservation, the cultivated crop areas consist of weedy, early successional and ruderal vegetation types typical of abandoned agricultural fields such as Bahai grass, broomsedge, crabgrass, Dallas grass, purple sprangle top, redtop panic grass, and signal grass. The forested area within the Gleason Reservation CT plant site appears to be comprised of deciduous species based on aerial imagery and according to field investigations on or nearby the site in 2008, the forested area likely contains an oak-hickory community comprising American beech, black oak, shagbark hickory, southern red oak, and white oak overstory with an open understory with deciduous holly, persimmon, and red maple.

Invasive plants, which are a major threat to native plant communities, have affected much of the Gleason Reservation. The lands on and adjacent to the reservation have been extensively altered as a result of previous land-use history. The most common invasive species encountered were Chinese privet and Japanese honeysuckle along with several non-native grasses and common weedy herbaceous species. These invasive species are Rank 1 (severe threat) and are of high priority to TVA (James 2002).

3.8.1.1.3.3 Transmission Corridors

The TL corridor for Alternative B will cross the Loess Plains (a subdivision of the Mississippi Valley Loess Plains) on the western portion, the Southeastern Plains and Hills (a subdivision of the Southeastern Plains Ecoregion) in the center of the corridor, and Western Highland Rim (a subdivision of the Interior Plateau) on the eastern edge and has the potential to cross a range of plant communities, including highly disturbed, early successional habitats dominated by invasive species, to rich and diverse herbaceous plant communities with possible landscape-level conservation importance (Griffith et al. 1997). The Loess Plains are characterized by gently rolling, irregular plains with productive agricultural practices of soybeans, cotton, corn, milo, sorghum, livestock, and poultry. Oak-hickory and southern floodplain forests are the natural community types, however much of this have been removed for cropland. Some less-disturbed bottomland forest and cypress-gum swamp habitats remain. The Southeastern Plains and Hills have slightly more rolling topography and relief than the Loess Plains, with oak-hickory forests grading into oak-hickory-pine forests toward the south. As stated for CUF Reservation and JCT Reservation, the Western Highland Rim is rolling terrain of open hills with oak-hickory forests.

Some agricultural use occurs in lower-gradient areas and valleys consisting of hay, pasture, cattle, corn, and tobacco.

Oak-hickory forests are generally composed of broadleaf deciduous trees of which white oak, northern red oak, black oak, shagbark hickory, and bitternut hickory dominate. Additional vegetation species in this community type include pignut hickory, white ash, black walnut, black cherry, chinquapin oak, American basswood, and American elm (Bryant et al. 1993). Oak-hickory-pine forests are similar to oak-hickory forests, except for the addition of shortleaf and loblolly pines. Floodplain forests exhibit similar species as oak-hickory in the region, but also contain swamp chestnut oak, cherrybark oak, pin oak, Shumard oak, shellbark hickory, shagbark hickory, and sweetgum. Understory species in these forests include more shade-tolerant species, such as maples, blackgum, elm, American beech, and dogwood (Applegate et al. 1995).

The majority of herbaceous vegetation habitat types occur along existing transmission line ROW, cropland, hayfields, and heavily grazed pastures. Most sites with herbaceous plant communities are dominated by plants indicative of early successional habitats including many non-native species. Early successional areas with naturalized vegetation contain herbaceous species like anise-scented goldenrod, beaked panic grass, broomsedge, field thistle, giant ironweed, gray goldenrod, hairy lespedeza, hairy small-leaf tick trefoil, hairy sunflower, hyssopleaf thoroughwort, Japanese honeysuckle, Japanese stiltgrass, Johnson grass, late purple aster, maypops, narrowleaf mountain mint, purpletop tridens, rabbit tobacco, red fescue, rice button aster, sawtooth blackberry, sericea lespedeza, silver beard grass, silver plume grass, swamp sunflower, tall goldenrod, trumpetweed, velvet panicum, whorled mountain mint, and yellow bristle grass.

3.8.1.1.4 Alternative C

3.8.1.1.4.1 Middle Tennessee TVA Power Service Area

The Middle Tennessee TVA Power Service Area primarily lies within the Interior Plateau ecoregion, further subdivided by the Western Highland Rim, Eastern Highland Rim, Outer Nashville Basin, and Inner Nashville Basin (Griffith et al. 1997). The Interior Plateau is a diverse ecoregion with natural vegetation, primarily oak-hickory forest, with some areas of bluestem prairie and cedar glades. As stated previously, the Western Highland Rim is characterized by rolling terrain of open hills and oak-hickory forests, which are described in Section 3.8.1.1.3.3. The Eastern Highland Rim has more level terrain than the Western Highland Rim, with landforms characterized as “tablelands” of moderate relief and irregular plains. Natural vegetation in this region is transitional between the oak-hickory type to the west and the mixed mesophytic forests to the east. Many bottomland hardwood forests that were formerly abundant have been inundated by large impoundments.

The major forest communities in the Middle Tennessee TVA region include mesophytic forest and southern-mixed forest (Dyer 2006). The mesophytic forest is the most diverse, with 162 tree species. While canopy dominance is shared by several species, red maple and white oak have the highest average importance values. A distinct section of the mesophytic forest, the Appalachian oak section, is dominated by several species of oak, including black, chestnut, northern red, scarlet and white oaks. The bottomland forests in this region are dominated by American elm, bald cypress, green ash, sugarberry and sweetgum.

The Nashville Basin contains limestone cedar glades and barrens communities associated with thin soils and limestone outcrops that support rare, diverse plant communities with a high proportion of endemic (i.e., restricted to a particular area) species (Baskin and Baskin 2003).

About 38 percent of the ecoregion is forested, 50 percent is agricultural and 9 percent developed (USGS 2016). Forests in the Nashville Basin are predominantly mesophytic, with a higher proportion of American beech, American basswood and sugar maple than in the Appalachian oak subtype (Dyer 2006). Eastern red cedar is also common. For the ecoregion as a whole, the rate of land cover change has been relatively low, with the predominant changes from forest and agriculture to developed land. The rate of these changes from the 1970s to the present has been very high in the greater Nashville and Huntsville areas.

Several rare (or otherwise geographically restricted or threatened by human activities) plant communities are found in the Middle Tennessee TVA PSA. The greatest concentration of cedar glades is in the Nashville Basin; a few also occur in the Highland Rim and the Valley and Ridge. Cedar glades contain many endemic plant species, including a few listed as endangered (Baskin and Baskin 2003); threats include urban development, highway construction, agricultural activities, reservoir impoundment and incompatible recreational use. The category of grasslands, prairies and barrens includes remnant native prairies; they are scattered across the TVA region but are most common on the Highland Rim.

Heavily disturbed pasturelands account for a majority of herbaceous vegetation present in Middle Tennessee. Vegetation includes Johnson grass, sericea lespedeza, and other common native and non-native herbaceous species.

3.8.1.2 Environmental Consequences

3.8.1.2.1 The No Action Alternative

Under the No Action Alternative, TVA would continue current plant operations. TVA would implement all of the planned actions related to the current and future management and storage of CCRs, which have either been reviewed or will be in subsequent NEPA analysis. As a result, no new work would be conducted that could potentially alter project-related environmental conditions within each plant. Therefore, there would be no direct or indirect effects to vegetation communities because there would be no physical changes to the current conditions.

3.8.1.2.2 Retirement, Decommissioning, Decontamination, and Deconstruction of CUF Plant

The only vegetation identified within the demolition boundary during the 2021 surveys was classified as ruderal open areas with species such as American pokeberry, Johnson grass, Chinese privet, purple passionflower, tall goldenrod, and dallis grass (Figure 3.8-1). These species and the limited spatial area (32.7 acres) provide little benefit to wildlife in the vicinity of CUF Plant.

Demolition of on-site buildings and structures would involve demolition to three feet below final grade via mechanical deconstruction and/or explosives. All buildings and structures with below grade features would be backfilled. Vegetation may colonize areas with sufficient soil following deconstruction and removal of the existing facility and would likely comprise similar species to those currently observed in ruderal open areas. No cumulative effects to vegetation are anticipated.

3.8.1.2.2.1 Environmental Justice Considerations

Effects to vegetation that would occur as a result of CUF coal facility retirement and D4 activities are not anticipated to have disproportionate and adverse human health or environmental effects on EJ populations in the CUF Reservation EJ study area. These effects would be minor and limited to the TVA-owned CUF Reservation, where no populations are present and EJ populations are removed by some distance (Figure 3.4-3).

3.8.1.2.3 Alternative A

3.8.1.2.3.1 Construction and Operation of CC Plant at CUF Plant Site

Construction of the CC plant within the CUF Reservation has the potential to directly or indirectly affect the vegetation described in Section 3.8.1.1.2.1. Effects to vegetation would generally result from earthmoving and vegetation clearing activities associated with the construction of the proposed project. To prevent the introduction and spread of invasive species, disturbed areas on all action alternatives will be revegetated with native or non-invasive plant species.

The construction of up to four short 500-kV transmission lines from the switchyard to the new CC plant also has the potential to affect vegetation on the CUF Reservation. This area consists of disturbed field (approximately 186 acres, 71 percent) and deciduous forest (68 acres, 26 percent), with small amounts of early successional or mixed evergreen forest (1.3 percent each). Forested areas may be limbed or cleared and converted to an herbaceous or scrub/shrub plant community. Plant communities on CUF Reservation are described in Section 3.8.1.1.1.

Vegetation within the active transmission ROW would have to be managed to assure the safe and reliable operation of the transmission facilities (TVA 2020a). Generally, areas within the transmission line easement would be maintained as scrub/shrub and herbaceous land. Typically, vegetation management activities consist of herbicide application (90 percent), mechanical control (i.e., brush hogs, equipment-mounted saws; 6 percent), and manual methods (i.e., chainsaw, handsaw; 4 percent) (TVA 2020a). Tree maintenance would be limited to trees that presented an immediate hazard to the reliability of the transmission system. Localized herbicide application and mowing are the vegetation management tools that would be used most frequently to clear vegetation on the floor of the open ROW. Other manual, mechanical, and herbicide application methods, along with debris management and restoration activities are likely to occur infrequently and/or do not have the potential to affect vegetation on a meaningful scale. Tree clearing along the ROW margins would result in a negligible overall change to plant habitats present on the landscape.

Cumulative effects to vegetation are not anticipated because of the proposed CC Plant and CCR management activities to occur on the CUF Reservation, as these activities are occurring on the managed Cumberland Reservation. Disturbed areas will be revegetated with native species and clearing and other vegetation management activities will be minimized to the extent possible.

3.8.1.2.3.2 Construction and Operation of Natural Gas Pipeline Lateral

Effects to vegetation would generally result from clearing the proposed pipeline easement. Based on desktop analyses, approximately 61.7 percent (694 acres) of the natural gas pipeline lateral is comprised of forested land that may be impacted (removed) by the proposed pipeline. Approximately 32 percent (359 acres) of the natural gas pipeline lateral already consists of hay/pasture or herbaceous plant communities. The proposed pipeline lateral is located directly adjacent to an existing TVA transmission line; therefore, the pipeline would have cumulative effects to vegetation along this corridor. Tree trimming, limb removal, or other modifications may be needed for existing access roads. A detailed analyses of project effects to vegetation is being prepared by TGP as part of the Environmental Report to be submitted with their certificate application that will be filed with the FERC for the proposed pipeline. Cumulative impacts to vegetation could occur because of past/present and RFFAs in proximity to the pipeline. Cumulative effects to vegetation would be minimized through proper siting and BMPs.

3.8.1.2.3.3 Environmental Justice Considerations

Effects to vegetation that would occur as a result of the proposed CC plant, transmission line activities, and natural gas pipeline lateral are not anticipated to have disproportionate environmental and human health effects on EJ populations in the CUF Reservation EJ study area. The minor effects to vegetation on the TVA-owned CUF Reservation would not in turn affect any human settlements, including EJ populations, as no populations are settled there. Effects occurring as a result of pipeline activities, while still minor, would be outside of TVA-owned reservations, where non-EJ populations are most prominent (nine out of 10 census block groups are non-EJ populations; see also Figure 3.4-3). Any indirect effects to human populations would be experienced by both EJ and other populations and, thus, are not anticipated to be disproportionate.

3.8.1.2.4 Alternative B

3.8.1.2.4.1 Construction and Operation of CT Plant at Johnsonville Reservation

The proposed CT plants would be constructed on developed land on the Johnsonville Reservation. Vegetation may be impacted within the project boundary during the construction of the Johnsonville Reservation. The vegetation present in this area consists of disturbed herbaceous vegetation. To prevent the introduction and spread of invasive species, disturbed areas will be revegetated with native or non-invasive plant species. No cumulative effects to vegetation are anticipated as the RFFA of the Aeroderivative plant would occur on developed portions of JCT.

3.8.1.2.4.2 Construction and Operation of CT Plant at Gleason Reservation

The construction of CT plants at the Gleason Reservation would occur within the 62 acres of undeveloped land adjacent to the existing CT units. The CT plants would be configured to minimize effects to forested areas and would likely be sited within the existing agricultural fields. As such, no cumulative effects to vegetation are anticipated.

3.8.1.2.4.3 Transmission and Other Components

As noted in Table 3.3-1, transmission lines typically result in an average of 5.5 acres of forest clearing per mile of new line, with a range of 0 to 30.5 acres/mile; for the proposed 40-mile transmission line, this equates to 220 acres of forest cleared (range 0 to 1,220 acres) and average of 4.5 acres of forest cleared for substations and switching stations. Also based on typical effects, the transmission line has the potential to affect an average of 0.9 acre/line mile of forested wetlands cleared, for an average of 36 acres of forested wetlands cleared. Farmland falling within the transmission line corridor could be temporarily impacted, but areas such as pasture, agricultural fields, or lawns would be returned to their former condition following construction. These areas are often subject to herbicide methods for localized treatments of weeds by landowners, and farmland does not often contain many trees requiring control (TVA 2020a); therefore, effects to agricultural areas will be minimal. For the 40-mile TL, it can be estimated that 220 acres of forest will be cleared, resulting in a long-term effect to forest management.

As described in Section 3.8.1.2.3.1, vegetation within the active transmission ROW would have to be managed to assure the safe and reliable operation of the transmission facilities and generally maintained as scrub/shrub and herbaceous land. Vegetation management activities would likely consist primarily of herbicide application with mechanical control or manual methods as needed; other manual, mechanical, or herbicide application methods occur infrequently and do not have the potential to affect vegetation on a meaningful scale (TVA 2020a). Tree maintenance would be limited to trees that presented an immediate hazard to the reliability of the transmission system. Tree clearing along the ROW margins would result in a negligible overall change to plant habitats present on the landscape.

Localized applications of herbicide would result in some level of off-target effect (TVA 2020a), In situations where the woody stem count is high on a given ROW, even localized application of herbicides could produce substantial effects to non-target species. However, these areas of high woody stem count would be unlikely to support high-quality herbaceous habitats, usually because of site-specific conditions unrelated to TVA vegetation management (i.e., owner land use, soil type, landscape position, etc.). In drier transmission line ROW areas with rocky or sandy soils, where woody stem count is inherently lower, localized herbicide application could foster herbaceous plant communities that are rare on the landscape. These important plant habitats may be globally rare or just relatively diverse herbaceous communities, with limited distribution remaining in the southeastern U.S. Mowing would remove nearly all woody stems; however, the amount of re-growth can be rapid depending on conditions on the ground (TVA 2020a). For example, in drier areas with sandy or rocky soils, the rate of tree establishment and growth is relatively slow. In this case mowing can help to maintain high quality native plant communities. However, in all but the driest habitats in the eastern U.S., tree invasion is rapid, and woody plants quickly replace herbaceous species. In addition, repeated mowing of transmission line ROW encourages stump resprouting (sucker growth) and promotes dense stands of woody species. This is particularly problematic in wetlands or on sites with rich soils. Using mowing alone, or as the primary mechanism for vegetation removal on ROWs, would reduce species diversity and encourage the dominance of woody plants able to proliferate through root resprouting.

TVA uses the Office-Level Sensitive Area Review (O-SAR) process to avoid effects to important plant habitats within ROWs by limiting the use of the most damaging methods in areas likely to contain grasslands dominated by native plant species (TVA 2020a). Broadcast and aerial herbicide is restricted on about 17 percent (about 41,000 acres) of TVA's ROW that are likely to contain important habitat. Manual, mechanical, and localized herbicide methods can be used in these areas and likely serve to perpetuate important herbaceous habitats found in the ROW by eliminating trees that rapidly encroach into open areas without appropriate disturbance. Rare plant habitat falling within the transmission line corridor is unlikely; slightly less than 1 percent (about 2,000 acres) of TVA ROW is known to contain rare plant habitats currently. If rare plant communities are identified along the transmission corridor, these areas would be documented in the O-SAR database and TVA biologists and operations staff would work together to ensure the habitats are protected during vegetation maintenance activities. This would ensure that the most potentially damaging tools, like broadcast herbicide, would not be used in ROW supporting important grassland habitats and that the proposed vegetation management activities would not have significant effects on terrestrial plant ecology of the region.

3.8.1.2.4.4 Environmental Justice Considerations

Effects to vegetation that would occur as a result of the proposed CT facilities on the Gleason and JCT Reservations and the transmission line activities associated with Alternative B would be minor and limited to the reservation boundaries, where no populations are settled. Thus, no effects would occur to EJ populations.

Effects to vegetation occurring as a result of transmission line activities, while still minor, would be outside of TVA-owned reservations, where effects would occur to EJ and non-EJ populations, alike. As such, these effects are not anticipated to be disproportionate on EJ populations. Effects to EJ populations regarding permanent conversion of farmland to maintained transmission line ROW is addressed in Section 3.5.1.2.4.4.

3.8.1.2.5 Alternative C

3.8.1.2.5.1 Construction and Operation of Solar and Storage Facilities

Alternative C would result in construction of solar and storage facilities that have the potential to affect vegetation communities. As noted in Table 3.2-1, TVA has evaluated typical effects associated with the development of solar facilities. Solar facilities average approximately 1.2 acres of forest clearing per MW, with a range of 0 to 15 acres per MW. Based on the need for approximately 3,000 MW of solar facilities, approximately 3,600 acres of forest would be cleared with a maximum of 45,000 acres cleared. In addition, TVA is proposing to expand future solar facilities by 10,000 MW by 2035 in order to meet customer and system demand, which would result in an average of 12,000 acres cleared (maximum 150,000 acres). TVA and solar developers would minimize effects to vegetation by siting facilities on previously cleared land and configuring the solar arrays, access roads, and other infrastructure to avoid sensitive vegetation communities. BESS sites are typically small enough to be sited to avoid adverse vegetation effects. Appropriate field investigations for rare plant communities would be completed prior to land disturbing activities.

Vegetation would be maintained in the long-term by traditional mowing and trimming around structures on a regular basis, depending on growth rate. Sheep grazing may also be employed to control invasive weed outbreak.

Cumulative effects to vegetation may occur under Alternative C with the addition of 10,000 MW of solar identified in the 2019 IRP throughout the TVA PSA. Based on the average of 1.2 acres of forest clearing per MW, this would result in 12,000 acres of vegetation effects within the TVA PSA. Cumulative effects to vegetation would be minimized through proper siting of solar facilities and the use of BMPs.

3.8.1.2.5.2 Transmission and Other Components

As noted in Table 3.3-1, transmission lines typically result in an average of 5.5 acres of forest clearing per mile of new line. Based on TVA's evaluation, an average of 1.7 miles of new transmission line are needed for solar facilities, which indicates that approximately 9.35 acres of forest may be impacted for each solar facility. Transmission lines would be maintained as described in Section 3.8.1.2.4.32.1.4.4.1.

Cumulative effects to vegetation may occur under Alternative C with the addition of 10,000 MW of solar identified in the 2019 IRP throughout the TVA PSA. Transmission lines would be required to support the new solar facilities. Cumulative effects to vegetation would be minimized through proper siting of solar facilities and the use of BMPs.

3.8.1.2.5.3 Environmental Justice Considerations

Effects to vegetation that would occur as a result of the proposed solar facilities and transmission line activities are not anticipated to have disproportionate and adverse human health or environmental effects on EJ populations in the EJ study area for Alternative C, as these effects would be minor and generally limited to the immediate project sites and transmission line corridors.

3.8.2 Wildlife

Although limited information exists for direct wildlife observations for the action alternatives, inferences can be made depending on the potential habitats present based on field surveys (if wildlife is not directly observed) or desktop analyses. For the purposes of the wildlife evaluation, threatened and endangered species and migratory species are included in Section 3.8.4 and therefore this section considers only those not listed with state or federal protections.

3.8.2.1 Affected Environment

3.8.2.1.1 CUF Reservation

As described in Section 3.8.1.1.1, most of the CUF site is forested with deciduous plant communities (58.9 percent) or disturbed fields (32.4 percent). A majority of these forests have experienced extensive previous disturbance and are degraded by non-native species infestations. The plant site is predominantly a disturbed area that contains an active coal-fired fossil plant and associated infrastructure. The site is developed for industrial power generation and remains in continuous operation and maintenance, including as well as ash pond closures. The area outside the CUF plant site to the south and west consists of rolling to steeper grade terrain dissected by tributaries to the floodplain complex associated with the embayment of Wells Creek. Rolling terrain has been converted from cattle pasture to naturalized habitat, where successional communities are evident. Steeper grade slopes were found to be comprised of mature upland forest. Old Scott Road is a gravel road passing east-west through the CUF Reservation. CUF Reservation contains numerous stream and wetland features as described in Section 3.6. The study area also contains local distributor and TVA electric utility line rights-of-way, where vegetation is maintained at low stature compatible with conductor clearance. Surface waters and wetlands on site are shown on Figure 3.6-1, and vegetation communities shown on Figure 3.8-1.

Field surveys were performed by TVA in July 2021 with a focus on identifying general wildlife and habitats on the CUF Reservation. Field review determined that the majority of the plant site near buildings and settling ponds holds little value for wildlife (TVA 2021h). Filled and capped ponds also hold little wildlife value; however, surface waters (i.e., the Cumberland River and associated tributaries) and wetlands immediately surrounding the plant offer habitat for shorebirds, wading bird, waterfowl, reptiles including turtles and snakes, and amphibians. The large swaths of forest that surround the plant site hold more value for a wider variety of wildlife species and is where the majority of the species were observed during the survey (Table 3.8-1). The least disturbed forest was found in the large fragments immediately adjacent to the landfill and along the northwestern edge of Wells Creek. Wildlife observed during the 2021 field surveys via visual observations, sign (e.g., scat), or call, and species identified from bat mist net surveys in 2011 are listed in Table 3.8-1.

Table 3.8-1. Wildlife Observed in or near the Project Area, Stewart County, Tennessee, July 2021 (TVA 2021h).

Common Name	Scientific Name	Habitat in Which Observation Occurred				
		Forest	**Field**	**Stream/Wetland**	**Road**	**Industrial**
Insects						
American dagger moth caterpillar	*Acronicta americana*	X				
Painted lady butterfly	*Vanessa cardui*		X			
Spicebush swallowtail Butterfly	*Papilio troilus linnaeus*		X			
tiger swallowtail butterfly	*Palilio glaucus*	X				
Birds						

Common Name	Scientific Name	Habitat in Which Observation Occurred				
		Forest	Field	Stream/Wetland	Road	Industrial
Acadian flycatcher	*Empidonax virescens*	X				
American crow	*Corvus brachyrhynchos*	X				
Barred owl	*Strix varia*	X				
Black vulture	*Coragyps atratus*					X
Bobwhite	*Colinus virginianus*		X			
Broad-winged hawk	*Buteo platypterus*		X			
Carolina chickadee	*Poecile carolinensis*	X				
Carolina wren	*Thryothorus ludovicianus*	X				
Cliff swallow	*Petrochelidon fulva*				X	
Common yellowthroat	*Geothlypis trichas*	X				
Double crested cormorant	*Nannopterum auritum*			X		
Downy woodpecker	*Dryobates pubsescens*	X				
Eastern wood peewee	*Contopus virens*	X				
Field sparrow	*Spizella pusilla*		X			
Great blue heron	*Ardea herodias*			X		
Great egret	*Ardea alba*			X		
Indigo bunting	*Passerina cyanea*	X				
Mourning dove	*Zenaida macroura*	X				
Northern cardinal	*Cardinalis*	X				
Northern mockingbird	*Mimus polyglottos*	X				
Pied-billed grebe	*Podilymbus podiceps*			X		
Piliated woodpecker	*Dryocopus pileatus*	X				
Red-bellied woodpecker	*Melanerpes carolinus*	X				
Ruby throated hummingbird	*Archilochus colubris*	X				
Scarlet tanager	*Piranga olivacea*	X				
Summer tanager	*Piranga rubra*	X				

Common Name	Scientific Name	Habitat in Which Observation Occurred				
		Forest	Field	Stream/Wetland	Road	Industrial
Tufted titmouse	*Baeolophus bicolor*	X				
White-breasted nuthatch	*Sitta carolinensis*	X				
White-throated sparrow	*Zonotrichia albicollis*	X				
Wild turkey	*Meleagris gallopavo*		X			
Wood thrush	*Hylocichla mustelina*	X				
Yellow-bellied cuckoo	*Coccyzus americanus*		X			
Mammals						
Armadillo	*Dasypus novemcinctus*	X				
Common Raccoon	*Procyon lotor*	X				
Coyote	*Canis latrans*				X	
Big brown bat	*Eptescius fuscus*	X				
Eastern red bat	*Lasiurus borealis*	X				
Evening bat	*Nycticeius humeralis*	X				
Southeastern bat	*Corynorhinus refinesquii*	X				
Tricolored bat	*Perimyotis subflavus*	X				
Eastern fox squirrel	*Sciurus niger*	X				
Eastern gray squirrel	*Sciurus carolinensis*	X				
White-Tailed Deer	*Odocoileus virginianus*	X				
Reptiles						
Black rat snake	*Pantherophos obsoletus*	X				
Eastern box turtle	*Terrapene Carolina carolina*	X				
Eastern garter snake	*Thamnophis sirtalis sirtalis*	X				
Red-eared slider	*Trachemys scripta elegans*			X		
Amphibian						
Fowlers toad	*Anazyrus fowleri*	X				
Green frog	*Rana clamitans*			X		

Common Name	Scientific Name	Habitat in Which Observation Occurred				
		Forest	Field	Stream/Wetland	Road	Industrial
Hyla spp.	*Hyla* spp.				X	
Salamander (unknown spp.)	--	X				
American toad	*Bufo americanus*	X				

Developed and disturbed areas, such as the CUF Reservation are home to a large number of common species, including American robin, American crow, Carolina chickadee, European starling, house finch, house sparrow, mourning dove, Carolina wren, northern cardinal, northern mockingbird, black vulture, and turkey vulture (National Geographic 2002). Mammals found in this community type include eastern gray squirrel, striped skunk, and raccoon. Road-side ditches provide potential habitat for amphibians, including American toad (toad tadpoles were observed in a ditch on the project site), and upland chorus frog. Reptiles potentially present include red-bellied snake, gray rat snake, and smooth earth snake (Powell et al. 2016; Gibbons and Dorcas 2005).

Deciduous forests located on the CUF Reservation provide habitat for an array of terrestrial animal species (National Geographic 2002) including birds (e.g., pileated woodpecker, red-tailed hawk, blue jay, cardinal, and American robin, all of which were observed during field investigations), mammals (coyote, eastern chipmunk, eastern woodrat, North American deermouse, and woodland vole [Kays and Wilson 2002]), and reptiles and amphibians (gray ratsnake, midland brownsnake, and scarlet kingsnake [Powell et. al 2016]; dusky salamander, marbled salamander, spotted salamander, and Cope's gray tree frog [Powell et. al 2016; Niemiller and Reynolds 2011]).

Forested areas also provide roosting habitat for several species of bats, particularly in areas where live trees exhibit exfoliating bark and/or dead-tree snags with crevices are present. Open areas, such as over open water or fields, also provides foraging habitat for bats. Potential habitat depicted on Figure 3.8-2 includes both, areas with roosting and foraging opportunities. Some examples of common bat species potentially found in this habitat are the big brown, eastern red, evening, hoary, and silver-haired bats. Mist net surveys completed by Environmental Solutions and Innovations, Inc. in 2011 captured big brown bat, eastern red bat, evening bat, southeastern bat, and tricolored bat on the CUF Reservation near Old Scott Road.

Wetlands and associated vegetation areas provide habitat for such birds as the prothonotary warbler, northern harrier, red-winged blackbird, song sparrow, swamp sparrow, and white-throated sparrow (National Geographic 2002). Mammals that may use this habitat include the American beaver, eastern harvest mouse, marsh rice rat, muskrat, and swamp rabbit (Kays and Wilson 2002). The eastern black kingsnake, eastern ribbonsnake, common gartersnake, midland watersnake, and gray ratsnake are all potential wetland reptiles (Powell et. al 2016). In addition to the amphibians listed above, the eastern red-spotted newt as well as the American bullfrog, bird-voiced tree frog, green frog, northern cricket frog, and pickerel frog are examples of some amphibians that may be present in wetlands on the CUF Reservation (Niemiller and Reynolds 2011).

Agricultural fields, hayfields/pastureland, and other herbaceous areas such as lawns, offer habitat to such bird species as the blue grosbeak, brown-headed cowbird, brown thrasher, common grackle, common yellowthroat, eastern bluebird, eastern kingbird, eastern meadowlark, eastern towhee, field sparrow, grasshopper sparrow, house finch, and northern mockingbird among others (National Geographic 2002). Mammals potentially present in fields or pasture include the eastern cottontail, eastern harvest mouse, eastern woodrat, hispid cotton rat, red fox, and striped skunk (Kays and Wilson 2002). Reptiles with the potential to occur in agricultural portions of the Project Site include the eastern milk snake, gray ratsnake, smooth earth snake, southern black racer, and eastern slender glass lizard (Powell et. al 2016).

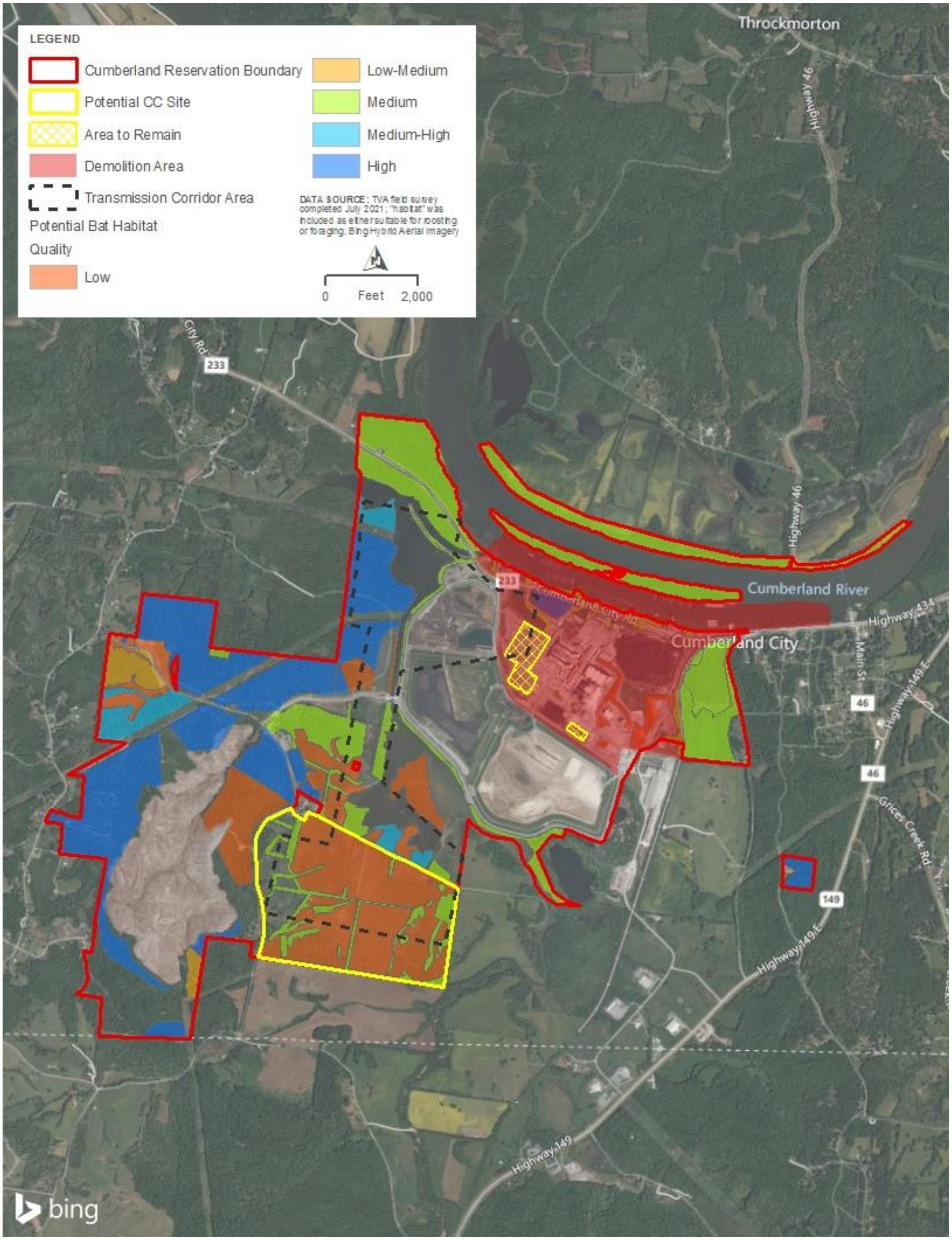

Figure 3.8-2. Potential Bat Habitat on the Cumberland Reservation

3.8.2.1.2 Alternative A

3.8.2.1.2.1 Proposed CC Plant

Alternative A includes the construction of a new CC plant of approximately 1,450 MW and short transmission lines on the existing Cumberland Reservation; therefore, the habitats and species that may be present at the site of the proposed CC plant comprise a subset of those discussed in Section 3.8.2.1.1. A review of the field studies (stream and wetland delineations) and other supporting information (such as NLCD and aerial imagery) showed the majority of the CC plant site consists of former agricultural fields, small groupings of trees, wetlands (29.4 acres), and streams (922 lf of perennial stream) and classified as disturbed field with poor-quality bat habitat (TVA 2021h). The transmission line corridor consists mainly of disturbed field and various types of deciduous forest, and includes a range of bat habitat which likely includes both foraging and roosting areas. The disturbed field comprises the same type of habitat as the primary CC plant site and consists of former agricultural fields. The deciduous forests within the transmission line corridor includes dry, open, rocky areas (8.0 acres, 12 percent), typical upland deciduous woods (44.1 acres, 65 percent), and bottomland hardwood forests (16.2 acres, 24 percent). Due to the range of habitat types on the CC plant site and within the transmission line corridor, these areas many support a diverse range of wildlife listed under “field,” “forest”, and “stream/wetland” as shown in Table 3.8-1.

3.8.2.1.2.2 Natural Gas Pipeline Lateral Corridor

The proposed pipeline lateral corridor is predominantly located adjacent to an existing TVA transmission line corridor. TGP is conducting surveys of wildlife in the corridor as part of the Environmental Report to be submitted with their certificate application that will be filed with the FERC for the proposed pipeline. Based on desktop review of supporting information (such as NLCD, aerial imagery, NWI and NHD datasets), the majority of the corridor adjacent to an existing ROW consists of larger contiguous forested area (694 acres) with herbaceous habitat communities (e.g., hay and pastureland; 359 acres) intermixed throughout, and numerous streams and wetlands crossing the corridor (Figure 3.6-2 and Figure 3.10-3). The wildlife listed under “forest”, “field”, or “stream/wetland” in Table 3.8-1 may be found in the natural gas pipeline lateral corridor

3.8.2.1.3 Alternative B

3.8.2.1.3.1 Johnsonville Reservation

The location of the proposed CT plant on the Johnsonville Reservation is adjacent to the Tennessee River and consists of disturbed and developed land with small areas of manicured lawn. The JCT Reservation holds little wildlife value and only common bird and mammal species accustomed to developed or urban areas are likely to be present, such as American robin, various sparrows, blue jays, northern cardinals, juncos, chickadees, starlings, crows, mockingbirds, squirrels, chipmunks, rabbits, raccoons, opossums, skunks, woodchucks, mice and deer (USDA, undated).

3.8.2.1.3.2 Gleason Reservation

Habitat occurring on the Gleason Reservation within which the proposed CT plant site would be located consists of two primary types: early successional habitat and deciduous forest. Early successional habitat makes up approximately 51 percent of the proposed CT plant site, consisting primarily of agricultural hay fields, and fields of grasses and forbs. Small stands of woody shrubs and tree saplings occur along drainage areas. Depending on the quality of the agricultural land, species found there may include pheasants, grouse, quail, prairie chickens, mourning doves, songbirds, leopard frogs, diamondback terrapin, bats, deer, and coyotes (USDA, undated).

Given the vegetation community typically found in oak-hickory forests of the southeastern plains and hills ecoregion, birds found in the forested area of the southern portion of Gleason Reservation may include blue jays, red-bellied woodpecker, red-eye vireo, Carolina wren, wood thrush, great crested flycatcher, tufted titmouse, and yellow-bellied cuckoo. Mammals in this tract may consist of fox squirrel, gray squirrel, and flying squirrel. Herpetofauna in this area could consist of Eastern box turtle, hognose snake, garter snake, five-line sink, and rough green snake (Bryant et al. 1993).

3.8.2.1.3.3 Transmission Corridors

A desktop review of the proposed 40-mile TL corridor identified land use along the TL as primarily agricultural, with smaller portions of forested area. Bodies of water, such as wetlands, streams, and ponds, are also present based on NHD and NWI databases. Overall, wildlife habitats present on the transmission corridor are likely common to the region and, as habitats, are not unique or uncommon.

Deciduous forests provide habitat for an array of terrestrial animal species. Avian species found in this habitat are downy woodpecker, eastern screech-owl, red-tailed hawk, white-breasted nuthatch, and yellow-billed cuckoo (National Geographic 2002). This area also provides foraging and roosting habitat for several species of bat, particularly in areas where the forest understory is more open. Some examples of bat species likely found within this habitat are big and little brown, eastern red, evening, hoary, Rafinesque’s big-eared, and silver-haired. Coyote, eastern chipmunk, eastern woodrat, North American deermouse, and woodland vole are also likely mammalian species present within this habitat (Kays and Wilson 2002). Gray ratsnake and DeKay’s brown snake as well as scarlet kingsnake are all common reptilian residents of this habitat (Powell et al. 2016). In forests sections with aquatic features, amphibians likely found in the area include dusky, marbled, and spotted salamanders as well as barking and Cope’s gray treefrogs (Powell et al. 2016; Niemiller et al. 2011).

Wetland habitat provides resources for such avian species as hooded warbler, northern harrier, red-winged blackbird, song sparrow, swamp sparrow and white-throated sparrow (National Geographic 2002). Mammalian species that may utilize this habitat are American beaver, eastern harvest mouse, marsh rice rat, muskrat, and swamp rabbit (Kays and Wilson 2002). Eastern black kingsnake, eastern ribbonsnake, common gartersnake, midland watersnake, and gray ratsnake are all wetland reptilian species potentially present (Powell et al. 2016). Eastern red-spotted newt and three-lined salamanders as well as American bullfrog, green frog, northern cricket frog, pickerel frog, and southern cricket frog are examples of some amphibian species that are likely present (Niemiller et al. 2011).

Pasture and agricultural fields offer habitat to a multitude of species such as blue grosbeak, brown-headed cowbird, brown thrasher, common grackle, common yellowthroat, Bewick’s wren, dickcissel, eastern bluebird, eastern kingbird, eastern meadowlark, eastern towhee, field sparrow, grasshopper sparrow, house finch, northern mockingbird, and prairie warbler among others (National Geographic 2002). Mammalian species likely present in this habitat include eastern cottontail, eastern harvest mouse, eastern woodrat, hispid cotton rat, red fox and striped skunk (Kays and Wilson 2002). Reptilian species with the potential to occur in the project area are eastern milk, gray ratsnake, smooth earthsnake and southern black racer snakes, as well as eastern slender glass lizard (Powell et al. 2016).

3.8.2.1.4 Alternative C

3.8.2.1.4.1 Middle Tennessee TVA Power Service Area

Much of the wildlife described in prior sections would also be found in the general Middle Tennessee TVA PSA for this Action Alternative, particularly those found in forested or agricultural areas of the Western Highland Rim and Nashville Basin. Wildlife found in the forested areas such as those described for the Eastern and Western Highland Rim regions include ovenbirds (eastern), black-throated green warblers (eastern), black-and-white warbler (eastern), blue jay, red-eyed vireo, wood thrush, Carolina chickadee, hairy woodpecker, and wood peewee. Mammals in these regions include the smoky and pygmy shrews (eastern), short-tailed shrews, white-footed mouse, eastern chipmunk, golden mouse, red bat, brown bat, eastern pipistrelle, gray squirrel, flying squirrel, fox squirrels, gray fox, raccoons, opossums, striped skunks, and white-tailed deer (Bryant et al. 1993). Herpetofauna in this region include Eastern box turtle, garter snake, ground skink, black rat snake, hognose snake, five-lined skink, and rough green snake; and in areas near water, also slimy salamander, dusky salamander, American toad, and spring peeper.

The Nashville Basin also includes a variety of birds such as blue jay, red-bellied woodpecker, red-eyed vireo, great crested flycatcher, tufted titmouse, Carolina wren, wood thrush, yellow-billed cuckoo, mockingbirds, mourning dove, and American robin (Bryant et al. 1993). Mammals in the Nashville Basin include short-tailed shrews, white-footed mouse, eastern chipmunk, red bat, little brown bat, eastern pipistrelle, fox squirrel, gray squirrel, and flying squirrel. Herpetofauna of this region includes eastern box turtle, hognose snake, garter snake, five-lined skink, and rough green snake; and in areas near water, other species such as the slimy salamander, American toad, spring peeper, and cave salamander may also be present.

3.8.2.2 Environmental Consequences

3.8.2.2.1 The No Action Alternative

Under the No Action Alternative, TVA would continue current plant operations until the scheduled retirement. TVA would implement all of the planned actions related to the current and future management and storage of CCRs, which have either been reviewed or will be in subsequent NEPA analysis. As a result, no new work would be conducted that could potentially alter project-related environmental conditions within each plant. Therefore, there would be no direct or indirect effects to wildlife because there would be no physical changes to the current conditions.

3.8.2.2.2 Retirement, Decommissioning, Decontamination, and Deconstruction of CUF Plant

Direct effects to common wildlife include temporary displacement and permanent displacement when vegetation and/or utilized habitat and utilized buildings and structures are removed. Few areas of vegetation exist within the CUF Plant demolition boundary, consisting only of ruderal open areas (Figure 3.8-1).While bat roosting habitat is not found within the demolition boundary, up to 46 acres of bat foraging habitat would be disturbed during demolition activities. However, bats would be foraging during night periods when demolition work is not occurring; therefore, effects to bats in this area would be negligible. Internal surveys of buildings proposed for demolition would occur prior to demolition to ensure colonies of bats or aggregations of other wildlife would not be impacted. See Section 3.8.4 for discussion of potential effects to osprey and other aggregations of protected migratory birds. Wildlife such as birds, reptiles, or amphibians on the shore of the Cumberland River could also be disturbed during demolition activities. Wildlife habituated to the area are likely to move to other suitable environments offsite or outside of the demolition boundary, which are plentiful, and it is expected that they would return to the project area upon project completion. Cumulative effects to wildlife may occur as a result of the RFFAs of CCR management activities occurring in proximity to the proposed D4 activities, but are anticipated to be minor.

3.8.2.2.2.1 Environmental Justice Considerations

Negative effects to wildlife in the immediate vicinity of CUF that would occur as a result of CUF coal facility retirement and D4 activities are not anticipated to adversely affect EJ populations in the CUF Reservation EJ study area. EJ populations are generally not present in the CUF Reservation EJ study area (one out of 10 census block groups are low-income EJ populations), and those nearby, are removed by some distance from the immediate TVA-owned reservation (Figure 3.4-3). The addition of wildlife into surrounding suitable habitat may be beneficial to EJ and other populations that utilize those habitats for subsistence and other purposes. This may be true if wildlife travel to nearby Lake Barkley Recreation Area or Cross Creeks National Wildlife Refuge, where people hunt for deer, turkey, waterfowl, and squirrel (see Section 3.9 for more detail on these recreational areas; USACE 2022 and USFWS 2022).

3.8.2.2.3 Alternative A

3.8.2.2.3.1 Construction and Operation of CC Plant at CUF

The entire 277-acre proposed CC plant area was classified as disturbed field during the 2021 field survey, although there are areas of fragmented forests strips and herbaceous wetlands (29.4 acres), as well. The transmission line corridor consists mainly of deciduous forest of various types and disturbed field. Vegetation removal and construction in the CC plant area and transmission corridors may result in direct effects to some common wildlife that may be immobile during the time of project activities (i.e., eggs, juveniles, hibernating individuals), particularly during breeding/nesting or winter seasons. However, tree removal at this site would occur between November 15 and March 31, thereby avoiding direct effects to many species of wildlife that may breed/nest in this area. Habitat removal likely would disperse mobile wildlife into surrounding areas in an attempt to find new food sources, shelter sources, and to reestablish territories. Over time, species utilizing early successional habitat are likely to return to the disturbed area following completion of construction activities.

Routine vegetation management of transmission line ROWs would have periodic effects on habitats within the ROW over the long-term. Methods may vary but are likely to include use of herbicides and various mechanical measures to control vegetation. Wildlife is expected to be displaced intermittently in conjunction with the presence of maintenance crews and the alteration of habitats.

Cumulative effects of the project on common wildlife species are expected to be negligible. Proposed actions across the transmission line would permanently remove existing forested habitat for common wildlife. Following completion of the project, the ROW would be maintained as early successional habitat, scrub-shrub habitat, or herbaceous fields with wetland areas, which would provide habitat for numerous common wildlife species. While the proposed actions would result in alteration of habitats and displacement of resident wildlife species, effects to wildlife are not expected to result in notable large-scale habitat alteration or destabilization of any wildlife species. Therefore, effects to wildlife resulting from the construction and operation of the proposed CC plant would be minor.

3.8.2.2.3.2 Construction and Operation of Natural Gas Pipeline Lateral

Based on desktop analyses, up to 694 acres of forested habitat and 359 acres of herbaceous plant communities could be impacted due to the construction and operation of the natural gas pipeline lateral. Clearing of forested habitats, vegetation removal of previously cleared areas within the existing transmission line ROW and trenching would be required to construct the proposed pipeline lateral and improve access roads. Most wildlife would move out of the area at the first sign of disturbance/construction activities; therefore, little direct effect is expected to most species. Immobile or slowly moving species may experience injury or mortality if unable to move from the area. Construction-associated disturbances and habitat removal would likely disperse wildlife into surrounding areas in an attempt to find new food and shelter sources and to reestablish territories. It is expected that over time those species utilizing early successional habitat would return to the project area upon completion of the proposed actions.

While wildlife habitats could be impacted, suitable alternate habitat exists in areas immediately adjacent to the natural gas pipeline lateral. Populations of common wildlife species likely would not be significantly impacted by the proposed pipeline. TGP is preparing a detailed analysis of wildlife habitats and effects that will be included in the Environmental Report to be submitted with their certificate application that will be filed with the FERC for the proposed pipeline.

Routine vegetation management of the natural gas pipeline lateral would have periodic effects on habitats within the ROW over the long-term. Methods may vary but are likely to include use of herbicides and various mechanical measures to control vegetation. Wildlife is expected to be displaced intermittently in conjunction with the presence of maintenance crews and the alteration of habitats. Over time, wildlife would become habituated to the herbaceous habitat of the natural gas pipeline lateral and those species associated with fields may be found in the corridor. Cumulative effects to wildlife may occur as a result of the past/present and RFFAs in proximity to the proposed pipeline, but are anticipated to be minor.

3.8.2.2.3.3 Environmental Justice Considerations

Negative effects to wildlife that would occur as a result of the proposed CC plant and transmission line activities would not adversely affect EJ populations in the CUF Reservation EJ study area. These effects would be minor and would occur where no human populations are settled and EJ populations are removed by some distance (Figure 3.4-3). The addition of wildlife into surrounding suitable habitat may be beneficial to EJ and other populations that utilize those habitats for subsistence and other purposes. This may be true if wildlife travel to nearby Lake Barkley Recreation Area or Cross Creeks National Wildlife Refuge, where people hunt for deer, turkey, waterfowl, and squirrel (see Section 3.9 for more detail on these recreational areas; USACE 2022 and USFWS 2022).

Effects to wildlife that would occur as a result of the proposed natural gas pipeline lateral would be minor, while outside of TVA-owned reservations. These effects would occur in areas where non-EJ populations are more prominent. While effects may be experienced by EJ populations located in the far eastern extreme of the pipeline corridor EJ study area, these effects would be similar to those experienced by non-EJ populations and, thus, are not anticipated to be disproportionate. The addition of wildlife into surrounding suitable habitat may be beneficial to EJ and other populations that utilize those habitats for subsistence and other purposes. This may be true if wildlife travel to nearby Lake Barkley Recreation Area, where people hunt for deer, turkey, and waterfowl (USACE 2022).

3.8.2.2.4 Alternative B

3.8.2.2.4.1 Construction and Operation of JCT Plant on Johnsonville Reservation

The proposed JCT plant would be located on previously disturbed, developed portions of the reservation. Effects to the common wildlife in the vicinity would be negligible. Wildlife in the area would likely move away from the area during construction activities and no direct harm would occur. See T&E section for discussion of potential effects to osprey. Cumulative impacts to wildlife would not occur, as the RFFA is located on a developed portion of the JCT Reservation.

3.8.2.2.4.2 Construction and Operation of CT Plant at Gleason Reservation

Approximately 39 acres of agricultural land and 34 acres of forested land could be impacted by the construction of a CT plant at Gleason Reservation. The proposed CT plant therefore has the potential to affect common wildlife and their associated habitats. Direct effects could occur to some common wildlife that may be immobile during the time of project activities (i.e., eggs, juveniles, or hibernating individuals), particularly during breeding/nesting and winter seasons. Habitat removal likely would disperse mobile wildlife into surrounding areas in an attempt to find new food sources, shelter sources, and to reestablish territories. Over time, species utilizing early successional habitat are likely to return to the disturbed area following completion of construction activities. During siting of the plant, TVA would avoid and minimize effects to forested areas or other sensitive habitats. Suitable alternate habitat exists in areas immediately adjacent to the Gleason Reservation and are common to the area. Populations of common wildlife species likely would not be significantly impacted by the proposed CT plant. Cumulative effects to wildlife would not occur.

3.8.2.2.4.3 Transmission and Other Components

Land use along the 40-mile TL corridor route primarily consists of agricultural land with smaller portions of forested area (see Section 3.10.2.3.3). Forested areas would require clearing of forested habitats and conversion to herbaceous or scrub/shrub habitat (see Section 3.8.1.2.4.3). Effects to wildlife would resemble those that are described in Section 3.8.2.2.3.2 for the natural gas pipeline lateral. While wildlife habitats would be impacted, suitable alternate habitat likely exists in areas immediately adjacent to the proposed TL. Populations of common wildlife species likely would not be significantly impacted by the proposed TL. Field studies would be conducted to assess potential affects to wildlife and birds of conservation concern that may be using habitat along the TL corridor.

Species using herbaceous and/or scrub-shrub habitat types could use the transmission line corridor. Continued maintenance of the transmission line vegetation would result in periodic disturbance of wildlife in the area, but would likely return to the corridor following completion of the maintenance activities.

3.8.2.2.4.4 Environmental Justice Considerations

Effects to wildlife that would occur as a result of the proposed CT facilities and transmission line activities would be limited to the immediate JCT and Gleason Reservations and transmission line corridors. The addition of wildlife into suitable habitat surrounding the TVA-owned reservations and the transmission line corridor may be beneficial to EJ and other populations that utilize those habitats for subsistence and other purposes, such as in nearby Camden Wildlife Management Area and Tennessee National Wildlife Refuge or on private properties. The latter case may be particularly beneficial in the JCT Reservation EJ study area, where minority EJ populations are present in the immediate vicinity.

3.8.2.2.5 Alternative C

3.8.2.2.5.1 Construction and Operation of Solar and Storage Facilities

Alternative C would result in construction activities that have the potential to affect wildlife directly or indirectly. As noted in Table 3.2-1, TVA has evaluated typical effects associated with the development of solar facilities. Nine percent of solar projects studied resulted in effects to migratory birds. None of the solar facilities impacted bald or golden eagles. TVA and solar developers would minimize effects to wildlife by siting facilities on previously disturbed land, such as agricultural or silvicultural sites, or land with few sensitive wildlife habitats. As noted in the IRP EIS (TVA 2019b), the maintenance of a permanent vegetative cover on a solar facility, particularly when composed of native plant species, can also increase local wildlife diversity (Beatty et al. 2017). Traditional mowing/trimming would be performed regularly for vegetation maintenance; sheep grazing may also be employed to control invasive weed outbreak.

Cumulative effects to wildlife may occur under Alternative C with the addition of 10,000 MW of solar identified in the 2019 IRP throughout the TVA PSA, but would be minor through proper siting of solar facilities and the use of BMPs.

3.8.2.2.5.2 Transmission and Other Components

Based on studies performed on previous TVA solar facilities, an average of 1.7 miles of new transmission line are needed for each solar facility, which have the potential to affect common wildlife and their habitats. While wildlife habitats would be impacted, suitable alternate habitat likely exists in areas immediately adjacent to the proposed TLs. Populations of common wildlife species likely would not be significantly impacted by the proposed TLs. Cumulative effects to wildlife may occur under Alternative C with the addition of 10,000 MW of solar identified in the 2019 IRP throughout the TVA PSA, but would be minor through proper siting of transmission lines and the use of BMPs.

3.8.2.2.5.3 Environmental Justice Considerations

Effects to wildlife that would occur as a result of the proposed solar facilities and transmission line activities are not anticipated to have disproportionate and adverse human health or environmental effects on EJ populations in the EJ study area of Alternative C. These effects would be minor and generally limited to the immediate project sites and transmission line corridors. The addition of wildlife into surrounding suitable habitat may be beneficial to EJ and other populations that utilize those habitats for subsistence and other purposes.

3.8.3 Aquatic Life

Aside from the ESA and related state laws, as well as harvest regulations established by states, the CWA is the primary law protecting aquatic life. The CWA is the primary federal statute that governs the discharge of pollutants and fill materials into Waters of the U.S. under Sections 401, 402, and 404. Water quality standards and NPDES discharge limits are established, in part, to protect aquatic life. CWA Section 316 regulates (a) wastewater discharges in order to minimize adverse effects of heat on aquatic life, and (b) the design and operation of cooling water intake structures to minimize adverse effects to aquatic life from entrainment and impingement.

3.8.3.1 Affected Environment

3.8.3.1.1 CUF Reservation

The primary aquatic environments related to CUF include Barkley Reservoir (Cumberland River, a tributary to the Ohio River), Wells Creek, and Scott Branch (Figure 3.6-1). The Cumberland River is impounded prior to its confluence with the Ohio River to create Lake Barkley. Near CUF, approximately 72 miles upstream of Lake Barkley Dam, Lake Barkley-Cumberland River is more riverine. CUF is located along the left descending bank near RM 103. Lake Barkley-Cumberland River adjacent to CUF is characterized as having poor to fair shoreline aquatic habitat with no aquatic macrophytes. The fish community consists of warmwater species with a mix of species typical of both rivers and reservoirs due to the CUF proximity to the main stem of Lake Barkley and more riverine conditions near the CUF (TVA 2016a).

Wells Creek is a small tributary of the Cumberland River that flows south-north through the central portion of the CUF property. Scott Branch is a tributary of Wells Creek that flows west-east through the property. An unnamed intermittent stream (tributary to Scott Branch) flows through the middle of the proposed landfill site. The lower reach of this stream near its confluence to Scott Branch has flowing water. The upper reach of this stream is dry during parts of the year and only experiences water flows during wet weather. Due to their proximity and connection to the Cumberland River, species composition is expected to be similar to that described above for the Cumberland River.

TVA has used a Reservoir Ecological Health monitoring program since 1990 to evaluate ecological conditions in Lake Barkley in support of continuance of the 316(a) thermal variance for the CUF discharge. A component of this monitoring program is a multi-metric approach to data evaluation for fish communities known as the Reservoir Fish Assemblage Index (RFAI). Fish communities are used to evaluate ecological conditions because of their importance in the aquatic food web and because fish life cycles are long enough to integrate conditions over time. Benthic (bottom dwelling) macroinvertebrate populations are assessed using the Reservoir Benthic Index (RBI) methodology. Because benthic macroinvertebrates are relatively immobile, negative effects to aquatic ecosystems can be detected earlier in benthic macroinvertebrate communities than in fish communities. A component of this monitoring program includes sampling the benthic macroinvertebrate community (TVA 2016a).

TVA sampled fish upstream and downstream of CUF between RM 102 and 107 in the spring, summer, and autumn of 2015. Upstream of CUF, 1,576 fish (34 species) were collected in Spring 2015, 753 fish (32 species) were collected in Summer 2015, and 597 fish (37 species) were collected in Autumn 2015. Typical species upstream of CUF included gizzard shad, spotfin shiner, emerald shiner, yellow bass, bluegill, longear sunfish and largemouth bass (downstream of CUF), 1,643 fish (32 species) were collected in Spring 2015, 604 fish (27 species) were collected in Summer 2015, and 705 fish (31 species) were collected in Autumn 2015. Typical species downstream of CUF included threadfin shad, longear sunfish, emerald shiner, largemouth bass, bluegill, gizzard shad, and yellow bass. Ecological health ratings were similar for both the upstream and downstream sites for all three seasons, ranging from fair to good (TVA 2016a).

As part of the same TVA 2015 study on the Cumberland River near CUF between RM 102 and 106.6, benthic (or bottom-dwelling) invertebrates were also collected. Oligochaetes, chironomids, and Asiatic clams (*Corbicula* spp.) were the dominant taxa both upstream and downstream of CUF. Ecological health ratings were similar between the upstream and downstream sites for all three seasons, ranging from fair to good (TVA 2016a).

A 2011 mussel survey conducted to characterize the freshwater mollusk community on the Cumberland River (spot dives) and Wells Creek (along sampling transects) near CUF found low abundances of a small number of relatively common mussel species. The three most numerous freshwater mussel species included winged mapleleaf, wartyback, and pink heelsplitter. On the Cumberland River, 24 mussels were collected from 23 locations (Catch per unit effort = 9 mussels/hour). On Wells Creek, 11 mussels were collected along four transect locations (density = 0.05 mussels/square meter) (Third Rock Consultants 2011).

3.8.3.1.2 Alternative A

3.8.3.1.2.1 Proposed CC Plant

Field surveys conducted during July and August 2021 identified two perennial streams on the CC plant site (Figure 3.6-1). These streams were surveyed during a period of drought conditions; however, fish were present and therefore indicate a permanence of hydrological conditions. Secondary indicators taken during the hydrologic determination note moderate to strong continuous bed and bank present, moderately sinuous channel with in-channel structure, presence of organic debris lines or piles, and macrobenthos present (specifically, mayfly), and growth of filamentous algae in one of the two streams. One of the streams was noted to be impacted by cattle access. These unnamed tributaries were not listed in the TDEC 303(d) streams list (TDEC 2020, TDEC 2022). The proposed transmission lines associated with the CC plant would be constructed within the CUF Reservation; therefore, streams and aquatic life associated with Scott Branch and Wells Creek described in Section 3.8.3.1.1 would be a part of this affected environment.

3.8.3.1.2.2 Natural Gas Pipeline Lateral Corridor

As described in the surface waters section above (Section 3.6.2.1.2.2), surface waters within the natural gas pipeline lateral corridor include 19 named streams and 24 unnamed tributaries. In total, approximately 11,620 lf of stream crosses the pipeline corridor based on the National Hydrology Dataset (NHD). These streams are classified for fish and aquatic life designated use. As part of this designation, the streams must meet certain criteria pertaining to water quality (dissolved oxygen, temperature, turbidity, metals and toxic substances, nutrients, coliform, etc.), biological integrity, flow, and habitat. To meet this designated use, the quality of stream habitat “shall provide for the development of a diverse aquatic community that meets regionally-based biological integrity goals” (TDEC 2019). Therefore, many of these streams may contain aquatic life such as fish and invertebrates if they have permanent flow.

3.8.3.1.3 Alternative B

3.8.3.1.3.1 Johnsonville Reservation

The JCT Reservation is located on the east bank of the Kentucky Reservoir of the Tennessee River. The proposed location for the CT plant is in previously developed portions of the reservation and does not contain waterbodies with aquatic life.

3.8.3.1.3.2 Gleason Reservation

The proposed Gleason CT plant site occurs within the Southeastern Plains ecoregion. Streams in this ecoregion typically are characterized by slightly elevated gradient with sandy substrates (Etnier and Starnes 1993). Extensive agricultural practices over the past several decades have resulted in the Obion River and surrounding tributaries being extensively channelized, resulting in little natural habitat for aquatic species. The nearby Middle Fork Obion River is currently listed on the TDEC 303(d) list as “not supporting” for failing biocriteria (TDEC 2008). Based on the NHD, one intermittent stream crosses the Gleason Reservation and ultimately flows to the Middle Fork Obion River (Figure 3.6-4). Approximately 1,618 lf of this intermittent stream is on the potential CT plant site. Aquatic life requiring perennial flow (such as fish or bivalves) are unlikely to be present; however, other organisms able to tolerate intermittent flow regimes may use the stream channel as habitat, such as crayfish, amphibians, and benthic macroinvertebrates.

3.8.3.1.3.3 Transmission Corridors

A desktop review of the proposed 40-mile-long transmission line corridor identified eight streams and tributaries in the vicinity. These include Chestnut Branch, North Fork Obion River, East Fork Clarks River, Holly Fork Creek, Cane Creek, Little Cane Creek, Mayo Branch, and Cypress Creek. While aquatic life data is not available for these streams, none of the streams are listed as impaired.

3.8.3.1.4 Alternative C

3.8.3.1.4.1 Middle Tennessee TVA Power Service Area

The Middle Tennessee region consists primarily of the Tennessee River and Cumberland River drainages (see Section 3.6.1.2.5.1). These river systems support a large variety of freshwater fishes and invertebrates (including freshwater mussels, snails, crayfish, and insects). Due to the presence of several major river systems, the region's high geologic diversity and the lack of glaciation, the region is recognized as a globally important area for freshwater biodiversity (Stein et al. 2000).

3.8.3.2 Environmental Consequences

3.8.3.2.1 The No Action Alternative

Under the No Action Alternative, TVA would continue current plant operations. TVA would implement all of the planned actions related to the current and future management and storage of CCRs, which have either been reviewed or will be in subsequent NEPA analysis. Continued short-term, direct, and negligible effects on fish eggs, fish larvae, and fish are expected from entrainment and impingement; however, the severity of these effects would be dependent upon the frequency of operations. The No Action Alternative would result in no change to current aquatic ecology conditions; as a result, no project-related environmental effects with respect to aquatic ecosystems would occur under this alternative.

3.8.3.2.2 Retirement, Decommissioning, Decontamination, and Deconstruction of CUF Plant

Although watercourses occur on the CUF Reservation, retirement, decommissioning, decontamination, and deconstruction ground disturbance activities would be minimized, and all work would be done in accordance with state and local BMPs. With proper implementation of BMPs, no direct effects to the aquatic communities that may be present in watercourses within the project area would be anticipated. All necessary CWA Section 404 and ARAP permits would be obtained for in-water work, such as the demolition of intake structures and mooring cells.

There is a possibility that aquatic ecology could be indirectly affected due to modification of the riparian zone by stormwater runoff resulting from construction activities associated with selective demolition. Potential effects due to removal of vegetation within the riparian zone include increased erosion and siltation, loss of habitat, and increased temperatures. Construction activities associated with the removal of buildings as well as backfilling facilities, could lead to increased siltation and runoff in the Cumberland River. With appropriate BMPs implemented during construction, operation, and maintenance of the proposed construction activities, any effects to aquatic ecology resulting from the proposed action would be insignificant.

The retirement of CUF would result in elimination of entrainment and impingement mortality of fish and shellfish in the vicinity of the CUF cooling water intake structure. Thermal discharges would also cease, generally improving water quality. Based on annual biomonitoring of the fish community as a condition of CWA Section 316(a), effects from CUF on fish populations in the vicinity of the plant are negligible, as the Cumberland River maintains a balanced and indigenous fish community as demonstrated through analysis of fish community diversity, trophic levels, limited presence of pollution-tolerant species, and representation of indigenous species. Some species, such as introduced subtropical species like threadfin shad, may depend on heated effluent, and the absence of thermal discharges during winter could result in fish kills of this or similar sensitive species. However, overall, the retirement of CUF is unlikely to result in a substantial change to the aquatic community. Cumulative effects to aquatic life are not anticipated.

3.8.3.2.2.1 Environmental Justice Considerations

Effects to aquatic life that would occur as a result of CUF coal facility retirement and D4 activities would be minor to minimized or mitigated and generally reduced in comparison to existing conditions. Effects to aquatic life that may be subsistence resources for EJ populations would similarly be minor to mitigated, and other populations who utilize these resources would be similarly affected; thus, effects to EJ populations would not be disproportionate.

3.8.3.2.3 Alternative A

3.8.3.2.3.1 Construction and Operation of CC Plant at CUF

The proposed CC plant would use air-cooled condensers, eliminating the need for water withdrawals[9] from the nearby Cumberland River and minimizing effects to aquatic life. Some water treatment may be required to support the CC plant which may result in upgrades to the water treatment plant. The facility would require potable water, which would be obtained from the existing public supply at the Cumberland Reservation (City of Erin Water Department).

Aquatic life could be affected either directly by the alteration of habitat conditions within riverine habitat, streams, wetlands, and other water bodies or indirectly due to modification of the riparian zone and storm water runoff resulting from construction and maintenance actives.

The barge unloading area may also undergo upgrades after construction activities are complete so that the area may be used as a public boat ramp. This could include replacement of the existing concrete surfacing, widening, and extension of the nose. The purpose of the boat ramp would primarily be for public utility, as TVA would only use the boat ramp as an unloading area on scheduled delivery days. Upgrades to the barge unloading area would be permitted in accordance with the CWA Section 404/401 and Section 10 regulations and would adhere to BMPs outlined in TVA's BMP manual.

Construction of a new switchyard at the CC plant and connecting two existing 500-kV TLs would result in negligible effects to aquatic life. Streams within or near the TL corridors or intersected by access roads have the potential to be impacted from surface water runoff increasing siltation to those receiving waters. Ground disturbance would be minimized, and all work would be conducted in accordance with BMPs outlined in TVA's BMP manual (TVA 2017a). Therefore, effects to the aquatic ecology of streams from the TL construction and operation would be minor and insignificant. Furthermore, applicable CWA Section 404 and 401 permits would be obtained from USACE for any stream alterations resulting from TL construction, and application of the terms and conditions of these permits would minimize these effects. As such, cumulative effects to aquatic life are not anticipated.

3.8.3.2.3.2 Construction and Operation of Natural Gas Pipeline

Aquatic life could be affected either directly by the alteration of habitat conditions within riverine habitat, streams, wetlands, and other water bodies or indirectly due to modification of the riparian zone and storm water runoff resulting from construction of the proposed pipeline. During the construction of the pipeline, surface water effects are likely to occur from trenching the pipeline. Horizontal directional drilling may be used under surface waters to minimize effects to aquatic life. Erosion and sediment control BMPs would also be deployed to minimize the

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[9] Water withdrawals would continue to be required for continued operation of the remaining unit at CUF until such time that the unit is retired.

potential for aquatic life effects. TGP is providing a detailed analysis of aquatic life effects in the Environmental Report to be submitted with their certificate application to the FERC for the proposed pipeline. Cumulative effects to aquatic life may occur with past/present and RFFA actions in proximity to the proposed pipeline but would be minimized through the use of BMPs.

3.8.3.2.3.3 Environmental Justice Considerations

Direct effects to aquatic life that would occur as a result of the proposed CC plant, transmission line activities, and natural gas pipeline lateral would be minimized or mitigated and generally limited to the immediate TVA-owned CUF Reservation and transmission line and pipeline corridors, where no populations are settled and EJ populations are removed (Figure 3.4-3) or settled in lower percentages than non-EJ populations (one out of 10 census block groups are low-income EJ populations in the pipeline corridor EJ study area). If indirect effects to aquatic life occur, these could in turn affect EJ populations that currently fish the affected waters. Such activities are known to occur in nearby Lake Barkley Recreation Area or Cross Creeks National Wildlife Refuge (see Section 3.9 for more details on these areas; USACE 2022 and USFWS 2022). These effects are not anticipated to be disproportionate on EJ populations, however, as the same effects would occur to other populations that fish those waters.

3.8.3.2.4 Alternative B

3.8.3.2.4.1 Construction and Operation of CT Plant at Johnsonville Reservation

Construction of the CT plant would occur on previously developed land and would result in no effects to aquatic life. BMPs would be installed along the adjacent reservoir to minimize erosion and subsequent sedimentation. With the implementation of BMPs, effects to aquatic life in the local surface waters are not expected. No water withdrawals would be needed for operation of the CT plant; however, water withdrawals would continue for the remaining CUF unit until it is retired. Water withdrawals made for cooling or service water purposes, as needed, would be regulated under the CWA NPDES permitting conditions. Cumulative effects to aquatic life would not occur.

3.8.3.2.4.2 Construction and Operation of CT Plant at Gleason Reservation

Construction of the CT plant has the potential to affect one intermittent stream. Aquatic life would be affected by the proposed action either directly by the alteration of habitat conditions within the stream or indirectly due to modification of the riparian zone and storm water runoff resulting from construction and maintenance activities. The CT plant would be sited to avoid and/or minimize effects to the streams as practicable. Cumulative effects to aquatic life would not occur.

3.8.3.2.4.3 Transmission and Other Components

The proposed 40-mile transmission line would cross surface waters, including Chestnut Branch, North Fork Obion River, East Fork Clarks River, Holly Fork Creek, Cane Creek, Little Cane Creek, Mayo Branch, Cypress Creek, and likely unnamed streams. As stated in Section 3.6.2.2.4.3, there are an estimated 2.9 stream crossings per mile of new transmission line (with a range of 0 to 50 crossings) based on typical effects described in Table 3.3-1; for the 40-mile transmission line, this equates to an average of 116 stream crossings (range 0 to 2,000). To minimize effects to aquatic life, TVA would avoid placing structures within surface waters, and effects would be minimized by crossing surface waters at a perpendicular angle where practicable. Erosion and sediment control BMPs would be deployed and USACE and TDEC permits would be obtained. Permanent stream crossings that cannot be avoided would be designed to not impede runoff patterns and the natural movement of aquatic fauna. Temporary stream crossings and other construction and maintenance activities associated with the TLs would comply with appropriate state permit requirements and TVA requirements as described in TVA's BMP manual (TVA 2017a).

3.8.3.2.4.4 Environmental Justice Considerations

Direct effects to aquatic life that would occur as a result of the proposed CT facilities at the Gleason Reservation and transmission line activities would be minimized through implementation of BMPs and adherence to CWA permit conditions and generally limited to the immediate TVA-owned Gleason Reservation and transmission line corridor, where EJ populations are removed, as in the case of Gleason (Figure 3.4-7 and Figure 3.4-8), or in varying percentages, as in the transmission line corridor. If indirect effects to aquatic life occur, these could in turn affect EJ populations that currently fish the affected waters. These effects are not anticipated to be disproportionate on EJ populations, however, as the same effects would occur to other populations that fish those waters.

3.8.3.2.5 Alternative C

3.8.3.2.5.1 Construction and Operation of Solar and Storage Facilities

Alternative C would result in construction activities that have the potential to permanently affect streams and/or temporarily affect aquatic life via stormwater runoff. As noted in Table 3.2-1, TVA has evaluated typical effects associated with the development of solar facilities. Estimates of an average 8.7 lf of stream effect per MW average would result in approximately 26,100 lf of stream effects for the 3,000 MW of solar facilities. Cumulative effects to aquatic life would occur; combined with future expansion of solar additions by 2030s forecasted in TVA's 2019 IRP, an additional 87,000 lf of stream effects could occur.

On-site surveys of aquatic resources and appropriate permitting (and mitigation) prior to land disturbance activities would be completed. Forested stream effects are typically avoided. TVA and solar developers would minimize effects to aquatic life by siting facilities on lands with few surface water resources, configuring the solar arrays, access roads, and other infrastructure to avoid surface waters, and maintaining vegetated buffers along surface waters. BESS sites are typically small enough to be sited to avoid surface water and aquatic life effects.

Appropriate BMPs would be installed, 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.

3.8.3.2.5.2 Transmission and Other Components

As noted in Table 3.3-1, transmission lines typically result in an average of 2.9 stream crossings per mile of new line. Based on TVA's evaluation, an average of 1.7 miles of new transmission line are needed for solar facilities, which indicates that approximately 5 surface water crossings may occur for each facility. To minimize effects to aquatic life, TVA would avoid placing structures within surface waters, and effects would be minimized by crossing surface waters at a perpendicular angle where practicable. Erosion and sediment control BMPs would be deployed and USACE and TDEC permits would be obtained. Cumulative effects to aquatic life would occur as a result of transmission lines associated with TVA's expansion of solar facilities in the 2019 IRP, but would be minor with implementation of BMPs.

3.8.3.2.5.3 Environmental Justice Considerations

Effects to aquatic life that would occur as a result of the proposed solar facilities and transmission line activities are not anticipated to have disproportionate environmental and human health effects on EJ populations in the EJ study area of Alternative C. Potential effects to aquatic life on the solar facility sites would be minimized or mitigated through BMPs such as avoiding surface water resources and maintaining vegetated avoidance buffers around surface waters. Transmission activities would take a similar approach. Erosion and sediment control measures would also be taken in association with both solar facility and transmission line activities. Effects to aquatic life would therefore be limited to the immediate project sites and transmission line corridors and would not affect or would not disproportionately affect EJ populations utilizing aquatic life resources nearby.

3.8.4 Threatened and Endangered Species

Some species of fish and wildlife are protected under the ESA and related state laws. The ESA was implemented to provide a framework to conserve and protect threatened and endangered species and their habitats. This act authorized the determination and listing of species as endangered and threatened; prohibited unauthorized taking, possession, sale, and transport of endangered species, provided authority to acquire land for the conservation of listed species, and authorized civil and criminal penalties for violating the ESA (among other authorizations). An endangered species is defined by the ESA as any species in danger of extinction throughout all or a significant portion of its range. Likewise, 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, also can 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. Under Section 7 of the ESA, federal agencies are required to consider the potential effects of their proposed action on endangered and threatened species and critical habitats. If the proposed action has the potential to affect these resources, the federal agency is required to consult with the USFWS.

Fish and game species are also protected by the hunting, fish, and trapping regulations enforced by the Tennessee Wildlife Resources Agency (TWRA) and the USFWS. In addition to these laws, the Migratory Bird Treaty Act (MBTA) of 1918, the Bald and Golden Eagle Protection Act (BGEPA) of 1940, and EO 13186 – Responsibilities of Federal Agencies to Protect Migratory Birds also provide protection to birds. The MBTA and EO 13186 address most native birds occurring in the U.S. The MBTA makes the purposeful taking, killing, or possession of migratory birds, their eggs, or nests unlawful, except as authorized under a valid permit. Federal agency actions are not subject to the MBTA. EO 13186, however, focuses on federal agencies taking actions with the potential to have negative effects on populations of migratory birds. It provides broad guidelines on avian conservation responsibilities and requires agencies whose actions affect or could affect migratory bird populations to evaluate those effects and implement practices to minimize, to the extent practicable, adverse effects on migratory bird resources. TVA is currently developing a Memorandum of Agreement with USFWS under EO 13186. Aside from federal and state laws regulating the hunting, trapping or other capture, and possession of some species, most wildlife other than birds generally receives no legal protection.

There are several laws and Executive Orders established for the protection of plant species and communities. In addition to fish and wildlife, plants are also protected under the ESA. The Rare Plant Protection and Conservation Act of 1985 provided the ability to legally list plants as threatened, endangered, and special concern (TDEC, n.d.). It also allowed the Tennessee Division of Natural Areas to enter into agreements with other agencies ‘with respect to programs designed to conserve rare plants,’ with a cooperative agreement between the USFWS and the State in establishing the Division of Natural Areas as the lead state agency in the process of listing and recovery efforts for federally endangered or threatened species of plants. The Plant Protection Act of 2000 consolidated previous legislation and authorized the U.S. Department of Agriculture (USDA) to issue regulations to prevent the introduction and movement of identified plant pests and noxious weeds. EO 13112 – Invasive Species directs 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 – Safeguarding the Nation from the Effects of Invasive Species amends EO 13112 and directs actions to continue coordinated federal prevention and control efforts related to invasive species. Agencies are also directed to incorporate consideration of human and environmental health, climate change, technological innovation, and other emerging priorities into their efforts to address invasive species (USDA 2018a).

A desktop review of the USFWS Information for Planning and Consultation (IPaC) tool, the TDEC rare species list, and the TVA Regional Natural Heritage Database (RNHD) for species of conservation concern potentially present within the project areas for the No Action and each of the Action Alternatives was conducted, including the proposed natural gas pipeline lateral under Alternative A and both alternative sites under Alternative B. Field surveys of the CUF Reservation were also conducted by TVA in July 2021 (TVA 2021e) to assess the potential for the presence of threatened and endangered species. Alterative site boundaries for CUF, JCT, and Gleason Reservations were used for the IPaC database. TDEC rare species lists are reported on a county-wide basis, and therefore species were listed for each county (Stewart, Humphreys, and Weakley) for each alternative. Information derived from the RNHD was reported from within five miles of the site for plant species, at the county level for aquatic species, and within three miles for terrestrial species. TGP is conducting field surveys of the proposed pipeline as part of the Environmental Report to be submitted with their certificate application that will be filed with the FERC for the proposed pipeline lateral. Species surveys would be conducted as part of a supplemental USFWS consultation if Alternative B or C are selected as the preferred alternative. Species identified from queries of the USFWS IPaC, TDEC, and TVA RNHD are included in Table 3.8-2.

Table 3.8-2. Species of Conservation Concern resulting from data queries for each Action Alternative

Common and Scientific Name	Cumberland (CUF) Reservation		Johnsonville (JCT) Reservation	Gleason Reservation	Habitat	Potential Habitat Presence		
	CUF Plant	Alt A Natural Gas Pipeline				CUF	JCT	Gleason
Bird								
Bewick's wren *Thryomanes bewickii*	SD	SD	SD		Prefer brushy areas, thickets and scrub in open country.	ü		
Bald eagle* *Haliaeetus leucocephalus*	SD+	SD	SD		Nests in tall, mature trees near large bodies of water such as large rivers, lakes, reservoirs, and coastal areas	ü		
Cerulean warbler *Setophaga cerulea*	SD	SD			Found in mature deciduous forest, particularly in floodplains or mesic conditions.	ü		
Golden eagle* *Aquila chrysaetos*	SD	SD			In their winter habitat in the eastern United States, they are found in heavily forested terrain, but most Golden Eagles prefer open areas of deserts, mountains, plateaus, and steppes where cliffs or tall forests alternate with open spaces.	ü		
Henslow's sparrow *Ammodramus henslowii*	ST	ST			Damp open fields and meadows with grass interspersed with weeds or shrubs.	ü		
Little blue heron *Egretta caerulea*			SD		Roost in trees and shrubs near water; forage for insects in wetlands and lakes. Colony observed on an island in Kentucky Reservoir.			

Common and Scientific Name	Cumberland (CUF) Reservation		Johnsonville (JCT) Reservation	Gleason Reservation	Habitat	Potential Habitat Presence		
	CUF Plant	Alt A Natural Gas Pipeline				CUF	JCT	Gleason
Osprey *Pandion haliaetus*	SR+	SR+	SR+		Found on rivers, lakes, reservoirs, lagoons, swamps, and marshes where fish are abundant.	ü	ü	
Piping plover *Charadrius melodus*			FT, ST		Forage in exposed sand flats, mudflats, sandy beaches, stream shorelines, and ephemeral ponds. Rare fall and spring migrants in the TN Valley region. Species has been documented foraging on mudflats in Kentucky Reservoir.		ü	
Swainson's warbler *Limnothlypis swainsonii*	SD	SD		SD	Mature, rich, damp, deciduous floodplain and swamp forests with thick understory.	ü		
Mammal								
Allegheny woodrat *Neotoma magister*			SD		Rock outcrops, cliffs, talus slopes, crevices			
Gray Bat *Myotis grisescens*	FE, SE	FE, SE	FE, SE		Roosts in caves or karst features year-round. Various foraging habitats including wet meadows, ponds, streams, and wetlands	ü		
Indiana Bat *Myotis sodalis*	FE, SE	FE, SE	FE, SE	FE, SE	Various roosting habitats including trees with exfoliating bark, caves and mines. Various foraging habitats including forests, wetlands, streams, and ponds.	ü		ü
Northern long-eared bat	FT, ST	FT, ST	FT, ST	FT, ST	Various roosting habitats including trees with exfoliating bark, caves and mines. Various foraging	ü		ü

Common and Scientific Name	Cumberland (CUF) Reservation		Johnsonville (JCT) Reservation	Gleason Reservation	Habitat	Potential Habitat Presence		
	CUF Plant	Alt A Natural Gas Pipeline				CUF	JCT	Gleason
Myotis septentrionalis					habitats including forests, wetlands, streams, and ponds.			
Rafinesque's big-eared bat *Corynorhinus rafinesquei*				SD	Caves, hollow trees, abandoned buildings; often associated with forested areas.	ü		ü
Tricolored Bat *Perimyotis subflavus*	FC, ST^{+}	FC, ST^{+}			Hibernates in caves, rock crevices and mines. Summer roosts include trees, cliffs, and sometimes buildings.	ü		
Southern bog lemming *Synaptomys cooperi*				SD	Marshy meadows, wet balds, & rich upland forests.			
Reptile								
Alligator snapping turtle *Macrochelys temminckii*	FPT, ST	FPT, ST	ST		Slow moving, deep waters of large rivers, sloughs, oxbows, swamps and lakes	ü		
Northern pinesnake *Pituophis melanoleucus*	ST	ST	ST		Well-drained sandy soils in pine/pine-oak woods; dry mountain ridges			
Western pygmy rattlesnake *Sistrurus miliarius streckeri*	ST	ST			Water in river floodplains, swamps, marshes, and wet prairies; occasionally drier wooded uplands	ü		
Amphibians								

Common and Scientific Name	Cumberland (CUF) Reservation		Johnsonville (JCT) Reservation	Gleason Reservation	Habitat	Potential Habitat Presence		
	CUF Plant	Alt A Natural Gas Pipeline				CUF	JCT	Gleason
Hellbender *Cryptobranchus alleganiensis*	SE	SE	SE		Clean and flowing water with plenty of oxygen in large streams and creeks. Areas with gravel bottoms and an abundance of rocks and submerged logs are necessary			
Fish								
Blue sucker *Cycleptus elongatus*	ST	ST	ST		Swift waters over firm substrates in big rivers.	ü		
Coppercheek darter *Nothonotus aquali*			ST		Only known to occur from the Duck River system of Tennessee. Occurs in small to medium rivers where it occurs in rocky riffles with clear, fast-flowing water.			
Firebelly darter *Etheostoma pyrrhogaster*				SD	Sand- and gravel-bottomed pools of headwaters, creeks, and small rivers; upper Coastal Plain in Obion River watershed; west Tennessee.			
Highfin carpsucker *Carpiodes velifer*			SD		Large rivers, mostly in Tennessee River drainage.			
Lake sturgeon *Acipenser fulvescens*	SE	SE			Bottoms of large, clean rivers and lakes.	ü		
Piebald madtom *Noturus gladiator*				SD	Large creeks & rivers in moderate-swift currents with clean sand or gravel substrates; Mississippi River tributaries.			

Common and Scientific Name	Cumberland (CUF) Reservation		Johnsonville (JCT) Reservation	Gleason Reservation	Habitat	Potential Habitat Presence		
	CUF Plant	Alt A Natural Gas Pipeline				CUF	JCT	Gleason
Pygmy madtom *Noturus stanauli*			FE, SE	FE, SE	Only occurs the Clinch River and the Duck River in Humphreys County. The preferred habitat includes gravel runs of clear, medium-sized rivers.			
Saddled madtom *Noturus fasciatus*			ST		Occurs in the Duck River system and nearby tributaries of the Tennessee River in Hardin and Wayne Counties, Tennessee. The preferred habitat includes rocky riffles, runs and flowing pools of clear creeks and small rivers			
Slenderhead darter *Percina phoxocephala*			SD		Small-large rivers with moderate gradient in shoal areas with moderate-swift currents; portions of Tennessee & Cumberland rivers watersheds.			
Tennessee logperch *Percina apina*			SD		Duck River system and Whiteoak Creek; currently restricted to the Western Highland Rim.			
Crustaceans								
Hatchie burrowing crayfish *Creaserinus hortoni*				SE	Primary burrower; uses saturated or seasonally saturated soils associated with permanent bodies of water			ü
Mollusks								

Common and Scientific Name	Cumberland (CUF) Reservation		Johnsonville (JCT) Reservation	Gleason Reservation	Habitat	Potential Habitat Presence		
	CUF Plant	Alt A Natural Gas Pipeline				CUF	JCT	Gleason
Clubshell *Pleurobema clava*			FE, SE	FE, SE	Small to medium sized rivers and streams with sand and fine gravel substrates or in clean, coarse sand and gravel runs			
Orangefoot pimpleback (pearlymussel) *Plethobasus cooperianus*			FE, SE	FE, SE	Perennial streams with rocky areas and swift to slow moving currents			
Pink mucket *Lampsilis abrupta*	FE, SE	FE, SE	FE, SE	SE	Large rivers with sand-gravel or rocky substrates with moderate to strong currents	ü		
Rabbitsfoot *Theliderma cylindrica*	FT, ST	FT, ST	FT, ST	FT, ST	Large rivers with sand and gravel	ü		
Ring pink *Obovaria retusa*			FE, SE	FE, SE	Large rivers in sand and gravel.			
Rough pigtoe *Pleurobema plenum*			FE, SE	FE, SE	Medium to large sized rivers, in substrates ranging from mud and sand to gravel, cobble, and boulders			
Slabside pearlymussel *Pleuronaia dolabelloides*			FE, SE	FE, SE	Large creek to moderately sized rivers. Generally observed in gravel substrates within interstitial sand, with moderate current.			
Spectaclecase *Cumberlandia monodonta*			FE, SE	FE, SE	Medium to large rivers; in substrates ranging from mud and			

Common and Scientific Name	Cumberland (CUF) Reservation		Johnsonville (JCT) Reservation	Gleason Reservation	Habitat	Potential Habitat Presence		
	CUF Plant	Alt A Natural Gas Pipeline				CUF	JCT	Gleason
					sand to gravel, cobble, and boulders			
Tan Riffleshell *Epioblasma florentina walkeri*		FE			Headwaters, riffles, and shoals in sand and gravel substrates			
Plants								
American ginseng *Panax quinquefolius*	SSC^{+}	SSC	SSC		Rich woods; identified during 2021 field surveys in dry deciduous woods	ü		
Bearded rattlesnake-root *Prenanthes barbata*	SSC	SSC	SSC		Barrens and dry woodlands	ü		
Blue mud-plantain *Heteranthera limosa*	ST	ST	ST		Mud flats			
Blue sage *Salvia azurea var. grandiflora*	SSC	SSC			Barrens			
Bristly sedge *Carex comosa*	ST	ST			Swamps	ü		
Butternut *Juglans cinerea*	ST	ST			Rich woods and hollows	ü		
Cow-parsnip *Heracleum maximum*	SSC	SSC			Moist woods and floodplains	ü		
Cream wild-indigo *Baptisia bracteata var. leucophaea*	SSC	SSC			Dry oak woods and barrens	ü		

Common and Scientific Name	Cumberland (CUF) Reservation		Johnsonville (JCT) Reservation	Gleason Reservation	Habitat	Potential Habitat Presence		
	CUF Plant	Alt A Natural Gas Pipeline				CUF	JCT	Gleason
Duck River bladderpod *Paysonia densipila*		SSC			Open limestone glades, disturbed lowlands along river and stream bottoms			
Eggert's sunflower *Helianthus eggertii*		SSC			Rocky, open oak-hickory woodlands and barrens on well drained soils			
Fen orchis *Liparis loeselii*	ST	ST			Calcareous seeps			
Fraser's loosestrife *Lysimachia fraseri*	SE	SE			Dry open woods	ü		
Grassleaf arrowhead *Sagittaria graminea*		ST			Littoral areas in ponds and lakes, swamps, or muddy banks			
Hairy Hawkweed *Hieracium longipilum*	SSC	SSC			Dry fields and sandy road banks	ü		
Hairy umbrella-sedge *Fuirena squarrosa*			SSC		Mesic communities, including sphagnous bogs, and can be found infrequently in pine-palmetto communities and wet prairies			
Halberd-leaf tearthumb *Polygonum arifolium*				ST	Wetlands and marshes			UNK
Harbison's hawthorn *Crataegus harbisonii*				SE	Dry rocky calcareous woods			UNK
Harper's fimbristylis *Fimbristylis perpusilla*			SE		Muddy shores and exposed bottoms of limesinks, flatwoods, farm ponds, and silty sandbars			

Common and Scientific Name	Cumberland (CUF) Reservation		Johnsonville (JCT) Reservation	Gleason Reservation	Habitat	Potential Habitat Presence		
	CUF Plant	Alt A Natural Gas Pipeline				CUF	JCT	Gleason
Heller's catfoot *Pseudognaphalium helleri*			SSC		Dry sandy woods			
Lake cress *Neobeckia aquatica*	SSC	SSC			Gum or cypress swamps			
Lamance iris *Iris brevicaulis*	SE	SE	SE		Moist fields, damp prairies, wet meadows, moist woodlands, streams, riverbanks, marsh areas, around lakes, around ponds, in ravines at the base of wooded slopes	ü		
Lance-like spike rush *Eleocharis lanceolata*	SSC	SSC			Wet areas	ü		
Matted spike-rush *Eleocharis intermedia*	SE	SE			Wet areas	ü		
Naked-stem sunflower *Helianthus occidentalis*				SSC	Limestone glades and barrens			
Northern prickly-ash *Zanthoxylum americanum*	SSC+				Identified in deciduous bottomland forest wetland on the CUF Reservation during surveys in 2021.	ü		

Common and Scientific Name	**Cumberland (CUF) Reservation**		**Johnsonville (JCT) Reservation**	**Gleason Reservation**	**Habitat**	**Potential Habitat Presence**		
	CUF Plant	**Alt A Natural Gas Pipeline**				**CUF**	**JCT**	**Gleason**
Ozark downy phlox *Phlox pilosa ssp. ozarkana*	SSC	SSC			Rocky, dry open woods	ü		
Price’s potato bean *Apios priceana*	FT, SE	FT, SE			Openings in rich woods	ü		
Purple milkweed *Asclepias purpurascens*	SSC	SSC			Barrens			
Red turtlehead *Chelone obliqua*				SSC	Alluvial swamps, wet woods			UNK
River bulrush *Bolboschoenus fluviatilis*			SSC		Marshes, openings in swamps, edges of ponds and streams, fresh tidal marshes, and inland salt marshes and ponds			
Sand grape *Vitis rupestris*		SE			Gravelly banks, river bottoms, stream beds, washes, and scoured boulders and cobbles; along the edges of limestone glades and barrens			
Short-beaked arrowhead *Sagittaria brevirostra*	ST	ST	ST		Swamps and floodplains	ü		
Short's bladder pod *Physaria globosa*		FE			Dry, open limestone ledges on river bluffs, talus of lower bluff slopes, and shale at cliff bases; usually south- to west-facing rocky slopes			

Common and Scientific Name	**Cumberland (CUF) Reservation**		**Johnsonville (JCT) Reservation**	**Gleason Reservation**	**Habitat**	**Potential Habitat Presence**		
	CUF Plant	**Alt A Natural Gas Pipeline**				**CUF**	**JCT**	**Gleason**
					and the tops, ledges, or bases of steep cliffs along major waterways			
Short's rock-cress *Boechera shortii*			SSC		Wooded bluffs and plains			
Smaller mud plantain *Heteranthera limosa*			ST		Small ephemeral rainwater pools			
Spinulose shield fern *Dryopteris carthusiana*				ST	Bogs			
Spreading false-foxglove *Aureolaria patula*	SSC	SSC			Oak woods and edges	ü		
Swamp lousewort *Pedicularis lanceolata*	SSC	SSC			Wet acidic barrens and seeps			
Sweet coneflower *Rudbeckia subtomentosa*	ST	ST			Barrens			
Sweetscent ladies'-tresses *Spiranthes odorata*			SE		Swamps and pond margins			
Sweet-scented indian plantain *Hasteola suaveolens*	SSC	SSC			Alluvial woods, moist slopes			

Common and Scientific Name	Cumberland (CUF) Reservation		Johnsonville (JCT) Reservation	Gleason Reservation	Habitat	Potential Habitat Presence		
	CUF Plant	Alt A Natural Gas Pipeline				CUF	JCT	Gleason
Texas goldentop *Euthamia gymnospermoides*	SE[+]				Identified during field surveys on the CUF Reservation in 2021 in early successional habitat within a transmission ROW	ü		
Torrey's mountain mint *Pycnanthemum torreyi*		SE			Dry upland forests, dry rocky woodlands over mafic, ultramafic, or calcareous rocks, edges of sandstone glades, dry-mesic barrens, thickets, upland meadows, and powerline ROWs			
Walter's barnyard grass *Echinocloa walteri*			SSC		Openings in the floodplain woodlands, swamps, marshes, low areas along ponds, rivers, and ditches. This grass also prefers disturbed open fields.			
Water-purslane *Didipis diandra*				ST	Swamps			
Insects								
Monarch butterfly *Danaus plexippus*	FC	FC	FC	FC	Milkweed and flowering plants	ü		ü

FE = Federal-Endangered; FT = Federal-Threatened; FPT = Federal Proposed-Threatened; FC: Federal Candidate for Listing; SE = State-Endangered; ST = State-Threatened; SSC = State Special Concern; SD = State Deemed in Need of Management; SR = State rare and uncommon
UNK = possibly potential presence but unknown pending field surveys of suitable habitat conditions
*Protected under the Bald and Golden Eagle Protection Act
[+]Record of observation on site

3.8.4.1 Affected Environment

3.8.4.1.1 CUF Reservation

Fish, wildlife, and plant species under state or federal protection that may be found on or in the vicinity of the CUF Reservation are summarized in Table 3.8-2. No federally designated critical habitat is located on the CUF Reservation. Species with potential habitat on CUF Reservation and those that have been directly observed on site are discussed below.

3.8.4.1.1.1 Birds

One species of bird (Henslow's sparrow) was listed as state-threatened based on the reviewed resources; five other species (Bewick's wren, bald eagle, cerulean warbler, golden eagle, and Swainson's warbler) were classified by the state as "Deemed in Need of Management". Species Deemed in Need of Management are those that "the director of TWRA believes should be investigated in order to develop information relating to populations, distribution, habitat needs, limiting factors, and other biological and ecological data to determine management measures necessary for their continued ability to sustain themselves successfully." All of the state or federally protected bird species or species of conservation concern have the potential to be present on the CUF Reservation based on required habitat and those habitats described in recent field surveys (TVA 2021h) (Table 3.8-2).

Henslow's sparrow habitat consists of damp open fields and meadows with grass interspersed with weeds or shrubs. On the CUF Reservation, this habitat may be found in or near wetlands contained in the former agricultural fields or in early successional habitat along existing transmission ROWs. Former agricultural fields and transmission ROWs are disturbed areas which commonly support both native and non-native, weedy plant species. The early successional habitat on CUF Reservation was observed to contain mainly annual ragweed, beefsteak plant, brown eyed Susan, and late-flowering thoroughwort; the former agricultural fields contained typical invasive plants such as Johnson grass and sericea lespedeza, as well as other native and non-native species (see Section 3.8.1.1.1, Figure 3.8-1); in combination with the wetlands identified in this area (Figure 3.6-1), these characteristics may provide the habitat to support the Henslow's sparrow.

Golden eagle is state Deemed in Need of Management and are also protected under the BGEPA (USFWS 2011). Tennessee is within the non-breeding resident range for this species (Table 3.8-2). The TVA RNHD found no records of a golden eagle within three miles of the CUF Reservation and the site would provide no nesting habitat; however, nearby waterbodies and fields may provide foraging grounds and therefore this species may be observed passing through the area. Bald eagle is also state Deemed in Need of Management, as well as protected under the BGEPA (USFWS 2011). Suitable nesting trees exist for bald eagle along Wells Creek and the Cumberland River. Bald eagles are typically found near large, open bodies of water such as rivers, lakes, and reservoirs. Bald eagles will nest on cliffs or large trees near water (NatureServe 2021). A search of the TVA natural heritage database shows 24 records of bald eagles within Stewart County. A bald eagle nest was active from 2005-2009 near CUF, approximately 0.26 mile west of CUF between the two TVA transmission line ROWs, suggesting habitat in this area is suitable for bald eagle nesting. No bald eagles or nests were observed during the 2021 field surveys; however, anecdotal reports state that they have been sighted flying over and near the project area foraging over the Cumberland River.

Suitable nesting habitat also exists for osprey on the CUF Reservation. Osprey are a candidate for federal listing currently under review and have a state rank of "rare and uncommon" in the state, with an estimated 21-100 occurrences. Osprey build large nests near water, on top of dead trees or artificial structures such as nesting poles, utility poles, and cells or TV towers (TWRA, undated). Nests are made of branches, sticks, twigs, and lined with smaller material. Six of the osprey nests are on lights over mooring cells in the Cumberland River, four nests are on lighting towers or structures around the coal pile, and the remaining six nests are on transmission structures in and around the plant site.

Bewick's wren is also state Deemed in Need of Management (Table 3.8-2). This species prefers brushy areas, thickets, and scrub areas in open country. Similar to Henslow's sparrow, this habitat type may be found in disturbed areas such as existing transmission ROWs or former agricultural fields on site (see Section 3.8.1.1.1, Figure 3.8-1). No Bewick's wrens were observed during the 2021 wildlife and protected terrestrial animal species assessment (TVA 2021h).

Cerulean warbler and Swainson's warbler are both species Deemed in Need of Management that require habitat exhibiting mature floodplain or mesic deciduous forests (Table 3.8-2). Approximately 9.8 percent of the deciduous forests on site consist of mesic or bottomland forest type (approximately 112 acres). Therefore, these species may be present if habitat is sufficient. No Cerulean or Swainson's warblers were observed during the 2021 wildlife and protected terrestrial animal species assessment (TVA 2021h).

3.8.4.1.1.1.1 Migratory Bird Species

Approximately 291 species of migratory birds have been identified in Stewart County, Tennessee (eBird 2021), and additional species likely occur regularly. The USFWS maintains a list of migratory birds of conservation concern (USFWS 2021). These species are not listed under the ESA but are a high conservation priority of the USFWS and without additional conservation action are likely to become candidates for listing under the ESA. Twenty-three species of birds of conservation concern are listed for Bird Conservation Region 24, Central Hardwoods, which contains the CUF Reservation (USFWS 2021). Species from this list with a "common" occurrence (during all seasons, breeding, wintering, or migration) as shown on range maps by the National Audubon Society (2022) were listed in Table 3.8-3. Additionally, species from the Migratory Birds list obtained from the USFWS IPaC report and the results of the 2021 wildlife and protected terrestrial animal species assessment were also included.).

Table 3.8-3. Migratory Bird Species of Conservation Concern Potentially Occurring in or identified on the CUF Reservation.

Common Name	Scientific Name	General Habitat Description	Habitat on Project Site?
Migrant Species (present as spring and fall migrant and/or during winter)			
Lesser Yellowlegs	*Tringa flavipes*	Winters and migrates along mudflats, sandy beaches, shores of lakes and ponds, and wet meadows.	No
Bobolink	*Dolichonyx oryzivorus*	Grasslands, meadows, and hayfields.	Yes
Rusty Blackbird	*Euphagus carolinus*	Winters in swamps, wet woodlands, and pond edges.	Yes, limited

Common Name	Scientific Name	General Habitat Description	Habitat on Project Site?
Semipalmated Sandpiper	*Calidrus pusilla*	Winters and migrates along mudflats, sandy beaches, shores of lakes and ponds, and wet meadows.	No
Breeding Season Migrants (may occur only during the breeding season)			
Bewick's Wren (Eastern)	*Thryomanes bewickii bewickii*	Overgrown fields, fencerows, woodland edges, often around buildings.	Yes
Chimney Swift	*Chaetura pelagica*	Forages over variety of habitats, requires chimneys or large hollow tree snags with open tops for nesting	No
Cliff Swallow	*Petrochelidon pyrrhonota*	Nest on cliff faces and man-made buildings near water bodies, bridges.	Yes, confirmed presence[+]
Eastern Whip-poor-will	*Antrostomus vociferus*	Woodlands with open understory.	Yes
Grasshopper Sparrow	*Ammodramus savannarum*	Grasslands, meadows, and hayfields.	Yes
Kentucky Warbler	*Geothlypis formosa*	Large moist forest tracts with mature trees and thick understory.	Yes*
Prothonotary Warbler	*Protonotaria citrea*	Breed in flooded bottomland forests, wooded swamps, and forests near lakes and streams larger than 250 acres.	Yes
Prairie Warbler	*Dendroica discolor*	Various shrubby habitats, including regenerating forests, open brushy fields, and Christmas tree farms	Yes*
Wood Thrush	*Hylocichla mustelina*	Breeds in mature deciduous and mixed forests, forests with dense understory, and forest edges.	Yes*
Resident Species (may occur year-round)			
Red-headed Woodpecker	*Melanerpes erythrocephalus*	Deciduous woodlands with oak or beech, groves of dead or dying trees, forested river bottoms, recent clearings, farmland, grasslands, forest edges and roadsides	Yes*
Field Sparrow	*Spizella pusilla*	Old fields and brushy areas.	Yes
Bald Eagle	*Haliaeetus leucocephalis*	Nest in forested areas adjacent to large bodies of water. For perching they prefer tall coniferous or deciduous trees.	Yes*

Common Name	Scientific Name	General Habitat Description	Habitat on Project Site?
Blue-winged Warbler	*Vermivora cyanoptera*	Nest in shrubby, second-growth habitat with scattered trees, such as abandoned farmland and forest clearings	Yes*
Double-crested Cormorant	*Phalacrocorax auritus*	Open water, reservoirs, larger lakes, and wide stretches of rivers across Tennessee. They nest on islands on some of the larger lakes in Tennessee	Yes, confirmed presence+
Osprey	*Pandion haliaetus*	Found on almost any expanse of shallow, fish-filled water, including rivers, lakes, reservoirs, lagoons, swamps, and marshes.	Yes, confirmed presence+

*Migratory birds of conservation concern potentially found on the CUF Reservation as determined by the 2021 wildlife and protected terrestrial animal species assessment (TVA 2021h). +Known nesting or colony locations on CUF Reservation

Many of the species listed in Table 3.8-3 may have supportive habitat on the CUF Reservation, particularly those using habitat consisting of deciduous forests or fields which were the dominate vegetation communities on the CUF Reservation (Section 3.8.1.1.1). Several species comprising bald eagle, blue-winged warbler, Kentucky warbler, prairie warbler, red-headed woodpecker, and wood thrush were identified during a query of USFWS' IPaC query for the CUF Reservation, and wood thrush were documented by song in a mature forest area during the July 2021 site visit.

Bald eagle, as discussed above, is a species Deemed in Need of Management by the TWRA and is also protected under the MBTA and BGEPA. Although no nests were observed during the 2021 surveys, the documented history of nesting on site suggest this area contains suitable habitat consisting of large, mature trees for nest building and nearby open water for foraging (i.e., Cumberland River).

Three notable species of migratory bird have been confirmed with nesting locations and/or colonies on the CUF Reservation. Sixteen osprey nests, one double crested cormorant (*Phalacrocorax auratus*) colony, and one cliff swallow (*Petrochelidon pyrrhonota*) colony were observed during the field surveys in July 2021 (TVA 2021h) (Figure 3.8-3). As stated above, osprey nests have been observed on lights over mooring cells in the Cumberland River, on lighting towers, and on transmission line structures. The cormorant nests are also on a transmission structure in the middle of Wells Creek.

A colony of cliff swallows with approximately 100 nests and 200 pairs of birds was originally observed nesting under a busy bridge over Wells Creek by TVA terrestrial zoologists in May 2017; although evidence indicates the colony had likely been established there for several years. The colony was again active at the time of the July 2021 field survey (TVA 2021h) (Figure 3.8-3). The colony has exhibited a tolerance for disturbance as they continue to roost under a busy road often traveled by large trucks. TVA has taken measures to protect this nesting colony during previous proposed actions.

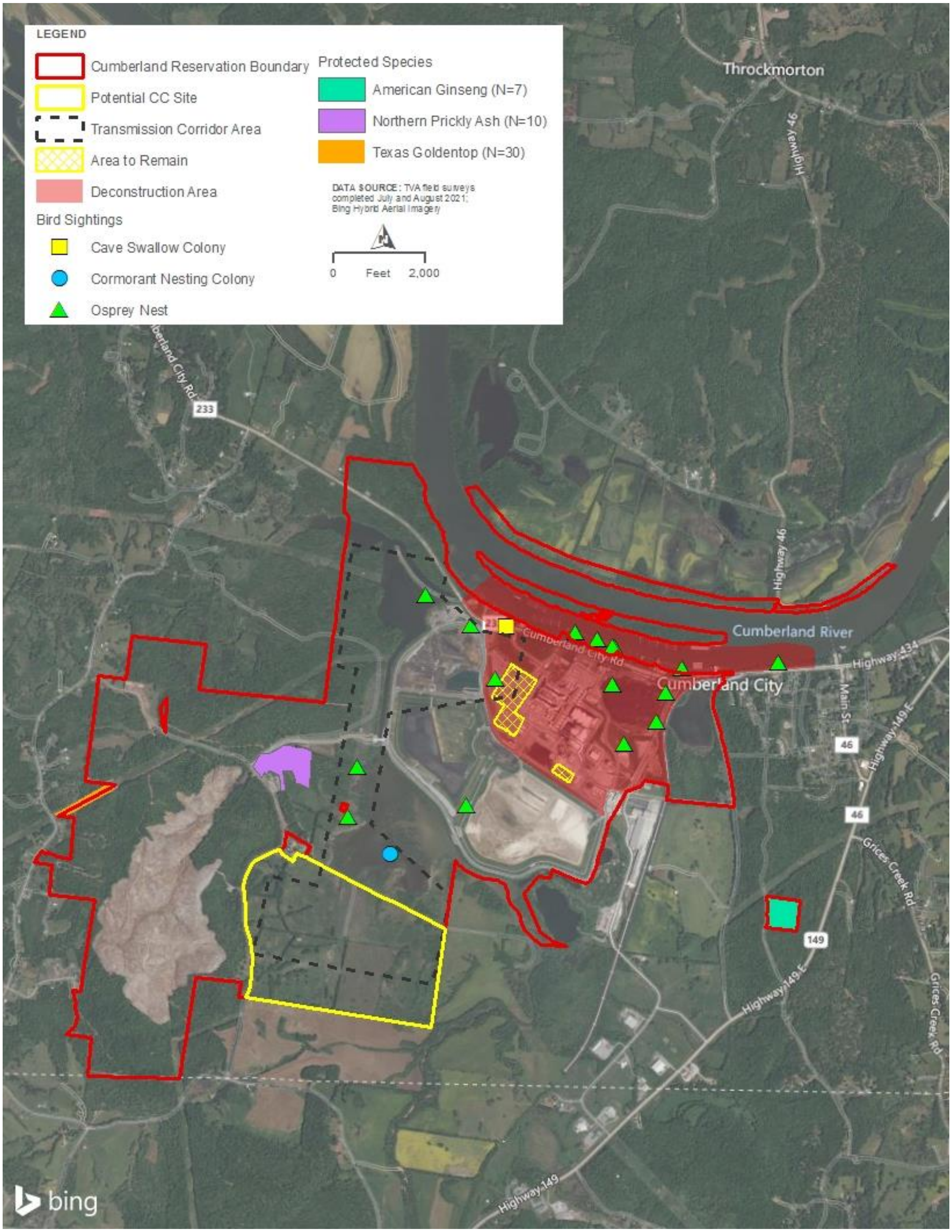

Figure 3.8-3. Protected Species Observations on the Cumberland Reservation

3.8.4.1.1.2 Mammals

Three species of bat with protected status were identified on the various resources lists, comprising gray bat, Indiana bat, and northern long-eared bat (Table 3.8-2). The tricolored bat, a candidate for listing under review by the USFWS and a state-threatened species, has also been captured during mist net surveys on CUF Reservation in 2011 (TVA 2021h) and therefore is also included in this review.

Gray bats almost exclusively roost in large caves throughout the year. They are sometimes found roosting in mines or buildings (NatureServe 2021). The TVA database has 12 records of gray bats in Stewart County. The closest record of this species is from Bellamy Cave approximately 8 miles away from CUF. No suitable roosting habitat for gray bat is present on CUF Reservation. Foraging habitat for this species may occur over open water areas associated with Wells Creek and the Cumberland River. Lower quality foraging habitat may be found over ash impoundments.

Indiana bats overwinter in large numbers in caves and forms small colonies under loose bark of trees and snags in summer months (Barbour and Davis 1974). During the summer it favors mature forests interspersed with openings and roots in trees with snags, cavities or exfoliating bark. Use of living trees, especially species such as shagbark hickory, mature white oaks, and other trees with suitable roost characteristics near suitable snags, has also been documented. Multiple roost sites are generally selected. The availability of trees of a size and sun exposure are other important limiting factors contributing to roost site suitability (Tuttle and Kennedy 2002, Harvey and Britzke 2002, Kurta et al. 2002). A search of the TVA database indicates five records of Indiana bat within Stewart County. The forested areas and open areas over Wells Creek, the Cumberland River and the ash impoundments may provide suitable foraging habitat for this species. Additionally, CUF is within known swarming area for Indiana bats that hibernate in Bellamy Cave in Montgomery County (USFWS 2015). No Indiana bats were captured during mist netting surveys in 2011 (ESI 2011). No active summer roost sites were identified. No winter hibernacula occur on CUF Reservation; however, most forested areas provide some value as potential summer roosting habitat for Indiana bat.

Northern long-eared bats suitable hibernacula includes caves and cave-like structures such as mines and railroad tunnels. These hibernacula typically have large passages with cracks and crevices for roosting; relatively constant, cool temperatures (32 to 48°F) and high humidity and minimal air currents. During summer, this species roosts singly or in colonies in cavities, underneath bark, crevices, or hollows of both live and dead trees (typical diameter greater than or equal to 3 inches). Males and non-reproductive females may also roost in cooler places, like caves and mines. Northern long-eared bats forage in upland and lowland woodlots, treelined corridors, and water surfaces, feeding on insects. In general, habitat use by northern long-eared bats is thought to be similar to that used by Indiana bats, although northern long-eared bats appear to be more opportunistic in selection of summer habitat (USFWS 2016). Like Indiana bat, most forested areas provide some value as potential summer roosting habitat for northern long-eared bat. Also similar to Indiana bats, the forested areas and open areas over Wells Creek, the Cumberland River and the ash impoundments may provide suitable foraging habitat for this species. A search of the TVA Natural Heritage Database indicates two records of northern long-eared bats captured within Stewart County. No winter roosting habitat was identified during on CUF during 2021 field surveys. However, one hibernaculum is known within 5-miles of the CUF Reservation.

The tricolor bat is the most common bat species in Tennessee and is found state-wide. This species hibernates in caves, rock crevices, and mines, and summer roosts in trees, cliffs, and sometimes buildings (TWRA, undated). No sufficient habitat exists on CUF Reservation for overwinter hibernation, however forested areas of the site may provide summer roosting habitat.

3.8.4.1.1.3 Reptiles

Three reptiles are state-listed as threatened for the state of Tennessee: alligator snapping turtle, northern pinesnake, and western pygmy rattlesnake (Table 3.8-2). Alligator Snapping Turtle is state-listed as threatened and federally proposed for listing as threatened. It is a rare reptile that is restricted to drainages, floodplains, swamps, and oxbow lakes associated with large rivers, only emerging from water for nesting and basking. The species does not inhabit isolated wetlands and ponds. Nesting occurs on riverbanks and sandbars at least 50 yards from the waters' edge (NatureServe 2021). While the Cumberland River may provide general habitat for this species, nesting areas are unlikely to occur within the demolition area given the distance to nesting sites for this species (to avoid inundation of nest/eggs).

Northern Pinesnake is state-listed as threatened in Tennessee. It is a large, nonvenomous snake typically found in sandy, well-drained upland pine or pine-oak woodlands. Northern pine snakes spend the majority of their time underground, but they are often encountered aboveground during spring and late summer to early autumn (Tennant 2003; Tuberville and Mason 2008). No habitat exists on-site to support the northern pinesnake.

Western Pygmy Rattlesnake is state-listed as threatened in Tennessee. It is a small venomous snake that may utilize a variety of habitats from wetland areas to pine-hardwood forests. This animal is extremely secretive and seldom encountered as it spends the day hidden beneath groundcover (Tennant 2003). Births usually occur in summer (NatureServe 2021). Based on field surveys of vegetation communities and surface water resources completed in 2021, there may be potential suitable habitat within the CUF Reservation for this species.

3.8.4.1.1.4 Amphibians

Eastern hellbender is a large salamander state-listed as Endangered in Tennessee. (Table 3.8-2) It is found in clear, rocky creeks and rivers with water temperatures that are ideally less than or equal to 20°C, and where there are large shelter rocks. Eggs are laid in nests in late summer or fall beneath these large, flat shelter rocks or submerged logs. No habitat exists on the CUF Reservation to support the hellbender.

3.8.4.1.1.5 Plants

Eleven threatened or endangered plant species were identified on the various state and federal protected species lists for CUF Reservation (Table 3.8-2). An additional 14 species are listed as State Special Concern. Of these species, three were identified during the 2021 field surveys: American ginseng, northern prickly-ash, and Texas goldentop.

American Ginseng is a state-listed Species of Special Concern and is listed due to commercial exploitation. Seven American ginseng were identified during field surveys in September 2021 in a 10.6-acre dry deciduous forest area discontinuous with the main CUF Reservation area (Figure 3.8-3). This forest had common species such as American beech, bitternut hickory, black gum, sassafras, sugar maple, sweetgum, tulip poplar, white ash, and white oak with American hophornbeam, poison ivy, Virginia creeper, and winged elm understory.

Northern prickly-ash is state-listed Species of Special Concern and was identified on CUF Reservation during 2021 field surveys. Ten northern prickly-ash trees were identified in a 17.3-

acre disturbed, deciduous bottomland forest on the central-west portion of the CUF Reservation (Figure 3.8-3). This habitat had overstory species such as American basswood, American sycamore, black walnut, Osage orange, slippery elm, and southern hackberry, sugar maple, and sweetgum, with bear's foot, common greenbrier, Chinese privet, coralberry, ironwood, multiflora rose, northern spicebush, pawpaw, river cane, winged elm, and overstory saplings in the understory. Herbaceous plants in this area included Broadleaf arrowhead, Canadian honewort, cardinal flower, Carolina elephant's-foot, Christmas fern, fox sedge, Frank's sedge, Japanese stiltgrass, jumpseed, smallspike false nettle, sweet woodreed, Virginia spiderwort, and wingstem.

Texas goldentop is a state-listed Endangered species identified on the CUF Reservation during 2021 field surveys. Thirty Texas goldentop were observed in a 5.5-acre transmission ROW on the west portion of CUF Reservation (Figure 3.8-3) consisting mainly of annual ragweed, beaked panic grass, blackeyed Susan, clustered mountain mint, flat-top goldenrod, golden tickseed, gray goldenrod, greater tickseed, hairy sunflower, hyssopleaf thoroughwort, little bluestem, Maryland meadow beauty, pink fuzzy bean, poorjoe, purple passionflower, roundleaf thoroughwort, wild bergamot, wholeleaf rosinweed, and wrinkleleaf goldenrod.

3.8.4.1.1.6 Aquatic Species

Four aquatic animal species including two fish and two mussels are listed in Table 3.8-2 for CUF Reservation based on the reviewed resources, including blue sucker, lake sturgeon, pink mucket, and rabbitsfoot.

Blue sucker is state-listed as threatened in Tennessee. It is a bottom-feeding fish that can be found in large rivers and lower parts of major tributaries in channels and flowing pools with moderate current. Occasionally they can be found in impoundments. Adults migrate upstream to spawn in riffles (NatureServe 2021). One blue sucker was captured upstream and five blue suckers were captured down stream of CUF during gill netting sampling as a part of 2015 biological monitoring of the Cumberland River (TVA 2016a). Most recently, two blue suckers were collected during electrofishing surveys in fall 2019 (TVA 2020b).

Lake sturgeon is a state-listed Endangered fish in Tennessee. It is a target species for a state-sponsored reintroduction program and has been aggressively stocked in many Tennessee reservoirs over the last several years. Lake sturgeon is a benthic species that feeds primarily on small benthic invertebrates such as leeches, snails, small clams, crustaceans, and sometimes small fish. Adults require large areas of rivers and lakes less than 30 feet deep with clean, fresh water (NatureServe 2021). Lake Sturgeon are found in the vicinity of CUF and were captured each year from 2009 to 2016 during biological surveys (TVA 2020b). One individual lake sturgeon was also collected during impingement sampling at CUF during the 2005-2007 impingement study (TVA 2007).

The pink mucket mussel is state- and federally listed as endangered, and the rabbitsfoot mussel is state- and federally listed as threatened. Both species are found in large rivers with sand and gravel substrates. A mussel survey in 2011 in the thermally affected area of the Cumberland River near CUF yielded no state- or federally-protected mussel species; river substrates were categorized as degraded/sub-optimal in the study area with clay as the dominant substrate overlain by silt (TVA 2020b). The protected mussel species have not been collected in the area in decades and TVA has concluded that they no longer occur in the vicinity of CUF.

3.8.4.1.1.7 Insects

Monarch butterflies are currently classified as a federal candidate species for listing. They are milkweed specialists and prefer habitats that provide them this species and other flowering plants, such as roadside areas, open areas, wet areas, or urban gardens (NatureServe 2021). While the former agricultural fields on the CUF Reservation may provide habitat for milkweed and/or the monarch butterfly, no milkweed was noted during 2021 field surveys in the disturbed (former agricultural) fields or transmission ROW (early successional) areas or anywhere else on CUF Reservation.

3.8.4.1.2 Alternative A

3.8.4.1.2.1 Proposed CC Plant Site

The proposed CC plant site and associated transmission line area is located within the boundary of the CUF Reservation; therefore, the species listed in Table 3.8-2 for CUF Reservation may be found on the CC plant site or within the transmission line area. However, based on the habitat types identified in the vegetation community described for the CC plant site during 2021 field surveys (i.e., disturbed fields), species that could have potential habitat on the CC plant site include: Bewick’s wren, Henslow’s sparrow; foraging habitat for gray bat, tricolored bat, Indiana bat, northern long-eared bat; western pygmy rattlesnake; and monarch butterfly. Bewick’s wren and Henslow’s sparrow may have potential habitat onsite, but neither species were observed during the 2021 field surveys (TVA 2021h). In addition to these species, the transmission line area also provides deciduous forest habitat, including upland forest and bottomland hardwood forest that may provide habitat for bald eagle, cerulean warbler, and Swainson’s warbler as well as summer roosting habitat for Indiana bat, northern long-eared bat, and tricolored bat. No bald eagle nests were observed during 2021 field surveys (TVA 2021h). The plant species marked as potentially occurring on site in Table 3.8-2 are generally found in habitats that could be present on the CC plant site or along the transmission line corridor, however no protected plant species were identified in these areas during targeted protected species surveys in September 2021 or during stream and wetland surveys in July/August 2021. Therefore, it is unlikely that these protected species are present. As stated above, no federally designated critical habitat is located on the CUF Reservation and therefore there is no designated critical habitat on the proposed CC plant site.

The majority of the CC plant site consists of low-quality bat foraging habitat (189 acres) interspersed with tree lines categorized as medium-quality summer roosting habitat for Indiana bat and northern long-eared bat (52 acres) (Figure 3.8-2). The field area may be used as foraging grounds for bat species, and trees could potentially be used for roosting. The transmission line area contains a range of bat habitat quality including some high-quality areas for summer roosting for Indiana bat, northern long-eared bat, and tricolored bat,

The migratory bird species of conservation concern for the proposed CC plant site are the same as those listed and discussed for the CUF Reservation in Section 3.8.4.1.1.1.1. None of the species nests or colonies as shown on Figure 3.8-3 are located within the proposed CC plant boundary; however, five osprey nests and a cormorant nesting colony fall within the proposed transmission line area. There is also potential for nests to be present along the OPGW transmission line. The osprey nests and cormorant colony are all located on existing transmission structures.

3.8.4.1.2.2 Natural Gas Pipeline Lateral Corridor

The natural gas pipeline lateral corridor originates on the southern boundary of the proposed CC plant site where the habitat was classified as disturbed field. The species discussed in

Section 3.8.4.1.2.1 (i.e., those associated with field habitat) have the potential to be present within the boundary of the natural gas pipeline lateral corridor in this area.

The natural gas pipeline lateral corridor crosses several counties including a variety of vegetation communities (see Section 3.8.1.1.2.2) and aquatic features (see Sections 3.6.2.1.2.2 and 3.6.3.1.2.2). Based on the NLCD, the natural gas pipeline lateral corridor comprises a mixture of forested (primarily deciduous) land (694 acres, 61.7 percent), fields (i.e., pasture/hay, cultivated crop, or herbaceous vegetation; 359 acres, 32.0 percent), and developed land (5.3 percent). Based on NHD and NWI, 43 named and unnamed streams (11,620 lf), and 12 wetland features (4.71 acres) also fall within the natural gas pipeline lateral corridor. Most of these areas have potential to provide quality habitat for wildlife, including some protected or rare species primarily associated with forested or field habitat, and/or streams and wetlands as listed in Table 3.8-2. TGP is conducting field surveys of the proposed pipeline as part of the Environmental Report to be submitted with their certificate application to the FERC for the proposed pipeline.

The migratory bird species of conservation concern for the proposed natural gas pipeline lateral site are the same as those listed in Table 3.8-3 and discussed for the proposed CC plant site and CUF Reservation in Section 3.8.4.1.1.1.1 (Bird Conservation Region 24, Central Hardwoods). None of the bird species nests or colonies as shown on Figure 3.8-3 are located within the natural gas pipeline lateral corridor.

3.8.4.1.3 Alternative B

3.8.4.1.3.1 Johnsonville Reservation

Fish, wildlife, and plant species under state or federal protection that may be found on or in the vicinity of the Johnsonville Reservation according to reviewed species lists are summarized in Table 3.8-2. No federally designated critical habitat is located on the Johnsonville Reservation. Land use on the Johnsonville CT plant site was classified almost entirely as medium- or high-intensity developed space (Figure 3.10-5). The most heavily disturbed and most degraded habitats are currently covered with herbaceous vegetation, including Johnson grass, sericea lespedeza, and other common native and non-native herbaceous species. The vast majority of herbaceous vegetation on the Johnsonville Reservation site is dominated by non-native plant species.

Species with potential habitat on Johnsonville Reservation and/or those with direct observational records are discussed below.

3.8.4.1.3.1.1 Birds

Two protected bird species have records of occurrence near the Johnsonville Reservation: piping plover and little blue heron. Piping plovers forage in exposed sand flats, mudflats, sandy beaches, stream shorelines, and ephemeral ponds. The populations of piping plover that can be found in the Tennessee Valley Region are rare fall and spring migrants. This species has been documented foraging on mudflats in the Kentucky Reservoir 0.4 miles from the Johnsonville Reservation. Piping plover have been documented foraging in settling ponds/ash ponds at other TVA coal plants.

Little blue herons congregate to roost in trees and shrubs near water. They forage for small fish and other aquatic animals in wetlands and lakes. A nesting colony of little blue heron is located approximately 1.7 miles from the Johnsonville Reservation on an island in Kentucky Reservoir. This species has the potential to nest in vegetation around the peninsula and forage in settling ponds/ash ponds.

Migratory Bird Species

The JCT Reservation falls within Bird Conservation Region 24, Central Hardwoods. This region has 23 species of migratory birds of conservation concern that may be found in the area. Species from this list with a “common” occurrence (during all seasons, breeding, wintering, or migration) as shown on range maps by the National Audubon Society (2022) were listed in Table 3.8-4. Species with direct observations are also included.

Table 3.8-4. Migratory Bird Species of Conservation Concern and Other Bird Species Potentially Occurring on the JCT Reservation.

Common Name	Scientific Name	General Habitat Description	Habitat on Project Site?
Migrant Species (present as spring and fall migrant and/or during winter)			
Lesser Yellowlegs	*Tringa flavipes*	Winters and migrates along mudflats, sandy beaches, shores of lakes and ponds, and wet meadows.	No
Bobolink	*Dolichonyx oryzivorus*	Grasslands, meadows, and hayfields.	No
Piping Plover	*Charadrius melodus*	Forage in exposed sand flats, mudflats, sandy beaches, stream shorelines, and ephemeral ponds. Rare fall and spring migrants in the TN Valley region.	No*
Rusty Blackbird	*Euphagus carolinus*	Winters in swamps, wet woodlands, and pond edges.	No
Semipalmated Sandpiper	*Calidrus pusilla*	Winters and migrates along mudflats, sandy beaches, shores of lakes and ponds, and wet meadows.	No
Breeding Season Migrants (may occur only during the breeding season)			
Bewick’s Wren (Eastern)	*Thryomanes bewickii bewickii*	Overgrown fields, fencerows, woodland edges, often around buildings.	No
Chimney Swift	*Chaetura pelagica*	Forages over variety of habitats, requires chimneys or large hollow tree snags with open tops for nesting	No
Cliff Swallow	*Petrochelidon pyrrhonota*	Nest on cliff faces and man-made buildings near water bodies, bridges.	No
Eastern Whip-poor-will	*Antrostomus vociferus*	Woodlands with open understory.	No
Grasshopper Sparrow	*Ammodramus savannarum*	Grasslands, meadows, and hayfields.	No
Kentucky Warbler	*Geothlypis formosa*	Large moist forest tracts with mature trees and thick understory.	No

Common Name	Scientific Name	General Habitat Description	Habitat on Project Site?
Little Blue Heron	*Egretta caerulea*	Roost in trees and shrubs near water; forage for insects in wetlands and lakes.	No*
Prairie Warbler	*Dendroica discolor*	Various shrubby habitats, including regenerating forests, open brushy fields, and Christmas tree farms.	No
Wood Thrush	*Hylocichla mustelina*	Breeds in mature deciduous and mixed forests, forests with dense understory, and forest edges.	No
Resident Species (may occur year-round)			
Red-headed Woodpecker	*Melanerpes erythrocephalus*	Deciduous woodlands with oak or beech, groves of dead or dying trees, forested river bottoms, recent clearings, farmland, grasslands, forest edges and roadsides	No
Field Sparrow	*Spizella pusilla*	Old fields and brushy areas.	No
Bald Eagle	*Haliaeetus leucocephalis*	Nest in forested areas adjacent to large bodies of water. For perching they prefer tall coniferous or deciduous trees.	No
Blue-winged Warbler	*Vermivora cyanoptera*	Nest in shrubby, second-growth habitat with scattered trees, such as abandoned farmland and forest clearings	No
Double-crested Cormorant	*Phalacrocorax auritus*	Open water, reservoirs, larger lakes, and wide stretches of rivers across Tennessee; Nest on islands on some of the larger lakes in Tennessee	No
Osprey	*Pandion haliaetus*	Found on almost any expanse of shallow, fish-filled water, including rivers, lakes, reservoirs, lagoons, swamps, and marshes.	Yes, confirmed presence
Red-tailed Hawk	*Buteo jamaicensis*	Open country, woodlands, prairie groves, mountains, plains, roadsides. Found in any kind of terrain that provides both some open ground for hunting and some high perches.	Yes, confirmed presence

*Species not identified on JCT Reservation but recent records nearby.

Two notable migratory bird species have been identified on JCT Reservation. Nine osprey nests exist on JCT as of April 2021. Three of these nests were on nesting platforms built specifically for this species, and three nests were observed on mooring cells. One was on a lighting structure north of the coal pile. Several of these nests and/or nest buffers fall within the JCT Reservation boundary.

Red-tailed hawks usually build nests in large trees in an open area or above the canopy near open fields or woodlands. On occasion they will also build nests on man-made structures like transmission towers. One active red-tailed hawk nest was observed at the edge of a switchyard at the southern end of the JCT Reservation in July 2019.

3.8.4.1.3.1.2 Mammals
Four protected mammal species of state or federal concern were listed as shown in Table 3.8-2, including the Allegheny woodrat, gray bat, Indiana bat, and northern long-eared bat. The Allegheny woodrat is found on rock outcrops, cliffs, talus slopes and crevices. No habitat for the Allegheny woodrat and no roosting habitat for the three bat species (described in Section 3.8.4.1.1.2) is within the JCT Reservation; however, bats may use the area and adjacent Kentucky Reservoir as foraging areas. Review of the TVA RNHD in October 2021 also indicated that no records of caves exist within three miles of the JCT Reservation.

3.8.4.1.3.1.3 Reptiles
Alligator snapping turtles have been captured in Kentucky Reservoir 1.5 miles from JCT Reservation. Both, the northern pine snake and the western pigmy rattlesnake have been approximately 2 miles from JCT. However, given the habitat requirements for these reptile species, none of them are expected to be present on the JCT CT plant site.

3.8.4.1.3.1.4 Amphibians
The hellbender was the only amphibian identified on the protected species lists for Humphreys County. This species is aquatic and since the potential CT plant location at JCT Reservation does not contain surface waters (Figure 3.6-3), no hellbenders are present.

3.8.4.1.3.1.5 Plants
Thirteen plant species were listed as state- or federally protected for the JCT Reservation; however, the current land use of the JCT CT plant site precludes the occurrence of protected plant species on this site. Furthermore, field surveys conducted in summer 2019 describe this area as comprising weedy species indicative of disturbed habitats and possessing “no conservation value” with no potential to support state or federally listed plants (TVA 2020a).

3.8.4.1.3.1.6 Aquatic Species
Fifteen fish and mollusks of conservation concern, listed in Table 3.8-2, were identified on species lists for the JCT Reservation. However, although the JCT Reservation is on the east bank of the Kentucky Reservoir, no surface waters are present within the heavily disturbed CT plant site. Therefore, none of the aquatic species listed in Table 3.8-2 could occur on site.

3.8.4.1.3.1.7 Insects
Monarch butterflies were listed as a federal candidate species. Habitat preference and life history characteristics of the monarch butterfly are provided in Section 3.8.4.1.1.7. The only undeveloped, open area on the CT plant site consists of a manicured lawn; therefore, it is unlikely that this species would be present on the JCT CT plant site except on a transitory basis.

3.8.4.1.3.2 Gleason Reservation
Fish, wildlife, and plant species under state or federal protection that may be found on or in the vicinity of the Gleason Reservation according to reviewed species lists are summarized in Table 3.8-2. No federally designated critical habitat is located on the Gleason Reservation.

Based on the NLCD, land use on the Gleason Reservation consists primarily of agricultural fields (62.1 percent) and forested areas (34 percent) (Figure 3.10-7). A review of the resource species lists for species of conservation concern resulted in 23 records of state- or federally protected, candidate, or species of conservation concern, however based on habitat requirements, only five of these species have the potential to occur on the Gleason Reservation and are discussed below.

3.8.4.1.3.2.1 Birds
Swainson's warbler is the only protected species of bird listed for Gleason Reservation with a status of "deemed of management concern." Swainson's warblers utilize extensive understory thickets in ravines or rich, damp deciduous floodplain and swamp forests (NatureServe 2021). They require areas with deep shade from both canopy and understory cover. The closest report of this species is about two miles from the Gleason Reservation along the Middle Fork of the Obion River. This species' required habitat is not found on the Gleason Reservation and therefore this species is unlikely to be present.

Migratory Bird Species
Thirty-nine species of birds of conservation concern are listed for Bird Conservation Region 27 Southeastern Coastal Plain, which contains the Gleason Reservation. Of these 23 species, at least 10 potentially occur with some regularity on or in the immediate vicinity of the Gleason Reservation (Table 3.8-5).

Table 3.8-5. Migratory Bird Species of Conservation Concern Potentially Occurring within the Gleason Reservation

Common Name	Scientific Name	General Habitat Description	Habitat on Project Site?
Migrant Species (present as spring and fall migrant and/or during winter)			
Bald eagle	*Haliaeetus leucocephalis*	Nest in forested areas adjacent to large bodies of water. For perching they prefer tall coniferous or deciduous trees.	No
Bobolink	*Dolichonyx oryzivorus*	Grasslands, meadows, and hayfields.	Yes
Dunlin	*Calidris alpina*	Tidal flats, beaches, muddy pools; wet tundra in summer. During migration and winter, widespread in coastal habitats; mainly mudflats, but also sand beaches, rocky shores. Inland, occurs on lake shores, sewage ponds, flooded fields.	No
Lesser Yellowlegs	*Tringa flavipes*	Boreal forest habitats, usually near wetlands	No

Common Name	Scientific Name	General Habitat Description	Habitat on Project Site?
Pectoral Sandpiper	*Calidris melanotos*	In migration, prairie pools, muddy shores, fresh and tidal marshes; in summer, tundra. Migrants favor grassy places rather than open mudflats. Often seen along grassy edges of shores, at edges of tidal marsh, in flooded fields or wet meadows.	No
Semipalmated Sandpiper	*Calidris pusilla*	During migration along coast found on mudflats in intertidal zone, shallow estuaries and inlets, beaches. Inland, occurs on edges of lakes and marshes next to very shallow water.	No
Breeding Season Migrants (may occur only during the breeding season)			
Eastern Whip-poor-will	*Antrostomus vociferus*	Woodlands with open understory.	Yes
Chimney swift	*Chaetura pelagica*	Open sky, especially over cities and towns.	Yes
Chuck-will's widow	*Antrostomus carolinensis*	Oak and pine woodlands. Breeds in shady southern woodlands of various types, including open pine forest, oak woodlands, edges of swamps.	Yes
Prairie Warbler	*Dendroica discolor*	Various shrubby habitats, including regenerating forests, open busy fields, and Christmas tree farms	Yes
Wood Thrush	*Hylocichla mustelina*	Breeds in mature deciduous and mixed forests, forests with dense understory, and forest edges.	Yes
Black-throated Green Warbler (Wayne's)	*Dendroica virens*	Coniferous and mixed forest regions	Yes
Kentucky Warbler	*Oporornis formosus*	Moist woodlands and forests with dense tangles and shrubs in the understory beneath an overstory tree canopy.	Yes
Prothonotary Warbler	*Protonotaria citrea*	Moist bottomland forests that are seasonally or permanently flooded.	UNK
Grasshopper Sparrow (Northern)	*Ammodramus savannarum perpallidus*	Dry grassland habitat, generally with low to moderate grass height and low percent shrub cover.	Yes

Common Name	Scientific Name	General Habitat Description	Habitat on Project Site?
American Kestrel (Southeast)	*Falco sparverius*	Fields and forest edges/fence rows.	Yes
Resident Species (may occur year-round)			
Red-headed Woodpecker	*Melanerpes erythrocephalus*	Deciduous woodlands with oak or beech, groves of dead or dying trees, river bottoms, recent clearings, farmland, grasslands, forest edges and roadsides	Yes
Field Sparrow	*Spizella pusilla*	Old fields and brushy areas.	Yes

UNK = unknown if suitable habitat and potential presence exists on site

Several migratory species of conservation concern may be found on the Gleason Reservation, either attracted to field habitat or the forested area. The condition and type of the forested area is not known, so it is unknown whether suitable habitat exists for some of the species in Table 3.8-4.

3.8.4.1.3.2.2 Mammals

The Indiana bat, northern long-eared bat, and Rafinesque's big-eared bat (*Corynorhinus rafinesquei*) are listed with potential occurrence on the Gleason Reservation. Life history characteristics for the Indiana bat and northern long-eared bat are included in Section 3.8.4.1.1.1.1. Rafinesque's big-eared bat prefers areas with caves for winter roosts and hollow trees, abandoned buildings. For summer roosts, it prefers areas under bridges or in culverts near wooded areas (NatureServe 2021). Depending on the type and condition of trees on site, the deciduous forest on southern portion of Gleason Reservation may provide potential summer roosting habitat for these bat species and open areas may provide foraging habitat; therefore, these species may be present.

3.8.4.1.3.2.3 Plants

Four species of plants were listed as state threatened or endangered for the Gleason Reservation, with an additional two species listed as state species of concern (Table 3.8-2). No federally listed plants were identified from the IPaC database. Of these listed plant species, three could have potential habitat on site: Halberd-leaf tearthumb, Harbison's hawthorn, and red turtlehead. Both Halberd-leaf tearthumb and red turtlehead are associated with wetland habitats; while the NWI did not identify wetlands on the Gleason Reservation, the NLCD classified the forested area as "woody wetlands." Field surveys will be completed to confirm presence or absence of wetland habitat on site prior to construction activities if this Action Alternative is selected. Like these wetland species, it is unknown whether Harbison's hawthorn (which is found in dry, rocky calcareous woods) could be present on the Gleason Reservation, pending field surveys of the forested area on the southern portion of the proposed CT plant site.

3.8.4.1.3.2.4 Aquatic Species

Three species of fish (one state- and federally listed, and one species Deemed in Need of Management) and one crayfish were identified on the resource species lists for the Gleason Reservation (Table 3.8-2).

The two listed fish species, the firebelly darter and the piebald madtom, occupy small to medium-size streams and rivers (Etnier and Starnes 1993, NatureServe 2021). According to the NHD, the only stream on the Gleason Reservation is intermittent (Figure 3.6-4) and not suitable habitat for fish which inherently require waterbodies with permanent flow regimes.

The Hatchie burrowing crayfish uses saturated or seasonally saturated soils associated with permanent bodies of water in Mississippi River tributaries and the Coastal Plain (USACE 2021). Habitat for this species may exist within the intermittent stream channel on the Gleason Reservation if this stream remains sufficiently saturated.

3.8.4.1.3.2.5 *Insects*

Monarch butterflies were listed as potentially present for Gleason Reservation according to the IPaC database. Details on the Monarch butterfly are included in 3.8.4.1.1.7. As stated previously, the cultivated crop areas on Gleason Reservation consist of weedy, early successional and ruderal vegetation types typical of abandoned agricultural fields such as Bahai grass, broomsedge, crabgrass, Dallas grass, purple sprangle top, redtop panic grass, and signal grass. These areas may also support flowering plants and/or milkweed, which is a host plant for this species.

3.8.4.1.3.3 Transmission Corridors

Based on a desktop review of the proposed 40-mile TL corridor, land use along the TL consists of primarily agricultural land with a small proportion of forested areas (see Section 3.10.2.3.3). Bodies of water, such as wetlands, streams, and ponds, are also present (see Sections 3.6.2.1.3.3 and 3.6.3.1.3.3). If this alternative is selected, field surveys would be performed along the TL corridor to determine if protected plant and animals are present in the proposed action area.

3.8.4.1.4 Alternative C

3.8.4.1.4.1 Middle Tennessee TVA Power Service Area

There is a wide range of species of conservation concern that may occur in the Middle Tennessee TVA PSAQ due to the variable, and sometimes rare, habitat types and vegetation communities. Protected species such as vertebrates as small as cave-dwelling bats and salamanders and as large as cougars and black bears, invertebrates such as mussels, and a variety of plants can be found in this region (Bryant et al. 1993). Some of the highest concentrations of federally listed threatened or endangered species are found in the Interior Low Plateau ecoregion (TVA 2019b), which includes the Western Highland Rim, Eastern Highland Rim, Outer Nashville Basin, and Inner Nashville Basin (Griffith et al. 1997). The taxonomic groups with the highest proportion of species listed under the ESA are fish and mollusks. Factors contributing to the high proportions of vulnerable species in these groups include the high number of endemic species in the TVA region and the alteration of their habitats by reservoir construction and water pollution. River systems with the highest numbers of listed aquatic species include the Tennessee, Cumberland and Coosa rivers.

Conservation efforts have successfully downgraded or removed some species from the ESA list in Tennessee, such as bald eagle. Conversely, some species have been added to federal and state listings due to declines driven by development/habitat loss, introduced pathogens (e.g., white nose syndrome), insects (e.g., gypsy moth, two-lined chestnut borer), or other causes (Bryant et al. 1993; TVA 2019b).

3.8.4.2 Environmental Consequences

3.8.4.2.1 The No Action Alternative

Under the No Action Alternative, CUF would continue operations. TVA would implement all of the planned actions related to the current and future management and storage of CCRs, which have either been reviewed or will be in subsequent NEPA analysis. As a result, no new work would be conducted that could potentially alter project-related environmental conditions within the plant. Therefore, no new effects on threatened or endangered species, or species of conservation concern or any suitable habitat would occur under this alternative.

3.8.4.2.2 Retirement, Decommissioning, Decontamination, and Deconstruction of CUF Plant

Under any Action Alternative, CUF would be decommissioned. The species discussed under this Action Alternative may be present within the demolition boundary. Vegetation communities within the demolition boundary consists only of ruderal open areas, which does not support any protected terrestrial species. However, 11 known osprey nests and a colony of cliff swallows fall within the demolition boundary.

Actions that rise to disturbance levels above typical, demonstrated tolerance levels will be performed when ospreys are not actively nesting. Deconstruction activities near mooring cells and the demolition of mooring cells has the potential to disturb and/or displace osprey nesting in the area. While the osprey nest is active (typically between March 1st and July 31), activities within 660 feet of the nest are limited to vegetation maintenance (bushhogs, mowers, and selective herbicide application only). Activities causing loud disturbances are not allowed during this period. Should there be a potential for effects to nesting osprey TVA will coordinate with USFWS to ensure compliance with federal law. Other birds nesting around the CUF site are acclimated to frequent, loud disturbances caused by the functioning of CUF. None of the proposed actions would affect the bridge where cliff swallows are nesting. With adherence to seasonal restrictions around osprey nests and/or coordination with USDA-Wildlife Services, proposed actions for the retirement of the CUF plant would not significantly affect populations of common wildlife species.

Prior to demolition, internal survey of the buildings proposed for demolition would occur to ensure no colonies of bats or other migratory birds have been established while buildings are inactive. Should bats or birds be observed, avoidance and minimization measures (such as seasonal restrictions) would be put in place and the appropriate state or federal agencies (USDA, USFWS, TWRA) would be contacted to ensure compliance. With these precautionary measures, no direct effects would be expected to protected bat species or colonies of migratory birds.

No known bat roosting habitat is present within the demolition boundary and while some of this area may be used for food resources, deconstruction activities would not be active during night periods when bats would be foraging. Limited indirect effects due to increased noise associated with deconstruction activities (e.g., explosives) has the potential to disturb bats roosting in nearby forests, if present. These effects would be short-term and minimal.

Several activities associated with this action 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), completed in April 2018. For those activities with potential to affect bats, TVA committed to implement specific conservation measures when direct and indirect effects to federally listed bat species are expected. Relevant conservation measures to this project are listed in the bat strategy form and must be reviewed and implemented as part of the approved project. Given the lack of effects to known roosting habitat and identified conservation measures, proposed project activities would not significantly affect gray bat, Indiana bat, northern long-eared bat, or tricolored bat.

There is potential for the alligator snapping turtle to be present in the Cumberland River within the demolition boundary; however, no nesting habitat is likely to fall within this disturbance area. Following completion of the D4 activities, the alligator snapping turtle could move into the area for foraging. Therefore, no effects to the alligator snapping turtle are expected for the retirement of the CUF plant.

Blue sucker was the only aquatic species with potential to be found near CUF based on required habitat and on prior surveys confirming the presence of this species. If the blue sucker is in the vicinity when D4 activities commence, it is likely that the fish will leave the area due to disturbance. It is unlikely that direct harm would occur. As described in Section 3.6.2.2.2, appropriate BMP measures would be implemented as a condition of USACE and ARAP permits to minimize any affects to species or habitats within or in the vicinity of the demolition area. No significant effects to habitat for this species would occur as a result of demolition work (i.e., mooring removal, shoreline barge facilities, etc.). No other suitable habitat for state- or federally listed aquatic species occurs within the demolition boundary (Figure 3.6-1); therefore, direct effects to state- or federally listed threatened and endangered aquatic species are not anticipated to occur from CUF retirement. Additionally, water discharges would continue to meet existing NPDES permit requirements, which are designed to be protective of aquatic life in receiving waters. Therefore, effects on listed fish and shellfish species near CUF are not anticipated.

The terrestrial habitat onsite is currently disturbed land comprised of fill material, which is generally unsuitable habitat for listed plant species identified for CUF Reservation. As stated, vegetation communities (as defined during the 2021 field surveys) within the demolition boundary consist only of ruderal open areas, which does not support any protected terrestrial species.

Cumulative effects to threatened and endangered species are not anticipated as CCR management activities on the CUF Reservation have completed Section 7 consultation and would adhere to conservation and mitigation measures.

3.8.4.2.2.1 Environmental Justice Considerations

Effects to threatened and endangered species that would occur as a result of CUF D4 activities are not anticipated to have disproportionately high and adverse human health or environmental effects on EJ populations in the CUF Reservation EJ study area. Of the census block groups comprising the CUF Reservation EJ study area, only a small portion (two of 16) were identified as EJ populations; therefore, non-EJ populations are more prominent in these study areas. Further, these effects would be minimized or mitigated as required due to the protected status of these species and would not be expected to lead to indirect or disproportionate effects to EJ populations.

3.8.4.2.3 Alternative A

3.8.4.2.3.1 Construction and Operation of CC Plant at CUF

The proposed construction of a CC plant would require disturbance and/or clearing of disturbed fields (former agricultural fields) and small areas of trees (Figure 3.8-1). This may also affect wetland habitat. Species that could experience habitat loss due to this action alternative includes Bewick’s wren, Henslow’s sparrow, western pygmy rattlesnake, and monarch butterfly, which may use these habitats; however, none of these species were observed during terrestrial wildlife and wetland surveys in 2021, and they are unlikely to be present based on the quality of habitat within the proposed CC plant area. No effects to protected plant species are expected as no threatened or endangered species were observed within the CC plant boundary during the 2021 field survey.

Individual Bewick's wrens, Henslow's sparrows, and western pygmy rattlesnake could be directly impacted by the proposed actions, should they occur in the action area at the time of vegetation removal and are immobile (i.e., juveniles, eggs, hibernation). Mobile adults would be expected to flush if disturbed. None of these species were observed on site during field surveys; however, targeted surveys for these particular species did not occur. Based on lack of known records at this particular site, and the abundance of similarly suitable habitat in the adjacent areas, proposed actions are not expected to affect populations of Bewick's wrens, Henslow's sparrows, or western pygmy rattlesnake.

The majority of the CC plant site consists of low-quality bat habitat (fields; 189 acres) interspersed with tree lines categorized as medium-quality bat habitat (52 acres) (Figure 3.8-2). The field area may be used as foraging grounds for bat species, and trees could potentially be used for roosting. Tree removal at the CC plant site would occur between November 15 and March 31 when listed bat species are not expected to be out on the landscape roosting in trees. Removal of suitable summer roosting habitat for federally listed bats would require consultation with USFWS under Section 7 of the ESA. Several activities associated with this project, including tree removal, 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), completed in April 2018. For those activities with potential to affect bats, TVA committed to implement specific conservation measures when effects to federally listed bat species are expected. Relevant conservation measures to this project are listed in the bat strategy form and must be reviewed and implemented as part of the approved project. Given the lack of effects to known roosting habitat and identified conservation measures, proposed project activities would not significantly affect gray bat, Indiana bat, northern long-eared bat, or tricolored bat.

Winter tree removal during this timeframe would also avoid direct effects to some nesting migratory songbirds of conservation concern and other birds of conservation concern. Therefore, significant effects are not anticipated.

Monarch butterfly is currently listed under the ESA as a candidate species and is not subject to Section 7 consultation under the ESA. Host plants and foraging habitat may exist in this area; however, none was noted during field surveys in 2021 of the disturbed (former agricultural) fields or transmission ROW (early successional areas) or elsewhere on CUF Reservation. Furthermore, based on the size of the action area significant effects to this species are not anticipated.

Cumulative effects to threatened and endangered species are not anticipated as CCR management activities on the CUF Reservation have completed Section 7 consultation and would adhere to conservation and mitigation measures.

3.8.4.2.3.2 Construction and Operation of Natural Gas Pipeline

Construction of the natural gas pipeline lateral would require clearing forested areas (694 acres) and maintenance of early successional and/or herbaceous habitat (pastures, cultivated fields, residential areas). Detailed analyses of effects to state- and federal listed species are being conducted by TGP as part of their future FERC filings. As suitable habitats are identified by

TGP, the pipeline route may be adjusted to avoid these habitats and effects to federal and state listed species. TGP is also consulting with the USFWS and state agencies on the potential effects to threatened and endangered species. Adherence to any Conservation Measures resulting from these consultations is expected to ensure proposed actions would not result in significant effects to listed species.

Species that may be impacted by the construction and maintenance of the natural gas pipeline lateral include those associated with forest and field habitats or stream and wetland habitats as listed in Table 3.8-2. Prevalent habitat in the adjacent and surrounding area of the pipeline would minimize effects to species within the corridor. Mobile species are likely to leave the area once construction activities commence and may return upon completion of the project if habitat is appropriate. While species associated with forested habitat may leave areas cleared for the natural gas pipeline lateral corridor, species associated with early successional or field habitat may colonize the natural gas pipeline lateral corridor following construction of this Action Alternative. Due to the prevalence of adjacent habitat and temporary effects of construction activities, this action alternative is not likely to adversely affect threatened or endangered species if present along the natural gas pipeline lateral.

Removal of suitable summer roosting habitat for federally listed bats may require consultation with USFWS under Section 7 of the ESA. To minimize effects to bat species, it is recommended that any tree removal occur in winter when these bats are not roosting in trees. Tree removal during this timeframe would also avoid direct effects to most nesting migratory songbirds of conservation concern.

The only aquatic species that could be found along the natural gas pipeline lateral corridor is the tan riffleshell mussel, depending on whether suitable habitat exists within one of the potential streams crossing the corridor. Stream crossings may be conducted by HDD or open cut methods. Applicable surveys for protected species and associated consultation with the agencies would be conducted prior to construction activities commencing. Erosion and sediment control BMPs would be deployed and USACE and TDEC permits would be obtained.

Routine vegetation management of the natural gas pipeline lateral would have periodic effects on habitats within the ROW over the long-term. Methods may vary but are likely to include use of herbicides and various mechanical measures to control vegetation. Protected species, if present, are expected to be displaced intermittently in conjunction with the presence of maintenance crews and the alteration of habitats. Over time, wildlife would become habituated to the herbaceous habitat of the natural gas pipeline lateral and those species associated with fields may be found in the corridor.

Cumulative effects to threatened and endangered species are not anticipated as past/present and RFFAs have or would likely complete Section 7 consultation and would adhere to conservation and mitigation measures. Cumulative loss of habitats may occur but would be minimized through the use of BMPs and proper siting of facilities.

3.8.4.2.3.3 Transmission and Other Components

Potential habitat for several protected species exists within the transmission line area. Direct effects could occur to immobile individuals that are present during vegetation removal and grading. Like with the natural gas pipeline lateral, mobile species are likely to leave the area once construction activities commence and may return upon completion of the project if habitat is appropriate. While species associated with forested habitat may leave areas cleared for the transmission line area, species associated with early successional or field habitat may colonize the area following construction (or after regrowth). Field surveys would be conducted within the off-site transmission line work area. Should listed species be found, avoidance and minimization measures would be put in place and state agencies would be contacted or Section 7 consultation with USFWS would occur as appropriate to ensure this aspect of the project does not significantly affect federally protected plant or animal species.

Summer roosting habitat and foraging habitat for listed bats exists within the transmission line area. Should tree removal be required for access roads to OPGW transmission lines, additional roosting or foraging habitat may be removed. Several activities associated with this proposed action, including tree removal for construction and maintenance of transmission lines, 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), completed in April 2018. For those activities with potential to affect bats, TVA would be committed to implementing specific conservation measures when effects to federally listed bat species are expected.

Some actions near nesting osprey and colonial nesting bird colonies are prohibited while birds are actively nesting. Five osprey nests and a cormorant nesting colony are located within the proposed transmission line area on the CUF Reservation (Figure 3.8-3), and osprey nests may be located on existing structures along the OPGW transmission line. Actions that rise to disturbance levels above typical, demonstrated tolerance levels will be performed when ospreys and/or cormorants are not actively nesting (between March and July). A survey for osprey nests along the OPGW would be conducted prior to installation. Should there be a potential for effects to nesting osprey along the transmission line area or the OPGW transmission line, TVA will coordinate with USFWS to ensure compliance with federal law.

As discussed in prior sections addressing effects to habitats due to transmission line or natural gas pipeline lateral corridor maintenance, routine vegetation management of the transmission line would be required to assure safe and reliable transmission facilities. Management activities likely include herbicide treatment and mowing to control vegetation growth through the ROW (TVA 2018h). Protected species, if present, are expected to be displaced intermittently in conjunction with the presence of maintenance crews and the alteration of habitats. Over time, wildlife would become habituated to the herbaceous habitat of the transmission line area and those species associated with fields or early successional habitat may be found in the corridor.

3.8.4.2.3.4 Environmental Justice Considerations

Effects to threatened and endangered species that would occur as a result of the proposed CC plant, transmission line activities, and natural gas pipeline lateral are not anticipated to have disproportionate and adverse human health or environmental effects on EJ populations in the CUF Reservation and pipeline lateral corridor EJ study areas. Of the census block groups comprising the CUF Reservation and pipeline corridors EJ study areas, only a small portion (two of 16 and one of 10, respectively) were identified as EJ populations; therefore, non-EJ populations are more prominent in these study areas. Further, these effects would be minimized or mitigated as required due to the protected status of these species and would not be expected to lead to indirect or disproportionate effects to EJ populations.

3.8.4.2.4 Alternative B

3.8.4.2.4.1 Construction and Operation of CT Plant at Johnsonville Reservation

Although two protected bird species have been identified within two miles of JCT Reservation, it is unlikely they would be present on the proposed CT plant site. Piping plovers are a rare fall and spring migrant in Tennessee. Suitable habitat for this species does not exist in the action area at the proposed CT site. Similarly, no suitable habitat for little blue heron is present in the proposed CT site on the JCT Reservation. Neither piping plover nor little blue heron would be impacted by the CT construction and operation.

Because the proposed CT plant at the JCT Reservation would be located on previously developed land, there would be no effects to most state- or federally protected species. Foraging habitat for bats and birds exists over water around the JCT Reservation boundary and BMPs would be implemented (as a requirement of associated permits) near these bodies of water to minimize effects to these habitats and resources.

Osprey may be disturbed during construction activities due to noise. Actions that rise to disturbance levels above typical, demonstrated tolerance levels will be performed when ospreys are not actively nesting. While the osprey nest is active (typically between March 1st and July 31), activities within 660 feet of the nest are limited to vegetation maintenance (bushhogs, mowers, and selective herbicide application only). Activities causing loud disturbances are not allowed during this period. Should there be a potential for effects to nesting osprey TVA will coordinate with USDA – Wildlife Services to ensure compliance with federal law.

Noise disturbance also has potential to disrupt a red-tailed hawk nest located outside of the JCT Reservation boundary. The active period for red tailed hawk nesting is generally within the same window for Osprey, and therefore loud disturbances will not occur during this period.

Cumulative effects to threatened and endangered species are not anticipated as Section 7 consultation for the proposed adjacent Aeroderivative CT project on JCT is being completed and effects would be minor. Both projects occur on highly disturbed and fragmented industrial landscape that offers minimal habitat for wildlife. The potential for cumulative effects is further minimized by conducting pre-construction surveys for osprey nests and coordination with USFWS to ensure compliance under the EO 13186 [Responsibilities of Federal Agencies to Protect Migratory Birds], if needed. In addition, several activities associated with this action were addressed in TVA's programmatic consultation with the USFWS on routine actions and federally listed bats in accordance with Endangered Species Act Section 7(a)(2), completed in April 2018. For those activities with potential to affect bats, TVA would committed to implement specific conservation measures when effects to federally listed bat species are expected.

3.8.4.2.4.2 Construction and Operation of CT Plant at Gleason Reservation

Several migratory species of conservation concern could be present on the Gleason Reservation. Depending on the timing of vegetation removal direct and indirect effects to migratory birds of conservation concern could occur. Similar effects could occur to Swainson's warbler should the species be present on site. Should migratory birds occur within the CT plant site at the time of tree removal or construction, those that are mobile are expected to flee if disturbed.

The forested habitat on the southern portion of Gleason Reservation may contain summer roosting habitat for bat species, and the open fields can function as foraging grounds for these species, as well. Removal of suitable summer roosting habitat for federally listed bats would require consultation with USFWS under Section 7 of the Endangered Species Act. However, such tree removal is an activity that was addressed in TVA's programmatic consultation with the U.S. Fish and Wildlife Service on routine actions and federally listed bats in accordance with Endangered Species Act Section 7(a)(2), completed in April 2018. For those activities with potential to affect bats, TVA would committed to implement specific conservation measures when effects to federally listed bat species are expected.

Three protected species of plants may be found on Gleason Reservation, either in the field habitat or in the forested area on the southern part of the site. Field surveys would be completed prior to any construction activities and Section 7 consultation with the USFWS would be conducted. If protected species are present, take authorization would be needed with possible relocation of individual plants to nearby suitable habitat.

If the stream on the Gleason Reservation is intermittent, no fish are expected to be present within this waterway, however conditions may be suitable for the Hatchie crayfish. Field investigations complete with delineation and hydrologic determination data forms and appropriate USACE and ARAP/TDEC permits would be completed prior to commencement of construction activities in order to minimize effects to this species and habitat, if present. As a part of this process, measures would be taken to avoid and minimize effects to aquatic resources to the maximum extent practicable.

There is possibility for the candidate species, monarch butterfly, to occur on site if host plants exist in the field area. A field survey of vegetation in this area would be conducted prior to construction to determine whether suitable habitat is present for this species. At this time Monarch butterfly is listed as a candidate species under the ESA and not subject to Section 7 consultation.

Cumulative effects to threatened and endangered species at Gleason would not occur.

3.8.4.2.4.3 Transmission and Other Components

Based on a review of 298 transmission line projects from 2005 to 2018, 32 of 256 projects (11 percent) affected federally listed threatened or endangered species or species proposed or candidates for listing (Table 3.3-1). Of 290 projects review, 63 (22 percent) projects affected state-listed endangered, threatened, or special concern species. Habitat and species surveys would be required for the proposed 40-mile transmission line. Depending on the results of the field surveys, USFWS consultation may be required under supplemental NEPA if Alternative B is selected as the preferred alternative.

3.8.4.2.4.4 Environmental Justice Considerations

Effects to threatened and endangered species that would occur as a result of the proposed CT facilities and transmission line activities are not anticipated to have disproportionate environmental and human health effects on EJ populations. These effects would be limited to the immediate TVA-owned reservations and transmission line corridor and generally not leading to indirect effects to EJ populations due to the protected status of these species. Except in rare cases of special use permits, EJ populations, like other populations, are restricted from harvesting or otherwise utilizing these species. Moreover, the effects to the protected species would be minimized or mitigated in consultation with USFWS and TDEC, as necessary.

3.8.4.2.5 Alternative C

3.8.4.2.5.1 Construction and Operation of Solar and Storage Facilities

Alternative C would result in construction activities that have the potential to affect federally and state-listed species directly or indirectly. There is also the potential for cumulative effects to federally and state-listed species with the expansion of 10,000 MW of solar facilities as identified in the 2019 IRP. As noted in Table 3.2-1, TVA has evaluated typical effects associated with the development of solar facilities. Forty-eight percent of solar projects studied resulted in effects to federally listed endangered or threatened species. TVA and solar developers would minimize effects to protected species by siting facilities on previously disturbed land, such as agricultural or silvicultural sites, or land with few sensitive wildlife habitats. Tree clearing would likely be limited to winter periods, or presence/absence surveys otherwise conducted. Further, the developers with TVA power purchase agreements would be required to complete Section 7 consultation through TVA and comply with USFWS conservation measures, which would result in the minimization or mitigation of effects.

3.8.4.2.5.2 Transmission and Other Components

Alternative C would result in construction of transmission lines and components that have the potential to affect federally and state-listed species directly or indirectly. There is also the potential for cumulative effects to federally and state-listed species with the expansion of 10,000 MW of solar facilities as identified in the 2019 IRP. Based on a review of 298 transmission line projects from 2005 to 2018, 32 of 256 projects (11 percent) affected federally listed threatened or endangered species or species proposed or Candidates for listing (Table 3.3-1). Of 290 projects reviewed, 63 (22 percent) projects affected state-listed endangered, threatened, or special concern species. Habitat and species surveys would be required for the proposed transmission lines associated with each solar or BESS site. Surveys and USFWS consultation would be required under NEPA if Alternative C is selected as the preferred alternative.

3.8.4.2.5.3 Environmental Justice Considerations

Effects to threatened and endangered species that would occur as a result of the proposed solar facilities and transmission line activities are not anticipated to have disproportionate environmental and human health effects on EJ populations in the TVA PSA EJ study areas, as these effects would be minor, limited to the immediate project sites and transmission line corridors, and generally not leading to indirect effects to EJ populations due to the protected status of these species.

3.9 Natural Areas, Parks, and Recreation

3.9.1 Affected Environment

Natural Areas, parks and recreation areas include sites typically managed and/or used for one or more of the objectives of recreation, plant and wildlife protection and management, scientific research and education, and scenic protection. They include national, state, and local parks and recreation areas; trails and greenways; national and state wildlife refuges, wildlife management areas, and forests; research natural areas; and scenic areas. This section addresses the natural areas, parks, or recreation areas that are on, immediately adjacent to (within 1 mile), or within the vicinity of the project areas (5-mile radius).

3.9.1.1 CUF Reservation

The only established recreation site on the CUF Reservation is a boat ramp with a capacity of approximately 15 vehicles/trailers. The ramp is located at RM 102.8. The cooling water discharge attracts boat fishing, and some bank fishing may also occur in this area. The Lower Cumberland River from the Kentucky-Tennessee line (CRM 74.6, approximately 28 miles upstream of CUF) to Cummings Creek (CRM 118.3, approximately 15 miles downstream of CUF) is classified for domestic and industrial water supply use, fish and aquatic life, recreation, livestock watering and wildlife, and irrigation. The entire length of Wells Creek is classified for fish and aquatic life use, recreation, livestock watering and wildlife, and irrigation (TDEC 2019). No Nationwide Rivers Inventory streams or Wild and Scenic Rivers are located near the CUF Reservation.

In addition, several public and commercial recreation and natural areas are located in the vicinity of the CUF. The Lake Barkley Recreation Area includes several sites, including one adjacent to and within CUF, that are managed by the USACE for camping, hiking, fishing, boating, and hunting. The Cross Creeks National Wildlife Refuge, located just north of the CUF boundary, is managed for biodiversity by the USFWS and is open to the general public on a seasonal basis. The Barkley Wildlife Management Area is located approximately 0.9 miles east of CUF. It is managed for biodiversity by the Tennessee Wildlife Resources Agency (TWRA) and is open to the general public on a seasonal basis. It is also located near a known meteor impact site, known as the Wells Creek Impact Structure. Recreational areas listed in the U.S. Protected Areas Database (US PAD) within 0.5 mile of the CUF Reservation are illustrated on Figure 3.9-1.

Local sites not listed in the US PAD include Riverbend Recreation Area and Guices Creek Recreation Area, which are located approximately 0.2 miles north and 0.9 miles west of the project site, respectively. Recreation areas within five miles of the project areas include Schmidt Family Park, a community park approximately 4.5 miles southwest of the project area, and Betsy Ligon Park, a community park that offers a playground, basketball court, walking paths, picnic areas, and cultural exhibits located approximately 4.5 miles south of the project area.

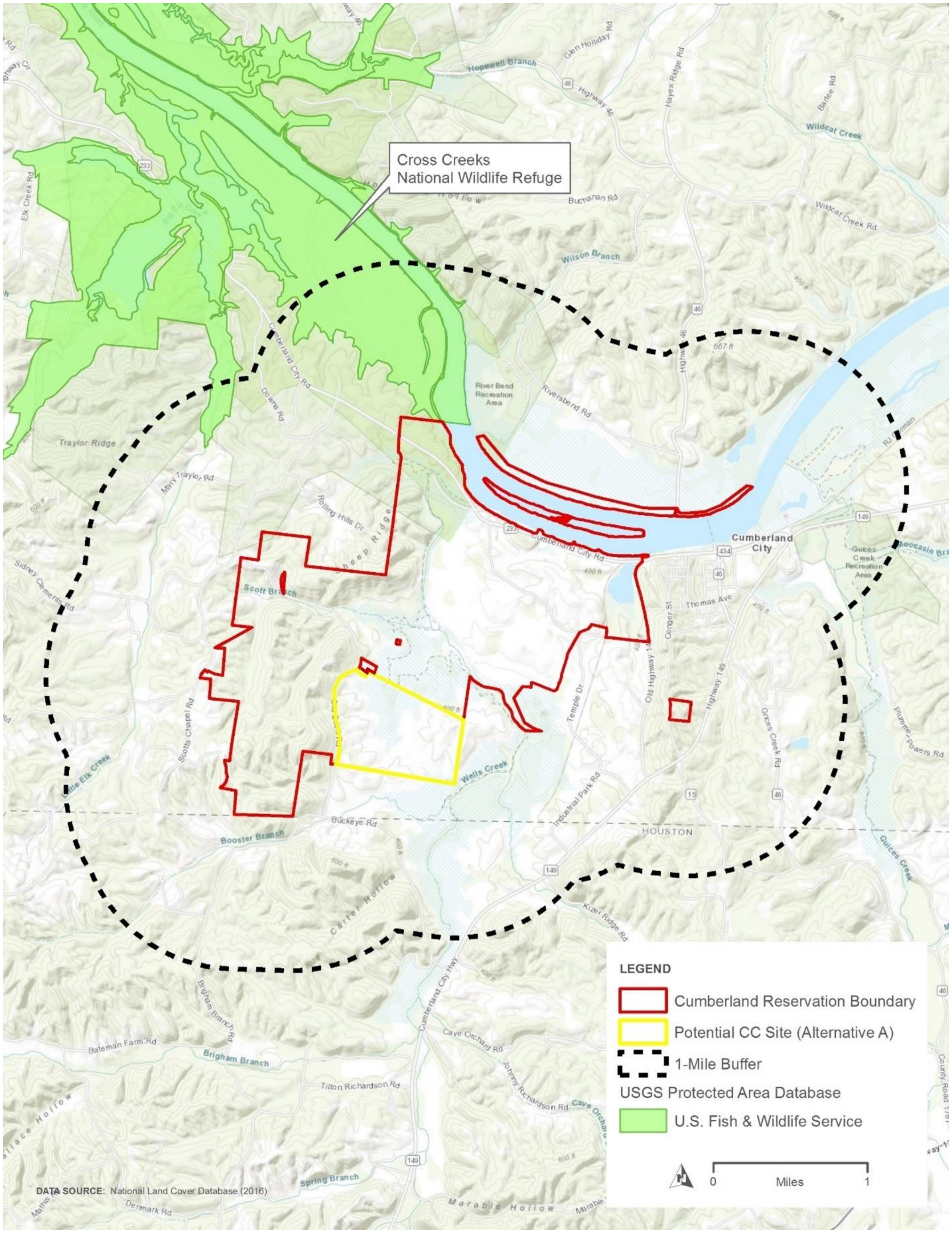

Figure 3.9-1. Federally protected areas within 1 mile of the CUF Reservation

3.9.1.2 Alternative A

Natural areas, parks, and recreation within the proposed CC Plant site, TLs and associated components would be within the CUF Reservation as described in Section 3.9.1.1.

3.9.1.2.1 Natural Gas Pipeline Corridor

The pipeline corridor project footprint directly intersects two waterbodies found on the Nationwide Rivers Inventory: Yellow Creek and Jones Creek. No Wild and Scenic Rivers were identified within the corridor. The corridor is within five-mile radius of the following sites listed on the PAD-US:

- 2.0 mi south of Lake Barkley Recreation Area (USACE)
- 0.7 mi north of Hava-Lakatu Lakes
- 3.0 mi north of Interstate Packaging
- 2.0 mi southwest of Guices Creek Recreation Area (TWRA)
- 3.8 mi east of Stewart State Forest (TN Division of Forestry)
- 2.3 mi southeast of Cross Creeks National Wildlife Refuge (USFWS)
- 4.9 mi north of Montgomery Bell State Park (TDEC)
- 4.2 mi west of Cheatham Wildlife Management Area (TWRA)
- 4.9 mi west of Narrows of the Harpeth State Historical Area
- 4.9 mi west of Harpeth River State Park
- 2.7 mi south of River Bend Recreation Area
- 4.0 mi northeast of Betsy Ligon Park
- 0.3 miles northeast of Christian Farms
- 0.8 miles south of Quail Hollow Farm
- 3.4 mi northeast of Dickson County Memorial Park
-

Recreational and natural areas within the vicinity of the project area (5 mi buffer) are illustrated on Figure 3.9-2.

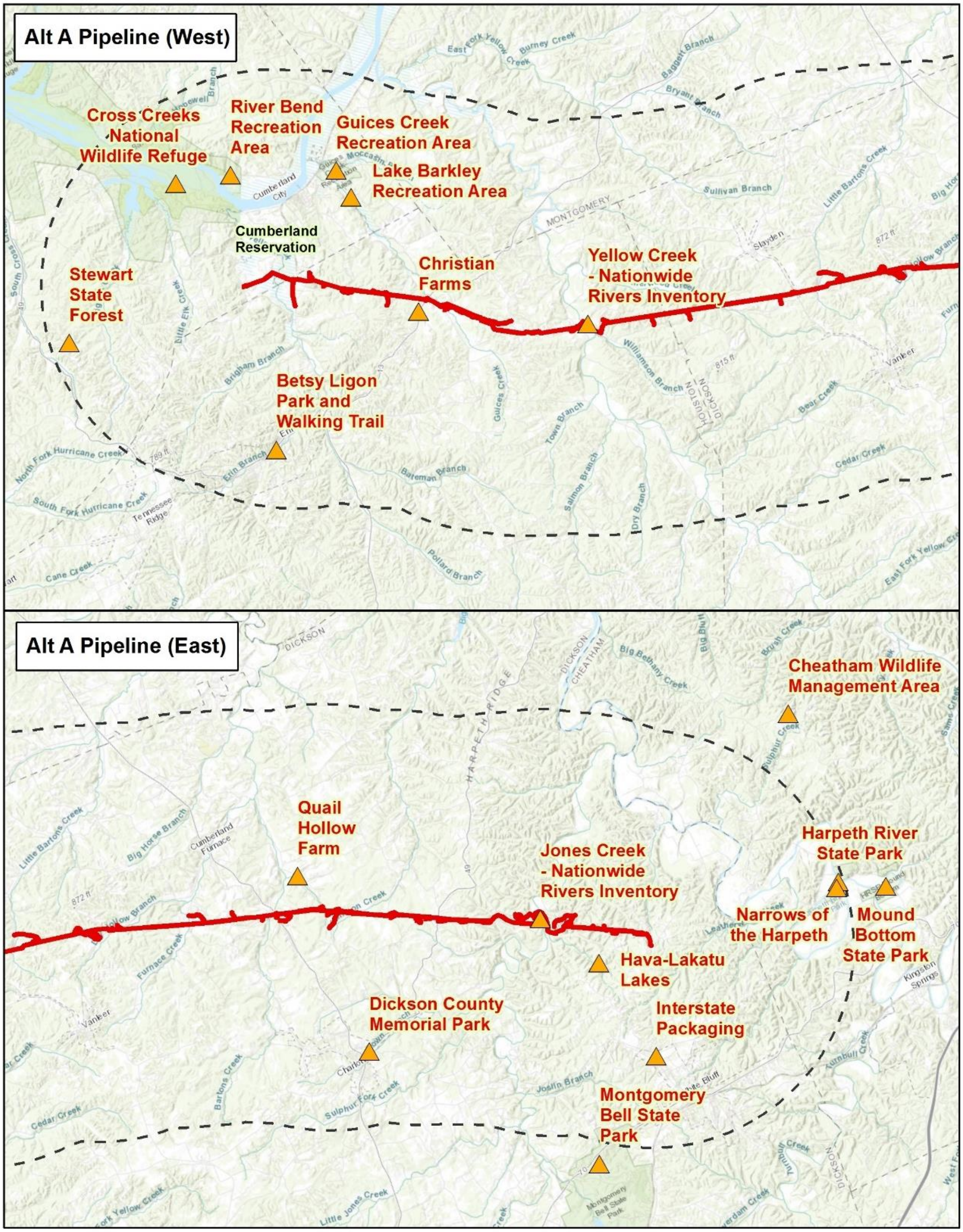

Figure 3.9-2. Natural areas, recreation areas, and parks within 5 miles of the Alt A pipeline

3.9.1.3 Alternative B

3.9.1.3.1 Johnsonville Reservation

JCT is located on the right descending bank of the TVA-managed and US PAD-listed Kentucky Reservoir at TRM 100. Recreation activities in this area of the reservoir and adjacent shoreline include boat fishing, general pleasure boating, swimming, picnicking, camping, and hiking. While there are no boat launching or shoreline fishing facilities on the plant property, plant cooling water discharge attracted boat fishing in the rectangular shaped inlet adjacent to the plant when the plant was operating. Since the plant shut down, boat fishing in this basin has decreased, although some boating activity continues to occur in these waters (TVA 2018a).

In addition to the Kentucky Reservoir, which exists within and in the vicinity of JCT, several additional sites listed on the US PAD exist within the vicinity (Figure 3.9-3):

- 0.9 mi west of Johnsonville State Historic Park (TVA)
- 0.9 mi east of Camden Wildlife Management Area (TWRA)
- 3.6 mi south of Nathan Bedford Forrest State Park (TVA)
- 4.7 mi north of Tennessee National Wildlife Refuge (TVA)

Several public and commercial recreation areas not listed in the US PAD are located in the vicinity of the JCT. Eva Park, a small community park that offers swimming and boat access to Kentucky Reservoir is located approximately 1.6 miles northwest of the CT plant site. C.L. Edwards Memorial Park, a community park that offers ball fields, walking paths, and pavilions is located approximately 0.2 mile south of the project area. The New Johnsonville Boat Ramp is located 0.5 miles southwest of the site and is used for boating and fishing.

Commercial recreation areas within 5 miles of the project areas include Anchor Harbor Marina, New Johnsonville Boat Ramp, Pebble Isle Marina, and Beaver Dam Resort. Anchor Harbor Marina is located within one mile of JCT and is accessed from U.S. Route 70. Pebble Isle Marina and Beaver Dam Resort are located more than one mile from JCT.

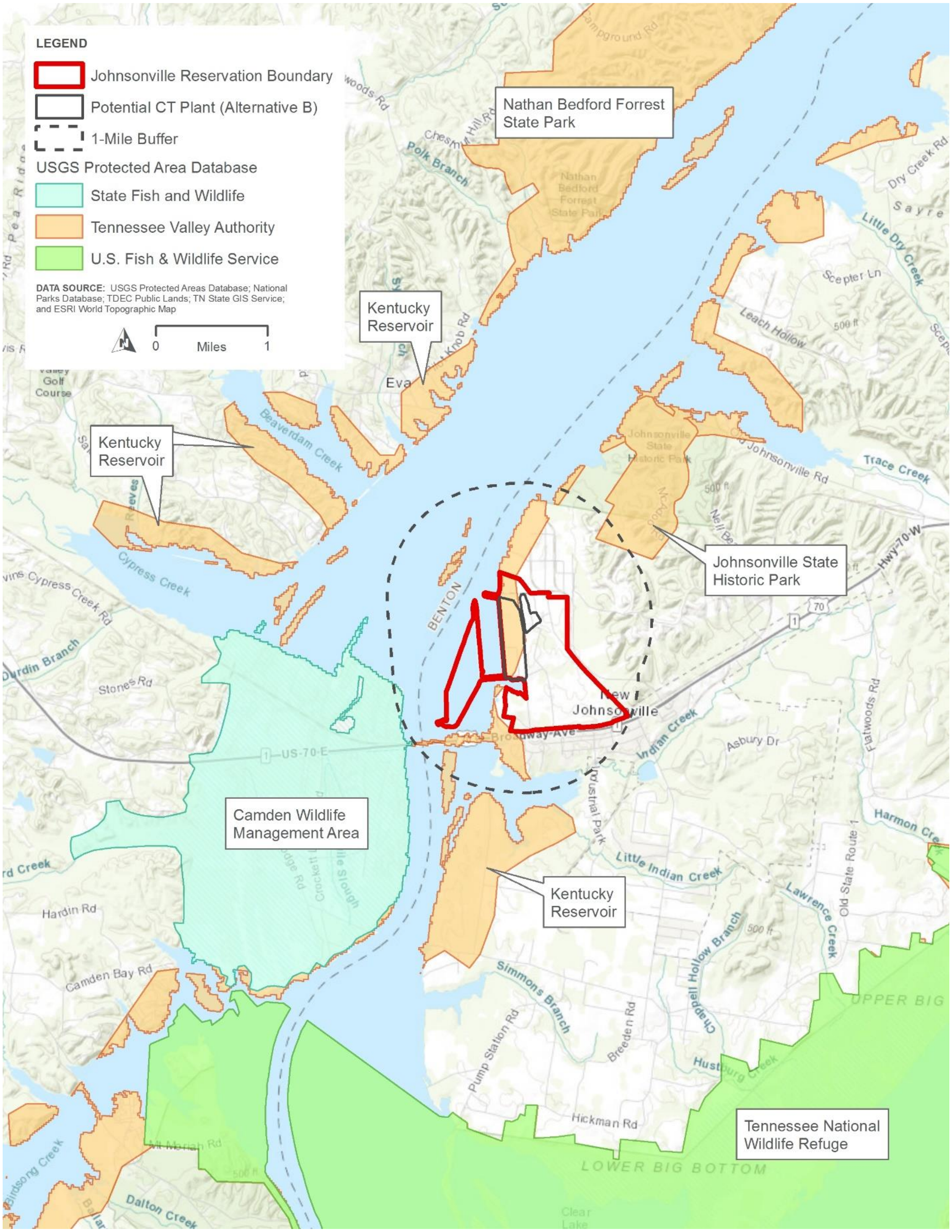

Figure 3.9-3. Federally protected areas within a 1 mile of the Alt B JCT Reservation

3.9.1.3.2 Gleason Reservation

There are no parks, managed areas, or ecologically significant sites on the Gleason property, and no areas listed in the US PAD exist within a five-mile radius of the site aside from the adjacent Middle Fork Obion River, which is on the National Rivers Inventory. No Wild and Scenic Rivers are within a five-mile radius of the site. No known lease agreements exist for recreational activities onsite. However, several public and commercial recreation areas are located in its vicinity. Gleason Raceway Park, a small raceway track that hosts racing events and car shows is located approximately 1.2 miles west of the project site. Rolling Hills Miniature Golf is located approximately one mile south of the project site. Gleason Community Center and Gleason Baseball Fields are located approximately 1.3 miles south of the project area. Recreational and natural areas within the direct vicinity of the project area (1 mi buffer) are illustrated on Figure 3.9-4.

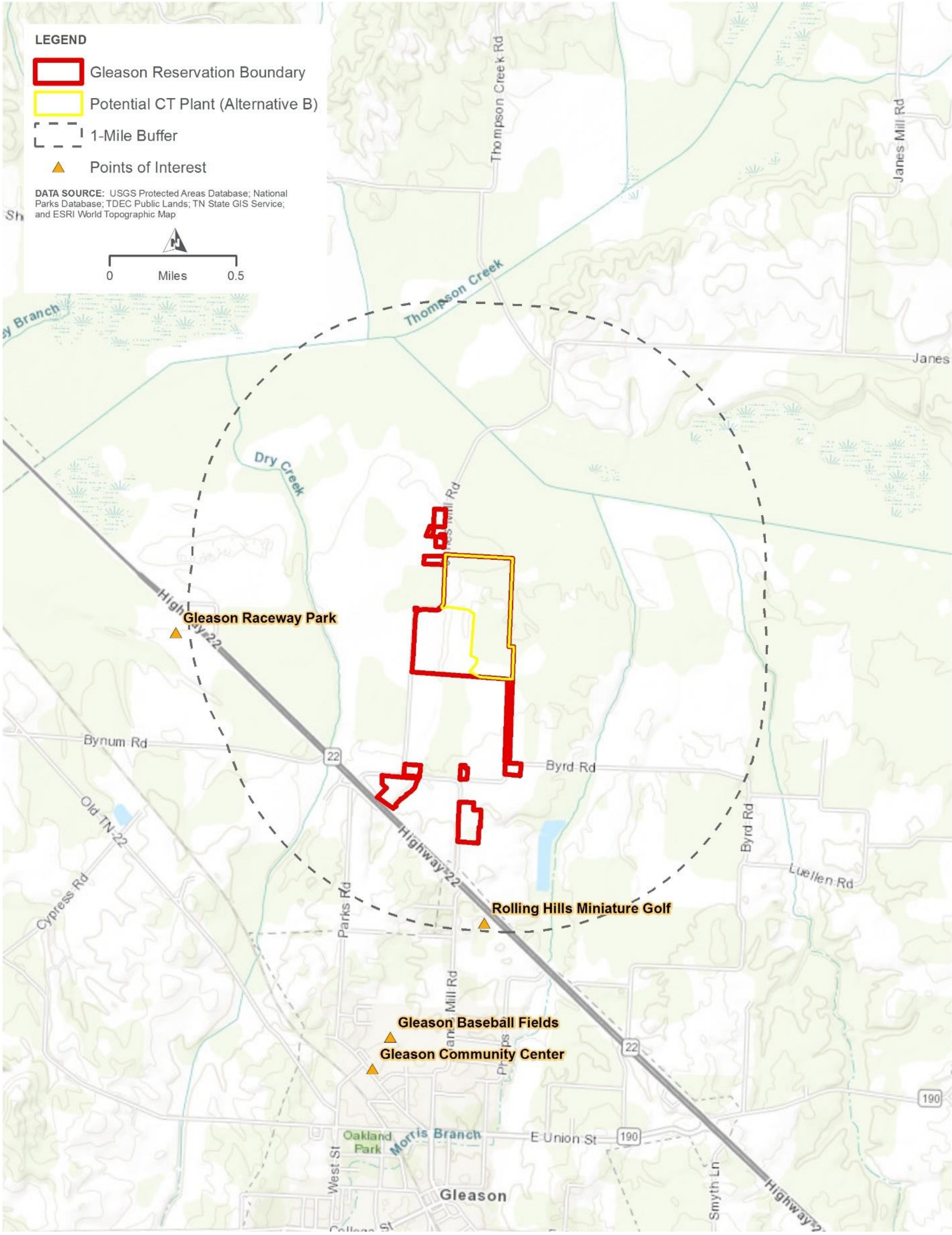

Figure 3.9-4. Natural and recreational areas within a 1 mile of the Alt B Gleason Reservation

3.9.1.3.3 Transmission Corridors
A route has not been identified for the proposed transmission corridor between Martin and Buchanan, Tennessee. According to the US PAD database, the following natural and recreation areas exist within the vicinity of this area: Obion River Wildlife Management Area (TWRA); Bean Switch Refuge (TWRA); Martin Recreation Complex (City of Martin); Harrison Road Complex (City of Martin); and Big Sandy Unit Tennessee National Wildlife Refuge (USFWS). No waterbodies listed in the National Rivers Inventory or Wild and Scenic Rivers exist near the corridor.

3.9.1.4 Alternative C

3.9.1.4.1 Middle Tennessee TVA Power Service Area
TVA anticipates that a portion of the solar facilities proposed under Alternative C would be located in the Middle Tennessee region in order to offset transmission system upgrades that may be required following the retirement of CUF. Numerous parks, managed areas and ecologically significant sites occur throughout the TVA service area in all physiographic regions, but are mostly concentrated outside of Middle Tennessee. Individual ecologically significant areas vary in size from a few acres to thousands of acres. Many areas cross state boundaries or are managed cooperatively by multiple agencies. Waterbodies listed in the National Rivers Inventory include the Harpeth River, Piney River, Green River, Red River, Stones River, Cumberland River, Elk River, Richland Creek, Goose Creek, Smith Fork, Sink Creek, Charles Creek, Collins River, Sequatchie River, Emory River, and Crab Orchard Creek. The only Wild and Scenic River in Tennessee is the Obed River, which is in between Middle and East Tennessee.

Power from these facilities would typically be delivered by direct connection to TVA's transmission system or via interconnections with local power companies that distribute power from TVA. TVA transmission line rights-of-way cross eleven National Park Service (NPS) units, nine National Forests, six National Wildlife Refuges, and numerous state wildlife management areas, state parks, and local parks (TVA 2018c). As specific sites have not yet been determined for evaluation under this alternative, typical effects of transmission projects have been listed under Table 3.3-1.

3.9.2 Environmental Consequences

3.9.2.1 The No Action Alternative
Under the No Action Alternative, TVA would continue to maintain and operate the CUF plant. TVA would implement all of the planned actions related to the current and future management and storage of CCRs, which have either been reviewed or will be in subsequent NEPA analysis. There would be no project-related effects to natural areas, parks and recreation areas in the vicinity of CUF. Dispersed recreation use patterns, especially bank fishing, would likely continue on some portions of the CUF.

3.9.2.2 Retirement, Decommissioning, Decontamination, and Deconstruction of CUF Plant
Under all action alternatives, TVA would retire, decommission, decontaminate, and deconstruct the CUF units and site. Because there are substantial distances between developed natural areas, parks and recreation areas in the vicinity of the site and the CUF boundaries, no effects on these areas are anticipated. The retirement, decommissioning, decontamination, and deconstruction of the CUF plant may temporarily eliminate or reduce fishing and other dispersed recreational activities on the CUF site and in the Cumberland River. However, it is expected that

these dispersed recreation activities could be accommodated at other similar banks in the surrounding area. Therefore, project effects on dispersed outdoor recreational activities should be minor. In addition, public access to the boat launching ramp located within the CUF boundary could be temporarily interrupted during deconstruction activities, resulting in minor adverse effects to boating launching opportunities. No cumulative effects to natural areas, parks, or recreation would occur.

3.9.2.2.1 Environmental Justice Considerations

Effects to natural areas, parks, and recreation that would occur as a result of CUF coal facility retirement and D4 activities would be temporary and minor. If fishing and hunting on the CUF Reservation is temporarily limited or not allowed, this could in turn affect EJ populations that currently fish and hunt at the Lake Barkley Recreation, portions of which are onsite on the CUF Reservation (USACE 2022). These effects are not anticipated to be disproportionate on EJ populations, however, as similar effects would occur to other populations that utilize the area for hunting and fishing.

3.9.2.3 Alternative A

3.9.2.3.1 Construction and Operation of CC Plant at Plant Site

Under Alternative A, TVA would retire the CUF, demolish the units, and construct and operate a CC plant and its associated transmission lines on the CUF Reservation. Improvements to the barge unloading area (Figure 2.1-3) are also associated with Alternative A. The existing barge unloading area would continue to serve as a public boat ramp after construction is complete. Improvements may include the replacement of the existing concrete surfacing, widening, and an extension of the nose. The improvements would be made largely for public enjoyment, as TVA would only utilize the unloading area on scheduled delivery days. During construction, the boat ramp within the CUF would be temporarily closed to the public to accommodate barge unloading activities. While temporary closure of the ramp will reduce boat access to waters around the plant site, Guices Creek Ramp, located about 2 miles upstream from CUF, will continue to provide access to this general part of the Cumberland River. Therefore, adverse effects to boating launching activities will be temporary and minor during construction but beneficial and long-term after construction is complete. No additional effects on natural areas, parks, and recreation areas in the project vicinity are anticipated outside of the CC Plant site.

No cumulative effects to natural areas, parks, or recreation are expected to occur, as any effects would be localized and minimal and recreational users could utilize other nearby facilities.

3.9.2.3.2 Construction and Operation of Natural Gas Pipeline

No direct effects to parks or managed areas within the 800-acre proposed pipeline corridor would occur. Yellow Creek and Jones Creek, on the National Rivers Inventory, may be indirectly impacted by pipeline crossings but the effect would be minor as the pipeline would likely be directionally-drilled underneath the riverbed. No direct, long-term effects to the other resources would occur within a five-mile radius. The only effects anticipated are minor and temporary effects to traffic on roads surrounding the sites during construction as well as temporary noise and visual disturbances during construction. Cumulative effects related to construction could occur as a result of past/present and RFFAs in proximity to the proposed pipeline.

3.9.2.3.3 Environmental Justice Considerations

Effects to natural areas, parks, and recreation that would occur as a result of the proposed CC plant and natural gas pipeline lateral would be temporary, minor, and generally limited to the immediate TVA-owned CUF Reservation and pipeline corridor or nearby vicinity, where non-EJ populations are more prominent (14 out of 16 census block groups and nine out of 10 census block groups are non-EJ populations, respectively; see also Figure 3.4-3 and Figure 3.4-4). If temporary closure of the Lake Barkley Recreation Area is necessary during construction, this could in turn affect EJ populations that currently utilize the recreation area. These effects are not anticipated to be disproportionate on EJ populations, however, as the same effects would occur to other populations that utilize the area.

3.9.2.4 Alternative B

3.9.2.4.1 Construction and Operation of CT Plant at Johnsonville Reservation

Under Alternative B, TVA would retire the CUF, demolish the units, and construct a CT plant on property located within the boundaries of the JCT Reservation. Long-term effects are not likely to occur to recreational activities within the Kentucky Reservoir. Noise and increased traffic during construction may have slight short-term effects on nearby areas identified in Section 3.9.1.3.1; however, the resources will still be accessible throughout construction. Therefore, project effects on dispersed outdoor recreational activities as well as natural resources should be minor. No cumulative effects to natural or recreation areas are expected to occur.

3.9.2.4.2 Construction and Operation of CT Plant at Gleason Reservation

Under Alternative B, TVA would retire the CUF, demolish the units, and construct a new CT plant on a portion of the Gleason Reservation. Because there are substantial distances between developed recreation areas and the site, no effects on these recreation areas are anticipated. There are no dispersed recreational activities such as hunting that are known to occur on the site. No other environmentally significant areas were identified in proximity to the reservation. Therefore, project effects on dispersed outdoor recreational activities should be minor to nonexistent. No cumulative effects to natural or recreation areas are expected to occur.

3.9.2.4.3 Transmission and Other Components

The proposed 40-mile-long TL would be sited to avoid and minimize effects to multiple parks, managed areas, and ecologically significant sites between Martin and Buchanan, Tennessee. There could be some short-term disruption of informal recreational use, such as hunting, within and immediately adjacent to the TL route during construction. No cumulative effects to natural or recreation areas are expected to occur.

3.9.2.4.4 Environmental Justice Considerations

Effects to natural areas, parks, and recreation that would occur as a result of the proposed CT facilities and the associated transmission line activities are not anticipated to have disproportionate and adverse human health or environmental effects on EJ populations. These effects would be minor to negligible. Moreover, they would be generally limited to the immediate TVA-owned reservations and transmission line corridor, where EJ populations are either not present, as in the case of Gleason (Figure 3.4-7 and Figure 3.4-8) or are present in varying percentages, as in the case of JCT, where minority EJ populations and other populations are in the immediate JCT Reservation vicinity (Figure 3.4-5). If long-term effects occur to recreational activities within the Kentucky Reservoir, which is partially within the boundaries of the proposed CT plant, this could in turn affect EJ populations that currently utilize the recreation area. However, these effects are not anticipated to be disproportionate on EJ populations, as similar effects would occur to other populations that utilize the area.

3.9.2.5 Alternative C

3.9.2.5.1 Construction and Operation of Solar and Storage Facilities

Because the exact project locations for solar and/or storage projects are not known at this time, TVA has compiled a list of typical effects associated with the construction and operation of PV facilities within the TVA region. This list was compiled by reviewing the EAs and EISs for PV projects, ranging from community scale to utility scale, over the past several years, 2014 through 2021. Based on the review of 31 projects, it was found that only 6.5 percent of solar projects affected parks and public lands.

Individual facilities would be sited to avoid effects to natural areas, parks, and other developed recreation areas and designed to reduce any visual effects to nearby areas. Solar facilities would eliminate informal recreational uses such as hunting from the 21,900 acres proposed to be developed as solar and storage facilities.

Future projects in the geographic area of analysis that include use of undeveloped lands to support industrial or other intensive developments could reduce the availability of lands suitable for recreation. In addition to the 3,000 MW of solar facilities, TVA is proposing to add 10,000 MW of solar by 2035 to meet customer demands and system needs. This would decrease the amount of potentially available land to support dispersed outdoor recreation activities such as, hunting, fishing, or nature observation. The combined effect of these future land development actions and Alternative C would likely result in a reduction in resources for dispersed recreation. However, in view of the relatively large amounts of rural and undeveloped lands within the counties selected, cumulative effects on dispersed recreation opportunities are expected to be minor. Because developed outdoor recreation areas are largely located sufficiently distant from the solar or storage project sites, no direct, indirect or cumulative effects on these resources is expected.

3.9.2.5.2 Transmission and Other Components

New TL connections, substations, etc. would typically be on or immediately adjacent to the solar/storage facility site, and they would be planned to minimize adverse effects to natural areas, parks, and recreation areas. New TLs would eliminate forested areas within the corridor, which could have long-term effects on ecological significance and recreational activities in the area.

A review of past solar PPA projects reflected an average of approximately 17.73 acres of additional effects as a result of access roads, transmission interconnections and upgrades for each solar facility. Upgrades are typically performed to increase the electrical capacity of the existing transmission lines and would include the items listed in Section 2.1.3.2.2.

In the 2019 IRP EIS, TVA compiled a list of typical effects from construction activities related to transmission projects. A total of 298 projects were included in the review (Table 3.3-1). It was found that 16 percent of 249 projects affected parks and public lands. There is the potential for cumulative effects with additional transmission lines and upgrades associated with an additional 10,000 MW of solar facilities by 2035. Cumulative effects would be minimized through siting and routing of transmission lines to avoid natural and recreation areas.

The land area required for battery storage facilities is typically only a few acres and construction-related effects are minimal. Operational effects are also minimal with adherence to typical mitigation measures and best management practices.

3.9.2.5.3 Environmental Justice Considerations

Effects to recreation areas that would occur as a result of the proposed solar facilities and transmission line activities are not anticipated to have disproportionate and adverse human health or environmental effects on EJ populations in the EJ study area of Alternative C. These effects would be minor, limited to the immediate project sites and transmission line corridors, and the same for other populations utilizing the affected areas.

3.10 Land Use

3.10.1 Regulatory Framework

Use of Federal and state lands is generally regulated by the acts establishing the various agencies as well as other laws. For example, the TVA Act gives TVA the authority to regulate the use of lands it manages as well as development across, along, or in the Tennessee River or any of its tributaries. The Farmland Protection Policy Act of 1981 (7 U.S.C. 4201 et seq.) recognizes the importance of prime farmland. Various state laws and local ordinances regulate land use, although a large portion of land in the TVA region is not subject to local zoning ordinances (TVA 2019b).

3.10.2 Affected Environment

3.10.2.1 CUF Reservation

Land use is defined as the way people use and develop land, including leaving land undeveloped and using land for agricultural, residential, commercial, and industrial purposes. Much of the construction under Alternative A would be on the 2,388-acre CUF site in Cumberland City, Stewart County, Tennessee (Figure 2.1-1). This site offers the advantages of being a previously disturbed area within existing TVA property; having existing transmission interconnection to the TVA transmission system; and being 30 miles from a major interstate natural gas pipeline lateral. Although the area has had intense disturbance as a result of plant operations, the proposed CC plant site is a greenfield site composed of fields, woodlands, and wetlands and has been farmed in the past (Figure 2.1-3). The Tennessee Trustee classifies the project area, including the Project Site, as commercial, agricultural, and farmland (Tennessee Trustee 2020 Stewart County Property Tax Information). Stewart County does not have a land use plan for the unincorporated portions of the county nor are lands subject to zoning restrictions (Stewart County Mayor’s Office; personal communication; September 24, 2021).

Images generated with the NLCD evaluation, visualization, and analysis tool show the CUF Reservation as largely deciduous forest, developed medium/high intensity area, and open water, with the CC plant site consisting of largely hay/pasture area (Figure 3.10-1, Table 3.6-1). The 2021 field investigations revealed a larger percentage of wetlands on the CUF site and within the boundaries of the proposed CC plant site than what is depicted on desktop NLCD results (TVA 2021e). See Section 3.6 for more information on field survey findings.

Table 3.10-1. Land Cover Within and Adjacent to the Proposed Alternative A CC Plant and CUF Reservation (Source: NLCD 2019)

ALT A - PLANT CC SITE		
NLCD Land Cover Type	Area (Acres)	% of Total Land
Open Water	1.56	0.56%
Developed, Open Space	5.56	1.99%
Deciduous Forest	20.91	7.49%
Mixed Forest	22.91	8.21%
Hay/Pasture	227.06	81.35%

ALT A - PLANT CC SITE		
Woody Wetlands	0.89	0.32%
Emergent Herbaceous Wetlands	0.22	0.08%
Total	279.10	100.0%

The 2,388-acre CUF Reservation consists of flat to gently rolling terrain that ranges in elevation from approximately 355 to 658 feet above mean sea level. Topography is highest on the western portion of the reservation, decreasing in elevation towards the northeast (Figure 3.6-2). CUF is located at the confluence of Wells Creek and the south bank of the Cumberland River, and Cumberland City Road (TN 233) runs along the northern border of the reservation. Rolling Hills Drive intersects the reservation and Old Scott Road intersects the CC plant site in the western portions. The reservation is bordered by Buckeye Road to the southwest. The reservation is bordered by Old Highway 149 and intersected by Wickham Avenue in the northeastern portion (Figure 2.1-3).

Forested and agricultural land makes up a majority of the land surrounding the reservation with smaller pockets of residential/commercial areas. Several industrial facilities are present alongside Old Highway 149 and Temple Drive southeast of the reservation. Small pockets of residences are present along Scotts Chapel Road west of the reservation. The fossil plant is within the corporate limits of Cumberland City, a town with a population of 305 (USCB 2020), and the remainder of the reservation is in unincorporated Stewart County. The next closest municipality is the City of Erin, which contains 1,224 residents and is 3.4 miles south of the reservation (USCB 2020).

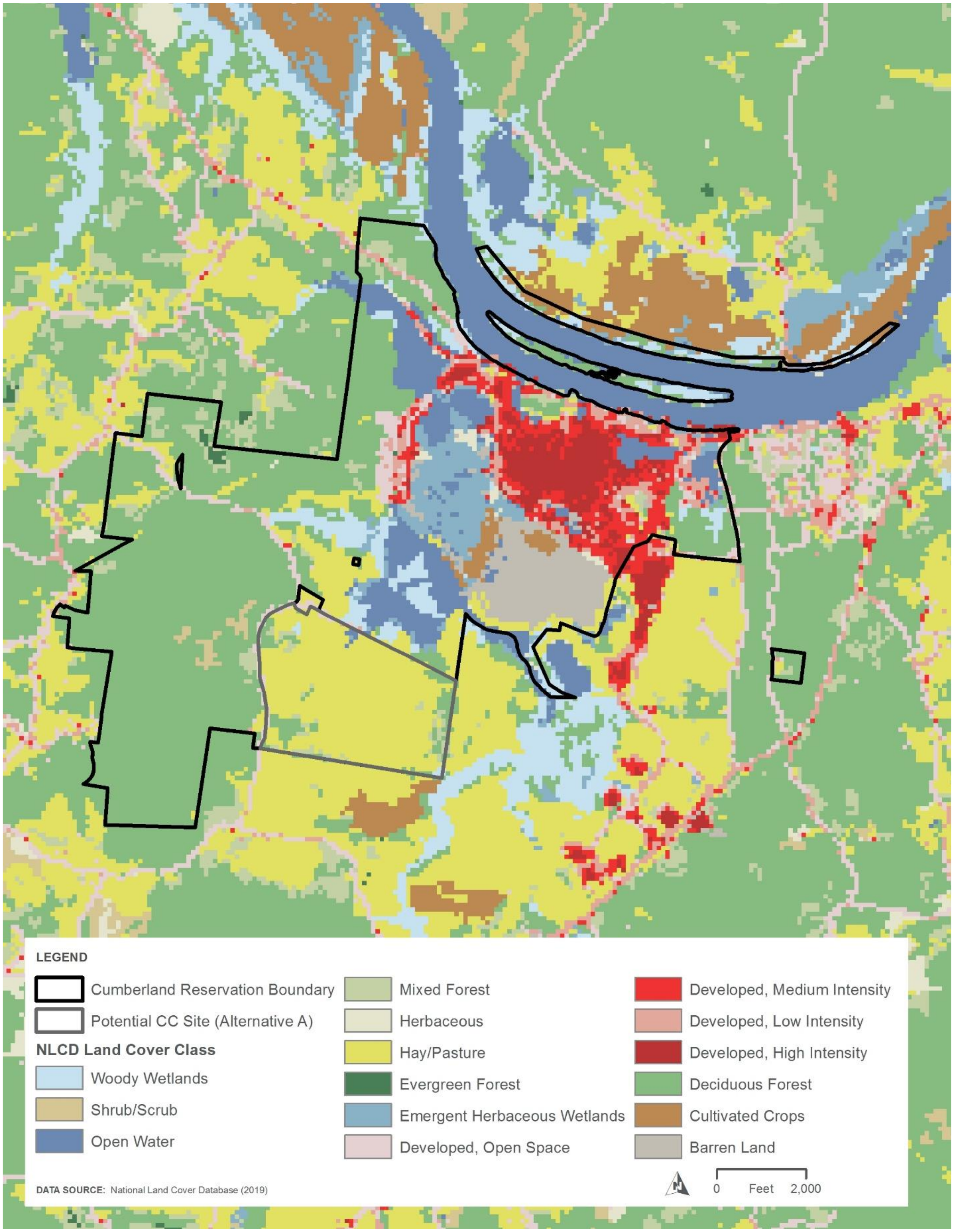

Figure 3.10-1. Land Cover Within and Adjacent to the Proposed Alternative A CC Plant and CUF Reservation (Source: NLCD 2019)

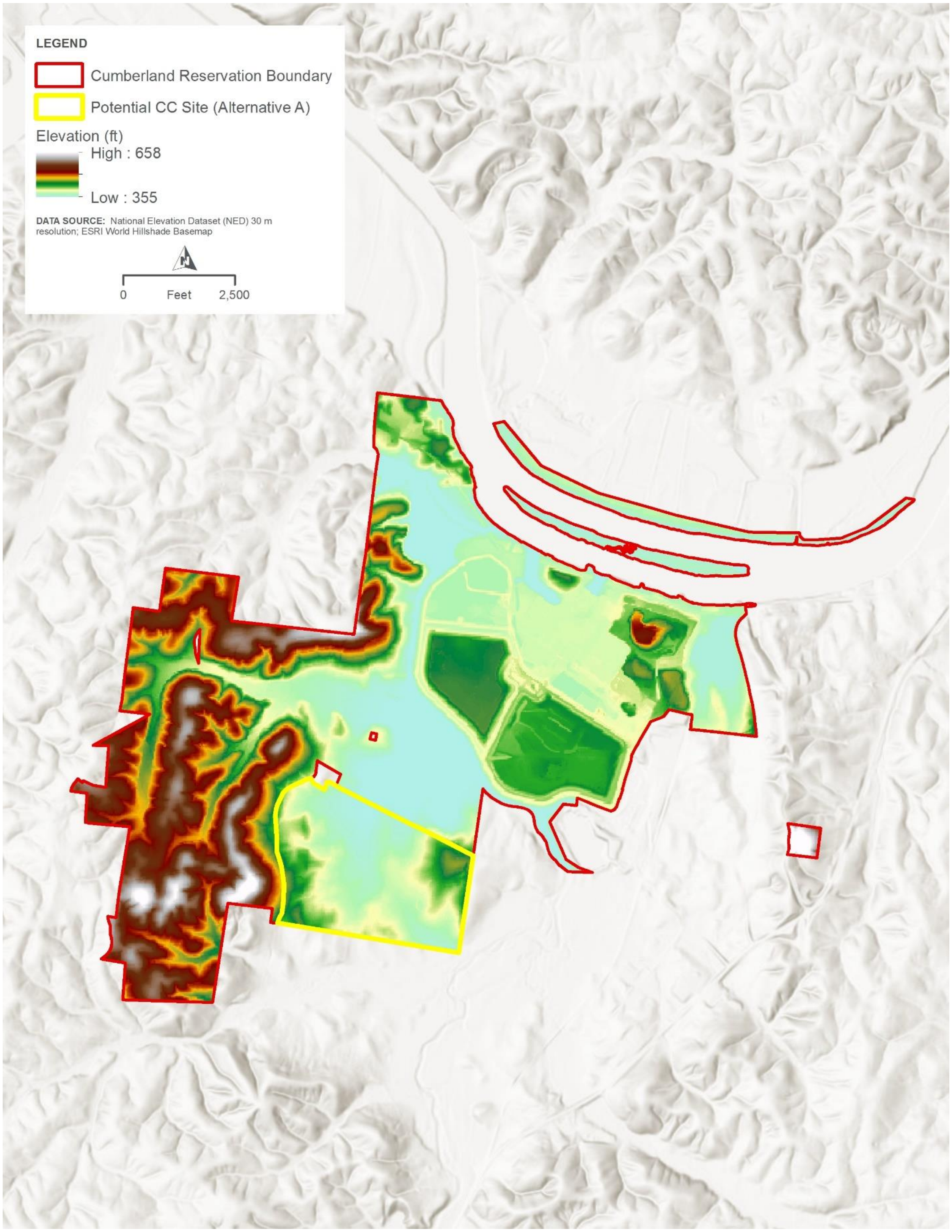

Figure 3.10-2. Elevation within the Alternative A proposed CC plant location and the CUF Reservation

Available historical aerial photographs and USGS topographic quadrangles document that land use near the project area was beginning to be developed dating back to the first available map in 1931, which showed the existence of many of the same major roadways and corridors as can be seen today. The addition of a quarry and the CUF site significantly changed the Project Site in the late 1960s and early 1970s. Industrial development has continued since the coal plant was completed in the 1960s as TVA expanded CCR storage areas and other industrial development, some associated with TVA (e.g., the wallboard plant), mostly to the east and southeast of the reservation.

3.10.2.2 Alternative A

Land use within the proposed CC plant site, TLs and associated components would be within the CUF Reservation as described in Section 3.10.2.1. Current land use in the area is largely industrial and agricultural.

3.10.2.2.1 Natural Gas Pipeline Lateral Corridor

The proposed corridor for the natural gas pipeline lateral that would provide fuel for the CC plant is shown on Figure 2.1-3 and is generally parallel to an existing TVA 500-kV TL. Land within the proposed 800-acre corridor is largely deciduous forest and pastureland, meaning the land is likely unused forest land or is farmed pastureland or timber (Figure 3.10-3, Table 3.10-2).

The corridor cuts across Highway 149, Highway 13, Highway 235, Highway 49, and terminates at Highway 250. Forested and rural-residential land uses dominate the landscape surrounding the corridor. Several businesses and residential concentrations are present alongside and occasionally within the corridor, especially in areas where the corridor intersects major roadways. The closest municipalities moving from west to southeast are Cumberland City, the town of Slayden, the town of Vanleer, the unincorporated community of Cumberland Furnace, the town of Charlotte, and the unincorporated community of Greenwood.

The corridor consists of terrain that ranges in elevation from approximately 355 to 871 feet above mean sea level. Topography is lowest at the western-most origin point of the pipeline at CUF, encountering a series of plateaus and valleys along the length of the pipeline. The highest points occur in the middle of the corridor, between figure slides #2 and #3 (Figure 3.6-4).

Table 3.10-2. Land Cover Within and Adjacent to the Proposed Alternative A Natural Gas Pipeline Corridor (Source: NLCD 2019)

Land Cover Types	Area (acres)	% of Total Land
Open Water	0.22	0.02%
Developed, Open Space	56.27	5.01%
Developed, Low Intensity	3.78	0.34%
Deciduous Forest	624.26	55.55%
Evergreen Forest	4.23	0.38%
Mixed Forest	65.38	5.82%
Shrub/Scrub	6.00	0.53%
Herbaceous	10.90	0.97%
Hay/Pasture	308.02	27.41%
Cultivated Crops	40.03	3.56%
Woody Wetlands	2.45	0.22%
Emergent Herbaceous Wetlands	2.22	0.20%
Totals	1,123.76	100.0%

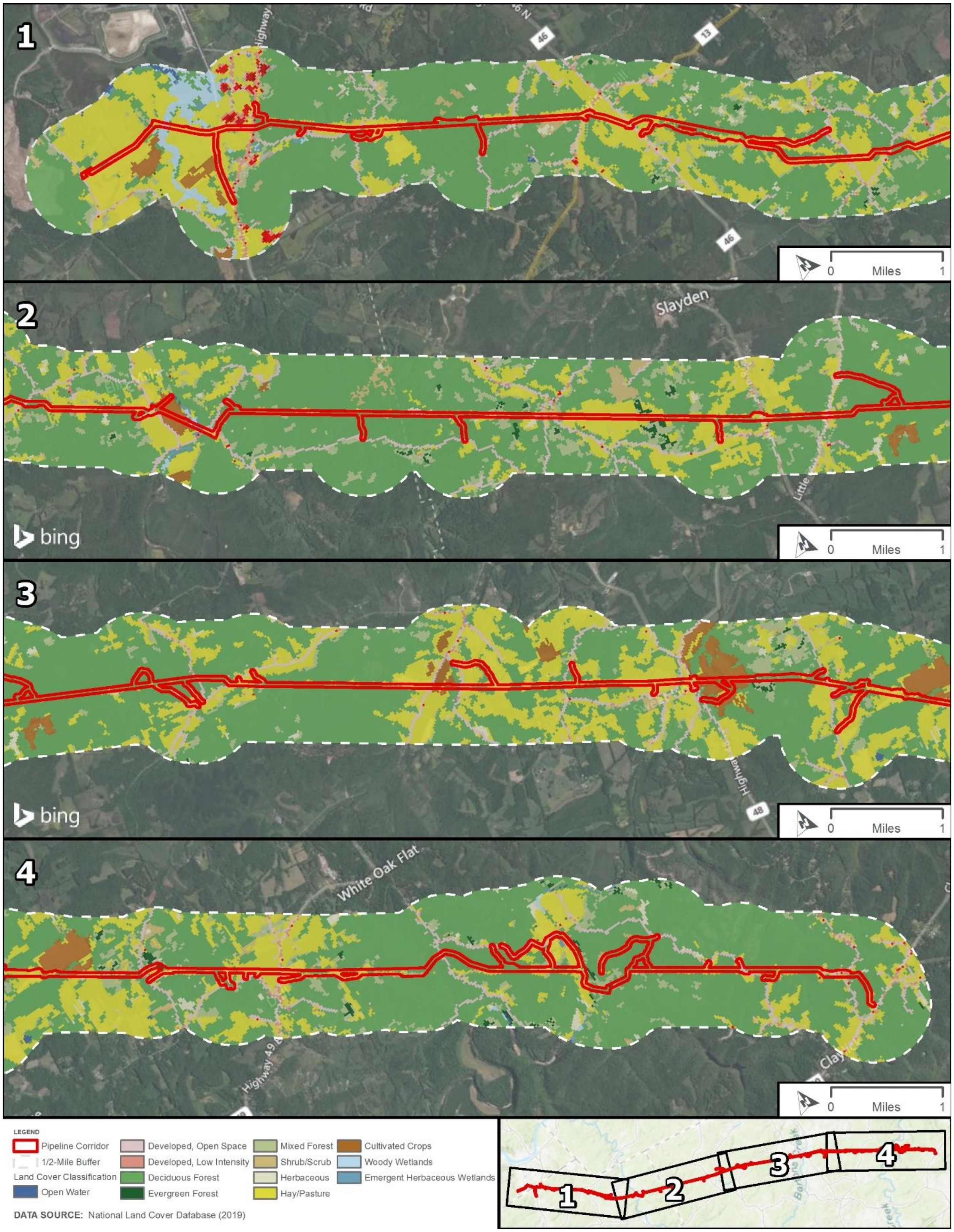

Figure 3.10-3. Land cover within and adjacent to the proposed Alternative A natural gas pipeline lateral corridor (Source: NLCD 2019)

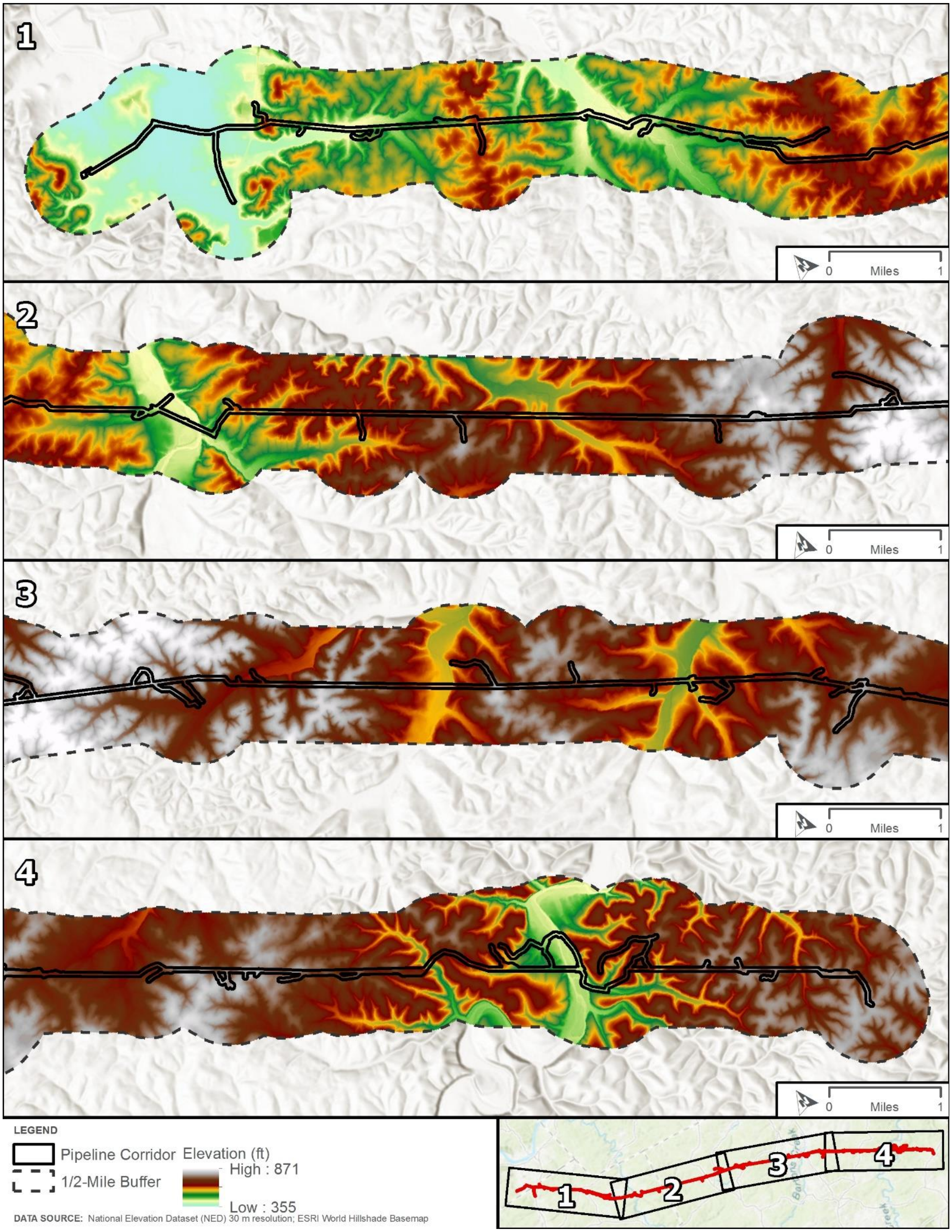

Figure 3.10-4. Elevation within the Alternative A proposed natural gas pipeline lateral corridor

3.10.2.3 Alternative B

3.10.2.3.1 Johnsonville Reservation

The JCT is located near New Johnsonville in Humphreys County, Tennessee. The reservation is approximately 720 mostly developed acres and located on the east bank of the Kentucky Reservoir of the Tennessee River. The reservation once hosted 10 coal-fired units, which have all been retired and are being demolished, and currently hosts 20 active CT units, one of which supplies co-generation steam to an adjacent chemical plant. An ash pond remains in the eastern portion of the site from the retired coal-fired units. State of Tennessee Comptroller of the Treasury's Real Estate Assessment Data classifies the area, including the JCT, as residential, commercial, industrial, and Federal land (State of Tennessee 2021). Humphreys County does not have land use plans or zoning regulations for unincorporated areas of the county; however, the City of New Johnsonville has zoning regulations within the city limits as well as within a five-mile buffer surrounding the city limits (Humphreys County Executive's Office; personal communication; September 24, 2021). JCT is zoned as industrial (I-1) (City of New Johnsonville, Richie Blue; personal communication; September 24, 2021). No relevant land use plan exists for the site.

Images generated with the NLCD evaluation, visualization, and analysis tool show JCT as consisting primarily of developed medium/high intensity area and hay/pasture, and the CT plant location consists of medium/high intensity area and open water (Figure 3.10-5). The full breakdown of land use types within the JCT can be seen in Table 3.10-3.

The elevation within the proposed CT plant site is largely uniform with low relief, ranging from 355 to 407 feet above mean sea level (Figure 3.10-6). The site is bordered on the south, east, and north by industrial facilities and on the west by an excavated harbor area.

Table 3.10-3. Land cover within JCT Reservation (Source: NLCD 2019).

	ALT B - JCT	
NLCD Land Cover Types	Area (AC)	% of Total Land
Open Water	21.79	20.55%
Developed, Open Space	0.44	0.42%
Developed, Low Intensity	6.45	6.08%
Developed, Medium Intensity	29.36	27.67%
Developed, High Intensity	39.81	37.53%
Barren Land	6.89	6.50%
Herbaceous	0.22	0.21%
Emergent Herbaceous Wetlands	1.11	1.05%
Total	106.08	100.0%

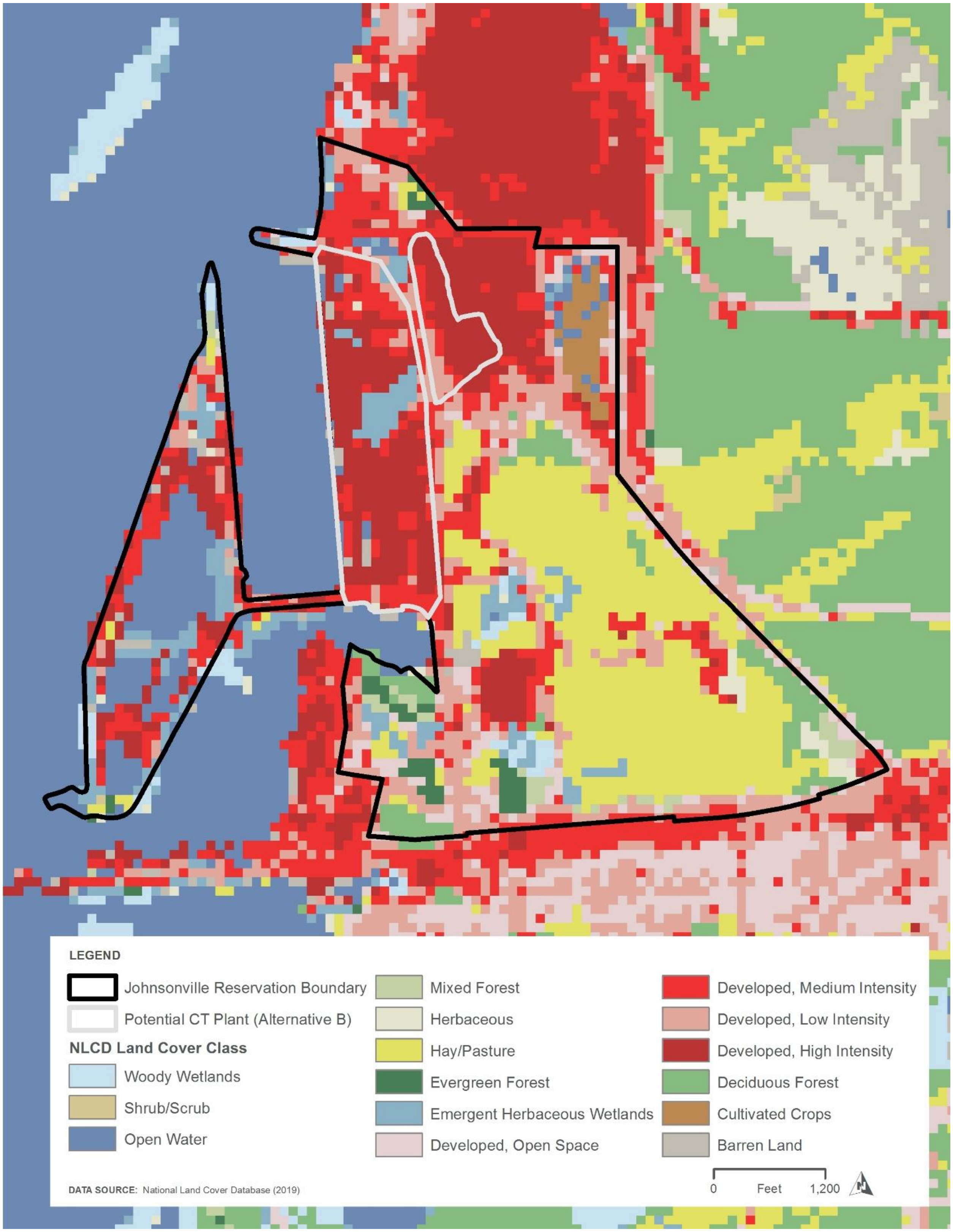

Figure 3.10-5. Land cover within the proposed Alternative B JCT Reservation and the proposed CT plant location (Source: NLCD 2019).

Figure 3.10-6. Elevation within the Alternative B proposed CT plant location within the JCT

U.S. Route 70/ State Highway 1, also locally known as Broadway Avenue, runs east to west near the southern border of JCT, and North Street runs north to south along JCT's eastern border. The surrounding area is largely forested and industrial/commercial with residential concentrations south of JCT. Several businesses are present alongside Broadway Ave. JCT is within the corporate limits of New Johnsonville that has a population of 1,804, and the next closest municipality is the unincorporated community of Eva with a population of 293 (USCB 2020).

Available historical aerial photographs and USGS topographic quadrangles document that land use in and around JCT was largely rural aside from structures neighboring the CSX railway running parallel to Broadway Ave. Over time, land use became much more industrialized with the construction of JCT beginning in 1949.

3.10.2.3.2 Gleason Reservation

The Gleason Reservation is located near Dresden in Weakley County, Tennessee. The reservation is approximately 97 acres and currently hosts a three-unit CT plant with a combined generation capacity of 500 MW. Unlike JCT, the proposed CT plant site is largely greenfield. The Weakley County Trustee classifies the project area, including the Project Site, as public utility (Weakley County Trustee; personal communication; September 24, 2021). Weakley County does not have a land use plan for the unincorporated portions of the county nor are lands subject to zoning restrictions (Weakley County Trustee; personal communication; September 24, 2021).

Images generated with the NLCD evaluation, visualization, and analysis tool show the proposed CT plant location as primarily cultivated crops and woody wetlands (Figure 3.10-7). Land use types within the proposed CT plant location can be seen in Table 3.10-4. The potential CT plant location is largely uniform with low relief, ranging from 349 to 371 feet above mean sea level (Figure 3.10-8). Topography is highest on the southern portion of the boundary, decreasing to the northeast.

The reservation is bordered by Janes Mill Road to the west. Agricultural and rural-residential land uses dominate the landscape south, west, and east of the reservation while undeveloped, forested land is north and northeast of the reservation. Several businesses are present alongside TN-22 southwest of the reservation, and development increases towards the south moving closer to the town of Gleason, the closest municipality with a population of approximately 1,369 (USCB 2020). Small residential concentrations are present within and just outside of the town limits.

Available historical aerial photographs and USGS topographic quadrangles document that land use in the project area has stayed largely rural-residential and agricultural with development staying relatively constrained to the Gleason town limits since the first available map from 1956.

Table 3.10-4. Land cover within the proposed Alternative B CT plant location within the Gleason Reservation (Source: NLCD 2019).

NLCD Land Use	Area (acres)	% of Total Land
Developed, Open Space	0.22	0.36%
Developed, Low Intensity	2.22	3.57%
Mixed Forest	0.67	1.07%
Cultivated Crops	38.70	62.14%
Woody Wetlands	20.46	32.86%
Totals	62.27	100.0%

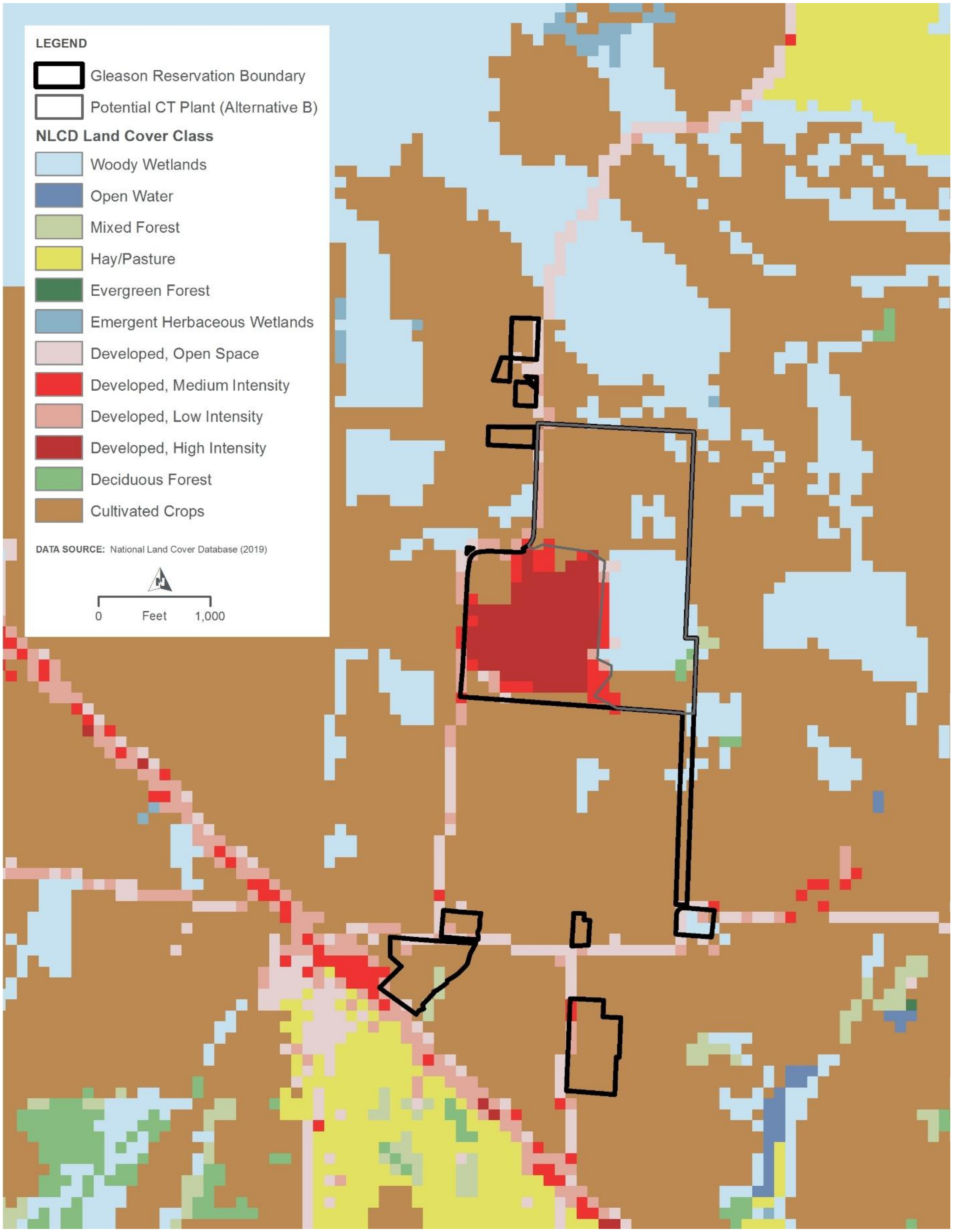

Figure 3.10-7. Land cover within the proposed Alternative B CT plant location within the Gleason Reservation (Source: NLCD 2019).

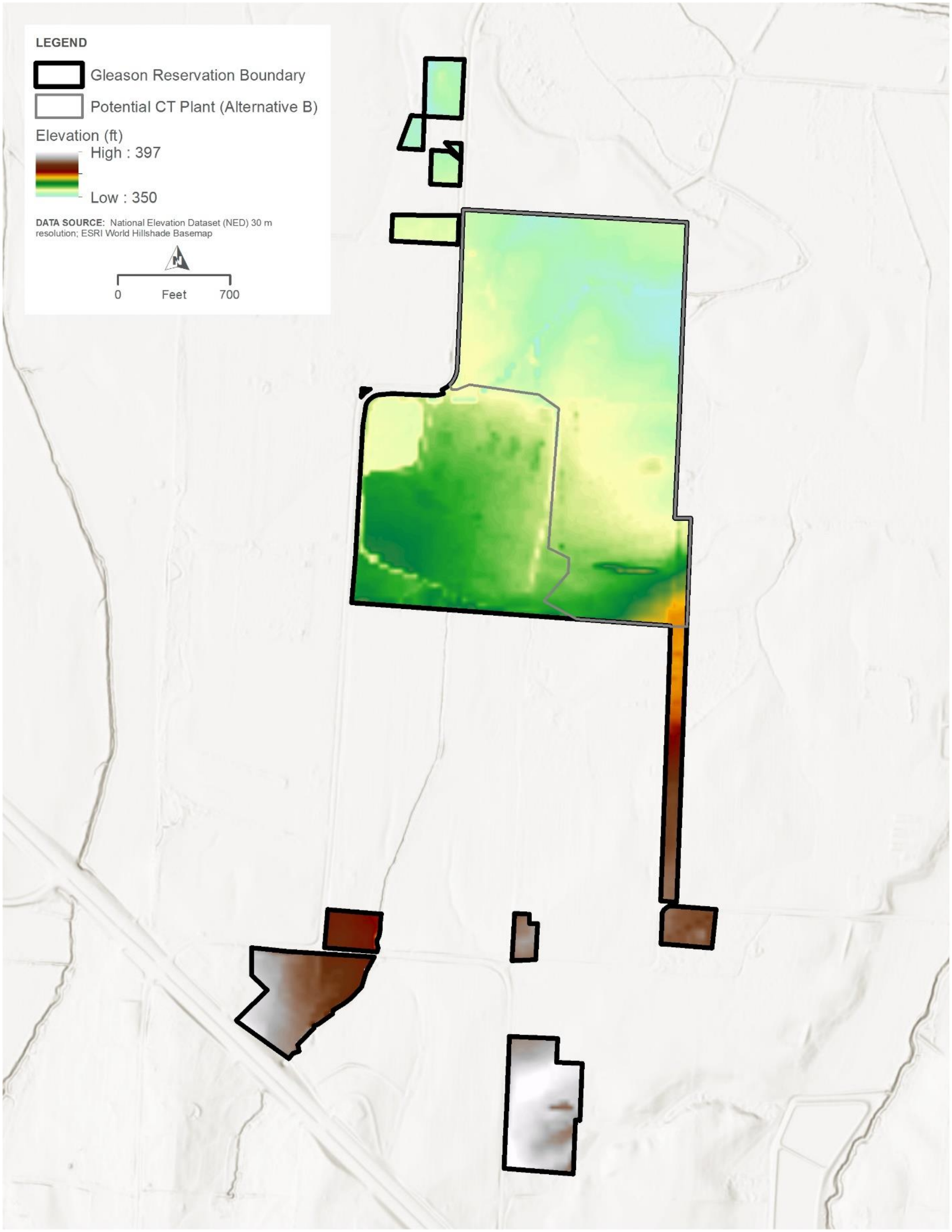

Figure 3.10-8. Elevation within the proposed Alternative B CT plant location within the Gleason Reservation

3.10.2.3.3 Transmission Corridors

Under Alternative B, TVA would construct a new approximately 40-mile 500-kV TL from the Weakley 500-kV station to a new station on the Marshall-Cumberland 500-kV TL. Land use along the proposed route is largely agricultural with smaller areas of forest. The proposed TL line intersects small, developed areas, including seven main roadways and multiple smaller rural roads.

3.10.2.4 Alternative C

3.10.2.4.1 Middle Tennessee TVA Power Service Area

TVA anticipates that a portion of the solar facilities proposed under Alternative C will need to be physically located in the Middle Tennessee region in order to offset transmission system upgrades that may be required following the retirement of CUF.

Middle Tennessee encompasses about 41% of the total land area in Tennessee, located mostly within the Nashville Basin, a dome, and the Highland Rim. The Cumberland Plateau is known for its hardwood forests and is one of the top hardwood timber producers in the country (Honey 2019). Forestland is predicted to decrease between 1997 and 2060 in the majority of counties in the TVA region, with several counties in the vicinity of Memphis, Nashville, Huntsville, Chattanooga, Knoxville and the Tri-Cities area of Tennessee predicted to lose more than 25 percent of forest area (Wear and Greis 2013). Loss of forest area within the TVA region is primarily a result of increasing urbanization and development. Most of the TVA region in some rural parts of western Tennessee are predicted to show little change, or in some scenarios, small increases in forestland by 2060 (Wear and Greis 2013).

Agriculture is a major land use and industry in the TVA region. In 2012, 41 percent of the land area in the TVA region was farmland that comprised 151,000 individual farms (USDA 2014). Between 2012 and 2017, statewide data for Tennessee show a small increase in the number of farms (USDA 2019c). The number of small farms (between 1 and 9 acres) in Tennessee has increased between 2012 and 2017, following a national trend (USDA 2019c). Average farm sizes range between 155 and 326 acres for states within the TVA region and have generally increased in size between 1997 and 2017. Middle Tennessee farms typically grow soybeans and tobacco, as well as raising beef cattle.

For the state of Tennessee, cropland and pastureland comprise 17 and 16 percent, respectively, of rural, non-Federal land in 2017 (USDA 2018b). Both cropland and pastureland have decreased in area since 1982; however, the rate of cropland and pastureland loss in Tennessee has declined between 2012 and 2015 (USDA 2018b). Farms in the TVA region produce a large variety of products that vary across the region. Region-wide, the major crop items by land area are forage crops (hay and crops grown for silage), soy, corn and cotton. The major farm commodities by sales are cattle and calves, poultry and eggs, grains and beans, cotton and nursery products (USDA 2014). Between 2012 and 2017, statewide data for Tennessee shows decreases in the number of farms and acres producing short rotation woody crops (USDA 2019c).

Power from these facilities would typically be delivered by direct connection to TVA’s transmission system or via interconnections with local power companies that distribute power from TVA. As specific sites have not yet been determined for evaluation under this alternative, typical effects of solar and transmission projects have been listed under Sections 3.2 and 3.3.

3.10.3 Environmental Consequences

3.10.3.1 The No Action Alternative

Under the No Action Alternative, TVA would continue to maintain and operate the CUF plant and would implement all of the planned actions related to the current and future management and storage of CCRs, which have either been reviewed or will be in subsequent NEPA analysis. Existing land uses in the areas of the action alternatives would likely remain industrial and rural.

3.10.3.2 Retirement, Decommissioning, Decontamination, and Deconstruction of CUF Plant

Under all action alternatives, TVA would retire, decommission, decontaminate, and deconstruct the CUF units and site. Land uses within the 2,388-acre CUF Reservation would remain industrial regardless of the action alternative selected to replace its generation, as an intake pump station, booster fan building, diesel fire pump house, switchyards, wastewater treatment system, and other facilities would remain operational onsite. As the land would remain in TVA possession and would not be accessible by the public, aside from the boat ramp which will be improved for public use, this change in land use would be considered insignificant. All previously approved CCR projects would continue to be implemented. Deconstruction of all aboveground structures within the project site to a depth of 3 ft below grade would result in disturbance to the soil in the immediate vicinity of the structures. All structures with below grade features would be filled with material from the deconstruction process as well as imported fill. This would result in a net increase in the amount of soil available on the site. As the entire project site is a previously disturbed area and would continue to be designated for nonagricultural purposes, no effects to prime farmland are anticipated. Once the D4 activities are completed, there is the potential for land use changes if the coal plant site is redeveloped. Cumulative effects to land use would not occur associated with the CCR management activities on the CUF Reservation.

3.10.3.2.1 Environmental Justice Considerations

Effects to land use that may occur as a result of redevelopment of the CUF Reservation are not anticipated to have disproportionate and adverse human health or environmental effects on EJ populations in the CUF Reservation EJ study area. These effects would be limited to the TVA-owned CUF Reservation, and no EJ populations are located in the immediate vicinity of the reservation (Figure 3.4-3). Moreover, effects experienced by EJ populations would likewise be experienced by other populations; thus, the effects would not be disproportionate on EJ populations.

3.10.3.3 Alternative A

3.10.3.3.1 Construction and Operation of CC Plant at CUF

Under Alternative A, TVA would retire the CUF, demolish the units, and construct and operate a CC plant on a 277-acre portion of the CUF Reservation. Transmission lines would also be constructed that have the potential to result in minor effects to land use. Land use on the developed portions of the CC plant site would change from the current, largely agricultural use to industrial and the rest of the site would remain largely undeveloped. 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, which will impose short-term effects during construction. Minimal ground disturbance is expected in laydown areas and in the boundaries of access roads, but, if the ground is disturbed, the 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. Long-term effects to land use would occur due to the conversion of any forest along the TL route to fields.

The activities associated with Alternative A would not have any indirect effects on land use, as further changes to the rural area would not be expected to be stimulated by the CC plant. The Project could continue the current land's industrial use for at least 30 years. Upon completion of CC plant decommissioning, the land could continue to be used for power generation or for other industrial uses. No cumulative effects to land use would occur.

3.10.3.3.2 Construction and Operation of Natural Gas Pipeline

The new pipeline will be located along an existing TL ROW, which could result in fewer environmental effects due to its proximity to previously disturbed land. While pipeline easements are typically 50 feet wide and the associated construction corridor 100-feet wide, TVA's analysis assumes a wider 200-foot corridor for purposes of this analysis. Therefore, TVA assumed tree removal will be required for forested areas within the 200-foot-wide ROW for construction access and would follow specifications outlined in Section 2.3. Construction of the pipeline would affect the land types identified in Table 3.10-2, largely forest (693 acres) and pastureland (308 acres).

It can be assumed that all resources within the corridor will be impacted by the construction of the pipeline in the short-term, with some land uses being able to resume after construction is complete when pasture and cropland is restored. Long-term effects will occur to other land uses within the corridor, such as forest management. Cumulative effects to land use may occur as a result of past/present and RFFAs in proximity to the pipeline corridor in that existing agricultural and forested land use is converted to industrial use.

3.10.3.3.3 Environmental Justice Considerations

Effects to land use that would occur as a result of the proposed CC plant and natural gas pipeline lateral would be minor and limited to the immediate TVA-owned CUF Reservation and pipeline corridor. The effects to land use in the CUF Reservation would occur in areas removed from identified EJ populations (Figure 3.4-3. and would, thus, not affect EJ populations. Likewise, the pipeline corridor comprises predominantly non-EJ populations (nine out of 10 census block groups are non-EJ populations; see also Figure 3.4-4). Long-term effects associated with loss of forested areas in the pipeline corridor could affect EJ populations that currently utilize those areas. These effects are not anticipated to be disproportionate on EJ populations, however, as similar effects would occur to other populations that utilize those areas.

3.10.3.4 Alternative B

3.10.3.4.1 Construction and Operation of CT Plant at Johnsonville Reservation

Under Alternative B, TVA would retire the CUF, demolish the units, and construct a total of four CT units on the Johnsonville Reservation. The completed CT plant would occupy less than 10 acres of the 100-acre, brownfield CT plant site. An additional 33 acres of the CT plant site would be used for laydown and parking during construction. Following construction, this area would be revegetated. The CT plant construction and operation would not change the industrial land use of the plant site or affect the industrial use of adjacent lands.

The activities associated with Alternative B would not have any indirect effects on land use, as further changes to the rural area would not be expected to be stimulated by the CT plant. No cumulative effects to land use would occur.

3.10.3.4.2 Construction and Operation of CT Plant at Gleason Reservation

Under Alternative B, TVA would retire the CUF, demolish the units, and construct a new CT plant on the Gleason Reservation. The CT plants would occupy less than 10 undeveloped acres of the 97-acre site. Land uses within the CT Plant site would be converted from cropland to industrial use, and the 60 acres identified for laydown or parking areas would be allowed to revert to their original use after construction.

The activities associated with Alternative B would not have any indirect effects on land use, as further changes to the rural area would not be expected to be stimulated by the CT plant. No cumulative effects to land use would occur.

3.10.3.4.3 Transmission and Other Components

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, which will impose short-term effects during construction. 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 following construction. Long-term effects to land use would occur due to the conversion of any forest along the TL route to fields.

In the 2019 IRP EIS, TVA compiled a list of typical effects from construction activities related to transmission projects. A total of 298 projects were included in the review (Table 3.3-1). An average of 13.1 acres were used per TL mile, and an average of 10.8 acres were used for new substations and switching stations. TLs averaged 0 acres of floodplain fill, 0 acres of prime farmland converted, and 5.5 acres of forest cleared per line mile. Substations and switching stations averaged 0.1 acres of floodplain fill, 6.9 acres of prime farmland converted, and 4.5 acres of forest cleared per station constructed. For the 40-mile TL, it can be estimated that 220 acres of forest will be cleared, resulting in a long-term effect to forest management.

3.10.3.4.4 Environmental Justice Considerations

Effects to land use that would occur as a result of the proposed CT facilities would be limited to the immediate TVA-owned reservations and would not lead to indirect effects in the surrounding areas; therefore, there would be no effects to EJ populations. Effects due to the proposed transmission line would affect areas that are currently under varying land uses, some developed and others not. As such, there would be permanent land use changes in some cases. However, areas that are currently pasture or agricultural fields would be returned to their former condition following construction. EJ populations that currently utilize these areas would experience minor, temporary effects. However, the same effects would be experienced by non-EJ populations; thus, the effects would not be disproportionate. Effects to EJ populations due to loss of prime farmland are addressed in Section 3.5.1.2.4.4.

3.10.3.5 Alternative C

3.10.3.5.1 Construction and Operation of Solar and Storage Facilities

Solar and battery storage projects require large land acreage (see Figure 3.10-9). Under Alternative C, TVA would construct and operate 3,000 MW of solar and 1,700 MW of battery storage at various sites, mostly within Middle Tennessee, which would require about 21,900 acres for the solar facilities and 640 acres for the battery storage facilities. Most operating and planned and approved TVA utility-scale solar facilities have been constructed on previously cleared pasture, hayfield, or crop land, and most have required little grading to smooth or level the site. Almost all TVA solar projects have affected farmland and resulted in changing the land use of farmed portions of the facility sites from agricultural to industrial. Effects to farmland, particularly areas designated as prime farmland, are described in more detail in Section 3.5.1. Forested portions of the sites were also changed to industrial land use. Other land uses on or in the vicinity of the solar facilities have generally not been affected. (Table 3.2-1). Land use is a factor in solar and storage site selection process, and some communities in the TVA region have ordinances addressing solar facilities. Some of these facilities require screening to reduce visual/land use effects. The land area required for battery storage facilities is typically only a few acres and construction-related effects are minimal.

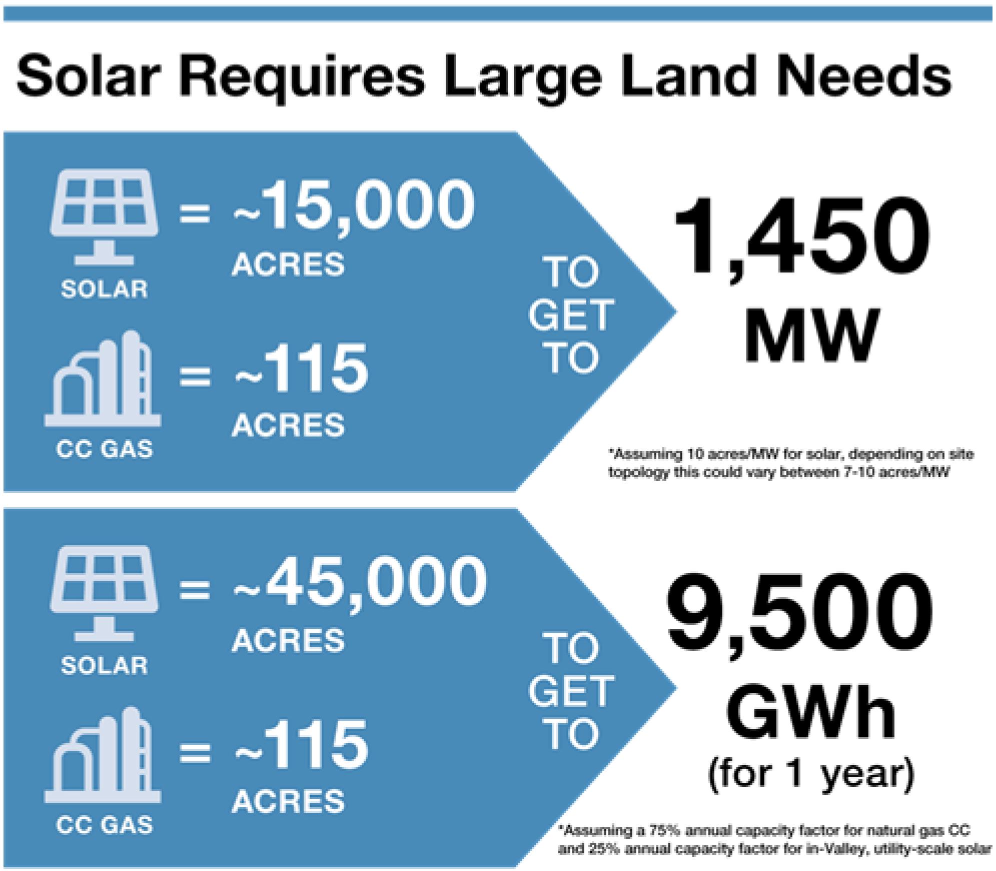

Figure 3.10-9. Comparison of Land Requirements for Gas and Solar Projects

Future projects in the geographic area of analysis that include use of undeveloped lands to support industrial or other intensive developments could result in a change in land use. In addition to the 3,000 MW of solar facilities, TVA is proposing to add 10,000 MW of solar by 2035 to meet customer demands and system needs. This would also change undeveloped or agricultural sites to industrial land use. The combined effect of these future land development actions and Alternative C would likely result in cumulative effects in land use changes. However, in view of the relatively large amounts of rural and undeveloped lands within the counties selected, cumulative effects on land use are expected to be moderate.

3.10.3.5.2 Transmission and Other Components

New TL connections and substations would typically be on or immediately adjacent to the solar or storage facilities, and they would be planned to minimize adverse land use effects. New TLs would eliminate forest management land use within the maintained ROW but not agricultural land use. New substations and switching stations would result in conversion to industrial land use. Cumulative effects to land use would also occur from additional transmission lines and substations associated with the addition of 10,000 MW of solar by 2035.

3.10.3.5.3 Environmental Justice Considerations
Based on the number of solar sites that would be needed to replace generation at CUF, there is potential for moderate effects to land use through conversion of agricultural land, particularly cropland, to developed land with potential for later restoration of agricultural use. These land use conversions have the potential for effects on EJ populations, depending on the number and location of solar facilities. While focused analyses for each proposed solar site would determine whether the specific project effects would be disproportionate on EJ populations, generally such effects resulting from the replacement solar generation proposed for Alternative C would be the same for EJ populations and other populations in the vicinity and, thus, not disproportionate on EJ populations.

3.11 Transportation

3.11.1 Affected Environment

3.11.1.1 CUF Reservation
CUF is served by highway, railway, and waterway modes of transportation. The closest airport is the Houston County Airport, 15 miles southwest of the site. Cumberland City Road (Highway 233) is the primary arterial roadway serving the CUF site (Figure 2.1-3). The two-lane road is oriented east—west and extends from its intersection with Highway 49 on the east side of Cumberland City to its intersection with Highway 49 to the west of CUF. There are three points of access into CUF from Cumberland City Road. Existing traffic conditions generated by CUF is composed of a mix of cars and light duty trucks, as well as medium duty to heavy duty trucks. The proposed CC plant site may be accessed by Old Scott Road on its western border; however, no traffic data is available from TDOT for this road. Old Scott Road intersects with Scotts Chapel Road, serving as the nearest traffic data point. The 2020-21 Annual Average Daily Traffic (AADT) counts for key roadways near CUF, all of which are 2-lane, are presented in Table 3.11-1.

Table 3.11-1. Average Daily Traffic Volume (2020-21) on Major Roadways Near CUF

Location (Station Number)	Existing AADT
Cumberland City Rd, on the northern border of CUF (81000059)	3,561
SR-46/Grices Creek Rd, 1.2 mi east of CUF (81000063)	781
Highway 149, 0.8 mi SE of CUF (81000073)	4,941
Highway 149, 0.4 mi east of CUF (81000058)	1,834
Scotts Chapel Road, 1.2 miles west of the CC plant site (81000060)	355

Source: Tennessee Department of Transportation, 2020-21[10]

3.11.1.2 Alternative A

3.11.1.2.1 Natural Gas Pipeline Corridor
Under Alternative A, TGP would construct approximately 32 miles of new 30-inch-diameter natural gas pipeline lateral and associated gas system infrastructure originating from TGP's existing 100 Line in Dickson County, Tennessee and terminating at the proposed power plant in Stewart County, Tennessee. The proposed gas pipeline lateral overview map is shown on

[10] Transportation Data Management System (ms2soft.com)

Figure 2.1-6. The corridor is served by highway and railway modes of transportation. The closest airport is the Schmid Airport, 0.4 miles south of the corridor. The corridor crosses Highway 149, Highway 13, Highway 235, and Highway 49, and terminates at Highway 250. All of these highways are 2-lane. The 2020-21 AADT counts are presented in Table 3.11-2.

Table 3.11-2. Average Daily Traffic Volume (2020-21) on Roadways Intersected by Alternative A Pipeline

Location (Station Number)	Existing AADT
Highway 149, 0.9 mi NE of the pipeline corridor at its western origin point (81000073)	4,941
TN-13, 2.3 mi NE of the western portion of the corridor (63000045)	603
Highway 235, 1 mi south of the midway point of the corridor (22000019)	1,275
Highway 49, 7.8 mi NE of corridor near the eastern termination point [11] (22000008)	3,358
Highway 250, 3.3 mi NE of eastern termination point of corridor (11000031)	1,140

Source: Tennessee Department of Transportation 2020-21

3.11.1.3 Alternative B

3.11.1.3.1 Johnsonville Reservation

The Johnsonville Reservation is served by highway, railway, and waterway modes of transportation. The closest airport is the Benton County Airport, seven miles west of the site. U.S. Route 70/ Highway 1, also locally known as Broadway Avenue, is the primary arterial roadway serving the JCT site. It has four lanes in western Humphreys County and a center turn lane in New Johnsonville.

There are two points of access into the Johnsonville Reservation from U.S. Route 70 (Figure 2.1-8). An at-grade ramp entrance on the south side of U.S. Route 70 that loops around to the north, crosses over the road and the double CSX Railroad tracks, and then enters JCT on the south side of the reservation, is the main roadway entrance. The Johnsonville Reservation is also accessible from North Street, which intersects U.S. Route 70 about 0.8 miles east of the main access point. North Street runs north from an at-grade intersection with U.S. Route 70, crosses the railroad tracks, and continues north along the east side of JCT.

Existing traffic conditions generated by JCT is composed of a mix of cars and light duty trucks, as well as medium duty to heavy duty trucks. The 2020-21 AADT counts are presented in Table 3.11-3.

Table 3.11-3. Average Daily Traffic Volume (2020-21) on Roadways in Vicinity of JCT

Location (Station Number)	Existing AADT
U.S. Route 70, 2.8 mi east of JCT (43000026)	9,006
U.S. Route 70, 0.8 mi west of JCT (27)	5,120
State Highway 927/Long Street, 1 mi SE of JCT (43000028)	4,134

[11] This AADT location was selected due to the fact that it is the closest traffic marker on this particular roadway, which is intersected by the pipeline corridor, despite the marker being distant from the corridor.

Location (Station Number)	Existing AADT
Country Road 929, 0.8 mi SE of JCT (43000060)	1,905

Source: Tennessee Department of Transportation 2020-21

3.11.1.3.2 Gleason Reservation

The Gleason Reservation is served by highway modes of transportation. The closest rail delivery point is in McKenzie, TN, 13 miles from Gleason. The closest airport is the Carroll County Airport, 13 miles southeast of the site. The two-lane Janes Mill Road is the primary roadway serving the reservation, and there are three access points to the west and south sides of the reservation from Janes Mill Road (Figure 2.1-10). Janes Mill Road intersects TN-22, a major four-lane highway in northwest Tennessee, about 0.8 miles south of the Gleason Reservation. Existing traffic generated by the existing Gleason plant is composed of a mix of cars and light duty trucks. The 2020-21 AADT counts are presented in Table 3.11-4.

Table 3.11-4. Average Daily Traffic Volume (2020-21) on Roadways in Proximity to Gleason

Location (Station Number)	Existing AADT
Janes Mill Road, 0.4 mi north of Gleason (92000168)	212
Highway 22/TN-22, 0.8 mi south of Gleason (92000091)	7,184
Parks Road, 1 mi south of Gleason (92000167)	938

Source: Tennessee Department of Transportation 2020-21

3.11.1.3.3 Transmission Corridors

Under Alternative B, TVA would construct an approximately new 40-mile 500-kV TL from Weakley 500-kV station to a new station on the Marshall-Cumberland 500-kV TL, running through Weakley and Henry Counties (Figure 2.1-11). The corridor is served by highway and railway modes of transportation. The closest airport is the Wayne's World Airport (3TN3), 2.3 miles south of the site. The corridor intersects U.S. Route 641 and Highways 22, 118, 89, 190, 140, 69, and 218. All of these highways are two-lane, aside from Highway 22, which is four-lane. The 2020-21 AADT counts are presented in Table 3.11-5.

Table 3.11-5. Average Daily Traffic Volume (2020-21) on Roadways Intersected by Alternative B TL Upgrades

Location (Station Number)	Existing AADT
US-641, 2.7 mi north of the eastern portion of the TL (40000016)	5,095
Highway 22, 0.3 mi SE of the western portion of the TL (92000098)	7,545
Highway 118, 0.7 mi north of the western portion of the TL (92000128)	996
Highway 89, 0.8 mi north of the western-central portion of the TL (92000170)	1,167
Highway 190, 3.4 mi south of the western-central portion of the TL (92000059)	473
Highway 140, 3.7 mi south of the central portion of the TL (40000046)	586

Location (Station Number)	Existing AADT
Highway 69, 2 mi south of the central portion of the TL (40000035)	2,580
Highway 218, 5.7 mi south of the central portion of the TL (40000183)	2,645

Source: Tennessee Department of Transportation 2020-21

3.11.1.4 Alternative C

3.11.1.4.1 Middle Tennessee TVA Power Service Area

TVA anticipates that a portion of the solar facilities proposed under Alternative C would be located in the Middle Tennessee region in order to offset transmission system upgrades that may otherwise be required following the retirement of CUF. As specific sites have not yet been determined for evaluation under this alternative, typical transportation effects of solar and storage construction and transmission projects have been listed under Section 3.2.

3.11.2 Environmental Consequences

3.11.2.1 The No Action Alternative

Under the No Action Alternative, TVA would continue to maintain and operate CUF. TVA would implement all planned actions related to the current and future management and storage of CCRs at the coal plants, which have either been reviewed or will be in subsequent NEPA analyses. Under this alternative, roadway and barge traffic to and from the fossil plant would remain the same.

3.11.2.2 Retirement, Decommissioning, Decontamination, and Deconstruction of CUF Plant

Although traffic on Cumberland City Road, Highway 46, Highway 149, and Highway 149 may increase during D4 activities as equipment is transported offsite, traffic will ultimately be reduced as a result of deconstruction of the CUF coal units. Routine plant deliveries would also be discontinued, including coal and limestone, and employment at the plant would be reduced.

Traffic is assumed to be distributed during a peak morning period (to the site) and a peak evening period (away from the site). Deconstruction-related vehicles (dozers, backhoes, graders, loaders, etc.) would be delivered to or removed from the proposed project sites on flatbed trailers. The routes affected by this increased traffic volume have not yet been determined, but it can be assumed that the roadways listed in Table 3.11-1 would be affected. Overall, the traffic volume generated by the construction workforce and the construction-related vehicles would be relatively minor and temporary.

Most of the deconstruction materials would be transported by truck and train off site for recycling and disposal at approved landfills. Recycling and disposal sites have not been determined at this time; thus, haul routes cannot be specified. However, it is estimated that there likely will be an increase in trips near the site for waste disposal and recycling, which would cause minor and temporary increases in traffic volume.

TVA may elect to implement a reclamation process to recover the maximum amount of reusable fuel from the stockpiled material. Stockpiled coal will be burned onsite. Any remaining product will be transported offsite for use or disposal. Scrap metal and other recyclable material will be transported to locations as determined by the demolition contractor. The remaining material would be hauled to the offsite landfill for disposal. Hazardous material, PCB, used oil and universal waste will be disposed of offsite with vendors/locations on TVA's Environmental Restricted Awards List.

Based on this level of use, effects to traffic operations are expected to be relatively minor. Implementation of this action would cause minor effects to the roadway network and localized roadway degradation along the route to the offsite destinations because of increased truck traffic. In addition, the proposed transport of material stockpiled on the site over public roadways would result in an increase in the number of vehicle miles traveled on those roadways. It is anticipated that the additional trips required for waste disposal and project traffic would not change the existing LOS of roadways near the site. However, the increase in vehicle miles is a factor in injury and fatal traffic crash rates. Therefore, there would be a minor effect related to increased traffic and driver safety.

Cumulative effects to roadways may occur as a result of the CCR management activities also occurring on the CUF Reservation, especially if the D4 and CCR management construction occur at the same time. 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 effects of the proposed actions to transportation are expected to be minor.

3.11.2.2.1 Environmental Justice Considerations

Effects to transportation that may occur as a result of CUF coal facility retirement and D4 activities are not anticipated to have disproportionate and adverse human health or environmental effects on EJ populations in the CUF Reservation EJ study area. These effects would be temporary, minor, and concentrated on public roads within a relatively small area around the TVA-owned CUF Reservation, where EJ populations are not prominent (Figure 3.4-3) and the effects would be similar for other populations utilizing the affected areas. For these reasons, the effects to EJ populations are not anticipated to be disproportionate.

3.11.2.3 Alternative A

3.11.2.3.1 Construction and Operation of CC Plant, Transmission Lines, and Other Components on CUF Reservation

Vehicular traffic on public roads as well as near the proposed gas pipeline lateral would increase during construction due to construction workers and materials moving to and from the plant and pipeline construction areas. The average construction workforce would be about 500 people with occasional higher peaks. TVA estimates an average of 750 workers would be employed onsite at the peak of the approximately three-year construction period. This does not include the construction workforce needed for TL upgrades, if required, as this work is not centralized in one location for any significant period of time. Temporary gravel parking lot(s) would be constructed on site to provide adequate parking for construction staff. Construction materials and plant components would primarily be delivered by truck and large components may be delivered by barge and unloaded at the existing barge landing. Once the CC plant begins operations, overall truck and barge traffic would decrease due to the reduction of coal and limestone deliveries for the CUF coal plant.

Project materials and equipment would be delivered to the CC plant site by highway for smaller items and railway or waterway for larger items. Improvements to the current barge unloading facilities would consist of grading and creation of dirt/rock ramping to the nose of the barge as well as potential concrete resurfacing and widening. Most delivered items would be placed in project laydown areas on the CC plant site to await installation. Roads within the CUF would be maintained during the construction process. Any temporary access roads constructed offsite would be designed in accordance with USDOT and relevant local requirements. Equipment used during the construction phase would include trucks, truck-mounted augers and drills, excavators, as well as tracked cranes and bulldozers. Once constructed, eight to twelve employees could be needed to operate the CC plant in addition to remaining CUF staff.

Workforce traffic would mainly consist of a mix of passenger cars and light duty trucks. Traffic is assumed to be distributed during a peak morning period (to the site) and a peak evening period (away from the site), but occasional overnight work may be required. Assuming one person per commuting vehicle, there would be a daily average morning inbound traffic volume of 500 vehicles and a daily outbound traffic volume of 500 vehicles for a total of 1,000 vehicles per day. Construction-related vehicles (dozers, backhoes, graders, loaders, etc.) would be delivered to or removed from the CC plant site on flatbed trailers under both the mobilization and demobilization stages of the projects. Additional traffic may cause some traffic delays. Overall, the effect from traffic volume generated by the construction workforce and the construction-related vehicles would have a moderate, short-term impact.

Hazardous materials, PCB, used oil, and universal waste will go for offsite disposal/recycling with vendors/locations on TVA’s Environmental Restricted Awards List. Nonhazardous wastes will go for disposal as directed by the contractor. During construction, it can be assumed that there will be an increase in trips near the site for waste disposal and recycling, which would cause minor and temporary increases in traffic volume.

Table 3.11-6. Changes in Traffic on Nearby Roadways During Construction of CUF CC Plant

Location (Station Number)	Existing AADT	Existing AADT Plus Construction Traffic	Temporary Traffic Increase to CUF due to Construction Traffic (%)
Cumberland City Rd, on the northern border of CUF (81000059)	3,561	4,761	33.7%
SR-46/Grices Creek Rd, 1.2 mi east of CUF (81000063)	781	1,981	153.6%
Highway 149, 0.8 mi SE of CUF (81000073)	4,941	6,141	24.3%
Highway 149, 0.4 mi east of CUF (81000058)	1,834	3,034	65.4%
Scotts Chapel Road, 1.2 miles west of the CC plant site (81000060)	355	1,555	338.0%

Source: Tennessee Department of Transportation, 2020-21

Implementation of this alternative would cause minor disturbances to the roadway network, and localized roadway degradation along the route to the offsite destinations because of increased truck traffic. The temporary increased traffic over public roadways would result in an increase in the number of vehicle miles traveled on those roadways. This increase in vehicle miles is a factor in injury and fatal traffic crash rates and would have a minor effect related to increased traffic and driver safety.

Cumulative effects to roadways may occur as a result of the CCR management activities also occurring on the CUF Reservation, especially if the D4 activities and CCR management construction occur at the same time. 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 effects of the proposed actions to transportation are expected to be minor.

3.11.2.3.2 Construction and Operation of Natural Gas Pipeline

Vehicular construction on public roads near the proposed gas pipeline lateral would increase during construction due to workers and materials moving to and from the pipeline construction areas. TGP is conducting detailed analyses of transportation effects related to the construction and operation of the proposed pipeline as part of the Environmental Report to be submitted with their certificate application that will be filed with FERC for the proposed pipeline. As pipeline construction work is not centralized in one location for any significant period of time, exact traffic increases along roadway intersections cannot be estimated at this time. Approximately two temporary contractor yards would be needed to provide adequate parking for construction staff, contractor management offices, equipment and vehicle staging and storage of pipe and other materials. Construction materials and pipeline components would be delivered by truck. Additional traffic may cause some traffic delays. Once the pipeline begins operations, any traffic increases surrounding the corridor would revert to pre-construction conditions.

Implementation of this alternative would cause minor disturbances to the roadway network and localized roadway degradation along the route to the offsite destinations because of increased truck traffic. The temporary increased traffic over public roadways would result in an increase in the number of vehicle miles traveled on those roadways. This increase in vehicle miles is a factor in injury and fatal traffic crash rates. Therefore, there would be a minor effect related to increased traffic and driver safety.

Minor cumulative effects to roadways may occur as a result of the past/present and RFFAs in proximity to the proposed pipeline. However, effects would be short term and coordination could occur to minimize effects to local commuters.

3.11.2.3.3 Environmental Justice Considerations

Effects to transportation that may occur as a result of the proposed CC plant and natural gas pipeline lateral are not anticipated to have disproportionate and adverse human health or environmental effects on EJ populations in the CUF Reservation and pipeline corridors EJ study areas. These effects would be mostly temporary and minor. Moreover, they would be limited to a relatively small area, along public roads around the TVA-owned CUF Reservation and pipeline corridor. Based on the small proportion of identified low-income populations (two of 16 census block groups) within the EJ study area for the pipeline lateral corridor, and their distance from public roads where effects would be concentrated (Figure 3.4-4), EJ populations are not expected to experience disproportionate effects.

3.11.2.4 Alternative B

3.11.2.4.1 Construction and Operation of CT Plant at Johnsonville Reservation

Project materials and equipment would primarily be delivered to Johnsonville by rail, utilizing the existing rail spur. Equipment used during the construction phase would include trucks, truck-mounted augers and drills, excavators, as well as tracked cranes and bulldozers. TVA estimates a maximum of 180 workers would be employed onsite at the peak of the two-year construction period at Johnsonville. This does not include the construction workforce needed for offsite TL upgrades, if required, as this work is not centralized in one location for any significant period of time. Once constructed, eight to twelve employees could be needed to operate the CTs at JCT in addition to current staff. Assuming one person per commuting vehicle, there would be a peak daily morning inbound traffic volume of 180 vehicles and a daily outbound traffic volume of 180 vehicles for a total of 360 vehicles per day (Table 3.11-7).

The daily workforce during construction of the proposed activities at JCT is expected to be approximately 60 workers per day. Workforce traffic would mainly consist of a mix of passenger cars and light duty trucks (such as delivery trucks). Traffic is assumed to be distributed during a peak morning period (to the site) and a peak evening period (away from the site). Construction-related vehicles (dozers, backhoes, graders, loaders, etc.) would be delivered to or removed from the proposed project sites on flatbed trailers under both the mobilization and demobilization stages of the projects. While the routes for additional traffic volume is not known at this time, this additional traffic may cause marginal traffic delays. Overall, however, the traffic volume generated by the construction workforce and the construction-related vehicles would have a moderate, short-term impact.

Hazardous materials, PCB, used oil, and universal waste would go for offsite disposal/recycling with vendors/locations on TVA's Environmental Restricted Awards List. Nonhazardous wastes would go for disposal as directed by the contractor. Additionally, scrap metal would be recycled at locations as determined by the demolition contractor. While disposal sites have not yet been determined it is estimated that there would be an increase in trips near the site for waste disposal and recycling, which would cause minor and temporary increases in traffic volume.

Minor cumulative effects to transportation, including traffic and local roads, may occur when the action alternative is combined with the proposed Aeroderivative CT project on JCT, particularly if these projects occur concurrently or overlap construction schedules. 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 effects of the proposed actions to transportation are expected to be minor.

Table 3.11-7. Changes in Traffic on Nearby Roadways During Construction of JCT CT Plant

Location (Station Number)	Existing AADT	Existing AADT Plus Construction Traffic	Temporary Traffic Increase to JCT due to Construction Traffic (%)
U.S. Route 70, 2.8 mi east of JCT (43000026)	9,006	9,366	4.0%
U.S. Route 70, 0.8 mi west of JCT (27)	5,120	5,480	7.0%
State Highway 927/Long Street, 1 mi SE of JCT (43000028)	4,134	4,494	8.7%
Country Road 929, 0.8 mi SE of JCT (43000060)	1,905	2,265	18.9%

3.11.2.4.2 Construction and Operation of CT Plant at Gleason Reservation

For the Gleason site, major project components would primarily be delivered to McKenzie, TN by rail, then delivered to the project site by truck and placed in designated project laydown areas until used. It is approximately 13 miles from the rail station to the Gleason site, and it is estimated that approximately 10 truck trips would be needed for the delivery of materials from the rail station to Gleason. All other project materials would be delivered by truck. Equipment used during the construction phase would include trucks, truck-mounted augers and drills, excavators, as well as tracked cranes and bulldozers. TVA estimates a maximum of 180 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 offsite TL upgrades, if required, as this work is not centralized in one location for any significant period of time. Once constructed, eight to twelve employees could be needed to operate the CTs at Gleason in addition to current staff. Assuming one person per commuting vehicle, there would be a peak daily morning inbound traffic volume of 180 vehicles and a daily outbound traffic volume of 180 vehicles for a total of 360 vehicles per day (Table 3.11-8).

The daily workforce during construction of the proposed activities at Gleason is expected to be approximately 60 workers per day. Workforce traffic would mainly consist of a mix of passenger cars and light duty trucks (such as delivery trucks). Traffic is assumed to be distributed during a peak morning period (to the site) and a peak evening period (away from the site). Additional traffic may cause some traffic delays. Overall, however, the traffic volume generated by the construction workforce and the construction-related vehicles would be relatively minor and temporary.

Hazardous materials, PCB, used oil, and universal waste will go for offsite disposal/recycling with vendors/locations on TVA’s Environmental Restricted Awards List. Nonhazardous wastes will go for disposal as directed by the contractor. Additionally, scrap metal will be recycled at locations as determined by the demolition contractor. While disposal sites have not yet been determined, it is estimated that there will be an increase in trips near the site for waste disposal and recycling, which would cause minor and temporary increases in traffic volume.

No cumulative effects to transportation are anticipated at the Gleason Reservation based on the minor and temporary effects to traffic volume and in consideration of the absence of RFFAs at Gleason.

Table 3.11-8. Changes in Traffic Effects on Nearby Roadways During Construction of Gleason CT Plant

Location (Station Number)	Existing AADT	Existing AADT Plus Construction Traffic	Temporary Traffic Increase to Gleason due to Construction Traffic (%)
Janes Mill Road, 0.4 mi north of Gleason (92000168)	212	572	169.8%
Highway 22/TN-22, 0.8 mi south of Gleason (92000091)	7,184	7,544	5.0%

Location (Station Number)	Existing AADT	Existing AADT Plus Construction Traffic	Temporary Traffic Increase to Gleason due to Construction Traffic (%)
Parks Road, 1 mi south of Gleason (92000167)	938	1,298	38.4%

3.11.2.4.3 Transmission and Other Components

Minor transportation effects would occur as a result of increased workforce traffic during the construction of the 40-mile transmission line associated with Alternative B. This work is not centralized in one location for any significant period of time. Because TL construction would occur over a 40-mile range, traffic effects due to construction would be widely distributed along the length of the line. Thus, it can be assumed that increases in traffic volume would be minor and temporary.

Implementation of this alternative would cause minor disturbances to the roadway network, and localized roadway degradation along the route to the offsite destinations because of increased truck traffic. The temporary increased traffic over public roadways would result in an increase in the number of vehicle miles traveled on those roadways. This increase in vehicle miles is a factor in injury and fatal traffic crash rates and would have a minor effect related to increased traffic and driver safety.

3.11.2.4.4 Environmental Justice Considerations

Effects to transportation that may occur as a result of the proposed CT facilities and transmission line activities would be mostly temporary, minor, limited to a relatively small area along the public roads around the TVA-owned reservations and transmission line corridor, and the effect would be the same for other populations utilizing the affected areas. While there are no EJ populations in the immediate vicinity of the Gleason Reservation, minority EJ populations are present in the immediate vicinity of the JCT Reservation. These short-term negative conditions would affect EJ populations given their proximity to the JCT Reservation. As non-EJ populations are adjacent to the plant vicinity on the west and south sides, the negative effects on transportation corridors are not anticipated to be disproportionate on EJ populations. Transportation effects from transmission line construction and upgrade activities are expected to be short-term and minimal. Thus, minimal to no effects are anticipated on EJ populations. Since EJ and non-EJ populations would experience these effects, they are not anticipated to be disproportionate on EJ populations.

Similar effects from the proposed CT facilities at JCT could be anticipated from other projects in the area as a result of construction activities. One example is the proposed JCT Aeroderivative project. The combined projects could cause cumulative minor, temporary effects to traffic and local roads if these projects occur concurrently or overlap construction schedules. Such effects would be mitigated by implementing appropriate traffic controls, such as by staging of trucks, spacing logistics, staggering work shifts, or timing truck traffic to occur during lighter traffic hours. EJ populations, like the non-EJ populations also nearby, may experience cumulative effects from implementation of Alternative B.

3.11.2.5 Alternative C

3.11.2.5.1 Construction and Operation of Solar and Storage Facilities

Traffic associated with the construction of solar facilities would include semi-truck trips to deliver materials and construction equipment to the site and remove packaging materials; employee passenger vehicles; dump trucks; and concrete trucks. During operations, project-specific traffic would largely be reduced to daily employee trips for security, maintenance, and repairs onsite with occasional larger vehicles such as crane trucks and forklifts being transported onsite for maintenance as needed. For reference, 80 employees were utilized during the construction period of the 20-MW TVA Cumberland Solar Project (4 employees per MW), and 250 employees were utilized during the construction period of the 150-MW TVA Elora Solar Energy Center (or 1.7 employees per MW) (TVA 2018b, TVA 2020a). Temporary traffic increases may be mitigated, if necessary, by broadcasting delays and highlighting alternate routes on news channels, radio, and on signage or adding temporary HOV lanes.

Minor cumulative effects to traffic and transportation may occur if Alternative C coincides with the proposed expansion of 10,000 MW of solar facilities by 2035. Additional construction traffic and workforce traffic may be experienced on highways and local roads. However, effects would be short term and coordination could occur to minimize effects to local travelers.

3.11.2.5.2 Transmission and Other Components

Minor transportation effects would occur as a result of increased workforce traffic during the construction of the transmission lines associated with the solar and storage sites under Alternative C. This work is not centralized in one location for any significant period of time. Transportation changes as a result of TL construction cannot be determined at this time and would be part of future NEPA reviews. Increases in traffic volume would be minor and temporary.

3.11.2.5.3 Environmental Justice Considerations

Transportation effects occurring as a result of the proposed solar facilities and transmission line activities are not anticipated to have disproportionate and adverse human health or environmental effects on EJ populations in the EJ study area of Alternative C. These effects would be mostly temporary, minor, limited to a relatively small area around the project sites and transmission line activities, and would be anticipated to be the same for other populations utilizing the affected areas. To determine disproportionate effects for a given solar facility, detailed EJ analyses would occur for each solar facility and transmission line activity under future NEPA reviews.

3.12 Utilities

3.12.1 Affected Environment

3.12.1.1 CUF Reservation

The CUF Site is located in an industrial and agricultural area in Cumberland City, Stewart County, TN. In addition to various mobile providers, telecommunication services in the Project Site vicinity are provided by AT&T, HughesNet, and Viasat (AT&T 2021; HughesNet 2021; Viasat 2021).

Electrical service is provided by Cumberland Electric Membership Corporation (CEMC), which distributes power provided by TVA (CEMC 2021). Existing power lines are present in the project area along Wickham Ave, Old Hwy 149, Cumberland City Rd, and other major and minor roads in the vicinity. Nine TL ROWs extend through the CUF site. TVA's Cumberland 161-kV TLs cross the southern portion of the site in a northeast-southwest and a southeast-west orientation.

TVA's Cumberland 500-kV TLs cross the western portion of the site in an east-west orientation (U.S. Energy Information Administration [EIA] 2021). There is not currently natural gas service in Cumberland City (Town of Cumberland City; personal communication; September 24, 2021).

As of 2015, the two coal-fired units at CUF had a water withdrawal rate of 2,319.2 MGD and a return of 2,311.6 MGD. With a net generation of 14,438,617 megawatt hours/year, CUF has a water use factor of 58,627 gallons/ megawatt hour (MWh) (TVA 2019b). According to the Town of Cumberland City, water service in the Project Site vicinity is provided either by the Cumberland City Utilities or private wells and septic systems. Due to being predominantly outside of incorporated municipality limits, water service at CUF and within the Project Site vicinity is provided either by the Cumberland City Utilities or private wells and septic systems (Town of Cumberland City; personal communication; September 24, 2021). Given their respective proximity to CUF, the residences located adjacent to the southern and northern portions of the Project Site may have water service from Cumberland City Utilities.

3.12.1.2 Alternative A

3.12.1.2.1 Proposed CC Plant Site

Utilities in the vicinity of the proposed CC plant site are generally described in Section 3.12.1.1.

3.12.1.2.2 Natural Gas Pipeline Lateral Corridor

The proposed approximately 32-mile pipeline lateral associated with Alternative A commences at milepost 0 in Dickson County, Tennessee, at an interconnection with TGP's existing Lines 100-3 and 100-4, runs northwest through Houston County, and terminates in at milepost 32 at the CUF site in Stewart County, Tennessee. The corridor is largely developed open space in rural areas with some roadway intersections. The following provides a summary of existing utilities in proximity to the pipeline lateral; TGP would provide information on associated utilities in the Environmental Report to be submitted with their certificate application that will be filed with the FERC for the proposed pipeline. In addition to various mobile providers, telecommunication services in the corridor's vicinity are provided by AT&T, Xfinity, HughesNet, TEC, and Viasat (AT&T 2021; Xfinity 2021; HughesNet 2021; TEC 2021; Viasat 2021). In the vicinity of the corridor, electrical service is provided CEMC, Meriwether Lewis Electric Cooperative, and Dickson Electric. Natural gas is distributed by the West Tennessee Public Utilities District. Given the rural nature of the area, the residences located adjacent to the corridor are not anticipated to have natural gas service. The West Tennessee Public Utilities District indicated that rural areas outside of city limits are less likely to have gas services (West Tennessee Public Utilities District, personal communication, October 2021).

As noted in Section 2.1.3.2.1, the Cumberland Reservation is located 30 miles from a major interstate pipeline with adequate capacity to serve a new CC plant. The construction and operation of a new CC plant would require construction of approximately 32 miles of new 30-inch-diameter natural gas pipeline lateral and associated gas system infrastructure in Dickson, Houston, and Stewart counties, Tennessee. The proposed gas pipeline lateral overview map shown on Figure 2.1-6 identifies the approximate route of a primary supply line that would be generally built along a 500 kV TL ROW. Due to the rural nature of the corridor, water supply may come from private wells or sewer systems, aside from the origination point of the corridor, which will likely utilize the same water source as CUF. Due to being predominantly outside of incorporated municipality limits, water service along the corridor is likely provided by private wells and septic systems. The residents in the areas of the corridor near Erin, TN may have water provided by the City of Erin Water Department.

3.12.1.3 Alternative B

3.12.1.3.1 Johnsonville Reservation

The JCT is located in an industrial area near New Johnsonville in Humphreys County, Tennessee. In addition to various mobile providers, telecommunication services in the Project Site vicinity are provided by HughesNet, Viasat, and TDS (TDS 2021; HughesNet 2021; Viasat 2021).

In the JCT site vicinity, electrical service is provided by Meriwether Lewis Electric Cooperative (MLEC), which distributes power provided by TVA (MLEC 2021). Existing power lines are present in the project area along North Street and other major and minor roads in the vicinity. Natural gas is distributed by the Humphreys County Utility District. As the JCT is located within the city limits, the residences located adjacent to the JCT would likely have natural gas service (Humphreys County Utility District 2021). Water service at JCT and in the JCT vicinity is provided by the City of New Johnsonville Water Department. As JCT is located within the city limits, the residences located adjacent to JCT may have water service from the City of New Johnsonville Water Department.

3.12.1.3.2 Gleason Reservation

The Project Site is located in a rural, unincorporated area near Dresden in Weakley County, Tennessee. In addition to various mobile providers, telecommunication services in the Gleason site vicinity are provided by AT&T, HughesNet, Viasat, EarthLink, and Spectrum (AT&T 2021; HughesNet 2021; Viasat 2021; EarthLink 2021; Spectrum 2021). In the vicinity of the site, electrical service is provided by Weakley County Municipal Electric System (WCMES), which distributes power provided by TVA (WCMES 2021). Existing power lines are present in the project area along Janes Mill Road and other major and minor roads in the vicinity. Natural gas is distributed by the West Tennessee Public Utilities District. Due to Gleason's existence outside of incorporated municipality limits, water service at Gleason and in the vicinity of the Project Site is provided either by Gleason Water & Wastewater or private wells and septic systems (Gleason Water & Wastewater 2021).

3.12.1.3.3 Transmission Corridors

The 40-mile TL associated with Alternative B begins east of Highway 45 in Weakley County and terminates west of Austin Peay Memorial Highway in Henry County, 28 miles northwest of the JCT site. The TL corridor is largely agricultural with intersections with Highways and State Routes. In addition to various mobile providers, telecommunication services in the corridor's vicinity are provided by AT&T, HughesNet, Viasat, EarthLink, and Spectrum (AT&T 2021; HughesNet 2021; Viasat 2021; EarthLink 2021; Spectrum 2021). In the vicinity of the site, electrical service is provided by Weakley County Municipal Electric System (WCMES), which distributes power provided by TVA (WCMES 2021). Natural gas is distributed by the West Tennessee Public Utilities District. Given the rural nature of the area, the residences located adjacent to the corridor may not have natural gas service (West Tennessee Public Utilities District, personal communication, October 2021). Due to being predominantly outside of incorporated municipality limits, water service along the corridor is likely provided by private wells and septic systems. The residents in the areas of the corridor near Dresden may have water provided by the Dresden Water Department.

3.12.1.4 Alternative C

3.12.1.4.1 Middle Tennessee TVA Power Service Area

Middle Tennessee power from the proposed solar and storage facilities would typically be delivered by direct connection to TVA's transmission system or via interconnections with local power companies that distribute power from TVA. Effects on local utilities would be assessed in future NEPA reviews for each solar and storage site.

TVA anticipates that a portion of the solar facilities proposed under Alternative C will need to be physically located in the Middle Tennessee region in order to offset transmission system upgrades that otherwise may be required following the retirement of CUF. The TVA PSA contains most of the Tennessee River Basin, which is considered one of the most water rich basins in the United States (TVA 2019). The Tennessee River Basin, which is about half of the TVA PSA, has been defined as the most intensively used basin in the contiguous United States as measured by intensity of freshwater withdrawals in gallons per day per square mile (gal/d/mi2) (Hutson et al. 2004). While the withdrawal rate is highest, the basin has the lowest consumptive use in the nation by returning about 96 percent of the withdrawals back for downstream use (Bowen and Springston 2018).

In 2015, estimated average daily water withdrawals in the TVA PSA totaled 12,966 MGD (Dieter et al. 2018, Bowen and Springston 2018). About 6.6 percent of these water withdrawals were groundwater and the remainder was surface water. The largest water use (77.7 percent of all withdrawals) was for thermoelectric generation as shown in Figure 3.12-1. Even though thermoelectric generation has the greatest withdrawal, about 99.2 percent is recycled and returned for downstream use in the TVA system (Bowen and Springston 2018).

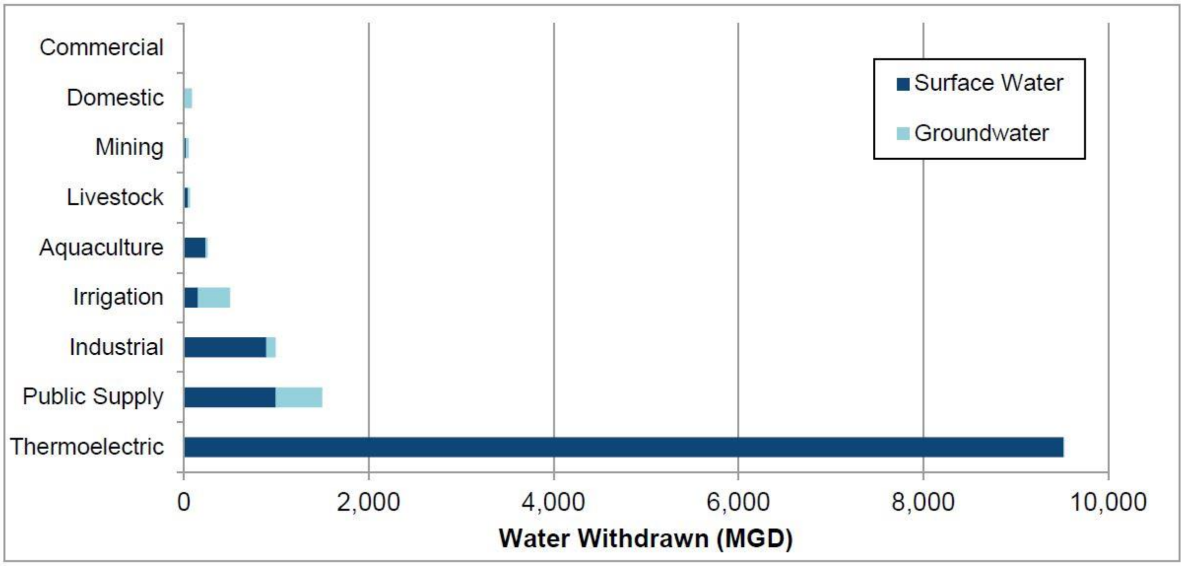

Figure 3.12-1. 2015 water withdrawals in the TVA power service area by source and type of use Source: Dieter et al. (2018), Bowen and Springston (2018).

Since 1950, the annual increase in groundwater withdrawals for public supply in Tennessee has averaged about 2.2 percent and the increase in surface water withdrawals has averaged about 3.5 percent (Figure 3.12-2). For the first time since 1950, there was a decrease in surface water withdrawal for public supply systems in Tennessee between 2010 and 2015. Although these data are for Tennessee public water supplies, they are representative of the overall trends in water use for the TVA PSA.

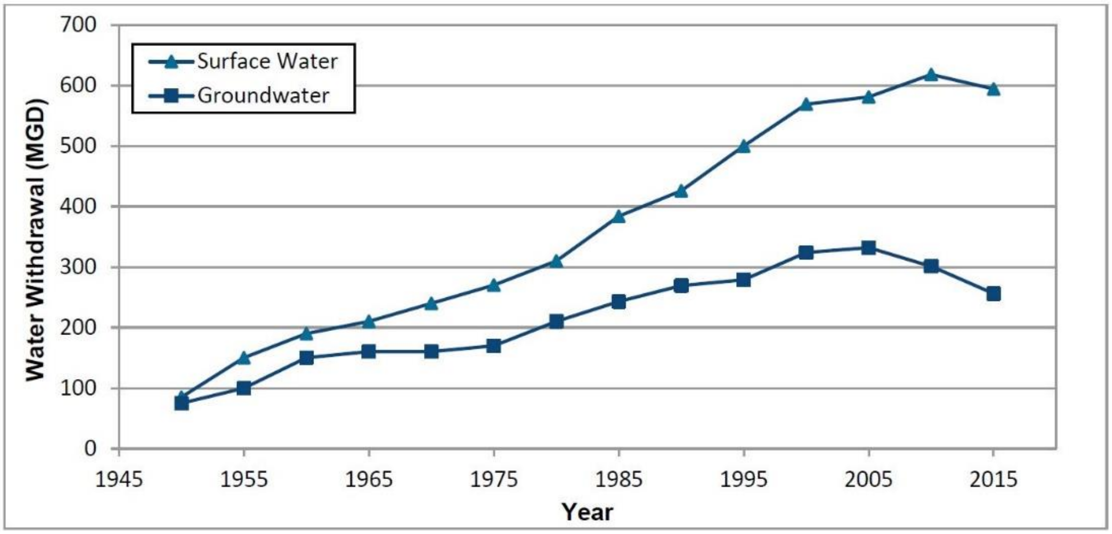

Figure 3.12-2. Groundwater and surface water withdrawals by water public systems in Tennessee, 1950 to 2015.

Source: Adapted from Webbers (2003). Additional Data: Kenny et al. (2009), Bohac and Bowen (2012), Bowen and Springston (2018).

3.12.2 Environmental Consequences

3.12.2.1 The No Action Alternative

Under the No Action Alternative, TVA would continue to operate and maintain the coal-fired units at CUF; therefore, no project-related effects to local utilities would occur. Existing on-site utilities would likely remain unchanged, with the exception of potential upgrades and maintenance.

3.12.2.2 Retirement, Decommissioning, Decontamination, and Deconstruction of CUF Plant

Under all Action Alternatives, TVA would retire, decommission, decontaminate, and deconstruct the CUF units and site. All buried utilities would be cut and capped within the project boundary and abandoned in place if they do not interfere with other ongoing projects in the vicinity. All hollow pipe utilities would be decommissioned and sealed with a mechanical cap or plug. The site would be restored to grade to provide proper drainage. The 161-kV and 500-kV switchyards (indicated by yellow cross-hatching in Figure 2.1-1.) would remain in place and operational.

Additional modifications to existing utilities on or surrounding the CUF site would occur with implementation of Alternative A, as detailed in Section 2.1.3.2.2. Electrical service to CUF would be provided by CEMC, and CEMC would coordinate with customers if outages were necessary. The project would obtain water by connection to a municipal source or by delivery via water trucks, if necessary. Thus, water service for the project may be obtained through the City of Erin Water Department. No cumulative effects to utilities are anticipated.

3.12.2.2.1 Environmental Justice Considerations

Effects to utilities that would occur as a result of CUF coal facility retirement and D4 activities would be temporary and minor, with only short-term outages anticipated in the immediate vicinity, where EJ populations are limited (one out of 10 census block groups in the EJ study area are low-income EJ populations; also see Figure 3.4-3). Since similar effects would be experienced by the limited EJ populations in the vicinity as other populations, they are not anticipated to be disproportionate.

3.12.2.3 Alternative A

3.12.2.3.1 Construction and Operation of CC Plant, Transmission Lines, and Other Components at CUF Plant Site

Under Alternative A, TVA would construct a new CC plant of approximately 1,450 MW at CUF including transmission lines and other components. The CC plant would be fueled by a reliable supply of natural gas from the proposed 32-mile-long pipeline. The potential corridor for the 32-mile-long new natural gas pipeline is generally located adjacent to an existing TVA transmission line extending from Dickson County, Tennessee, through Houston County, and terminating at the proposed CC plant in Stewart County, Tennessee. TVA would construct a new switchyard at the CC plant connecting two existing 500-kV TLs and make other transmission system modifications to transmit the energy generated by the new CC plant.

Natural gas-fueled CC plants (gas turbine followed by a steam turbine) require water for steam generation and condensation. As of 2015, the water use factors for TVA's CC plants ranged from 208-935 gallons/MWh. TVA has elected to use air cooling at the CC plant to minimize effects to the nearby Cumberland River, groundwater, or overall water supply. The facility will require potable water, which would be obtained from the existing public supply at CUF (City of Erin Water Department).

CC compressor washing also requires demineralized water. Wash effluent would be collected in tanks and, after analysis, disposed of at an approved wastewater treatment facility off-site. Demineralized water would be made onsite and stored onsite in two, one-million-gallon tanks that would be constructed at the time of the CC plant.

The replacement of the CUF coal-fired units with CC units would result in reduced water use at the site (TVA 2019b). Construction of CC plant components at CUF would require below-ground construction activities that may encounter groundwater. Such activities include installation of deep foundations, if needed, to support the proposed CC plant and associated facilities. However, because such activities and their effects to groundwater patterns or availability are localized and generally limited to the construction phase, effects from construction are expected to be minor. TLs and switchyards do not require water to operate, so water supply use would be limited to the construction period and therefore temporary.

Prior to starting plant construction, TVA would coordinate with existing telecommunications, electricity, natural gas, and water and sewer utilities. Adverse effects to existing utilities would not occur. No cumulative effects to utilities are anticipated.

3.12.2.3.2 Construction and Operation of Natural Gas Pipeline

The construction and operation of a new CC plant will require construction of approximately 32 miles of new natural gas pipeline lateral and gas system infrastructure to connect the plant to the new gas pipeline lateral. Compression requirements, if any, will be determined by the technical requirements of the CT brand chosen and located on the CUF Reservation. TGP is assessing utility effects as part of the Environmental Report to be submitted with their certificate application that will be filed with the FERC for the proposed pipeline. Service disruptions will be minimized through coordination between TGP, TVA, and the affected utilities.

The natural gas pipeline lateral will not require water to operate, so water supply use would be limited to the construction period. Water supply for construction would be obtained from various sources such as local wells, ponds, trucking-in water or municipal sources. Water supply sources would be identified as part of the Environmental Report to be submitted with the certificate application that will be filed with the FERC for the proposed pipeline. The development of the natural gas pipeline lateral trench to bury the pipeline at sufficient depth to allow for the minimum cover requirements to the top of the pipe in accordance with USDOT regulations pursuant to the Natural Gas Pipeline Safety Act of 1968, landowner requests, and permit conditions, would require below ground construction activities that may encounter groundwater. However, because such activities and their effects to groundwater patterns or availability are localized and generally limited to the construction phase, effects from construction are expected to be minor. No cumulative effects to utilities are anticipated.

3.12.2.3.3 Environmental Justice Considerations

CC plant-related effects to utilities would be reduced in comparison to existing conditions and minor, with effects occurring on a TVA-owned reservation, where no populations exist (Figure 3.4-3). Effects occurring as a result of pipeline activities, while still minor, would be outside of TVA-owned reservations. Non-EJ populations are more prominent in the pipeline corridor EJ study area, with nine out of 10 census block groups being non-EJ populations (see also Figure 3.4-4). While effects may be experienced by EJ populations located in the far eastern extreme of the pipeline corridor EJ study area, these effects would be similar to those experienced by non-EJ populations and, thus, are not anticipated to be disproportionate.

3.12.2.4 Alternative B

TVA proposes to construct CT plants with a combined total capacity of approximately 1,530 MW on the JCT and Gleason Reservations. Both sites currently have operating natural gas-fired generation facilities, adequate natural gas supply, and include transmission interconnections to the TVA system.

3.12.2.4.1 Construction and Operation of CT Plant at Johnsonville Reservation

Some water treatment may be required to support the new CT plants under Alternative B. The plant would require potable water, which would be obtained from the City of New Johnsonville Water Department. Up to about 130 GPM at JCT would be used for inlet air evaporative cooling in summer ambient temperatures. Potable water for domestic use and safety showers would be obtained from the existing public supply. The replacement of the CUF coal-fired units with CT units would result in an overall reduction in water use (TVA 2019b).

The CT plant would be fueled by a reliable supply of natural gas. Preliminary estimates indicate an upper bound of 220 MCF/day of natural gas would be needed to fuel the CT plant at JCT, running at maximum capacity. This demand would require piping to connect the CT plant to the existing natural gas pipeline lateral and metering station, and any necessary expansion of the existing metering station would be accommodated within the existing reservation boundaries. New gas compression would likely be needed at Johnsonville, which would be located onsite and constructed and operated by TVA.

Electrical service to JCT is provided by MLEC, and MLEC would coordinate with customers if outages were necessary. TVA would coordinate with existing telecommunications, electricity, natural gas, and water and sewer utilities prior to starting construction. Adverse effects to existing utilities would not occur. No cumulative effects to utilities are anticipated.

3.12.2.4.2 Construction and Operation of CT Plant at Gleason Reservation

Some water treatment may be required to support the new CT plant under Alternative B. The plant would require potable water, which would be obtained from Gleason Water & Wastewater. Up to about 100 GPM at Gleason would be used for inlet air evaporative cooling in summer ambient temperatures. Potable water for domestic use and safety showers would be obtained from the existing public supply. The replacement of the CUF coal-fired units with CT units would result in an overall reduced water use (TVA 2019b). New gas compression may be required at Gleason to supply the new CT plant.

At the Gleason site, the CT plant would also be fueled by a reliable supply of up to 165 million standard cubic feet per day of natural gas, with Gleason running at maximum capacity. This demand would require piping to connect the CT plant to the existing natural gas pipeline lateral and metering station, and any necessary expansion of the existing metering station would be accommodated within the existing reservation boundaries. New gas compression would likely be needed at Gleason, which would be located onsite and constructed and operated by TVA.

Electrical service to Gleason is provided by WCMES, and WCMES would coordinate with customers if outages were necessary. TVA would coordinate with existing telecommunications, electricity, natural gas, and water and sewer utilities prior to starting construction. Adverse effects to existing utilities would not occur. No cumulative effects to utilities are anticipated.

3.12.2.4.3 Transmission and Other Components

The onsite transmission system modifications necessary to transmit the energy generated by the proposed Johnsonville and Gleason CT plants are described in Section 2.1.4.4. Alternative B would also require the construction of a new approximately 40-mile, 500-kV TL in Weakley and Henry counties. The components of this TL would be sited in a manner to avoid effects to existing utilities, such as electrical distribution lines and buried pipelines, within or in the vicinity of the construction corridor. Prior to initiating construction, TVA would coordinate with the potentially affected utilities and mitigate any potential effects to the utilities. Any utility service interruptions would be minimized and overall effects to area utilities would be minimal. TLs and switchyards do not require water to operate, so water supply would not be impacted due to the transmission upgrades associated with this alternative.

3.12.2.4.4 Environmental Justice Considerations

For JCT and Gleason Reservations, effects of utility effects would be minor and limited to the immediate TVA-owned reservations. While there are no EJ populations in the immediate vicinity of the Gleason Reservation, minority EJ populations are present in the immediate vicinity of the JCT Reservation. However, because utility effects will be limited to the immediate TVA-owned reservation, these effects will occur where no EJ populations reside. Utility effects from transmission line construction and upgrade activities are expected to be short-term, minimal and are anticipated to result in minimal to no effects to EJ populations. Since EJ and non-EJ populations would experience the potential minimal effects, they are not anticipated to be disproportionate on EJ populations.

3.12.2.5 Alternative C

3.12.2.5.1 Construction and Operation of Solar and Storage Facilities

Under Alternative C, TVA would add 3,000 MW of solar generating facilities paired with 1,700 MW of battery storage facilities, primarily in Middle Tennessee, utilizing a combination of PPAs with third-party developers and TVA-built and operated facilities. PV facilities do not typically require a water source for operation but may require potable water for onsite facilities or sewer during operation. BESS facilities typically require a water supply to support fire safety systems. Both PV and BESS facilities typically require electrical service and telecommunications services. Utility effects would be minimized by identifying and coordinating with utilities early prior to construction to avoid service disruptions. Minor effects to existing utilities or water supply are anticipated under Alternative C. While additional solar facilities may be constructed in

Middle Tennessee, cumulative effects would be minor as developers and TVA would identify utility locations early and coordinate to avoid disruptions.

3.12.2.5.2 Transmission and Other Components

The construction of TLs associated with solar and BESS sites would not affect water supply or other utilities. The components of any necessary TLs would be sited in a manner to avoid effects to existing utilities, such as electrical distribution lines and buried pipelines, within or in the vicinity of the construction corridor. Prior to initiating construction, TVA would coordinate with the potentially affected utilities and mitigate any potential effects to the utilities. Any utility service interruptions would be minimized and overall effects to area utilities would be minimal. TLs and switchyards do not require water to operate, so water supply would not be impacted due to the transmission upgrades associated with this alternative.

3.12.2.5.3 Environmental Justice Considerations

Effects to utilities that would occur as a result of the proposed solar facilities and transmission line activity would be minor and the same for other populations utilizing the affected utility resources. While utilities effects would be minimized or mitigated, such effects would be anticipated to be the same for EJ populations and other populations in the vicinity. To determine disproportionate effects for a given solar facility, detailed EJ analyses would occur for each solar facility and transmission line activity under future NEPA reviews.

3.13 Cultural Resources

3.13.1 Regulatory Framework

Cultural resources include Pre-Contact and historic archaeological sites, districts, buildings, structures, and objects, as well as locations of important historic events that lack material evidence of those events. Cultural resources are considered historic properties if included in, or considered eligible for inclusion in, the National Register of Historic Places (NRHP) maintained by the NPS. The eligibility of a resource for inclusion in the NRHP 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 and association, and:

1) are associated with important historical events; or
2) are associated with the lives of significant historic persons; or
3) embody distinctive characteristics of a type, period, or method of construction or represent the work of a master, or have high artistic value; or
4) have yielded or may yield information (data) important in history or prehistory.

Because of their importance to the Nation's heritage, historic properties are protected by several laws. Federal agencies, including TVA, have a statutory obligation to facilitate the preservation of historic properties, stemming primarily from the National Historic Preservation Act (NHPA; 16 U.S.C. §§ 470 et seq.). Other relevant laws include the Archaeological and Historic Preservation Act (16 U.S.C. §§ 469-469c), Archaeological Resources Protection Act (16 U.S.C. §§ 470aa-470mm) and the Native American Graves Protection and Repatriation Act (25 U.S.C. §§ 3001-3013).

Section 106 of the NHPA requires federal agencies to 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) of the state in which the action would occur and with any other interested consulting parties, including federally recognized Indian tribes.

Section 110 of the NHPA sets out the broad historic preservation responsibilities of federal agencies and is intended to ensure that historic preservation is fully integrated into their ongoing programs. Federal agencies are responsible for identifying and protecting historic properties and avoiding unnecessary damage to them. Section 110 also charges each federal agency with the affirmative responsibility for considering projects and programs that further the purposes of the NHPA, and it declares that the costs of preservation activities are eligible project costs in all undertakings conducted or assisted by a federal agency.

3.13.2 Affected Environment

Existing conditions for cultural resources are presented for the vicinity of the project sites, where concentrated project effects to this resource area could occur. Project affected environments are also assessed for the proposed natural gas pipeline lateral, new TLs, and TL upgrade activities.

3.13.2.1 CUF Reservation

There have been several field-based cultural resources surveys previously completed within the boundaries of the CUF Reservation, documenting 33 recorded archaeological sites within the CUF Reservation. These sites are summarized in Table 3.13-1. Five of these sites (40SW702, 40SW720, 40SW721, 40SW723, and 40SW799) contain historic cemeteries. Ten of these sites (40SW63, 40SW703, 40SW704, 40SW708, 40SW710, 40SW711, 40SW715, 40SW719, 40SW723, and 40SW702/1285974), indicated by boldface type in Table 3.13-1, are located within or immediately adjacent to the potential CC plant site on the CUF Reservation or within the proposed transmission corridor. TVA included CUF in a historic architectural assessment in 2008; no NRHP-eligible resources were identified. Based on concurrence by the TN SHPO, TVA considers CUF ineligible for the NRHP.

Table 3.13-1. Recorded Archaeological Sites Within the CUF Reservation

Site Number	Site Type	NRHP Recommendation
40SW47	Pre-Contact Archaic village site	Undetermined
40SW49	Pre-Contact nondiagnostic open habitation	Undetermined
40SW63	**Pre-Contact Early to Late Archaic and Early to Middle Woodland open habitation**	**Undetermined**
40SW201	Pre-Contact Late Archaic, Woodland, and Mississippian open habitation	Undetermined
40SW219	Early to middle 19th century iron furnace	Listed; mitigated and destroyed
40SW699	Early to middle 19th century iron mining pits	Not Eligible
40SW701	Pre-Contact nondiagnostic open habitation; 19th and 20th century historic scatter	Not Eligible

Site Number	Site Type	NRHP Recommendation
40SW702/1285974	**Pre-Contact Late Archaic to Early Woodland open habitation; 1800-1950 Graveyard Hill Cemetery**	**Potentially Eligible**
40SW703	**Pre-Contact nondiagnostic open habitation**	**Not Eligible**
40SW704	**Pre-Contact nondiagnostic open habitation**	**Not Eligible**
40SW705	Pre-Contact nondiagnostic open habitation	Not Eligible
40SW706	Pre-Contact nondiagnostic open habitation	Not Eligible
40SW708	**Pre-Contact nondiagnostic open habitation**	**Not Eligible**
40SW710	**Pre-Contact Middle to Late Archaic open habitation; 20th century domestic scatter**	**Potentially Eligible**
40SW711	**Pre-Contact nondiagnostic open habitation**	**Not Eligible**
40SW712	Pre-Contact nondiagnostic open habitation	Not Eligible
40SW713	Pre-Contact nondiagnostic open habitation	Not Eligible
40SW714	Pre-Contact nondiagnostic open habitation	Not Eligible
40SW715	**Pre-Contact nondiagnostic open habitation**	**Not Eligible**
40SW716	Early to middle 20th century farmstead	Not Eligible
40SW717	Middle 19th to 20th century roadbed	Not Eligible
40SW719	**Middle 19th to 20th century roadbed**	**Not Eligible**
40SW720	1900-2011 Parrott Cemetery	Not Eligible
40SW721	1900-1950 Brosheer Cemetery	Not Eligible
40SW722	Early to middle 19th century iron mining pit	Not Eligible
40SW723/SW0074 5/NRHP 88000262	**19th, 20th, and early 21st century Brunson-Hollister House and family cemetery**	**Eligible**
40SW796	Pre-Contact nondiagnostic open habitation	Recommended Not Eligible
40SW797	Pre-Contact nondiagnostic open habitation	Recommended Not Eligible
40SW798	Pre-Contact non-diagnostic open habitation	Recommended Not Eligible
40SW799	Pre-Contact nondiagnostic open habitation; 1720-1860 private cemetery	Undetermined
40SW800	Pre-Contact nondiagnostic open habitation	Recommended Not Eligible

Site Number	Site Type	NRHP Recommendation
40SW801	Pre-Contact nondiagnostic open habitation	Undetermined
40SW802	Pre-Contact nondiagnostic open habitation	Recommended Not Eligible

***bold sites are within/immediately adjacent to the potential CC plant project area or transmission corridor**

There are 57 previously identified historic architectural resources within a 0.5-mile search radius of CUF. These resources are summarized in Table 3.13-2 and depicted on Figure 3.13-1. One of these resources (SW-745), known as the Henry Hollister House (also known as the Jesse Brunson Place), is located immediately adjacent to the proposed CC plant. This property includes a ca. 1850 house and historic cemetery. The Henry Hollister House was listed in the NRHP in 1988 for its significance under Criterion B, for its association with a prominent ironmaster during the height of the Western Highland Rim iron industry, and under Criterion C as a good example of transitional Greek Revival/Italianate design. This property is associated with historic archaeological site 40SW723, which TVA and the Tennessee State Historic Preservation Officer (SHPO) have agreed is eligible for listing in the NRHP.

There are eight mapped previously surveyed areas within a 0.5-mile search radius of CUF. In correspondence dated December 20, 2021, the Tennessee Department of Archaeology (TDOA) noted that this list is not comprehensive and there may be negative finding reports nearby or references to additional publications on site records.

Table 3.13-2. Recorded Historic Architectural Resources On and Within 0.5 Mile of the CUF Reservation

Resource	Name	Construction Date	NRHP Status
SW-744	DR-Scott House	1898	Not Eligible, non-extant
SW-745	**Jesse Brunson Place**	**1781**	**Eligible**
SW-747	Christian-School House	1870	Not Eligible, non-extant
SW-748	Gordon Schmid Smokehouse	1890	Not Eligible, non-extant
SW-749	Old Parchman Place	1881	Not Eligible
SW-750	Billy Ballard Place	1931	Not Eligible
SW-751	Old Ford Place	1881	Not Eligible
SW-753	Old Lowery Place	1881	Not Eligible
SW-754	Lowery Barn	1881	Not Eligible
SW-755	Old Lowery-Smokehouse	1881	Not Eligible
SW-758	The Old Holley House	1881	Not Eligible
SW-759	N/A	1930	Not Eligible
SW-761	N/A	Unknown	Not Eligible
SW-764	Charles Finch	1930	Not Eligible
SW-766	G.L. Landis	1930	Not Eligible
SW-767	G.L. Landis	1930	Not Eligible
SW-768	Cleo-Summers	1906	Not Eligible
SW-769	Old Wallace’s Grocery	1916	Not Eligible
SW-770	Thomas and Bradford	1910	Not Eligible
SW-772	Old Christian-Store	1920	Not Eligible

Resource	Name	Construction Date	NRHP Status
SW-773	G.L. Landis House	1920	Not Eligible
SW-774	G.C. Bass House	1906	Not Eligible
SW-775	Henry Clay Thomas	1920	Not Eligible
SW-776	Herbert Parchman	1925	Not Eligible
SW-780	Church of Christ	1930	Not Eligible
SW-783	Old Crockarell House	1910	Not Eligible
SW-784	Workshop for C.C. Academy	1930	Not Eligible
SW-785	Jim McCracken	1900	Not Eligible
SW-786	Principal's House	1885	Not Eligible
SW-787	The Brocadice House	1925	Not Eligible
SW-788	DR-Scott Place	1911	Not Eligible
SW-789	Kate & G.L. Landis	1843	Not Eligible
SW-790	W.T. Thomas-School	1925	Not Eligible
SW-791	Old Ballard Place	1831	Not Eligible
SW-792	N/A	1841	Not Eligible
SW-793	N/A	1901	Not Eligible
SW-794	Jim Walden House	1900	Not Eligible
SW-795	Old DR-Scott Place	1881	Not Eligible
SW-796	Old S.E. Bradford Place	1881	Not Eligible
SW-797	N/A	Unknown	Not Eligible
SW-798	Gurley Wilson	1906	Not Eligible
SW-799	Old Williams-Bailey Place	1885	Not Eligible
SW-800	Reynolds Place	1905	Not Eligible
SW-801	Christian G. Schmid	1890	Not Eligible
SW-835	Richardson House	1930	Not Eligible
SW-838	N/A	1900	Not Eligible, non-extant
SW-839	N/A	1900	Undetermined
HO-HS-1	N/A	1948	Not Eligible
SW-BR-10	N/A	c. 1960	Not Eligible
SW-CE-2	N/A	Unknown	Not Eligible
SW-CH-7	N/A	c. 1910	Not Eligible
SW-HS-1	N/A	c. 1900	Not Eligible
SW-HS-4	N/A	c. 1960	Not Eligible
SW-HS-5	N/A	c. 1965	Not Eligible
SW-HS-6	N/A	c. 1930	Not Eligible
SW-HS-8	N/A	1948	Not Eligible
SW-HS-9	N/A	c. 1940	Not Eligible

***Bold resource is eligible for listing in the NRHP**

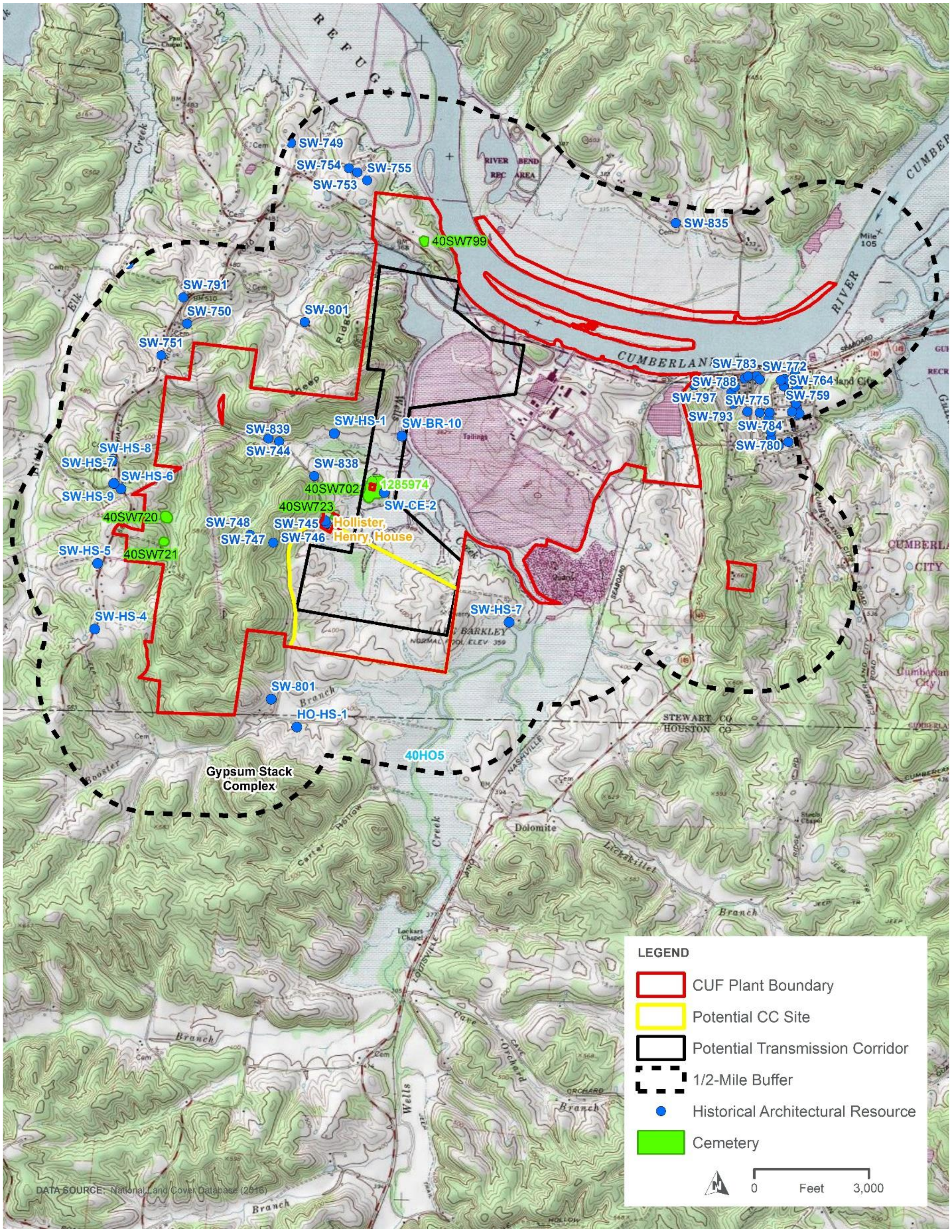

Figure 3.13-1. Previously Recorded Historic Architectural Resources Within 0.5 Mile of the CUF Reservation.

3.13.2.2 Alternative A

3.13.2.2.1 Construction and Operation of CC Plant, Transmission Lines, and Other Components at CUF Plant Site

As noted above in Table 3.13-2, there are 13 previously identified archaeological sites (40SW47, 40SW63, 40SW201, 40SW702, 40SW703, 40SW704, 40SW705, 40SW708, 40SW710, 40SW711, 40SW715, 40SW719, and 40SW723) located within or immediately adjacent to the proposed CC plant site and/or transmission line corridor. Six of these sites (Sites 40SW47, 40SW63, 40SW201, 40SW702, 40SW710, and 40SW723) have unknown NRHP eligibility or are currently eligible or potentially eligible for listing in the NRHP.

- Site 40SW47, mapped within the proposed transmission line corridor, consists of a Pre-Contact Archaic village site; the NRHP eligibility of this site is unknown. However, two prior archaeological surveys (Barrett and Karypnec 2008; DuVall 1995) were not able to relocate this site. It also was not identified in adjacent areas during the 2021 archaeological survey (Hunter et al. 2022). The TDOA site form provides very little information about the site. Therefore, the exact location of this site is unknown. It is possible that the site was destroyed by construction of CUF. It is also possible the site was incorrectly mapped when it was identified and is not located on TVA property.

- Site 40SW63, located within both the proposed CC Plant Site and proposed transmission line corridor, consists of a Pre-Contact Early to Late Archaic and Early to Middle Woodland open habitation; the NRHP eligibility of this site is considered "potentially eligible".

- Site 40SW201, located within the proposed transmission line corridor, consists of a Pre-Contact Late Archaic, Woodland, and Mississippian open habitation; the NRHP eligibility of this site is unknown.

- Site 40SW702, located within the proposed transmission line corridor, consists of a Pre-Contact Late Archaic to Early Woodland open habitation and the 1800-1950 Graveyard Hill Cemetery; this site is potentially eligible for listing in the NRHP. The cemetery is also designated as Resource 1285974.

- Site 40SW710, located within the proposed CC Plant project area, consists of a Pre-Contact Middle to Late Archaic open habitation, as well as a twentieth century domestic scatter; this site is potentially eligible for listing in the NRHP.

- Site 40SW723 is located within/immediately adjacent to the potential CC plant project area and within the proposed transmission line corridor. It is associated with the NRHP-listed Henry Hollister House and family cemetery and is eligible for listing in the NRHP.

3.13.2.2.2 Natural Gas Pipeline Lateral Corridor

In 2021, Stantec (Simpson et al. 2021) conducted a cultural resources survey of the proposed natural gas pipeline lateral corridor. As a result of this survey and several other previous surveys, there are 24 recorded archaeological sites within the corridor, outside of the CUF Reservation. These sites are summarized in Table 3.13-3. One of these sites (1647123-Moore Cemetery) is a historic cemetery. Three previously recorded sites (40DS113, 40HO83, and 40HO86) within the corridor were identified as potentially eligible for listing in the NRHP (Simpson et al. 2021). Site 40DS113 consists of an Early Archaic and Middle Woodland open habitation. Site 40HO83 consists of a Pre-Contact nondiagnostic open habitation. Site 40HO86 consists of an Early Archaic open habitation, as well as an historic rural domestic scatter. In addition, the pipeline corridor on TVA's Cumberland Reservation crosses two previously-recorded sites (40SW63 and 40SW710), both of which are potentially eligible for inclusion in the NRHP.

Table 3.13-3. Recorded Archaeological Sites Within the Proposed Natural Gas Pipeline Corridor.

Site Number	Site Type	NRHP Recommendation
40DS113	**Early Archaic and Middle Woodland open habitation**	**Potentially Eligible**
40DS114	Pre-Contact nondiagnostic open habitation	Not Eligible
40DS115	Pre-Contact nondiagnostic open habitation	Not Eligible
40DS116	Pre-Contact nondiagnostic open habitation	Not Eligible
40DS117	Pre-Contact nondiagnostic open habitation	Not Eligible
40DS118	Pre-Contact nondiagnostic open habitation	Not Eligible
40DS119	Pre-Contact nondiagnostic open habitation	Not Eligible
40DS120	Pre-Contact nondiagnostic open habitation	Not Eligible
40DS121	Pre-Contact nondiagnostic open habitation	Not Eligible
40DS122	Middle Archaic open habitation; rural domestic scatter	Not Eligible
40DS123	Pre-Contact nondiagnostic open habitation	Not Eligible
40DS124	Pre-Contact nondiagnostic open habitation	Not Eligible
40DS125	Rural domestic scatter	Not Eligible
40DS126	Pre-Contact nondiagnostic open habitation	Not Eligible
40DS127	Pre-Contact nondiagnostic open habitation	Not Eligible
40DS128	Pre-Contact nondiagnostic open habitation	Not Eligible
40HO11	Pre-Contact nondiagnostic open habitation	Not Eligible
40HO83	**Pre-Contact nondiagnostic open habitation**	**Potentially Eligible**
40HO85	Pre-Contact nondiagnostic open habitation	Unknown
40HO86	**Early Archaic open habitation; rural domestic scatter**	**Potentially Eligible**
40HO95	Pre-Contact nondiagnostic open habitation	Not Eligible
40HO96	Pre-Contact nondiagnostic open habitation	Not Eligible
40SW704	Pre-Contact nondiagnostic open habitation	Not Eligible
1647123	Moore Cemetery	Not Eligible

There are 29 previously recorded historic architectural resources within 0.5 mile of the corridor outside of the Cumberland Reservation. Two of these resources (HO-85 and DS-491) are within the pipeline corridor; both resources are not eligible for listing in the NRHP. These resources are summarized in Table 3.13-4 and depicted on Figure 3.13-2. One of the previously recorded resources (HO-20) within 0.5 mile of the corridor is eligible for listing in the NRHP. Resource HO-20 is the Buckeye Road Bridge, constructed in 1946.

Table 3.13-4. Recorded Historic Architectural Resources Within 0.5 Mile of the Proposed Natural Gas Pipeline Corridor.

Resource	Name	Construction Date	NRHP
DS-362	Samuel T. Brumit House	1870	Not Eligible
DS-429	N/A	1920	Not Eligible
DS-478	N/A	Unknown	Not Eligible
DS-485	N /A	Unknown	Not Eligible
DS-486	N/A	Unknown	Not Eligible
DS-487	N/A	Unknown	Not Eligible
DS-488	N/A	Unknown	Not Eligible
DS-489	N/A	Unknown	Not Eligible
DS-490	N/A	Unknown	Not Eligible
DS-491	N/A	Unknown	Not Eligible
DS-492	N/A	Unknown	Not Eligible
DS-493	N/A	Unknown	Not Eligible
DS-494	N/A	Unknown	Not Eligible
DS-495	N/A	Unknown	Not Eligible
DS-496	N/A	Unknown	Not Eligible
DS-497	N/A	Unknown	Not Eligible
HO-1	Alfie Skelton Place	1853	Not Eligible
HO-112	Clements House	1900	Not Eligible
HO-17	Union-Stanfill Furnace	1853	Not Eligible
HO-20	**Buckeye Road Bridge**	**1946**	**Eligible**
HO-30	Carr House	1796	Not Eligible
HO-31	Abernathy House	1790	Not Eligible
HO-85	The Rye House	1904	Not Eligible
HO-190	Hudson House	1865	Not Eligible
HO-196	N/A	Unknown	Not Eligible
HO-197	N/A	Unknown	Not Eligible
HO-207	Ellis Mills Store	1890	Not Eligible
HO-211	N/A	1892	Not Eligible
SW-747	Gordon-Schmid	1870	Not Eligible

***Bold resource is eligible for listing in the NRHP**

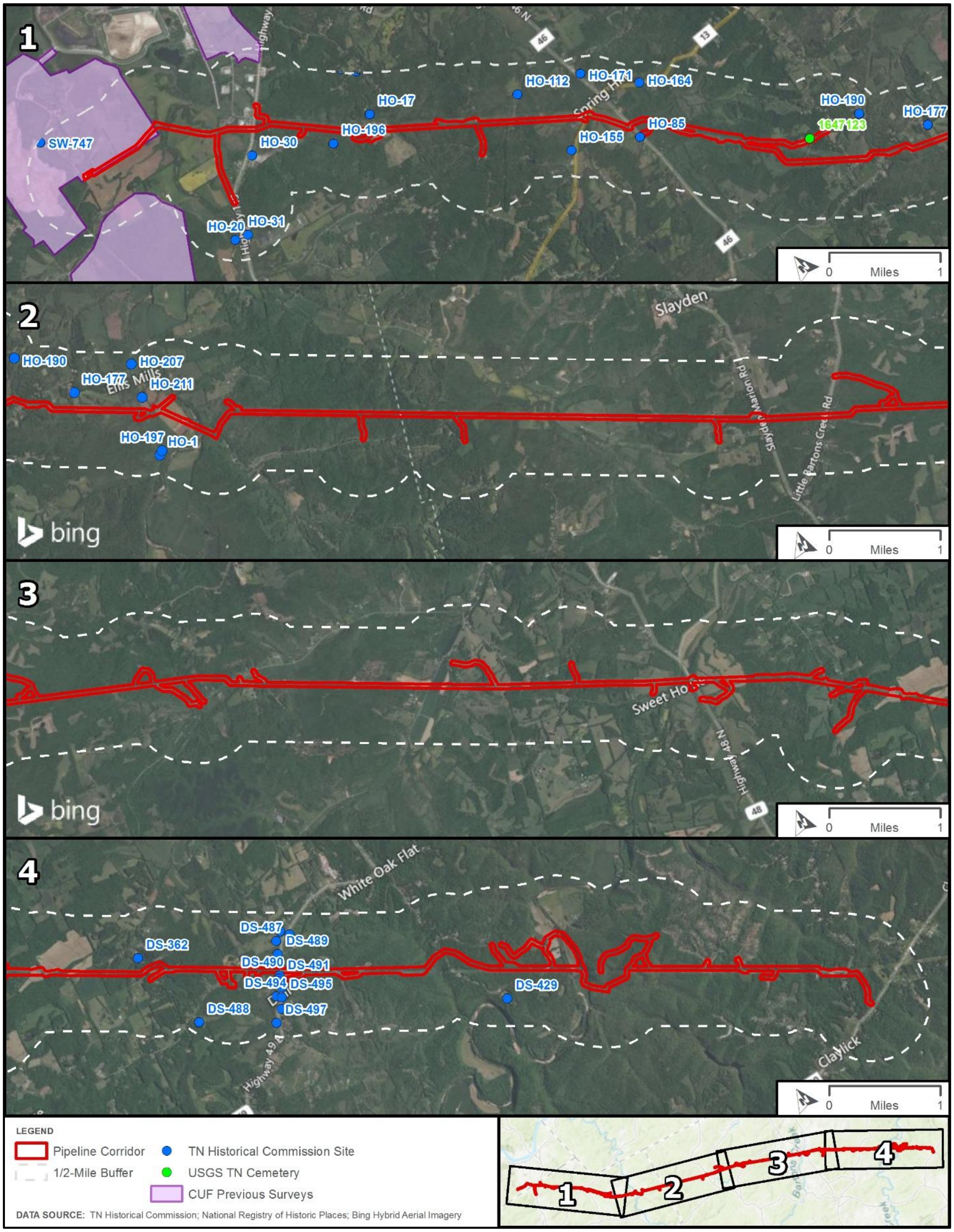

Figure 3.13-2. Previously Recorded Historic Architectural Resources Within 0.5 Mile of the Proposed Natural Gas Pipeline Corridor.

3.13.2.3 Alternative B

3.13.2.3.1 Johnsonville Reservation

There have been several previous cultural resources surveys on and near the Johnsonville Reservation, as depicted in Figure 3.13-3. In 2000, TRC Garrow Associates, Inc. (Ezell 2000) conducted an archaeological survey of two alternative ash disposal sites containing a total of 49 acres near the reservation. In 2001, TRC Garrow Associates, Inc. (McKee 2001) conducted an archaeological survey of a proposed generator plant on the reservation. The study area consisted of 40 acres, located to the south of the current proposed CT plant location. In 2018, Tennessee Valley Archaeological Research (Dison et al. 2018a) conducted an archaeological survey of the north railyard in connection with construction of a proposed water basin at the plant. The survey area contained approximately 21.3 acres, located adjacent to the proposed CT plant location. In 2018, Tennessee Valley Archaeological Research (Dison et al. 2018b) also surveyed two planned laydown yards associated with the proposed demolition of the Johnsonville Fossil Plant. These two survey parcels, located to the south of the proposed CT plant location, totaled 3.38 acres. TRC Environmental (Blankenship et al. 2019) conducted archaeological surveys of six separate areas throughout the Johnsonville Fossil Plant that covered a total of 171 acres; no archaeological resources were identified. Additionally, TVA has consulted with various agencies for several projects in this area. These include a proposed heat recovery steam generator, the Johnsonville Fossil Plant deconstruction, and four actions related to the plant deconstruction. These include closure of the JCT coal yard, closure of the JCT coal yard runoff pond, construction of a process water basin, and development of a borrow site.

There is one previously recorded archaeological site located within the existing JCT project area of the Johnsonville Reservation. Site 40HS277 was recorded by the Tennessee Division of Archaeology in 1994 based on information provided by a private individual who collected artifacts during JCT construction in the late 1940s. Site 40HS277 was reported as measuring 100 meters by 100 meters, and yielded a Clovis point. The site was located where the JCT condenser intake and water treatment plant were later constructed. Comparison of pre-1950 contour maps with the JCT grading plan and current setting indicates the site was destroyed by the construction of the condenser water intake. According to the site form, the site could not be relocated during a 2006 revisit. Based on this information, TVA has found that site 40HS277 is no longer extant; the TN SHPO agreed by letter dated February 14, 2018.

TVA has previously determined that JCT is ineligible for the NRHP as a historic architectural resource, and SHPO has formally agreed with this determination on multiple occasions.

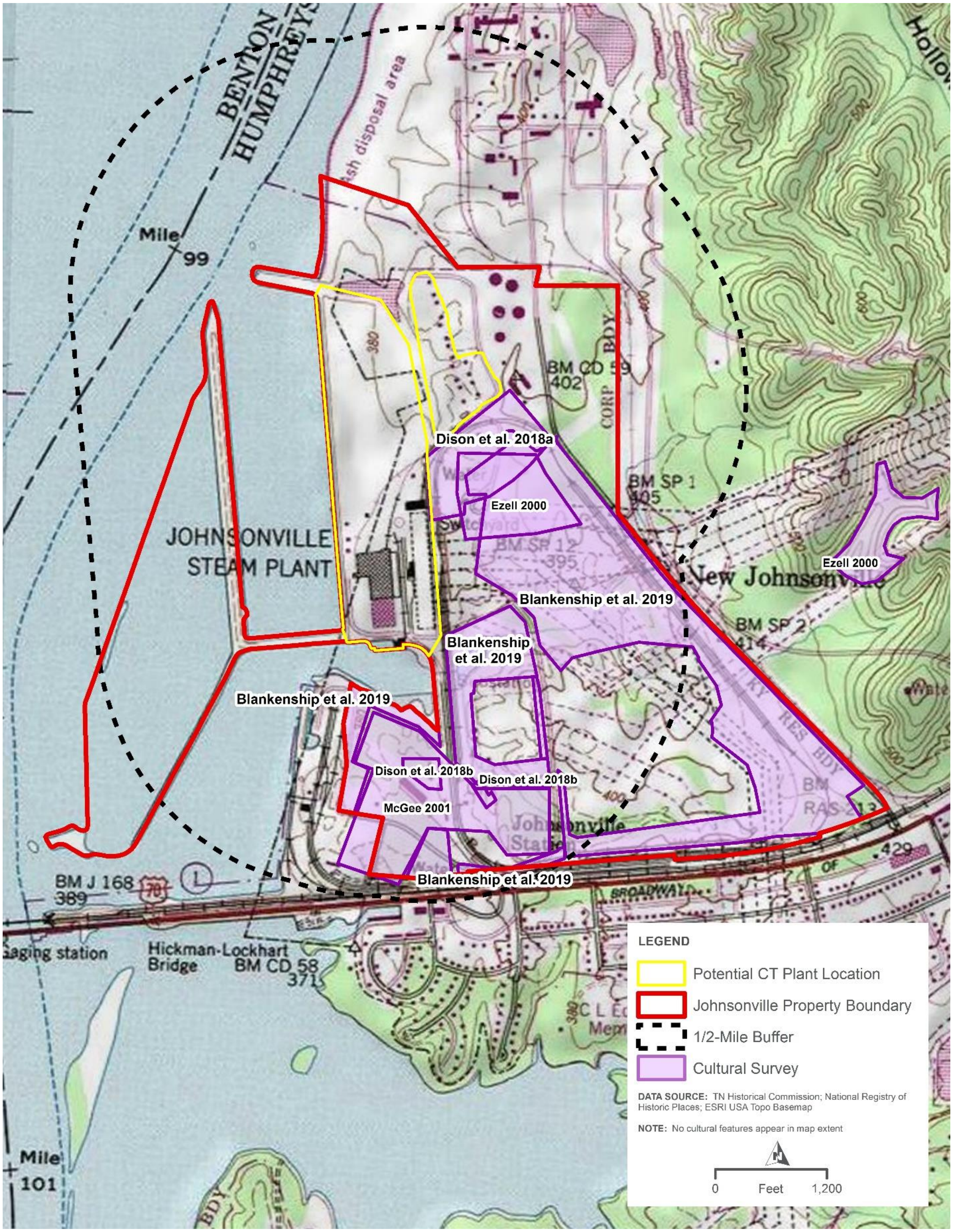

Figure 3.13-3. Locations of previously surveyed areas at the Johnsonville Reservation.

3.13.2.3.2 Gleason Reservation

There are no previously recorded archaeological resources within the potential plant location. There has been one previous cultural resources survey within this area. In 2008, TRC conducted a cultural resources survey of 20 acres for the location of new cooling towers at the Gleason Reservation (McKee and Karpynec 2009). No archaeological were identified during the survey. The potential plant location is comprised of undeveloped agricultural fields and wooded areas. Therefore, TVA will conduct an archaeological survey of previously unsurveyed areas before implementing Alternative B and constructing the Gleason CT plant.

There are no previously recorded historic architectural resources within the potential plant location. TRC identified no historic architectural resources during their survey of the proposed 20-acre cooling tower site, or within 0.5 miles of this proposed development (McKee and Karpynec 2009). There is one previously recorded historic architectural resource (WK-970) within the ½ mile study buffer of the potential plant location (Figure 3.13-4). Resource WK-970 is the Featherston House, constructed in 1900. This resource is not eligible for listing in the NRHP. The location of this resource is shown in Figure 3.13-4. TVA will conduct an architectural survey of the viewshed surrounding the potential CT plant location, and complete all necessary consultations before implementing Alternative B and constructing the Gleason CT plant.

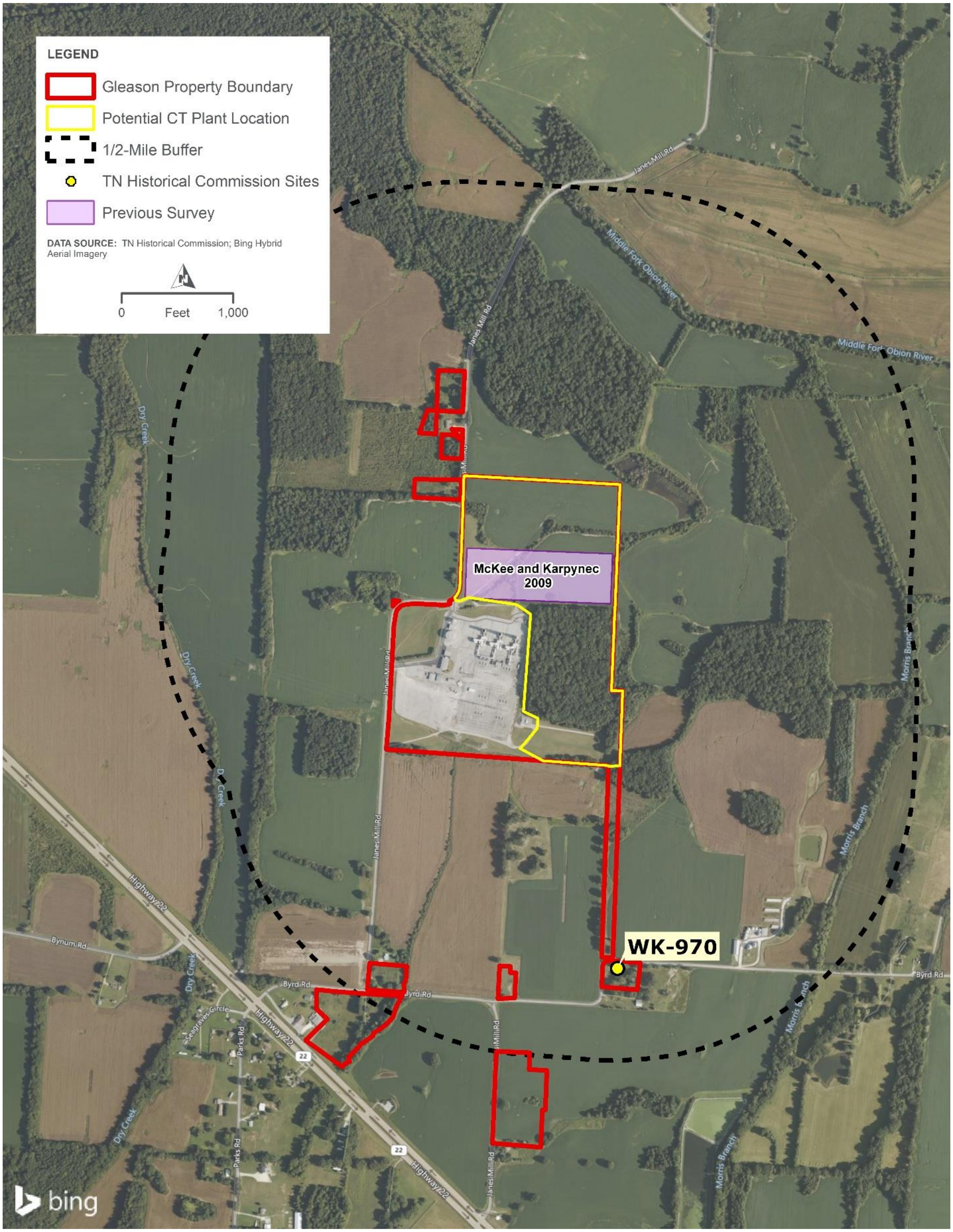

Figure 3.13-4. Previously Recorded Historic Architectural Resources and Previous Cultural Resources Surveys Within 0.5 Mile of the Gleason Reservation.

3.13.2.3.3 Transmission Corridor

There has been no historic property records research done for the proposed transmission line. As noted in Table 3.3-1, 14 percent of TVA new transmission line projects affect historic properties. The proposed 40-mile transmission line would require archaeological and architectural surveys and Section 106 consultation during future NEPA reviews.

3.13.2.4 Alternative C

TVA anticipates that a portion of the solar facilities proposed under Alternative C will be located in Middle Tennessee. As specific sites have not yet been determined for evaluation under this alternative, typical cultural resources effects of solar and storage construction and transmission projects have been listed under Section 3.2 and 3.3. A broad overview of archaeological resources, historic structures, and traditional cultural properties (TCPs) in the TVA region is presented below.

3.13.2.4.1 Archaeological Resources

Human occupation in the TVA region began at the end of the Ice Age with the Paleo-Indian Period (13,500 – 11,000 years before present, or "B.P."). In the Tennessee Valley, prehistoric archaeological chronology is generally broken into four broad time periods: following the Paleo-Indian Period are the Archaic (11,000 – 3,000 B.P.), Woodland (3,000 – 1,100 B.P.), and Mississippian (1,100 – 500 B.P.) periods. Archaeological sites from all these periods, as well as from the more recent historic period, are very numerous throughout the TVA region. They occur on a variety of landforms and in a variety of environmental contexts. Sites are rarely found on steep slopes, with the exception of rock shelters, which have been used throughout the Pre-Contact and historic periods and often contain artifacts and features with value to archaeology and history. Areas affected by construction, mining, civil works projects and highways, for example, tend to lack significant archaeological resources due to modern ground disturbing activities.

The most reliable information about the locations of archaeological sites is produced during Phase I archaeological surveys conducted for compliance with Section 106 and Section 110. Numerous surveys have been conducted along reservoir shorelines, within reservoirs, and on power plant reservations. However, large areas remain that have not been surveyed. Some TVA transmission line corridors and many highway corridors have also been surveyed. But outside of TVA reservoirs and power plant reservations, the density of surveys is low and relatively little is known about archaeological site distributions.

The earliest documentation of archaeological research in the region dates back to the 19th century when entities such as the Smithsonian Institute and individuals such as Cyrus Thomas undertook some of the first archaeological excavations in America to document the history of Native Americans (Guthe 1952). TVA was a pioneer in conducting archaeological investigations during the construction of its dams and reservoirs in the 1930s and early 1940s (Olinger and Howard 2009). Since then, TVA has conducted numerous archaeological surveys associated with permitting actions, power plants, and transmission system construction and maintenance. These surveys, as well as other off-reservoir projects, have identified more than 2,000 sites, including over 250 within or in the immediate vicinity of TVA transmission line rights-of-way. A large proportion of these sites have not been evaluated for NRHP eligibility. The number of sites eligible or potentially eligible for listing on the NRHP is unknown.

Archaeological survey coverage and documentation in the region varies by state. Each state keeps records of archaeological resources in different formats. While digitization of this data is under way, no consistent database is available for determining the number of archaeological sites within the TVA region. Survey coverage on private land has been inconsistent and is largely project-based rather than focusing on high probability areas, so data is unlikely to be representative of the total population of archaeological sites. Based on a search through TVA's data and reports of archaeological surveys on reservoirs, TVA estimates that over 11,000 archaeological sites have been recorded on TVA reservoir lands, including submerged lands. Significant archaeological excavations have occurred as a result of TVA and other federal projects and have yielded impressive information regarding the prehistoric and historic occupation of the Southeastern U.S. Notable recent excavations and related projects in the region include those associated with the Townsend, Tennessee highway expansion; Shiloh Mound on the Tennessee River in Hardin County, Tennessee; the Ravensford site in Swain County, North Carolina; and documentation of prehistoric cave art in Alabama and Tennessee.

3.13.2.4.2 Historic Structures

Historic architectural resources are found throughout the TVA region and can include houses, barns, public buildings, TVA facilities, and historic transmission lines. Many historic structures in the region have been either determined eligible for listing or have been listed in the NRHP. However, historic architectural surveys have been conducted in only a fraction of the land area within the region.

Over 5,000 historic structures have been inventoried in the vicinity of TVA reservoirs and power system facilities. Of those evaluated for NRHP eligibility, at least 85 are included in the NRHP and about 250 are considered eligible or potentially eligible for listing.

3.13.2.4.3 Traditional Cultural Properties

The TVA region is a diverse cultural landscape that held special meaning to its past inhabitants and to their descendants. Some of these places can be considered Traditional Cultural Properties (TCP). A TCP is defined as a property that is eligible for inclusion on the NRHP because of its association with cultural practices or beliefs of a living community that (a) are rooted in that community's history, and (b) are important in maintaining the continuing cultural identity of the community (Parker and King 1998). Similarly, a cultural landscape is defined as "a geographic area, including both cultural and natural resources and the wildlife or domestic animals therein, associated with a historic event, activity, or person or exhibiting other cultural or aesthetic values" (Birnbaum 1994). TVA does not make public sensitive information regarding the location or other information regarding sacred sites or TCPs identified by consulting tribes. Some examples of TCPs within the study area include mound sites, segments of the Trail of Tears, and stacked stone features. The Trail of Tears consisted of many routes and sub-routes that were traveled by Native Americans during their removal from their ancestral homelands. Segments of the Trail of Tears cross TVA transmission lines at approximately 278 locations (TVA 2018a). Stacked stone features often appear as single or a group of cylindrically stacked limestone. The origin and purpose of these stone features is uncertain, but a resolution passed by the United South and Eastern Tribes, Inc. (USET), in 2007, recommended that all federal agencies involved in the Section 106 process consider stacked stone features that cannot be conclusively linked to a historic origin to be a TCP under NRHP Criterion A (USET 2007).

3.13.3 Environmental Consequences

3.13.3.1 The No Action Alternative

Under the No Action Alternative, TVA would continue to operate and maintain CUF. TVA would implement all of the planned actions related to the current and future management and storage of CCRs, which have either been reviewed or will be in subsequent NEPA analysis. Under the scope of this EIS, no work would be conducted that would result in loss or disturbance of cultural resources beyond existing conditions. Therefore, no project-related environmental effects to cultural resources would occur under this alternative.

3.13.3.2 Retirement, Decommissioning, Decontamination, and Deconstruction of CUF Plant

There is one previously recorded archaeological resource within the CUF. Site 40SW47 consists of a Pre-Contact Archaic village site located along the Cumberland River. The NRHP eligibility of this site is unknown. On a modern historic aerial photograph, the site location appears to be within an undeveloped wooded parcel. Because previous attempts to locate the site were unsuccessful, and all undisturbed areas in the CUF Reservation have been investigated for archaeological sites, TVA assumes this site is not located in the affected area.

SW-745, known as the Henry Hollister House, is within 0.5 mi of the proposed D4 activities at CUF. D4 activities are likely to cause vibrations in the vicinity of structures to be demolished. However, seismologic analyses carried out at recent demolitions of other tall industrial chimneys in the United States strongly suggest that the vibrations would not result in measurable effects on archaeological deposits (Protec 2008, 2009, and 2013). These seismological analyses were conducted to measure the effects from demolition-related vibrations on standing structures in the vicinity of the chimney demolitions. In each case, vibrations were below the recommended limits set by the U.S. Bureau of Mines Report (Siskind et al. 1980). The report authors in each case concluded the demolitions would not cause damage to structures within the radius of influence. Vibrations resulting from the demolition of the smokestacks would be of similar magnitude. Therefore, TVA does not expect vibrations resulting from the demolition to cause any physical effects to SW-745 or 40SW47 if it is determined to exist onsite.

While the landfill construction associated with the CCR management activities at CUF directly impacted an archaeological site, cumulative effects are not anticipated as consultation and mitigation has been completed.

3.13.3.2.1 Environmental Justice Considerations

Effects to cultural resources that would occur as a result of CUF coal facility retirement and D4 activities are not anticipated to have disproportionate and adverse human health or environmental effects on EJ populations. These effects would be avoided, minimized, or mitigated through implementation of cultural resources survey and NHPA consultation with Native American tribes and interested stakeholders, which could include other EJ populations.

3.13.3.3 Alternative A

3.13.3.3.1 Construction and Operation of CC Plant, Transmission Lines, and Other Components at CUF Plant Site

Under Alternative A, TVA would construct and operate a CC plant, - a new switchyard at the CC plant and connect two existing 500-kV TLs, all on the CUF Reservation. There are six previously identified archaeological sites (Sites 40SW47, 40SW63, 40SW201, 40SW702, 40SW710, and 40SW723) within the boundaries of the proposed CC plant site and/or proposed transmission line corridor. Based on the current siting of the CC plant, direct effects to the archaeological sites would be avoided.

The recorded location of Site 40SW47 is located within the proposed transmission line corridor. However, as noted above, due to multiple surveys not being able to relocate the site, TVA assumes that this site is not located in the affected area. Site 40SW63 is located outside the proposed CC plant site, and within the proposed transmission line corridor and proposed natural gas pipeline lateral; the NRHP eligibility of this site is considered potentially eligible, by consultation consensus between TVA and SHPO. Site 40SW710 is located outside the proposed CC plant site and within the proposed natural gas pipeline lateral and is potentially eligible for listing in the NRHP. Since the proposed natural gas pipeline lateral cannot avoid these two sites, Phase II archaeological testing is planned to determine definitively the NRHP eligibility of the resources. Site 40SW201 is located within the proposed transmission line corridor; the NRHP eligibility of this site is unknown. Site 40SW702 is located near the proposed transmission line corridor; this site is potentially eligible for listing in the NRHP. Site 40SW702, the Graveyard Hill Cemetery, is also designated as Resource 1285974. Site 40SW723, the Henry Hollister House, is located within approximately one-half mile of the potential CC plant site and the proposed transmission line corridor. Potential effects to the Henry Hollister House from construction-related truck traffic will be avoided or minimized by limiting routing construction vehicle traffic from the south along Old Scott Road.

The NRHP-listed Henry Hollister House (SW-745) is located within the ½-mile buffer of the proposed CC Plant and switchyard. Views to the CC Plant and switchyard would be at least partially blocked by thick stands of mature trees. TVA will consider potential visual and vibrational effects caused by the construction, implementation, and operation of the CC Plant on this resource, and will consult further with SHPO regarding potential adverse effects.

There are three identified historic architectural resources within a ½ mile buffer of the proposed CC plant (Table 3.13-1) that are extant: SW-745, SW-801, and HS-01. All of these are ineligible for listing on the NRHP. Two previously-inventoried historic architectural properties once located within a ½-mile buffer, SW-747 and SW-748, were previously removed and are no longer extant.

To fulfill its obligations under Section 106 of the NHPA, TVA will consult with the TN SHPO on specific effects to cultural resources. While the landfill construction associated with the CCR management activities at CUF directly impacted an archaeological site, cumulative effects are not anticipated as consultation and mitigation has been completed.

3.13.3.3.2 Construction and Operation of Natural Gas Pipeline

There are 24 previously recorded archaeological sites within the proposed pipeline corridor (Figure 3.13-4). One of these sites (1647123-Moore Cemetery) is an historic cemetery. Three of the previously recorded sites (40DS113, 40HO83, and 40HO86) within the corridor are potentially eligible for listing in the NRHP. TGP’s final design for the pipeline would determine whether the Moore Cemetery will be avoided and left in place. Likewise, TGP’s design would determine whether the three potentially eligible archaeological sites can be avoided. If these sites cannot be avoided, further archaeological testing investigations may be necessary to determine their NRHP eligibility.

There are 29 previously recorded historic architectural resources within 0.5 mile of the pipeline corridor. One of the previously recorded resources (HO-20) is eligible for listing in the NRHP. Resource HO-20 is the Buckeye Road Bridge, constructed in 1946. Because the natural gas pipeline lateral will be subsurface and given the distance of the bridge from the pipeline corridor, this installation would have no effect on Resource HO-20.

The proposed pipeline corridor on TVA property traverses potentially-eligible archaeological sites 40SW63 and 40SW710. As required by Section 106, additional study of both sites is planned, under FERC’s direction, to fully determine the NRHP eligibility of these sites. If either site is determined eligible, in consultation with the SHPO and tribes, and avoidance is not possible, then mitigation would be required. The specific mitigation plans would be stipulated in a Memorandum of Agreement involving FERC, the SHPO, and any tribes wishing to participate.

To fulfill its obligations under Section 106 of the NHPA, TVA and FERC will each consult with the TN SHPO and federally recognized Indian tribes on their respective actions regarding specific effects to cultural resources along the pipeline corridor if Alternative A proceeds.

Cumulative effects to cultural resources are not anticipated as a result of past/present and RFFAs near the proposed pipeline. If federal permitting is required on those projects, cultural surveys and Section 106 consultation would be required.

3.13.3.3.3 Environmental Justice Considerations

Effects to cultural resources that would occur as a result of the proposed CC plant and natural gas pipeline lateral are not anticipated to have disproportionate and adverse human health or environmental effects on EJ populations. These effects would be avoided, minimized, or mitigated through implementation of cultural resources survey and NHPA consultation with Native American tribes and interested stakeholders, which could include other EJ populations.

3.13.3.4 Alternative B

3.13.3.4.1 Construction and Operation of CT Plant at Johnsonville Reservation

Under Alternative B, TVA would construct a new CT plant on property located within the boundaries of the Johnsonville Reservation. The proposed CT plant would be built on previously developed portions of the reservation. There is one previously recorded archaeological site (Site 40HS277), though this site is no longer extant and is not within the proposed CT plant site .

There are no previously recorded historic architectural resources within the potential plant location, or within the ½ mile study buffer of the potential plant location. The proposed CT plant location is immediately adjacent to an area recently reviewed for the Johnsonville Aeroderivative Combustion Turbines Project (TVA 2022e). For that project, TVA stated that the entire viewshed has been previously surveyed and/or disturbed as part of other activities on the reservation and no eligible or listed historic structures were identified. Section 106 consultation with the SHPO was conducted on these previous projects and concurrence was received (Appendix B). Therefore, TVA considers the architectural APE to be lacking in historic properties. As such, in accordance with Section III. C of TVA's Section 106 PA, TVA has not completed a new archaeological or architectural survey of the APE.

To fulfill its obligations under Section 106 of the NHPA, TVA will consult with the TN SHPO on specific effects to cultural resources if Alternative B proceeds. No cumulative effects to cultural resources would occur as no archaeological or architectural sites are within the adjacent Aeroderivative CT plant site.

3.13.3.4.2 Construction and Operation of CT Plant at Gleason Reservation

Under Alternative B, TVA would construct a new CT plant on a portion of the Gleason Reservation. There are no previously recorded archaeological resources on the proposed CT plant site. Twenty acres within this area have previously been subjected to a cultural resources survey (McKee and Karpynec 2009). The site is comprised of undeveloped agricultural fields and wooded areas.

There are no previously recorded historic architectural resources on or within ½ mile of the proposed CT plant site that are eligible for or listed in the NRHP. To fulfill its obligations under

Section 106 of the NHPA, TVA will consult with the TN SHPO on specific effects to cultural resources if Alternative B proceeds. No cumulative effects to cultural resources would occur.

3.13.3.4.3 Transmission and Other Components

Under Alternative B, TVA would construct an approximately 40-mile, 500-kV TL in Weakley and Henry counties. The exact location of the transmission line is not known at this time and therefore TVA has not surveyed the project area for historic properties. TVA has compiled a list of typical effects associated with the construction and operation of transmission line facilities within the TVA region. As noted in Table 3.3-1, 14 percent of new transmission line projects affect historic properties. These effects generally consist of visual effects to historic architectural resources and physical effects to archaeological sites. TVA would seek to avoid any potential adverse effects on any NRHP-listed or eligible archaeological sites or historic architectural properties in the affected area. If adverse effects cannot be avoided, TVA would seek in consultation with SHPO and federally recognized Indian tribes, ways to avoid or minimize the adverse effects. If unavoidable, adverse visual effects to historic architectural resources could be mitigated through wooded buffers. Adverse direct effects to archaeological sites could be mitigated through Phase III archaeological investigations. Given the large area of the potential transmission line and other components, there is the possibility of multiple TCPs. To fulfill its obligations under Section 106 of the NHPA, TVA will consult with the TN SHPO and federally recognized Indian tribes on specific effects to cultural resources if Alternative B proceeds.

3.13.3.4.4 Environmental Justice Considerations

Effects to cultural resources that would occur as a result of the proposed CT facilities and transmission line activities are not anticipated to have disproportionate and adverse human health or environmental effects on EJ populations in the JCT or Gleason Reservation EJ study areas, as these effects would be avoided, minimized, or mitigated through implementation of cultural resources survey and NHPA consultation with Native American tribes and interested stakeholders, which could include other EJ populations.

3.13.3.5 Alternative C

3.13.3.5.1 Construction and Operation of Solar and Storage Facilities

Under Alternative C, TVA would construct and operate 3,000 MW of solar and 1,700 MW of battery storage at various sites, mostly within Middle Tennessee, which would require 21,900 acres of solar and 640 acres of battery storage. Since the exact project locations of the solar and storage facilities are not known at this time, TVA has compiled a list of typical effects associated with the construction and operation of solar facilities within the TVA region. This list was compiled by reviewing the EAs and EISs for PV projects, ranging from community-scale to utility-scale, since 2014. A total of 31 projects were included in the review. Of these, approximately 3 percent have affected historic properties. These effects generally consist of visual effects to historic architectural resources and direct physical effects to archaeological sites. TVA would seek to avoid any potential adverse effects on any NRHP-listed or eligible archaeological sites or historic architectural properties in the affected area. If adverse effects cannot be avoided, TVA would seek in consultation with SHPO and federally recognized Indian tribes, ways to avoid or minimize the adverse effects. If unavoidable, adverse visual effects to historic architectural resources could be mitigated through wooded buffers. Adverse direct effects to archaeological sites could be mitigated through Phase III archaeological investigations. Given the large area of the potential solar developments, there is the possibility of multiple TCPs. To fulfill its obligations under Section 106 of the NHPA, TVA will consult with the TN SHPO on specific effects to cultural resources if Alternative C proceeds.

There is the potential for cumulative effects to cultural resources associated with the expansion of 10,000 MW of solar facilities as outlined in the 2019 IRP. Cumulative effects would be minimized through siting and avoidance of NRHP-listed or eligible sites, consultation with SHPO, and mitigation.

3.13.3.5.2 Transmission and Other Components

Under Alternative C, the new transmission line construction would be on and in the immediate vicinity of the solar and storage sites. The transmission line components would be designed to avoid effects to historic properties. Possible effects to historic properties generally consist of visual effects to historic architectural resources and direct physical effects to archaeological sites. Adverse visual effects to historic architectural resources could be mitigated through wooded buffers. TVA would seek to avoid any potential adverse effects on any NRHP-listed or eligible archaeological sites or historic architectural properties in the affected area. If adverse effects cannot be avoided, TVA would seek in consultation with SHPO and federally recognized Indian tribes, ways to avoid or minimize the adverse effects. Adverse direct physical effects to archaeological sites could be mitigated through Phase III archaeological investigations. To fulfill its obligations under Section 106 of the NHPA, TVA will consult with the TN SHPO on specific effects to cultural resources if Alternative C proceeds.

There is the potential for cumulative effects to cultural resources associated with the expansion of 10,000 MW of solar facilities and their associated transmission lines as outlined in the 2019 IRP. Cumulative effects would be minimized through siting and avoidance of NRHP-listed or eligible sites, consultation with SHPO, and mitigation.

3.13.3.5.3 Environmental Justice Considerations

Effects to cultural resources that would occur as a result of the proposed solar facilities and transmission line activities are not anticipated to have disproportionate and adverse human health or environmental effects on EJ populations in the EJ study area for Alternative C. These effects would be avoided, minimized, or mitigated through implementation of cultural resources survey and NHPA consultation with Native American tribes and interested stakeholders, which could include other EJ populations. To determine disproportionate effects for a given solar facility, detailed EJ analyses would occur for each solar facility and transmission line activity under future NEPA reviews.

3.14 Solid and Hazardous Waste

3.14.1 Regulatory Framework

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, may be 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 USEPA 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. In Tennessee, requirements for solid wastes are focused on solid waste processing and disposal under Rule 0400-11-.01.

Potential effects related to solid and hazardous waste of transmission line construction and operation were considered. Because of the nature of the action alternatives, any potential effects to solid and hazardous waste would be minor and insignificant. Thus, any further analysis of transmission lines and their effect on solid and hazardous waste resources was not deemed necessary.

3.14.2 Affected Environment

3.14.2.1 CUF Reservation and Transmission Corridor

3.14.2.1.1 Solid Waste

The primary solid wastes that result from the operation of CUF are CCRs in the form of ash and gypsum. Between 2016 and 2018, CUF produced an annual average of 431,565 tons of ash (fly and bottom ash) and 773,167 tons of gypsum. TVA has historically managed storage of CCR materials generated at CUF in a combination of onsite dry stacks, wet stacks and impoundments.

Fly ash and boiler slag are comprised of the noncombustible particles or components in coal. Both fly ash and bottom ash are composed primarily of silica, aluminum oxide and iron oxide. These waste streams also contain a variety of heavy metals at limited concentrations including arsenic, cadmium, chromium, copper, lead, mercury and selenium. In Tennessee, CCR are regulated as special wastes that require special approval for the wastes to be disposed of at a landfill specifically permitted to receive those types of wastes (Class I or II disposal facility).

Demolition and construction debris would be generated during the demolition of the metal buildings, footings, asphalt, etc. The facilities would be inspected for regulated materials (asbestos, lead paint, etc.) and would be properly abated prior to demolition. These wastes, if generated, would be disposed as required by state and federal regulations. Remaining demolition debris would be disposed offsite.

3.14.2.1.2 Hazardous Waste

Hazardous, non-radiological wastes typically produced by common facility operations include paint and paint solids, paint thinners, discarded out-of-date chemicals, parts washer liquids, sand blast grit, chemical waste from cleaning operations and broken fluorescent bulbs. The amount of these wastes generated varies with the size and type of facility. Wastes regulated under TSCA that are typically encountered at TVA sites include PCBs, historically used in insulating fluids in electrical equipment.

CUF is considered a small quantity generator of hazardous waste by TDEC. In 2019, CUF shipped 2,371 pounds of hazardous waste (paint, paint chips/rags, obsolete aerosols, labpack materials, lithium batteries, liquids from x-ray developing machine, cleaners, and used PPE) to designated off-site facilities for disposal (TDEC 2019).

3.14.2.1.3 Universal Waste

Universal wastes are a subset of hazardous wastes that are widely generated and can include batteries, pesticides, 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. CUF is considered a small quantity handler of universal waste that include batteries, lamps/bulbs, and mercury-containing equipment.

3.14.2.2 Alternative A

3.14.2.2.1 Proposed CC Plant Site

The proposed CC plant site is located within the CUF Reservation (Section 3.14.2.1). The site is in agricultural fields and forested area that is not likely to contain or currently produce solid or hazardous waste.

3.14.2.2.2 Natural Gas Pipeline Corridor

Based on a review of the TDEC Division of Remediation database, permitted Tennessee landfill sites, solid waste processors, transfer or convenience centers, and UST database and the USEPA ECHO database (USEPA 2022), the following sites were identified within 0.5-miles of the pipeline corridor:

- TVA Cumberland Fossil Plant, located along the natural gas pipeline lateral corridor, was listed in the Tennessee permitted landfill database as a Class II landfill. No violations were listed in association with the landfill.

- The Cumberland City convenience center, located adjacent to the natural pipeline corridor, was listed in the solid waste database. No violations were listed in association with the convenience center.

- Sudden Service 61 (a filling station), located 0.37 miles northeast (upgradient) of the natural gas pipeline lateral, was listed in the UST database for 12 current USTs at the facility. No leaks or violations were listed in association with the USTs.

Based on the lack of violations or leaks, none of the above sites are considered a concern for Alternative A.

3.14.2.3 Alternative B

3.14.2.3.1 Johnsonville Reservation

Based on a review of the TDEC division of remediation database, permitted Tennessee landfill sites, solid waste processors, transfer or convenience centers, and UST database and the USEPA ECHO database (USEPA 2022), the following sites were identified within the Johnsonville Reservation:

- The Johnsonville Fossil Plant coal yard, located within the Johnsonville Reservation, was listed in the remediation database as withdrawn.
- The New Johnsonville Fossil Plant was listed in the remediation database as closed.

The following sites were identified within 0.5-miles of the Johnsonville Reservation:

- E.I Dupont Landfill East Hollow, located north adjacent of the Johnsonville Reservation, was listed in the Tennessee permitted landfill database as a Class II landfill. No violations were listed in association with the landfill.
- E.I. Dupont Landfill North Hollow, located north adjacent of the Johnsonville Reservation, was listed in the Tennessee permitted landfill database as a Class II landfill. No violations were listed in association with the landfill.
- E.I. Dupont Landfill Ross Hollow, located north adjacent of the Johnsonville Reservation, was listed in the Tennessee permitted landfill database as a Class II landfill. No violations were listed in association with the landfill.
- The Dupont Johnsonville facility, previously located north adjacent of the Johnsonville Reservation, was listed in the remediation database as closed. No further information was provided.

Based on the lack of violations or leaks, none of the above sites are considered a concern for Alternative B.

3.14.2.3.2 Gleason Reservation

Based on a review of the TDEC division of remediation database, permitted Tennessee landfill sites, solid waste processors, transfer or convenience centers, and UST database and the EPA ECHO database, the following sites were identified within 0.5-miles of the Gleason Reservation:

- The Gleason Generating facility, the currently operating CT plant on the Gleason Reservation, was listed in the CAA, CWA, and RCRA databases within the USEPA ECHO database (USEPA 2022). No violations were identified in any of the databases.
- Chappell Mine #26, located 0.5 mile southwest (downgradient) of the Gleason Reservation, was listed in the CWA database within the USEPA ECHO database (USEPA 2022). No violations were identified.
- Gleason STP, located 0.5 miles northeast (downgradient) of the Gleason Reservation, was listed in the CWA database within the USEPA ECHO database (USEPA 2022). Quarterly violations were reported for exceedances of biological oxygen demand (BOD) or nitrogen concentrations since January 2019.

Based on the lack of violations the Gleason Generating facility and Chappell Mine #26 are not considered a concern for Alternative B. Although the Gleason STP does have reported violations, it is not considered a concern because of the distance and gradient from the Gleason Reservation.

3.14.2.4 Alternative C

3.14.2.4.1 Middle Tennessee TVA Power Service Area

The affected environment of solid and hazardous waste in the Middle Tennessee region is based on general information in the IRP EIS (TVA 2019b). Coal-fueled generating plants produce large quantities of ash and other coal combustion solid wastes and nuclear plants produce radioactive wastes. Industries within Middle Tennessee also produce solid and hazardous waste that is tracked through various federal and state databases. The location of proposed solar and storage facilities are not known; prior to development into a solar or storage facility, Phase I environmental site assessments would be conducted to identify potential records of environmental concern, including solid and hazardous wastes.

3.14.3 Environmental Consequences

3.14.3.1 The No Action Alternative

Under the No Action Alternative, TVA would continue to operate CUF. TVA would implement all of the planned actions related to the current and future management and storage of CCRs at the fossil plants, which have either been reviewed or will be in subsequent NEPA analysis. As a result, existing solid and hazardous waste management would not change from continuing operations under this alternative. The production and disposal of hazardous and universal wastes are not expected to change under the No Action Alternative.

3.14.3.2 Retirement, Decommissioning, Decontamination, and Deconstruction of CUF Plant

For all alternatives, the CUF plant would be retired, decommissioned, decontaminated, and deconstructed. The plant would be demolished to a depth of three feet below final grade. The solid and hazardous wastes listed below may be generated during demolition:

- Asbestos containing materials (ACM);
- Mercury in equipment switches and gauges;
- Lead-containing materials including paint, coatings, roof vents, circuit boards, batteries, and cathode ray tubes;
- Electronic wastes
- PCBs in replacement bushings and light ballasts;
- Materials such as glaze, caulk, building siding, roofing materials, electric cable, cable trays;
- Other construction wastes (e.g., concrete, scrap metal);
- Universal waste (fluorescent light bulbs, batteries, etc.);
- Off spec/surplus chemicals contained in aboveground storage tanks;
- Containerized petroleum products or chemicals;
- Refrigerants and ozone depleting substances;
- Tritium exit signs;
- Radioactive sources from equipment;
- Various oils and fuels;
- Antifreeze;

- Batteries in bulk and associated fixtures including deep cycle series uninterruptible power supply batteries and lead batteries from emergency lighting;
- Street lighting;
- Batteries;
- Creosote (in railroad ties); and
- Technology Enhanced Naturally Occurring Radioactive Materials (TENORM).

A regulated material survey will be completed prior to demolition to estimate the materials and quantities for wastes generated. Additionally, all areas with stains or containing hazardous materials should be addressed prior to demolition as practical. All generated wastes should be handled in accordance with the TVA BMP procedures and local, state, and federal guidelines.

Direct effects would be minor due to the limited potential for hazardous waste to be discharged and/or released into the environment during D4 activities. Some wastes such as hazardous wastes, PCBs, ACMs, lead-based paints, and universal wastes which require special removal, handling, or disposal would be evaluated prior to demolition. These materials will be disposed of at a facility permitted to handle the waste streams. Non-hazardous or special waste will need to be transported to a landfill or other approved disposal facilities.

Possible short-term effects to the local environment are possible through the release of fugitive dust during demolition and while removing material to the landfill. If other projects in the area result in minor releases of fugitive dust or hazardous material, this may result in minor cumulative effects. Project and cumulative effects would be minimized through mitigation measures, including dust suppression and environmental controls. Due to the temporary nature of the operations and the use of permitted disposal facilities, along with trained and experienced contractors and personnel, environmental effects from waste handling and disposal are not anticipated. Degradation over time of the remaining structures and material that is incorporated into those remaining structures may cause minor indirect environmental effects.

3.14.3.2.1 Environmental Justice Considerations

Waste-related effects that would occur as a result of CUF coal facility retirement and D4 activities are not anticipated to have disproportionate and adverse human health or environmental effects on EJ populations in the CUF Reservation EJ study area. These effects would be temporary and mitigated. Moreover, the effects would generally be limited to the TVA-owned CUF Reservation or selected waste facilities in the area and are not anticipated to have a disproportionate effect on EJ populations, as the same effects would be experienced by other populations.

3.14.3.3 Alternative A

3.14.3.3.1 Construction and Operation of CC Plant at CUF

Under Alternative A, the proposed 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 on site. Appropriate spill prevention, containment, and disposal requirements for hazardous wastes would be implemented to protect construction and plant works, the public, and the environment. A permitted hazardous waste disposal facility would be used for ultimate disposal of the wastes. Once construction is completed, the generation of hazardous waste during operations would be similar to the current waste generation rates.

Any spills related to the Project would be reported to TDEC. A sampling and cleanup report would be prepared for the facility and sent to TDEC to document each spill and clean up. Each spill, regardless of amount, would be cleaned up within 48 hours, and a spill report would be completed. Copies of any spill and cleanup reports would be kept on site.

Designated contractor and subcontractor personnel would be responsible for daily inspection, cleanup, and proper labeling, storage, and disposal of all refuse and debris produced. Disposal containers such as dumpsters or roll-off containers would be obtained from a proper waste disposal contractor.

Construction of the CC Plant would generate typical construction debris and small volumes of solid waste:

- Paper, wood, glass and plastics would be generated from packing materials, waste lumber, insulation, and empty nonhazardous chemical containers.
- Scrap metal would result from welding, cutting, framing, and finishing operations, electrical wiring, disposal of packing materials, and empty nonhazardous chemical containers.

Construction and waste debris will be placed in roll-offs and disposed of at a permitted offsite construction and demolition landfill. TVA will manage all solid wastes in accordance with applicable state regulations and TVA BMP procedures.

During construction, TVA will rely on the use of portlets and holding tanks at the construction trailer site. Waste will be pumped using an approved/licensed pump and haul vendor and sent to POTW. Once operational, the site facilities will connect to the existing online sewer system.

If CCR management projects in the area result in solid waste or hazardous material, this may result in minor cumulative effects. Cumulative effects would be minor as TVA will manage all hazardous and solid wastes in accordance with applicable federal and state regulations and TVA BMP procedures.

3.14.3.3.2 Construction and Operation of Natural Gas Pipeline

Under Alternative A, the proposed construction activities for the pipeline could result in the generation of solid and hazardous wastes. This EIS uses desktop analysis findings; however, TGP is conducting a detailed analysis of potential solid and hazardous waste effects as part of the Environmental Report to be submitted with their certificate application that will be filed with the FERC for the proposed pipeline. If present, the gradient of the project could result in runoff into the project trench and workspace areas. Should contaminated media (i.e., soil or groundwater) be encountered during construction, routine procedures would be followed to ensure work was stopped, access to the site was limited, and contaminated soil was contained and collected for sampling. Depending on the results of the analysis, a route variation to avoid the site would be considered or a site-specific plan for completing construction within the contaminated area would be prepared in accordance with applicable environmental regulations and in coordination with the appropriate agency(ies). Any soil verified as contaminated would not be placed back into the trench unless approved by the appropriate agency(ies). Decontamination could involve removing select regulated materials in a safe and practical manner in such a way that the pipeline is left in a status that does not present a hazard or risk to the environment or personnel.

Fueling of some construction vehicles typically occurs in the construction area. Other mobile equipment would return to the onsite laydown areas for refueling. An appropriate SPCC plan would be implemented by TGP to minimize the potential of a spill during construction and operation of the pipeline. Special procedures would be identified to minimize the potential for fuel spills, and spill control kits would be carried on all refueling vehicles for activities such as refueling, vehicle or equipment maintenance procedures, waste removal, and tank clean-out. A fuel truck may be stored on site for the duration of construction. Safety Data Sheets for all applicable materials present on site would be made readily available to onsite personnel.

Construction-related wastes may include skids, construction debris, timber mats, and used ECD materials will be removed and disposed of at an approved facility. No construction material will be buried in the ROW. All used lubricants and cleanup materials will be containerized and disposed of at an approved facility. All sandblasting materials will be contained and disposed of properly. Shipping manifests will be maintained that verify the proper labeling and shipping of all wastes to authorized off-site facilities. Once construction of the pipeline is completed, solid and hazardous wastes should not be generated.

If RFFAs in the area result in solid waste or hazardous material, this may result in minor cumulative effects. Cumulative effects would be minor as applicable federal and state regulations would be followed.

3.14.3.3.3 Environmental Justice Considerations

Waste-related effects that would occur as a result of the proposed CC plant and natural gas pipeline lateral would be temporary and mitigated, with some effects occurring on a TVA-owned reservation, where no populations exist and EJ populations are not in close proximity to the site (Figure 3.4-3). Effects occurring as a result of pipeline activities, while still minor, would be outside of TVA-owned reservations. In the pipeline corridor EJ study area, non-EJ populations are generally more prominent (nine out of 10 census block groups are non-EJ populations; see also Figure 3.4-4). While effects may be experienced by EJ populations located in the far eastern extreme of the pipeline corridor EJ study area, these effects would be similar to those experienced by non-EJ populations and, thus, are not anticipated to be disproportionate.

3.14.3.4 Alternative B

Construction of CT plants at Johnsonville and Gleason would result in a potential increase in generation of hazardous waste at each reservation. Solid and hazardous waste effects would be similar to those described for the CC plant construction under Alternative A. Various hazardous wastes, such as waste paints, coasting and adhesive wastes, and spent solvents, could be produced during construction. These wastes would be temporarily stored in properly managed hazardous waste storage areas on site. Appropriate spill prevention, containment, and disposal requirements for hazardous wastes would be implemented to protect construction and plant works, the public, and the environment. A permitted hazardous waste disposal facility would be used for ultimate disposal of the wastes. During normal operation, CT plants produce very small quantities of solid waste during normal operation; therefore, the generation of solid and hazardous waste during operations would be similar to the current waste generation rates at each reservation. Cumulative effects would be minor as TVA will manage all hazardous and solid wastes in accordance with applicable federal and state regulations and TVA BMP procedures.

3.14.3.4.1 Environmental Justice Considerations

Waste-related effects that would occur as a result of the proposed CT facilities and transmission line activities are not anticipated to have disproportionate and adverse human health or environmental effects on EJ populations in the JCT or Gleason Reservation or pipeline corridor EJ study areas. These effects would be temporary or reduced in comparison to existing conditions, mitigated, and generally limited to the immediate TVA-owned reservations and transmission line corridor.

3.14.3.5 Alternative C

3.14.3.5.1 Construction and Operation of Solar and Storage Facilities

Construction of solar sites typically produce petroleum-based oils and fuels and generation of liquid and solid wastes in the form of used oil, construction debris, packing materials, and general construction wasted. During construction of the proposed solar facility, materials are typically stored on site in storage tanks, vessels, or other appropriate containers specifically designed for the characteristics of these materials. The storage facilities would include secondary containment in case of tank or vessel failure. Construction and decommissioning-related materials stored on site would primarily be liquids such as used oil, nitrogen, diesel fuel, gasoline, hydraulic fluid, and other lubricants associated with construction equipment. Safety Data Sheets for all applicable materials present on site would be made readily available to onsite personnel.

Fueling of some construction vehicles typically occurs in the construction area. Other mobile equipment would return to the onsite laydown areas for refueling. Special procedures would be identified to minimize the potential for fuel spills, and spill control kits would be carried on all refueling vehicles for activities such as refueling, vehicle or equipment maintenance procedures, waste removal, and tank clean-out. A fuel truck may be stored on site for the duration of construction.

During operation, bulk chemicals would be stored in storage tanks; other chemicals would be stored in returnable delivery containers. Chemical storage areas would be designed to contain leaks and spills. The transport, storage, handling, and use of chemicals would be conducted in accordance with applicable laws, ordinances, regulations, and standards. While the various transformers would contain oil, there would be no separate oil or hydraulic fluid stored on site related to transformers.

Construction of solar sites also generates construction debris and general trash, including pallets and flattened cardboard module boxes. Universal wastes and unusable materials would be handled, stored, and managed in accordance with Tennessee Universal Waste requirements. Waste collection and disposal would be conducted in accordance with applicable regulatory requirements to minimize health and safety effects. To the extent possible, waste will be recycled. Materials that cannot be recycled would be disposed of at an approved facility to be determined by the designated contractor(s). No waste oil would be disposed of on the solar or storage facility sites.

If necessary, TVA, the facility developer, or the construction contractor would obtain a hazardous waste generator identification number from the state prior to generating any hazardous waste. Any spills related to the project would be reported to state regulator. A sampling and cleanup report would be prepared for the project site and sent to the state regulator to document each spill and clean up.

Cumulative effects may occur with the additional 10,000 MW of solar facilities planned under the 2019 TVA IRP. Cumulative effects to solid and hazardous wastes would be minor as facilities would be constructed and managed in accordance with established procedures and applicable regulations.

3.14.3.5.2 Environmental Justice Considerations

Waste-related effects that would occur as a result of the proposed solar facilities and transmission line activities are not anticipated to have disproportionate and adverse human health or environmental effects on EJ populations in the EJ study area for Alternative C. While these effects would be temporary, mitigated, and generally limited to the immediate project sites and transmission line corridors, such effects would be anticipated to be the same for EJ populations and other populations in the vicinity. To determine disproportionate effects for a given solar facility, detailed EJ analyses would occur for each solar facility and transmission line activity under future NEPA reviews.

3.15 Safety

3.15.1 Regulatory Framework

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. U.S. Department of Labor, OSHA is the main statute protecting the health and safety of workers in the workplaces. OSHA regulations are presented in Title 29 CFR Part 1910 (29 CFR 1919), OSHA Standards. A related statute, 29 CFR 1926, contains health and safety regulations specific to the construction industry. The Tennessee Department of Labor and Workforce Development has adopted federal OSHA standards contained in 29 CFR Parts 1910 and 1926 pursuant to Tennessee Code Annotated Section 50-3-201 (TVA 2016b). The other states in the TVA region have similar workplace safety regulatory programs.

3.15.2 Affected Environment

The routine operations and maintenance activities at the existing TVA facilities reflect a safety conscious culture. Activities are performed consistent with OSHA and state standards and requirements and specific TVA guidance. Personnel at TVA facilities are conscientious about health and safety having addressed and managed operations to reduce or eliminate occupational hazards through implementation of safety practices, training, and control measures.

TVA has a safety program in place to prevent worker injuries and accidents. The various prevention programs include but are not limited to the following:

- Operations and Maintenance Plans
- Hazard Communication
- Housekeeping
- Project Safety Plans
- Competent Person
- Ground Disturbance
- Lifting Operations
- Energy Isolation (Lockout/Tag out)
- Cutting, Burning, Welding and other “Hot Work”
- Incident Reporting and Investigations
- Personal Protective Equipment
- Hearing Conservation
- Employee Training
- Contractor Evaluation and Acceptance
- Emergency Spill/Release Plans
- Emergency Response Plan

The implementation of proper engineering and equipment design, administrative controls such as employee training and compliance with regulatory requirements related to Health and Safety, help ensure that the risks associated with work at TVA facilities remain low.

3.15.2.1 CUF Reservation

Public emergency services in the vicinity of the CUF Reservation include law enforcement services and fire protection services in Cumberland City, and urgent care clinics and a hospital in the city of Erin. The Stewart County Emergency Management Agency (EMA) has the responsibility and authority to coordinate with state and local agencies in the event of a release of hazardous materials (Tennessee EMA 2021).

The Stewart County Community Medical Center, located in Dover, TN, approximately 11 miles (22 minutes) southwest of the Project Site, is the closest medical provider to the Project Site.

Law enforcement services in Cumberland City are provided by the Cumberland City Police Department in Cumberland City, Tennessee, approximately one mile (four minutes) from the CUF. Stewart County law enforcement services are provided by the Stewart County Sheriff's Office in Dover, Tennessee, approximately 12 miles (25 minutes) from the CUF.

Fire protection services are provided by the Cumberland City Fire Department, located approximately two miles (five minutes) from the CUF.

3.15.2.2 Alternative A

3.15.2.2.1 Natural Gas Pipeline Corridor

Public emergency services in the area of the proposed 32-mile pipeline include urgent care clinics, hospitals, law enforcement services, and fire protection services. The Stewart, Houston, and Dickson County EMAs have the responsibility and authority to coordinate with state and local agencies in the event of a release of hazardous materials (Tennessee EMA 2021). The Houston County Community Hospital, located in Erin, TN approximately 3.7 miles (7 minutes) southwest of the corridor is the closest medical provider along the corridor. Law enforcement services are provided by the Cumberland City Police Department in Cumberland City, TN (2.1 miles north, 3 minutes). Fire protection services are provided by the Houston County Fire Department, located approximately 3.3 miles (7 minutes) southwest of the corridor. These are the closest emergency services to a specific point on the corridor. Distances and travel times will vary at different points on the corridor.

3.15.2.3 Alternative B

3.15.2.3.1 Johnsonville Reservation

Public emergency services in the vicinity of the Johnsonville Reservation include law enforcement services, a medical center, and fire protection services in New Johnsonville, and urgent care clinics and a hospital in the city of Camden. The Humphreys County EMA has the responsibility and authority to coordinate with state and local agencies in the event of a release of hazardous materials (Tennessee EMA 2021).

The New Johnsonville Family Health Center, located in New Johnsonville, approximately one mile (five minutes) southeast of the plant site, is the closest medical provider to the site. Law enforcement services in New Johnsonville are provided by the New Johnsonville Police Department, approximately one mile (three minutes) from the JCT. Humphreys County law enforcement services are provided by the Humphreys County Sheriff's Office in Waverly, approximately 12 miles (17 minutes) from the JCT. Fire protection services are provided by the

New Johnsonville Fire Department, located approximately one mile (three minutes) from the JCT.

3.15.2.3.2 Gleason Reservation

Public emergency services in the vicinity of the Gleason Reservation include law enforcement services and fire protection services in the town of Gleason, walk-in clinics in the town of Dresden, and a hospital in the city of McKenzie. The Weakley County EMA has the responsibility and authority to coordinate with state and local agencies in the event of a release of hazardous materials (Tennessee EMA 2021).

The Gleason Clinic, located in Gleason, Tennessee, approximately two miles (five minutes) south of the Gleason site, is the closest medical provider to the site. Law enforcement services in Gleason are provided by the Gleason Police Department, approximately three miles (six minutes) from the Gleason site. Weakley County law enforcement services are provided by the Weakley County Sheriff’s Office in Dresden, approximately six miles (six minutes) from the site. Fire protection services are provided by the Gleason Fire Department, located approximately three miles (five minutes) from the site.

3.15.2.3.3 Transmission Corridors

Public emergency services in the area of the proposed new 40-mile TL include urgent care clinics, hospitals, law enforcement services, and fire protection services. The Weakley and Henry County EMAs have the responsibility and authority to coordinate with state and local agencies in the event of a release of hazardous materials (Tennessee EMA 2021).

The West Tennessee Healthcare Volunteer Hospital Emergency Room, located in Martin, approximately 4.8 miles (eight minutes) north of the corridor, is the closest medical provider near the corridor. Law enforcement services are provided by the Weakley County Sheriff's Office in Dresden (3.7 miles south, seven minutes) and the Henry County Sheriff's Office (7.4 miles south, 11 minutes) in Paris. Fire protection services are provided by the City of Martin Fire-Rescue Station 1, located approximately 5.2 miles (nine minutes) from the corridor. These are the closest emergency services to a specific point on the corridor. Distances and travel times will vary at different points on the corridor.

3.15.2.4 Alternative C

3.15.2.4.1 Middle Tennessee TVA Power Service Area

TVA anticipates that a portion of the solar and storage facilities proposed under Alternative C will be located in the Middle Tennessee region. During construction, workers would have an increased safety risk typical for other construction activities. Particular caution would be taken when handling solar panels due to the potential for electric shock. The standard practice is for contractors to establish and maintain health and safety plans in compliance with OSHA regulations. See Section 2.3.1 for more details on standard BMPs.

3.15.3 Environmental Consequences

3.15.3.1 The No Action Alternative

Under the No Action Alternative, TVA would continue to operate and maintain the CUF plant and adhere to all applicable safety standards. No project-related effects on public health and safety would result.

3.15.3.2 All Action Alternatives

TVA’s Standard Programs and Processes related to safety would be strictly adhered to during implementation of all the action alternatives. The safety programs and processes are designed to identify actions required for the control of hazards in all activities, operations, and programs.

They also establish responsibilities for implementing Section 19 of the Occupational Safety and Health Act of 1970. TVA and its contractors are required to comply with Occupational Safety and Health regulations and follow a Site-Specific Safety & Health Plan.

Potential public health and safety hazards could result from increased traffic on roadways as a result of all the action alternatives. Residential and other human use areas along roadways used by construction traffic to access the site would experience increased commercial and industrial traffic. Awareness of these residences and establishment of traffic procedures to minimize potential safety concerns would be addressed in the health and safety plans followed by construction contractor(s).

3.15.3.3 Retirement, Decommissioning, Decontamination, and Deconstruction of CUF Plant

Under all Action Alternatives, TVA would retire, decommission, decontaminate, and deconstruct the CUF plant. Primary operational measures that would be discontinued due to the plant retirement include daily coal barge operations, coal pile management, pumping and use of water from the Cumberland River for the coal plant, and thermal discharges back into the Cumberland River. The combustion of coal for the production of power would cease as would generation of wastes associated with such power production, thereby reducing any risks resulting from proximity to coal combustion for workers onsite.

During D4 activities, workers would have an increased safety risk. However, because D4 work has known hazards, the standard practice is for contractors to establish and maintain health and safety plans in compliance with OSHA regulations. Health and safety plans emphasize BMPs for site safety management to minimize potential risks to workers. Examples of BMPs include employee safety orientations; establishment of work procedures and programs for site activities; use of equipment guards, emergency shutdown procedures, lockout procedures, site housekeeping, and PPE; regular safety inspections; and plans and procedures to identify and resolve hazards. Asbestos-containing materials in building structures and systems would be remediated as necessary to be protective of environment and worker health and safety, but full abatement would not occur until demolition activities are initiated.

An SPCC plan would be implemented to minimize the potential of a spill during the drainage and disposal of oil and fluids and to instruct on-site workers on how to contain and clean up any potential spills. Decontamination would involve removing select regulated materials in a safe and practical manner in such a way that the plant is left in a status that does not present a hazard or risk to the environment or personnel. Limited contamination work undertaken at the fossil plants may include abatement and disposal of regulated materials, which include but are not limited to PCB equipment, asbestos, hazardous waste, and solid waste. The perimeter of each grouping of project elements would remain securely fenced during demolition and decontamination, and access gates would normally remain locked. General public health and safety would not be at risk in the event of an accidental spill on site. Emergency response would be provided by the local, regional, and state law enforcement, fire, and emergency responders.

Since explosive demolition would be conducted under tight security, the danger to the public from this activity would likely be very low. Explosives would be managed under the direction of a licensed blaster. Security would be a very important component of this event to eliminate as much as possible any threats to public health or safety. Once explosives arrive onsite, 24-hour security would be provided to monitor the explosives. Detailed security plans would be developed and provided to area emergency response agencies. Security details, including any information about the transport and storage of explosives, would be limited to authorized personnel only. Site security on the day of the event would be strictly enforced, and trespassing would not be tolerated. Notifications to the public would be issued prior to the use of explosives for demolition. Health and safety hazards could result from premature detonation or premature collapse of structures during demolition if explosives are used. These risks are reduced if mechanical demolition is utilized, though precautions should still be implemented. Overall, effects to public health and safety in association with implementation of the Proposed Action would be considered temporary and minor.

During demolition and materials removal, truck traffic of other projects on the CUF Reservation and CCR Management activities would add to the traffic. This could result in cumulative safety effects as a result of the cumulative traffic effects from nearby projects. Effects would be anticipated to be temporary and minor and would affect primarily the truck drivers and construction personnel. Controls would be needed to ensure truck traffic is coordinated and safe. With proper planning, adherence to OSHA regulations and health and safety plans, and implementation of BMPs, cumulative effects from the project in relation to public health and safety would not occur.

3.15.3.3.1 Environmental Justice Considerations

Safety-related effects that would occur as a result of CUF coal facility retirement and D4 activities are not anticipated to have disproportionate and adverse human health or environmental effects on EJ populations in the CUF Reservation EJ study area. These effects would be temporary and minor to mitigated. Moreover, the effects are anticipated to be limited to the TVA-owned CUF Reservation or immediate vicinity, where EJ populations are not present and are removed by some distance (Figure 3.4-3). The effects would generally be experienced by other populations since they are more prominent in the immediate CUF vicinity.

3.15.3.4 Alternative A

3.15.3.4.1 Construction and Operation of CC Plant at CUF

Under Alternative A, TVA would retire the CUF, demolish the units, and construct and operate a CC plant on the CUF Reservation. TVA would also construct a new switchyard at the CC plant and connect two existing 500-kV TLs. During construction, workers would have an increased safety risk. See Section 2.3.1 Standard practices and routine measures for additional details on standard BMPs.

The CC plants will require minor and temporary movement of fuel gas and oil. An SPCC plan would be implemented to minimize the potential of a spill during construction and operation and to instruct on-site workers on how to contain and clean up any potential spills. Decontamination would involve removing select regulated materials in a safe and practical manner in such a way that the plant is left in a status that does not present a hazard or risk to the environment or personnel. Limited contamination work undertaken at the fossil plants may include abatement and disposal of regulated materials, which include but are not limited to PCB equipment, asbestos, hazardous waste, and solid waste. The perimeter of each grouping of Project elements would remain securely fenced during construction and operation, and access gates would normally remain locked. Security fencing around site boundary will be installed during construction. Once the plant is operational, permanent security fencing will be installed. General public health and safety would not be at risk in the event of an accidental spill on site. Emergency response would be provided by the local, regional, and state law enforcement, fire, and emergency responders.

During construction of the CC plant, truck traffic of other projects on the CUF Reservation and CCR Management activities would add to the traffic. This could result in cumulative safety effects as a result of the cumulative traffic effects from nearby projects. Effects would be anticipated to be temporary and minor and would affect primarily the truck drivers and construction personnel. Controls would be needed to ensure truck traffic is coordinated and safe.

The public health and safety effects of air quality from coal plant operations would be reduced, as the CC Plant will produce less emissions. The CC plant would also use an SCR system located within the HRSG for additional NO_x reduction. As 19.5% aqueous ammonia will be used rather than anhydrous (gaseous) ammonia used by the coal plant, an onsite ammonia receiving and storage facility will not be required. See the Air Quality Section for more information.

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.

TL construction and operation requires a high level of safety risk management due to the dangers present when working near high-voltage equipment. Overall, effects to public health and safety in association with the transmission system components on the CUF Reservation would be considered temporary and minor. With proper planning, adherence to OSHA regulations and health and safety plans, and implementation of BMPs, cumulative effects from the project in relation to public health and safety would not occur.

3.15.3.4.2 Construction and Operation of Natural Gas Pipeline

The construction and operation of a new CC plant will require construction of approximately 32 miles of new natural gas pipeline lateral and gas system infrastructure. During construction, workers would have an increased safety risk. However, because construction work has known hazards, the standard practice is for contractors to establish and maintain health and safety plans in compliance with OSHA regulations. The proposed pipeline will be designed in accordance with U.S. Department of Transportation (USDOT) regulations (49 CFR 192) for material selection and qualification, minimum design requirements, and protection from internal, external, and atmospheric corrosion. All pipe is anticipated to be USDOT Pipeline and Hazardous Material Safety Administration Class 1, 2, or 3 rated as required. Additional information on safety will be provided as part of the Environmental Report to be submitted with the certificate application that will be filed with the FERC for the proposed pipeline.

An appropriate SPCC plan would be implemented by TGP to minimize the potential of a spill during construction and operation of the pipeline. Decontamination could involve removing select regulated materials in a safe and practical manner in such a way that the pipeline is left in a status that does not present a hazard or risk to the environment or personnel. General public health and safety would not be at risk in the event of an accidental spill on site. Emergency response would be provided by the local, regional, and state law enforcement, fire, and emergency responders. Overall, effects to public health and safety in association with construction and operation of the gas pipeline lateral would be minor.

During construction of the pipeline, truck traffic of other projects in the area could add to the traffic. This could result in cumulative safety effects as a result of the cumulative traffic effects from nearby projects. Effects would be anticipated to be temporary and minor and would affect primarily the truck drivers and construction personnel. Controls would be needed to ensure truck traffic is coordinated and safe. With proper planning, adherence to OSHA regulations and health and safety plans, and implementation of BMPs, cumulative effects from the project in relation to public health and safety would not occur.

3.15.3.4.3 Environmental Justice Considerations

Safety-related effects that would occur as a result of the proposed CC plant and natural gas pipeline lateral would be temporary and minor to mitigated per implementation of BMPs and adherence to OSHA regulations, as described above. These effects would also be limited to the TVA-owned CUF Reservation and pipeline corridor, where EJ populations are either removed from the immediate vicinity, as with the CUF Reservation (two out of 16 census block groups are low-income EJ populations; see also Figure 3.4-3), or limited, as with the pipeline corridor (one out of 10 census block groups are low-income EJ populations; see also Figure 3.4-4). While effects may be experienced by EJ populations located in the far eastern extreme of the pipeline corridor EJ study area, these effects would be similar to those experienced by non-EJ populations and, thus, are not anticipated to be disproportionate.

3.15.3.5 Alternative B

3.15.3.5.1 Construction and Operation of CT Plant at Johnsonville Reservation

Under Alternative B, TVA would construct a new CT plant on the JCT Reservation. During the construction of the CT plant, workers would have an increased safety risk. However, because construction work has known hazards, the standard practice is for contractors to establish and maintain health and safety plans in compliance with OSHA regulations. See Section 2.3.1 for more details on standard BMPs.

CT plants require the movement of fuel gas and oil. An SPCC plan would be implemented to minimize the potential of a spill during construction and operation and to instruct on-site workers on how to contain and clean up any potential spills. Security fencing around the site boundary will be installed during construction. Once the plant is operational, permanent security fencing will be installed. General public health and safety would not be at risk in the event of an accidental spill on site. Emergency response would be provided by the local, regional, and state law enforcement, fire, and emergency responders.

The public health and safety effects of air quality from CT operations would be negligible. Operating the CT plant would require air emissions monitoring. Reduction of NOX emissions from the CTs would be achieved through DLN combustion systems. Exhaust stacks would be equipped with continuous emissions monitoring systems. Emissions from the units would adhere to the requirements of TDEC and federal regulations.

During construction of the CT plant, truck traffic of other projects in the area, such as the proposed adjacent Aeroderivative CT project, could add to the traffic. This could result in cumulative safety effects as a result of the cumulative traffic effects from nearby projects. Effects would be anticipated to be temporary and minor and would affect primarily the truck drivers and construction personnel. Controls would be needed to ensure truck traffic is coordinated and safe. With proper planning, adherence to OSHA regulations and health and safety plans, and implementation of BMPs, cumulative effects from the project in relation to public health and safety would not occur.

3.15.3.5.2 Construction and Operation of CT Plant at Gleason Reservation

Under Alternative B, TVA would construct a new CT plant on the Gleason Reservation. Effects to health and safety and the measures to address effects are the same as those described in Section 3.15.3.5.1 for the JCT CT plant.

3.15.3.5.3 Transmission and Other Components

New double breaker bays would be added, and switchyards would be added, or current switchyards expanded at both JCT and Gleason. New 500-kV TLs and a 40-mile TL would also be added. All unit substation transformers would be oil filled; therefore, concrete foundations and an oil containment system would be included. During construction, workers would have an increased safety risk. However, because construction work has known hazards, the standard practice is for contractors to establish and maintain health and safety plans in compliance with OSHA regulations. TL safety effects would be comparable to those discussed in Section 3.15.3.4.1.

3.15.3.5.4 Environmental Justice Considerations

Safety-related effects that would occur as a result of the proposed CT facilities and transmission line activities would be temporary and minor to mitigated per implementation of BMPs and adherence to OSHA regulations, as described above. These effects would also be limited to the immediate TVA-owned reservations and transmission line corridor. While there are no EJ populations in the immediate vicinity of the Gleason Reservation, minority EJ populations are present in the immediate vicinity of the JCT Reservation. However, because safety-related effects will be limited to the immediate TVA-owned reservation and apply to on-site workers and not the general public, these effects will occur where no EJ populations reside. Safety-related effects from transmission line construction and upgrade activities are expected to be short-term and minimal. Thus, minimal to no effects are anticipated on EJ populations. Since EJ and non-EJ populations would experience these effects, they are not anticipated to be disproportionate on EJ populations.

3.15.3.6 Alternative C

3.15.3.6.1 Construction and Operation of Solar and Storage Facilities

Under Alternative C, TVA would construct and operate 3,000 MW of solar and 1,700 MW of battery storage at various sites, primarily in Middle Tennessee. During construction, workers would have an increased safety risk typical for other construction activities. Particular caution would be taken when handling solar panels due to the potential for electric shock. The standard practice is for contractors to establish and maintain health and safety plans in compliance with OSHA regulations. See Section 2.3.1 for more details on standard BMPs.

Once solar panels are installed and in operation, they are considered to be very safe for humans and wildlife. Solar projects do not cause EMF levels such that there will be effects on nearby residents. Sites are typically designed and operated using standard industry practices with sufficient setbacks to reduce or eliminate EMF exposure to adjacent property owners. EMF strength is typically measured in milli-gauss (mG). While long-term exposure to levels above 4mG is still identified as a concern (Cleveland 2017); the EMF generated by the solar facilities and associated transmission lines are typically less than 4mG.

The perimeter of each grouping of solar arrays, as well as substations and energy storage facilities, would remain securely fenced during construction and operation, and access gates would normally remain locked. Security fencing around the site boundary will be installed during construction. Once the facility is operational, permanent security fencing will be installed.

The construction of Alternative C combined with the RFFA of planned 10,000 MW expansions of solar facilities could result in cumulative safety effects as a result of the cumulative traffic effects from nearby projects. Effects would be anticipated to be temporary and minor and would affect primarily the truck drivers and construction personnel. Controls would be needed to ensure truck traffic is coordinated and safe. With proper planning, adherence to OSHA regulations and health and safety plans, and implementation of BMPs, cumulative effects from the project in relation to public health and safety would not occur.

3.15.3.6.2 Transmission and Other Components

The extent of transmission lines necessary under Alternative C is not yet known. Transmission line effects to safety would be comparable to those discussed in Section 3.15.3.4.1.

3.15.3.6.3 Environmental Justice Considerations

Safety-related effects that would occur as a result of the proposed solar facilities and transmission line activities are not anticipated to have disproportionate and adverse human health or environmental effects on EJ populations in the EJ study area for Alternative C, as these effects would be temporary, minor and mitigated, and limited to the immediate project sites and transmission line corridors. Such effects would be anticipated to be the same for EJ populations and other populations. To determine disproportionate effects for a given solar facility, detailed EJ analyses would occur for each solar facility and transmission line activity under future NEPA reviews.

3.16 Socioeconomics

Social, economic, and sociocultural characteristics of potentially affected populations are assessed in this section using the 2010 Census, 2020 Census, and the 2019 ACS. State-level USCB data are included for comparison purposes. These data were obtained utilizing USCB Explore Census Data (USCB 2021). Where appropriate, additional data from USCB and other federal and state agencies are employed.

The area considered for socioeconomic analysis varies relative to the alternative and corresponds to the extent of effects (both adverse and beneficial) anticipated for that alternative (Figure 3.16-1). The area considered for the CUF Reservation and for the TVA facilities associated with Alternative B is the approximated geographic area from which the labor market is derived. The labor market area consists of the counties where the facilities are located and all adjacent counties. For the natural gas pipeline lateral corridor associated with Alternative A, the extent of effects are expected to be more limited than those associated with the natural gas plants, while also representing a temporary labor market area given the local effects to employment from pipeline construction; thus, a three-mile radius of the pipeline is assessed for the socioeconomic analysis. To better represent the data given the smaller study area, census tract data, given as Census Tract number (e.g., CT 601) by county, are utilized to characterize socioeconomics in the linear pipeline lateral corridor.[12]

For Alternative C, the area from which potentially affected populations are identified is the Middle Tennessee region of the TVA PSA (Figure 3.4-2), as assessed by the census data associated with each county in the region.

[12] Whereas block group data were used in the EJ analyses, census tract data were determined to be appropriate for the socioeconomic analysis pertaining to the pipeline. This is because socioeconomic analyses are not intended to identify sensitive populations that could be overlooked if the analyses are not conducted at a final level of detail, such as achieved with block group data, and instead are presenting characteristics of the general population pertaining to demographics, housing, employment, and income. These characteristics are appropriately represented at the census tract level, as commensurate with the anticipated socioeconomic effects.

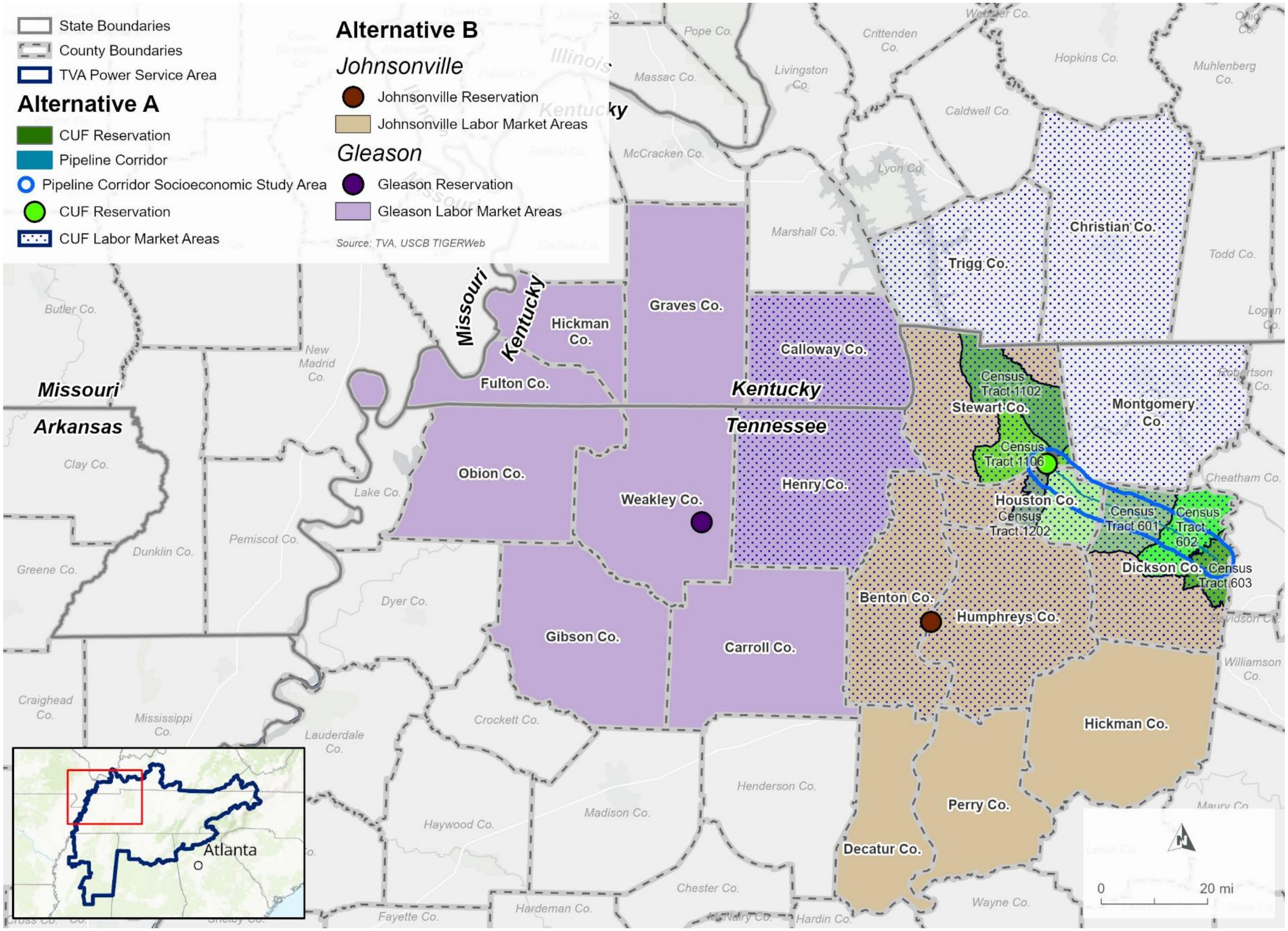

Figure 3.16-1. CUF Reservation and Alternative A and B Socioeconomic Study Areas

3.16.1 Affected Environment

3.16.1.1 CUF Reservation

The labor market area for CUF is Stewart County, Tennessee, where the facility is located, and Benton, Dickson, Henry, Houston, Humphreys, and Montgomery counties, Tennessee, and Calloway, Christian, and Trigg counties, Kentucky. The CUF labor market area is largely rural but includes a few small cities, the largest being Clarksville in Montgomery County, with 166,722 people in 2020; Hopkinsville in Christian County, with 31,180 people in 2020; Murray in Calloway County, with 17,307 people in 2020; and Dickson in Dickson County, with 16,058 people in 2020. The CUF labor market area also encompasses the transmission line corridors associated with Alternative A.

3.16.1.1.1 Demographics and Housing

Population data for the affected counties and associated states are provided in Table 3.16-1, based on the 2010 Census and the 2020 Census. As shown, from 2010 to 2020, population growth in all affected counties except Dickson and Montgomery counties was less than the growth for the associated states. Six of the 10 affected counties recorded population losses over that period. Of the affected counties, only Stewart County, where the CUF Reservation is located, and Dickson, Humphreys, and Montgomery counties recorded population gains over that period.

Table 3.16-1. Population Change for the CUF Labor Market Area

Geography	2010 Census	2020 Census	% Change
Tennessee	*6,346,105*	*6,910,840*	*8.9*
Stewart County (CUF)	13,324	13,657	2.5
Benton County	16,489	15,864	-3.8
Dickson County	49,666	54,315	9.4
Henry County	32,330	32,199	-0.4
Houston County	8,426	8,283	-1.7
Humphreys County	18,538	18,990	2.4
Montgomery County	173,331	220,069	27.7
Kentucky	*4,339,367*	*4,505,836*	*3.8*
Calloway County	37,191	37,103	-0.2
Christian County	73,955	72,748	-1.6
Trigg County	14,339	14,061	-1.9

Sources: 2010 Census; 2020 Census

Other demographic characteristics of the 10 affected counties, as compared with associated states, are summarized in Table 3.16-2, based on the 2019 ACS. The populations of affected counties were generally more aged than the state populations. The exceptions for this were in Montgomery, Calloway, and Christian counties, where the larger cities are present, and the populations were younger than the associated states. In Stewart County and all but three other affected counties, there were lower percentages of people who were high school graduates or higher than the associated states.

Table 3.16-2. Demographic Characteristics for the CUF Labor Market Area

Geography	% of Population 65 Years and Over	Median Age	% High School or Higher*	% of Occupied Housing Units, Renter Occupied	Median Year Housing Units Built
Tennessee	*16.0*	*38.7*	*87.5*	*33.7*	*1984*
Stewart County (CUF)	19.6	44.2	87.2	25.0	1986
Benton County	23.8	47.9	82.4	22.9	1985
Dickson County	15.5	39.1	83.7	24.9	1986
Henry County	22.8	45.1	85.9	23.8	1981
Houston County	20.9	43.9	77.2	23.5	1981
Humphreys County	19.3	42.0	84.9	22.2	1980
Montgomery County	9.1	30.8	92.9	40.5	1993
Kentucky	*16.0*	*38.9*	*86.3*	*32.8*	*1980*
Calloway County	16.8	35.6	89.5	37.6	1984
Christian County	12.1	28.3	85.6	51.9	1979
Trigg County	22.2	46.2	88.0	19.0	1990

*Of Population over 25 Years and includes High School Equivalency
Source: 2019 ACS

According to the 2019 ACS, the majority of affected counties, including Stewart County, had lower percentages of renter-occupied housing units than their respective state. In six of the affected counties, including Stewart County, housing units were generally newer than across the respective state.

3.16.1.1.2 Regional Economy, Employment, and Income

As of June 2021, CUF directly employed 252 people. This includes a range of positions such as general laborers, steamfitters, machinists, electricians, analysts, administrators, and supervisors. The CUF average annual salary is approximately 125 percent higher than the average annual wages per employee in affected counties, based on the Quarterly Census of Employment and Wages from the U.S. Bureau of Labor Statistics (USBLS; USBLS 2022). CUF also employs contractors for both short- and long-term operations labor support and contracts with coal and limestone mining operations and transportation companies that support additional employment and account for significant contributions to the area economy.

CUF also has indirect and induced effects on the local economy. Indirect effects result from changes in sales, income, or employment within the CUF region, and induced effects occur through the recirculation of money received through direct and indirect income sources and the subsequent creation of additional jobs and economic activities.

TVA makes payments in lieu of taxes, also called tax equivalent payments, to states where TVA sells electricity or owns power system assets. The payments total five percent of gross proceeds from the sale of power in the prior fiscal year (FY), with some exclusions. Tennessee Code Annotated Title 67, Chapter 9, Part 1 (T.C.A. § 67-9-102) directs how the funds are apportioned within the state and mandates that an individual county's portion of the total payment is determined by its proportion of population, total land area, and TVA-owned land in the county. Per T.C.A. § 67-9-102, in FY2021, $2.9 million of TVA's overall tax equivalent payment paid to Tennessee was allocated to Stewart County.

Table 3.16-3 summarizes 2019 ACS data on employment and income for the affected counties. All affected counties had lower percentages of people in the labor force than their respective state. Nine of the 10 affected counties, including Stewart County, had unemployment rates above that of the associated state. Based on the Quarterly Census of Employment and Wages from USBLS, the annual average total employment in Stewart County was estimated to be 2,759 in 2020 (USBLS 2022). Direct employment at CUF comprises about 9 percent of this total. Based on the 2019 ACS, per capita income in all affected counties except Trigg County was lower than that of their respective state.

Table 3.16-3. Employment and Income Characteristics for the CUF Labor Market Area

Geography	% of 16+ Civilian Population in Labor Force	Unemployment Rate	% Employed in Education Services, Healthcare, and Social Services	% Employed in Transportation, Manufacturing, and Utilities	Per Capita Income
Tennessee	*61.0*	*3.2*	*22.5*	*19.6*	*$29,859*
Stewart County (CUF)	52.2	6.4	20.3	21.5	$24,113
Benton County	47.4	6.8	27.8	20.0	$22,636
Dickson County	58.2	3.2	21.3	23.4	$27,115
Henry County	50.1	4.7	24.1	21.9	$24,124
Houston County	49.8	5.9	34.4	21.3	$22,360
Humphreys County	53.3	7.5	29.8	19.1	$25,428
Montgomery County	58.2	6.5	18.6	23.8	$26,923
Kentucky	*59.0*	*3.3*	*24.0*	*20.7*	*$28,178*
Calloway County	58.7	4.3	17.2	35.3	$23,219
Christian County	47.3	7.4	23.7	24.1	$23,021
Trigg County	53.7	9.2	23.4	23.2	$28,264

Source: 2019 ACS

Pertinent civilian employment characteristics for the affected counties are also shown on Table 3.16-3. Manufacturing and healthcare generally lead the industries for employment, with education services employing larger percentages, as well. Though not shown on Table 3.16-3, construction also employs larger percentages of people in the CUF labor market area. Stewart County and eight other affected counties exceeded state percentages for civilians employed in transportation, manufacturing, and utilities.

3.16.1.2 Alternative A

3.16.1.2.1 Natural Gas Pipeline Lateral Corridor

Census tracts within a three-mile radius of the natural gas pipeline lateral corridor, called the pipeline corridor socioeconomic study area, include or touch seven census tracts within portions of Stewart, Houston, and Dickson counties in Tennessee.

3.16.1.2.1.1 Demographics and Housing

Population data for the pipeline corridor socioeconomic study area and Tennessee are provided in Table 3.16-4, based on the 2010 Census and the 2019 ACS. As shown, from 2010 to 2019, population growth in all affected counties was less than the growth for the state, and four of the seven census tracts recorded population losses over that period.

Table 3.16-4. Population Change in the Pipeline Corridor Socioeconomic Study Area

Geography	2010 Census	2019 ACS*	% Change
Tennessee	*6,346,105*	*6,709,356*	*8.9*
Dickson County			
CT 601 (Pipeline)	4,210	4,118	2.2
CT 602 (Pipeline)	6,625	7,215	-8.9
CT 603 (Pipeline)	6,376	6,845	-7.4
Houston County			
CT 1201 (Pipeline)	3,228	3,170	1.8
CT 1202 (Pipeline)	2,203	2,456	-11.5
Stewart County			
CT 1102	6,544	6,318	3.5
CT 1106 (Pipeline)	2,547	2,582	-1.4

*2019 ACS data was used for calculating % Change for this alternative rather than 2020 Census Data due to changes in census tract boundaries between the 2010 Census and 2020 Census.
Sources: 2010 Census; 2019 ACS

Other demographic characteristics of the affected census tracts, as compared to Tennessee, are summarized in Table 3.16-5, based on the 2019 ACS. The populations of all but two of the affected census tracts were more aged than the state population. The exceptions for this were in Dickson County CT 602 and Dickson County CT 603, near the city of Dickson, where the populations were younger than across Tennessee. In all but two affected census tracts, there were lower percentages of people who were high school graduates or higher than the state.

According to the 2019 ACS, all affected census tracts had lower percentages of renter-occupied housing units than the state. In five of the seven census tracts, housing units were newer than across the respective state.

Table 3.16-5. Demographic Characteristics in the Pipeline Corridor Socioeconomic Study Area

Geography	% of Population 65 Years and Over	Median Age	% High School or Higher*	% of Occupied Housing Units Renter Occupied	Median Year Housing Units Built
Tennessee	*16.0*	*38.7*	*87.5*	*33.7*	*1984*
Dickson County					
CT 601 (Pipeline)	16.1	42.9	87.5	16.3	1985
CT 602 (Pipeline)	13.4	38.1	76.3	24.8	1984
CT 603 (Pipeline)	12.1	38.2	76.5	24.6	1987
Houston County					
CT 1201 (Pipeline)	15.0	42.3	77.7	24.5	1985
CT 1202 (Pipeline)	25.1	44.1	78.1	25.6	1973
Stewart County					
CT 1102	17.7	42.1	90.0	25.5	1987
CT 1106 (Pipeline)	21.0	48.3	80.1	15.1	1989

*Of Population over 25 Years and includes High School Equivalency. Source: 2019 ACS

3.16.1.2.1.2 Employment and Income

Table 3.16-6 summarizes 2019 ACS data on employment and income for the pipeline corridor socioeconomic study area. All affected census tracts had lower percentages of people in the labor force than their respective state. Five of the seven affected census tracts had unemployment rates above that of the associated state. Based on the 2019 ACS, per capita income across the study area was lower than that of their respective state.

Table 3.16-6. Employment and Income Characteristics in the Pipeline Corridor Socioeconomic Study Area

Geography	% of 16+ Civilian Population in Labor Force	Unemployment Rate	% Employed in Education Services, Healthcare, and Social Services	% Employed in Transportation, Manufacturing, and Utilities	Per Capita Income
Tennessee	*61.0*	*3.2*	*22.5*	*19.6*	*$29,859*
Dickson County					
CT 601 (Pipeline)	54.8	1.0	19.6	21.9	$24,231
CT 602 (Pipeline)	49.0	5.1	29.8	21.3	$21,969
CT 603 (Pipeline)	59.0	5.2	21.9	13.7	$21,423
Houston County					
CT 1201 (Pipeline)	58.9	7.6	17.7	35.6	$22,841
CT 1202 (Pipeline)	43.0	2.4	26.7	33.7	$17,524
Stewart County					
CT 1102	55.8	6.5	25.3	20.4	$21,143
CT 1106 (Pipeline)	47.8	8.0	9.2	19.7	$24,104

Source: 2019 ACS

Pertinent civilian employment characteristics for the affected census tracts are also shown on Table 3.16-6. In the pipeline corridor socioeconomic study area, manufacturing and healthcare generally lead the industries for employment, with education services employing larger percentages, as well. Though not shown on Table 3.16-6, construction also employs larger percentages of people in the pipeline corridor socioeconomic study area. All but one census tract exceeded state percentages for civilians employed in transportation, manufacturing, and utilities.

3.16.1.3 Alternative B

3.16.1.3.1 Johnsonville Reservation

The labor market area for JCT is Humphreys County, where the facility is located, and Benton, Decatur, Dickson, Hickman, Houston, and Perry counties, Tennessee. The Johnsonville labor market area is largely rural but includes the more urban area associated with Dickson in Dickson County, which had a population of 16,058 in 2020.

3.16.1.3.1.1 Demographics and Housing

Population data for the affected counties and associated state are provided in Table 3.16-7, based on the 2010 Census and the 2020 Census. As shown, from 2010 to 2020, population growth in all affected counties except Dickson County was less than the growth for the state. Three of the seven affected counties recorded population losses over that period. Of the affected counties, only Humphreys County, where the Johnsonville Reservation is located, and Dickson, Hickman, and Perry counties recorded population gains over that period.

Table 3.16-7. Population Change for the Johnsonville Labor Market Area

Geography	2010 Census	2020 Census	% Change
Tennessee	*6,346,105*	*6,910,840*	*8.9*
Humphreys County (Johnsonville)	18,538	18,990	2.4
Benton County	16,489	15,864	-3.8
Decatur County	11,757	11,435	-2.7
Dickson County	49,666	54,315	9.4
Hickman County	24,690	24,925	1.0
Houston County	8,426	8,283	-1.7
Perry County	7,915	8,366	5.7

Sources: 2010 Census; 2020 Census

Other demographic characteristics of the seven affected counties, as compared with the state, are summarized in Table 3.16-8, based on the 2019 ACS. The populations of affected counties were more aged than the state population. In all affected counties, there were lower percentages of people who were high school graduates or higher than the state.

Table 3.16-8. Demographic Characteristics for the Johnsonville Labor Market Area

Geography	% of Population 65 Years and Over	Median Age	% High School or Higher*	% of Occupied Housing Units, Renter Occupied	Median Year Housing Units Built
Tennessee	*16.0*	*38.7*	*87.5*	*33.7*	*1984*
Humphreys County (Johnsonville)	19.3	42.0	84.9	22.2	1980
Benton County	23.8	47.9	82.4	22.9	1985
Decatur County	23.4	46.4	85.9	19.0	1981
Dickson County	15.5	39.1	83.7	24.9	1986
Hickman County	16.8	41.1	78.6	19.7	1983
Houston County	20.9	43.9	77.2	23.5	1981
Perry County	20.5	43.2	74.9	17.6	1987

*Of Population over 25 Years and includes High School Equivalency
Source: 2019 ACS

According to the 2019 ACS, all affected counties had lower percentages of renter-occupied housing units than the state. In all but three of the affected counties, housing units were generally older than across Tennessee.

3.16.1.3.1.2 Employment and Income

Table 3.16-9 summarizes 2019 ACS data on employment and income for the affected counties. All affected counties had lower percentages of people in the labor force than the state. Six of the seven affected counties, including Humphreys County, had unemployment rates above that of Tennessee as a whole. Based on the Quarterly Census of Employment and Wages from USBLS, the annual average total employment in Humphreys County was estimated to be 5,790 in 2020 (USBLS 2022). Based on the 2019 ACS, per capita income in all affected counties was lower than that of the state.

Table 3.16-9. Employment and Income Characteristics for the Johnsonville Labor Market Area

Geography	% of 16+ Civilian Population in Labor Force	Unemployment Rate	% Employed in Educational Services, Healthcare, and Social Services	% Employed in Transportation, Manufacturing, and Utilities	Per Capita Income
Tennessee	*61.0*	*3.2*	*22.5*	*19.6*	*$29,859*
Humphreys County (Johnsonville)	53.3	7.5	29.8	19.1	$25,428
Benton County	47.4	6.8	27.8	20.0	$22,636
Dickson County	58.2	3.2	21.3	23.4	$27,115
Decatur County	51.5	9.3	25.0	26.4	$23,857
Hickman County	51.4	4.0	23.5	20.5	$22,856
Houston County	49.8	5.9	34.4	21.3	$22,360
Perry County	47.1	8.6	31.9	27.6	$27,970

Source: 2019 ACS

Pertinent civilian employment characteristics for the affected counties are also shown on Table 3.16-9. Manufacturing and healthcare generally lead the industries for employment, with education services employing larger percentages, as well. Though not shown on Table 3.16-9, construction also employs larger percentages of people in the Johnsonville labor market area. All affected counties except Humphreys County exceeded state percentages for civilians employed in transportation, manufacturing, and utilities.

3.16.1.3.2 Gleason Reservation

The labor market area for Gleason is Weakley County, Tennessee, where the facility is located, and Carroll, Gibson, Henry, and Obion counties, Tennessee, and Calloway, Fulton, Graves, and Hickman counties, Kentucky. The Gleason labor market area is largely rural but includes the more urban area associated with Murray in Calloway County, Kentucky, which had a population of 17,307 in 2020. The CUF labor market area also encompasses the transmission line corridors associated with Alternative B. These occur within Weakley and Henry counties.

3.16.1.3.2.1 Demographics and Housing

Population data for the affected counties and associated states are provided in Table 3.16-10, based on the 2010 Census and the 2020 Census. As shown, from 2010 to 2020, population growth in all affected counties was less than the growth for the two states. All but one of the affected counties recorded population losses over that period. Of the affected counties, only

Gibson County, near the urban areas associated with Dyersburg and Jackson, Tennessee (both outside the Gleason labor market area), recorded population gains over that period.

Table 3.16-10. Population Change for the Gleason Labor Market Area

Geography	2010 Census	2020 Census	% Change
Tennessee	*6,346,105*	*6,910,840*	*8.9*
Weakley County (Gleason)	35,021	33,510	-6.1
Carroll County	28,522	27,886	-0.3
Gibson County	49,683	49,228	1.5
Henry County	32,330	32,284	-0.4
Obion County	31,807	30,365	-3.2
Kentucky	*4,339,367*	*4,505,836*	*3.8*
Calloway County	37,191	38,837	-0.2
Fulton County	6,813	6,130	-4.4
Graves County	37,121	37,248	-1.3
Hickman County	4,902	4,510	-7.8

Sources: 2010 Census; 2020 Census

Other demographic characteristics of the nine affected counties, as compared with the states, are summarized in Table 3.16-11, based on the 2019 ACS. The populations of all but two affected counties were more aged than the state population. The exceptions to this were in Weakley County, where the Gleason Reservation is located, and Calloway County, where the city of Murray is located. In all affected counties except Calloway and Graves counties, there were lower percentages of people who were high school graduates or higher than the state.

According to the 2019 ACS, Weakley County and three of the nine other affected counties had higher percentages of renter-occupied housing units than the state. In all but one of the affected counties, housing units were generally older than across the associated state. The exception to this was in Calloway County, where Murray is located.

Table 3.16-11. Demographic Characteristics for the Gleason Labor Market Area

Geography	% of Population 65 Years and Over	Median Age	% High School or Higher*	% of Occupied Housing Units, Renter Occupied	Median Year Housing Units Built
Tennessee	*16.0*	*38.7*	*87.5*	*33.7*	*1984*
Weakley County (Gleason)	18.0	38.6	85.1	34.7	1977
Carroll County	19.9	42.5	84.1	26.9	1976
Gibson County	17.7	39.9	85.3	31.7	1975
Henry County	22.8	45.8	85.9	23.8	1981
Obion County	19.8	42.6	83.5	35.1	1974
Kentucky	*16.0*	*38.9*	*86.3*	*32.8*	*1980*
Calloway County	16.8	35.6	89.5	37.6	1984
Fulton County	20.1	43.5	79.1	38.7	1970
Graves County	18.2	39.7	87.4	24.5	1977
Hickman County	24.3	48.0	80.1	17.2	1976

*Of Population over 25 Years and includes High School Equivalency

Source: 2019 ACS

3.16.1.3.2.2 Employment and Income

Table 3.16-12 summarizes 2019 ACS data on employment and income for the affected counties. All affected counties had lower percentages of people in the labor force than their respective state. All the affected counties, including Weakley County, had unemployment rates above that of the associated state. Based on the Quarterly Census of Employment and Wages from the U.S. Bureau of Labor Statistics, the annual average total employment in Weakley County was estimated to be 10,715 in 2020 (USBLS 2022). Based on the 2019 ACS, per capita income in all affected counties was lower than that of their respective state.

Table 3.16-12. Employment and Income Characteristics for the Gleason Labor Market Area

Geography	% of 16+ Civilian Population in Labor Force	Unemployment. Rate	% Employed in Educational, Healthcare, and Social Services	% Employed in Transportation, Manufacturing, and Utilities	Per Capita Income
Tennessee	*61.0*	*3.2*	*22.5*	*19.6*	*$29,859*
Weakley County (Gleason)	54.4	5.6	23.4	28.8	$22,755
Carroll County	52.2	5.3	23.0	26.1	$22,394
Gibson County	55.2	6.1	22.6	23.0	$23,211
Henry County	50.1	4.7	24.1	21.9	$24,124
Obion County	55.6	5.5	25.4	21.5	$23,375
Kentucky	*59.0*	*3.3*	*24.0*	*20.7*	*$28,178*
Calloway County	58.7	4.3	17.2	35.3	$23,219
Fulton County	45.3	10.2	24.0	22.0	$18,247
Graves County	57.0	6.1	21.1	26.6	$24,750
Hickman County	45.7	7.0	20.0	30.6	$28,114

Source: 2019 ACS

Pertinent civilian employment characteristics for the affected counties are also shown on Table 3.16-12. Manufacturing and healthcare generally lead the industries for employment, with education services employing larger percentages, as well. Though not shown on Table 3.16-12, construction also employs larger percentages of people in the Gleason labor market area. All affected counties exceeded state percentages for civilians employed in transportation, manufacturing, and utilities.

3.16.1.4 Alternative C

3.16.1.4.1 Middle Tennessee TVA Power Service Area

The Alternative C socioeconomic study area consists of the Middle Tennessee region, as based on regions in the TVA PSA defined by the TVA Economic Development team (TVA 2022d; Figure 3.4-2). The Alternative C socioeconomic study area is separated into its 24 associated counties for evaluation purposes.

3.16.1.4.1.1 Demographics and Housing

Population data for the 24 counties in Middle Tennessee are provided in Table 3.16-13 in comparison with Tennessee as a whole, based on the 2010 Census and the 2020 Census. As shown, from 2010 to 2020, population growth in 14 of the 24 counties was less than the growth for the state. Two counties, Houston and Maury counties, recorded population losses over that period.

Table 3.16-13. Population Change in the Alternative C Socioeconomic Study Area

Geography	2010 Census	2020 Census	% Change
Tennessee	*6,346,105*	*6,910,840*	*8.9*
Bedford County	45,058	50,237	11.5
Cheatham County	39,105	41,072	5.0
Coffee County	52,796	57,889	9.6
Davidson County	626,681	715,884	14.2
Dickson County	49,666	54,315	9.4
Franklin County	41,052	42,774	4.2
Giles County	29,485	30,346	2.9
Hickman County	24,690	24,925	1.0
Houston County	8,426	8,283	-1.7
Humphreys County	18,538	18,990	2.4
Lawrence County	41,869	44,159	5.5
Lewis County	12,161	12,582	3.5
Lincoln County	33,361	35,319	5.9
Marshall County	52,266	53,276	1.9
Maury County	26,075	25,866	-0.8
Montgomery County	172,331	220,069	27.7
Moore County	6,362	6,461	1.6
Perry County	7,915	8,366	5.7
Robertson County	66,283	72,803	9.8
Rutherford County	262,604	341,486	30.0
Stewart County	13,324	13,657	2.5
Sumner County	160,645	196,281	22.2
Williamson County	183,182	247,726	35.2
Wilson County	113,993	147,737	29.6

Sources: 2010 Census; 2020 Census

Other demographic characteristics of Middle Tennessee, as compared with the state, are summarized in Table 3.16-14based on the 2019 ACS. In half of the 24 counties, the populations in the study area were more aged than the respective states. Except in seven counties, there were lower percentages of people who were high school graduates or higher than across the state.

According to the 2019 ACS, the counties in Middle Tennessee generally had lower percentages of renter-occupied housing units than across the state. In most counties, housing units were newer than across the state.

Table 3.16-14. Demographic Characteristics of the Alternative C Socioeconomic Study Area

Geography	% of Population 65 Years and Over	Median Age**	% High School or Higher*	% of Occupied Housing Units, Renter Occupied	Median Year Housing Units Built**
Tennessee	*16.0*	*38.7*	*87.5*	*33.7*	*1984*
Bedford County	15.0	37.9	82.1	31.5	1986
Cheatham County	14.6	40.3	87.0	23.0	1988
Coffee County	17.2	39.7	85.4	31.9	1984
Davidson County	12.0	34.3	89.1	45.7	1981
Dickson County	15.5	39.1	83.7	24.9	1986
Franklin County	19.4	42.2	87.5	25.5	1983
Giles County	19.8	43.9	85.8	30.4	1981
Hickman County	16.8	41.1	78.6	19.7	1983
Houston County	20.9	43.9	77.2	23.5	1981
Humphreys County	19.3	42	84.9	22.2	1980
Lawrence County	17.6	39.3	83.4	24.7	1979
Lewis County	20.5	43.3	84.3	22.0	1986
Lincoln County	18.9	42.6	83.5	24.9	1983
Marshall County	15.7	42.6	85.4	28.2	1986
Maury County	15.5	43.5	90.2	30.1	1989
Montgomery County	9.1	30.8	92.9	40.5	1993
Moore County	20.5	45	85.9	15.2	1988
Perry County	20.5	43.2	74.9	17.6	1987
Robertson County	14.5	39	87.2	26.0	1989
Rutherford County	10.2	33.5	91.8	34.8	1996
Stewart County	19.6	44.2	87.2	25.0	1986
Sumner County	15.6	39.8	89.7	26.4	1991
Williamson County	12.7	39.1	95.3	19.4	1997
Wilson County	15.4	40.4	91.6	23.2	1993

*Of Population over 25 Years and includes High School Equivalency
**For the PSA regions, the "medians" given are averages of the medians across the associated counties.
Source: 2019 ACS

3.16.1.4.1.2 Employment and Income

Table 3.16-15 summarizes 2019 ACS data on employment and income for the Alternative C socioeconomic study area. A majority of the 24 counties had lower percentages of people in the labor force and higher rates of unemployment than across the state. Based on the 2019 ACS, per capita income was lower than that of the state in 18 of the 24 counties.

Table 3.16-15. Employment and Income Characteristics for the Alternative C Socioeconomic Study Area

Geography	% of 16+ Civilian Population in Labor Force	Unemployment. Rate	% Employed in Educational Services, Healthcare, and Social Services	% Employed in Transportation, Manufacturing, and Utilities	Per Capita Income
Tennessee	*61.0*	*3.2*	*22.5*	*19.6*	*$29,859*
Bedford County	61.6	4.3	30.9	18.3	$24,864
Cheatham County	64.3	4.0	18.3	21.8	$27,893
Coffee County	59.7	4.5	31.1	17.2	$26,557
Davidson County	71.4	4.1	12.3	25.4	$36,440
Dickson County	58.2	3.2	21.3	23.4	$27,115
Franklin County	55.5	3.8	25.3	26.6	$28,317
Giles County	56.3	5.7	30.7	21.7	$25,690
Hickman County	51.4	4.0	23.5	20.5	$22,856
Houston County	49.8	5.9	34.4	21.3	$22,360
Humphreys County	53.3	7.5	29.8	19.1	$25,428
Lawrence County	54.1	8.1	27.5	25.3	$21,720
Lewis County	52.0	2.6	24.6	30.1	$21,516
Lincoln County	57.6	4.0	28.7	18.5	$26,965
Marshall County	60.6	6.0	31.5	21.0	$25,410
Maury County	63.6	4.0	30.0	25.6	$28,970
Montgomery County	58.2	6.5	18.6	23.8	$26,923
Moore County	55.1	4.8	33.5	21.9	$30,658
Perry County	47.1	8.6	31.9	27.6	$27,970
Robertson County	64.4	4.9	19.7	20.2	$29,524
Rutherford County	71.3	4.3	19.4	22.6	$30,159
Stewart County	52.2	6.4	20.3	21.5	$24,113
Sumner County	65.7	3.0	18.2	23.2	$33,851
Williamson County	68.8	2.8	10.1	26.4	$52,702
Wilson County	66.0	3.8	16.8	21.8	$34,575

Source: 2019 ACS

Pertinent civilian employment characteristics for the PSA are also shown on Table 3.16-15. Manufacturing and healthcare generally lead the industries for employment, with education services employing larger percentages, as well. Though not shown on Table 3.16-15, construction also employs larger percentages of people in Middle Tennessee. The region generally exceeded state percentages for civilians employed in transportation, manufacturing, and utilities.

3.16.2 Environmental Consequences

3.16.2.1 The No Action Alternative

Under the No Action Alternative, TVA would continue to operate and maintain the CUF coal units as part of the TVA generation portfolio. TVA would implement all the planned actions related to the current and future management and storage of CCRs at the coal plants, which have either been reviewed or will be in subsequent NEPA analysis. Employment at CUF would continue to be an option in the labor market area, and contracts associated with CUF operations and any plant modifications and indirect and induced economic activities would continue to support the regional economy. However, the repairs and maintenance necessary to maintain reliability, while providing local employment opportunities, may have a minor adverse effect on ratepayers.

3.16.2.2 Retirement, Decommissioning, Decontamination, and Deconstruction of CUF Plant

The coal facilities at CUF would be retired between 2026 and 2033 and would transition to the D4 process detailed in Table 2.1-1, which would temporarily increase employment in Stewart County. Routine plant deliveries would also be discontinued. All previously approved CCR projects would continue to be implemented.

With the phased unit retirements at CUF, contracts associated with coal operations and indirect and induced economic activities would also occur in phases and would be reduced, canceled, or cease. The 252 people currently employed by CUF may become temporarily unemployed with CUF coal facility retirement. While this decrease in employment represents approximately nine percent of total employment as estimated for 2020 in Stewart County (USBLS 2022), minor direct adverse economic effects to the area would result. TVA will continue to identify employment opportunities across the TVA region for all interested employees. Given the prominence of several other employment options in the CUF vicinity, including manufacturing, educational services, health care, and construction, current CUF employees may potentially find alternative employment in these other industries. However, based on the 2019 ACS, the median earnings for full-time employment in these industries in affected counties are approximately $16,000 to $29,000 less on average than in the utilities industry. CUF employees and any associated family members may also temporarily relocate for work or follow recent depopulation trends and permanently relocate to outside the CUF area, and these changes may affect familial and community relations in the CUF labor market area.

Mining of coal and limestone for use at CUF and the transportation of these products to CUF provides additional regional employment. The retirement of the CUF coal facilities may result in indirect employment effects to the nearby mining, trucking, and barge industries. Unless the coal and limestone mines find alternative markets for the tonnage currently purchased by CUF, minor indirect adverse economic effects to the affected counties and the region from which these CUF products are purchased would occur from closure of this facility. Due to potential unemployment, reemployment in different industries, and relocations, these changes may also affect familial and community relations in the region from which these CUF products are purchased. Even with CUF coal closures, TVA anticipates having gypsum supplies for several years following coal retirement and could continue to supply various companies with this product until the gypsum stores are depleted.

Construction of projects in vicinity to the CUF plant, such as the CCR management activities, could create short-term, beneficial cumulative effects to socioeconomics in the area.

3.16.2.2.1 Environmental Justice Considerations

The retirement of the CUF coal facilities would result in loss of CUF coal-related employment and may result in indirect employment effects to the nearby mining, trucking, and barge industries. Due to the loss of direct and indirect employment associated with CUF, competition for employment in other fields in the CUF labor market area, such as manufacturing, educational services, health care, and construction, may increase. Such trends could lead EJ populations in the CUF Reservation EJ study area to relocate for work or follow recent depopulation trends and permanently relocate to different locations in Tennessee or beyond. These changes may affect familial and community relations among EJ populations in the CUF labor market area. However, overall, the retirement of CUF coal facilities is not anticipated to result in disproportionate effects to EJ populations, as the effects would be the same to non-EJ populations.

3.16.2.3 Alternative A

Under Alternative A, the CUF coal facilities would be retired, as described in Section 3.16.2.2. The existing switchyard at CUF would be maintained for use in future operations associated with a proposed CC plant. The CC plant would be constructed on the CUF Reservation in Stewart County, Tennessee. The new CC plant would require construction of approximately 32 miles of new 30-inch-diameter natural gas pipeline lateral and associated gas system infrastructure in Stewart, Houston, and Dickson counties.

While CUF coal closures would decrease employment in the CUF labor market area for the long-term, construction of the CC plant and the pipeline associated with Alternative A would temporarily increase employment in the area. Construction of the CC plant would take approximately three years and would provide up to 600 jobs at peak. TGP anticipates a maximum workforce of 400 people during construction of the pipeline. Attempts will be made to hire local and regional construction workers to the extent feasible, provided these workers possess the necessary skills and experience for pipeline construction. To the extent the local workforce does not possess the skills required, specialized workers will be obtained from outside the local areas. TGP anticipates that approximately 50 percent of the workforce would be sourced from the local area, which will have a net positive impact on employment, wages and household spending in the area.

Ongoing employment at the new CC plant, anticipated to permanently employ approximately 25 to 35 people, and, to a limited degree, in relation to the gas system infrastructure, would be new employment options in the CUF labor market area and in the pipeline corridor socioeconomic study area. TGP plans to use existing operational personnel to operate and maintain the pipeline facilities and does not anticipate hiring permanent workers to operate and maintain the proposed pipeline following construction. These temporary and permanent employment increases would help offset some employment losses associated with CUF coal facility retirement. Construction of projects in the vicinity of the proposed CC plant, such as the CCR management activities, could create short-term, beneficial cumulative effects to socioeconomics in the area.

3.16.2.3.1 Environmental Justice Considerations

Construction of the CC plant and the pipeline associated with Alternative A would temporarily increase employment in the CUF labor market area. These socioeconomic effects would have a minor beneficial effect to area EJ populations.

3.16.2.4 Alternative B

Under Alternative B, the CUF coal facilities would be retired, as described in Section 3.16.2.2. TVA would replace the power generated by the existing CUF plant with new CT plants located at the existing Johnsonville and Gleason Reservations, in Humphreys and Weakley counties, respectively. Existing natural gas pipeline lateral and associated infrastructure are in place serving these two locations. While CUF coal closures would decrease employment in the CUF labor market area for the long-term, construction of the CT facilities associated with Alternative B would temporarily increase employment in the JCT and Gleason labor market areas, which partially overlap the CUF labor market area. Construction of the CT facilities would take approximately two years to complete and would provide up to 180 jobs at peak. Labor needs associated with operation of the new CT plants, anticipated to permanently employ approximately 8 to 12 people, would increase employment options in the JCT and Gleason labor market areas, which partially overlap the CUF labor market area. These temporary and permanent employment increases would help offset employment losses associated with CUF coal facility retirement. Construction of projects in vicinity to the JCT and Gleason plants, such as JCT Aeroderivative project, could create short-term, beneficial cumulative effects to socioeconomics in their respective labor markets.

3.16.2.4.1 Environmental Justice Considerations

Construction of the CT facilities associated with Alternative B would temporarily increase employment in the JCT and Gleason labor market areas. Minority EJ populations are present in the immediate vicinity of the JCT Reservation, and in total, six of the 19 census block groups within the JCT Reservation labor market area are low-income and/or minority EJ populations (Figure 3.4-5 and Figure 3.4-6). While there are no EJ populations in the immediate vicinity of the Gleason Reservation, four of the 15 census block groups within the labor market area are low-income and/or minority EJ populations (Figure 3.4-7 and Figure 3.4-8).

3.16.2.5 Alternative C

TVA anticipates that a large portion of the solar facilities proposed under Alternative C will need to be physically located in the Middle Tennessee region. While specific sites have not yet been determined for evaluation under this alternative, typical socioeconomic effects associated with solar facilities include temporary beneficial effects to local population numbers; temporary and permanent beneficial effects to local employment; temporary indirect beneficial effects to the local economy; and long-term beneficial effects to the local tax base. Cumulative effects would also occur if Alternative C was combined with the 10,000 MW expansion of solar planned in the 2019 TVA IRP, as typical temporary benefits of construction employment would increase.

3.16.2.5.1 Environmental Justice Considerations

Construction of the solar facilities associated with Alternative C would temporarily increase employment in Middle Tennessee. These socioeconomic effects could potentially have a minor beneficial effect to EJ populations in the areas selected for the solar facilities, as they would to non-EJ populations in those locations.

Construction of projects in vicinity to the JCT and Gleason plants, such as JCT Aeroderivative project, could create short-term, beneficial cumulative effects to socioeconomics in their respective labor markets. These could combine with project effects and increase the beneficial effects to EJ and other populations.

3.17 Noise

3.17.1 Regulatory Framework

Noise is unwanted or unwelcome sound that is 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 and 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.

Sound is measured in units of decibels (dB) on a logarithmic scale. Because not all noise frequencies are perceptible to the human ear, A-scale weighting decibels (dBA), which filter out sound in frequencies above and below human hearing, are typically used in noise assessments. A noise level change of three dBA or less is barely perceptible to average human hearing, while a five 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 perceived to be four times as loud and may represent a “dramatic change” in loudness.

The day-night sound level (Ldn) is the 24-hour equivalent sound level, which incorporates 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 sounds that occur at night. Typical background day-night noise levels for rural areas are anticipated to range between an Ldn of 35 and 50 dB, whereas higher-density residential and urban areas background noise levels range from 43 dB to 72 dB (USEPA 1974). Background noise levels greater than 65 dBA can interfere with normal conversation, watching television, using a telephone, listening to the radio, and sleeping. Common indoor and outdoor noise levels from various noise sources are listed in Table 3.17-1.

The Noise Control Act of 1972, along with its subsequent amendments (Quiet Communities Act of 1978, USC 42 4901-4918), delegates authority to the states to regulate environmental noise and directs government agencies to comply with local community noise statutes and regulations. Many local noise ordinances are qualitative, such as prohibiting excessive noise or noise that results in a public nuisance. Because of the subjective nature of such ordinances, they are often difficult to enforce. Some other local communities have noise ordinances that set allowable maximum noise levels for various activities.

The EPA 1974 guidelines recommend that Ldn not exceed 55 dBA for outdoor residential areas. The U.S. Department of Housing and Urban Development (HUD) considers an Ldn of 65 dBA or less to be compatible with residential areas (HUD 1985). For traffic-related noise, the Federal Highway Administration (FHWA) has set a threshold of 67 dBA as the sound level at which noise abatement should be considered (2011). Transportation noise primarily includes noise from truck traffic. Three primary factors influence highway noise generation: traffic volume, traffic speed, and vehicle type. Generally, heavier traffic volumes, higher speeds, and greater numbers of trucks increase the sound level of highway traffic noise. Other factors that affect the sound level of traffic noise include a change in engine speed and power, such as at traffic lights, hills, and intersecting roads and pavement type.

Highway 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 would result in a 3 dBA increase in noise levels, which in and of itself would not normally be a perceivable noise increase. The expected level of construction noise is dependent upon the nature and duration of each project. Construction activities for most large-scale projects would be expected to result in increased noise levels as a result of the operation of construction equipment onsite and the movement of construction-related vehicles (i.e., worker trips, and material and equipment trips) on the surrounding roadways. Noise levels associated with construction activities would increase ambient noise levels adjacent to the construction site and along roadways used by construction-related vehicles. Construction noise is generally temporary and intermittent in nature as it generally only occurs on weekdays during daylight hours which minimizes the effect to sensitive receptors.

Table 3.17-1. Common Indoor and Outdoor Noise Levels

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

Source: American Association of State Highway and Transportation Officials (AASHTO) 1993

3.17.2 Affected Environment

3.17.2.1 CUF Reservation

The existing CUF plant is on a large reservation of approximately 2,388 acres located on the shores of Barkley Reservoir in an industrial area. Noise generating sources in the vicinity of the project site include boat traffic, routine vehicle operations at the project site, and the existing coal facility. Sensitive noise receptors in the vicinity of the proposed project area include residences and recreational areas. Lake Barkley Recreation Area adjoins the northern reservation boundary and Riverbend and Guices Creek recreation areas, both of which have developed recreation facilities (Section 3.9), are located approximately 0.3 miles north and 0.9 miles west of the reservation, respectively (see Figure 3.17-1). There are two residences on the demolition boundary along Cumberland City Road. The total number of noise receptors within 0.5 mile of CUF and their classifications can be seen in Table 3.17-1.

3.17.2.2 Alternative A

3.17.2.2.1 Proposed CC Plant Site

The proposed CC plant site is in an undeveloped portion of the CUF Reservation comprised of fields and forest. The nearest residence, the Henry Hollister House, is located within/directly adjacent to the CC plant site (Section 3.13.2). Aside from the Henry Hollister House, the closest sensitive receptors to the proposed site include residential subdivisions, with homes located approximately 0.7 miles east of the proposed plant site.

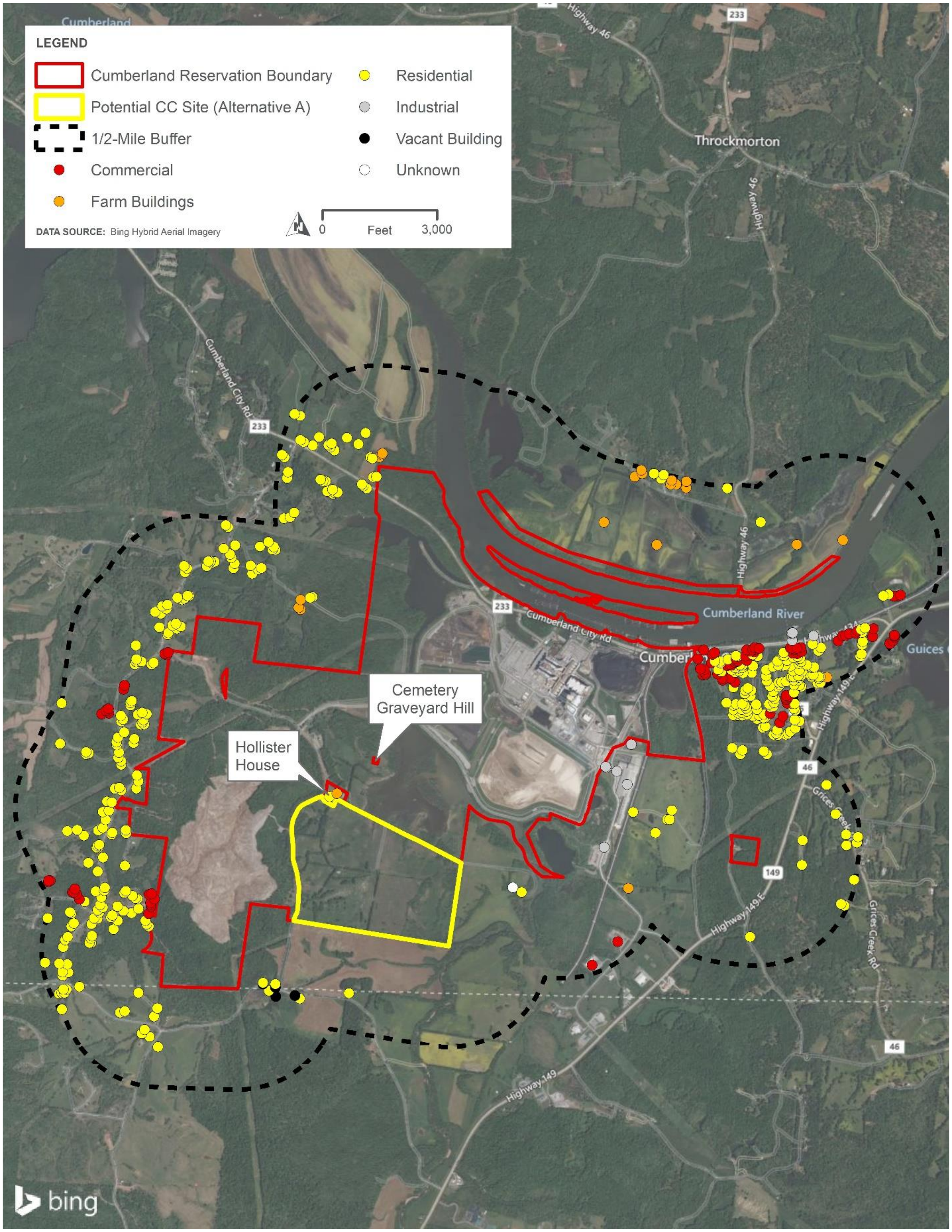

Figure 3.17-1. **Noise Receptors within 0.5 mile of the CUF Reservation boundary.**

Table 3.17-2. CUF Plant Noise Receptors within 0.5 mile

Noise Receptor Type	Alt A – CUF Reservation
COMMERCIAL	93
FARM BUILDING	22
INDUSTRIAL	11
RESIDENTIAL	380
VACANT	4
UNKNOWN	1
TOTAL	**511**

3.17.2.2.2 Natural Gas Pipeline Corridor

Noise generating sources in the vicinity of the 32-mile pipeline include traffic and farm equipment, as well as industrial operations at the CUF plant at its northwestern end. Sensitive noise receptors in and within 0.5 mile of the pipeline corridor are listed in Table 3.17-3.

Table 3.17-3. Alt A Pipeline Noise Receptors within 0.5 mile

Noise Receptor Type	Alt A – PIPELINE
COMMERCIAL	38
RESIDENTIAL	659
CHURCH	3
SCHOOL	3
SPORTS FIELD	2
Vacant	606
UNKNOWN	204
TOTAL	**1515**

Sensitive noise receptors in the vicinity of the proposed pipeline include residences and recreational areas, as seen in Table 3.17-3. Receptors are fairly evenly dispersed across the length of the pipeline corridor and consist largely of residences and vacant buildings. The closest sensitive receptors to the proposed pipeline are residential subdivisions, with homes located along the length of the corridor. A few residences occur within the proposed pipeline construction corridor. The noise receptors within 0.5 mile of the pipeline corridor and their classifications can be seen in Table 3.17-3.

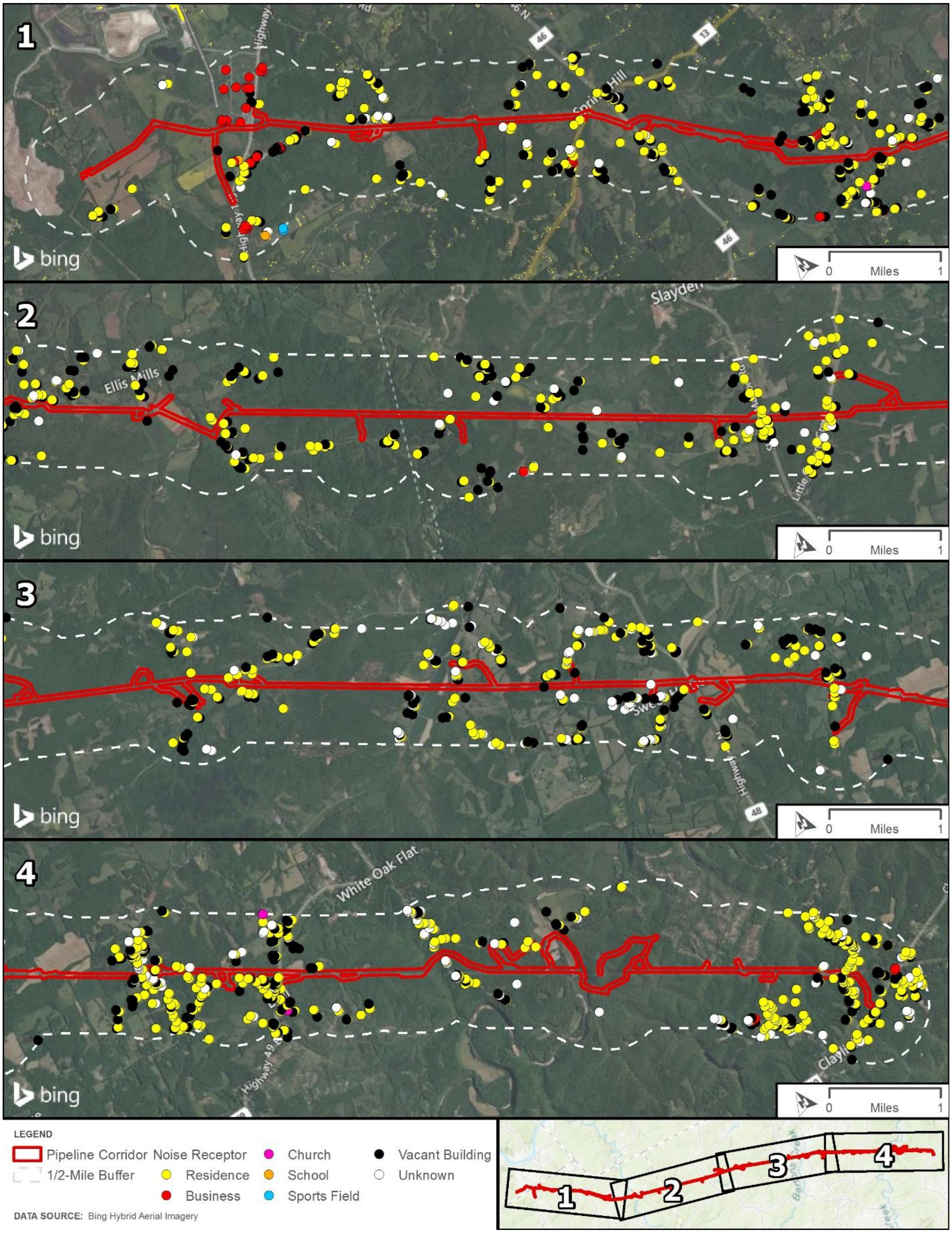

Figure 3.17-2. Noise Receptors within 0.5 mile of the proposed Alternative A natural gas pipeline lateral.

3.17.2.2.3 Transmission Corridors

The proposed transmission lines associated with Alternative A would be contained within the CUF Reservation and have the same affected noise environment as described in Section 3.17.2.1.

3.17.2.3 Alternative B

3.17.2.3.1 Johnsonville Reservation

JCT is located along the east bank of the Tennessee River in an industrial area. Noise generating sources in the vicinity of the project site include periodic barge operations on the river, railroad operations, and routine vehicle operations at the existing reservation. All occupied buildings in the vicinity of the proposed CT plant site are industrial, and there are no nearby sensitive noise receptors (Figure 3.17-3).

Figure 3.17-3. JCT Noise Receptors

3.17.2.3.2 Gleason Reservation

Gleason is located near Dresden in Weakley County, Tennessee in an agricultural area. Noise generating sources in the vicinity of the project site include farm machinery, a nearby raceway, routine vehicle operations at the project site, and the currently operating CT plant. There are few sensitive noise receptors in the vicinity of the proposed CT plant site (Table 3.17-4). The nearest noise-sensitive recreational areas are over a mile away from the site, and residential concentrations are largely to the southwest of Highway 22. However, there are a small number of residences within a mile of the plant, with the closest one approximately 1,600 feet to the north.

Table 3.17-4. Noise Receptors within 0.5 mile of the Gleason Reservation

Noise Receptor Type	Alt B – Gleason
COMMERCIAL	1
RESIDENTIAL	3
TOTAL	**4**

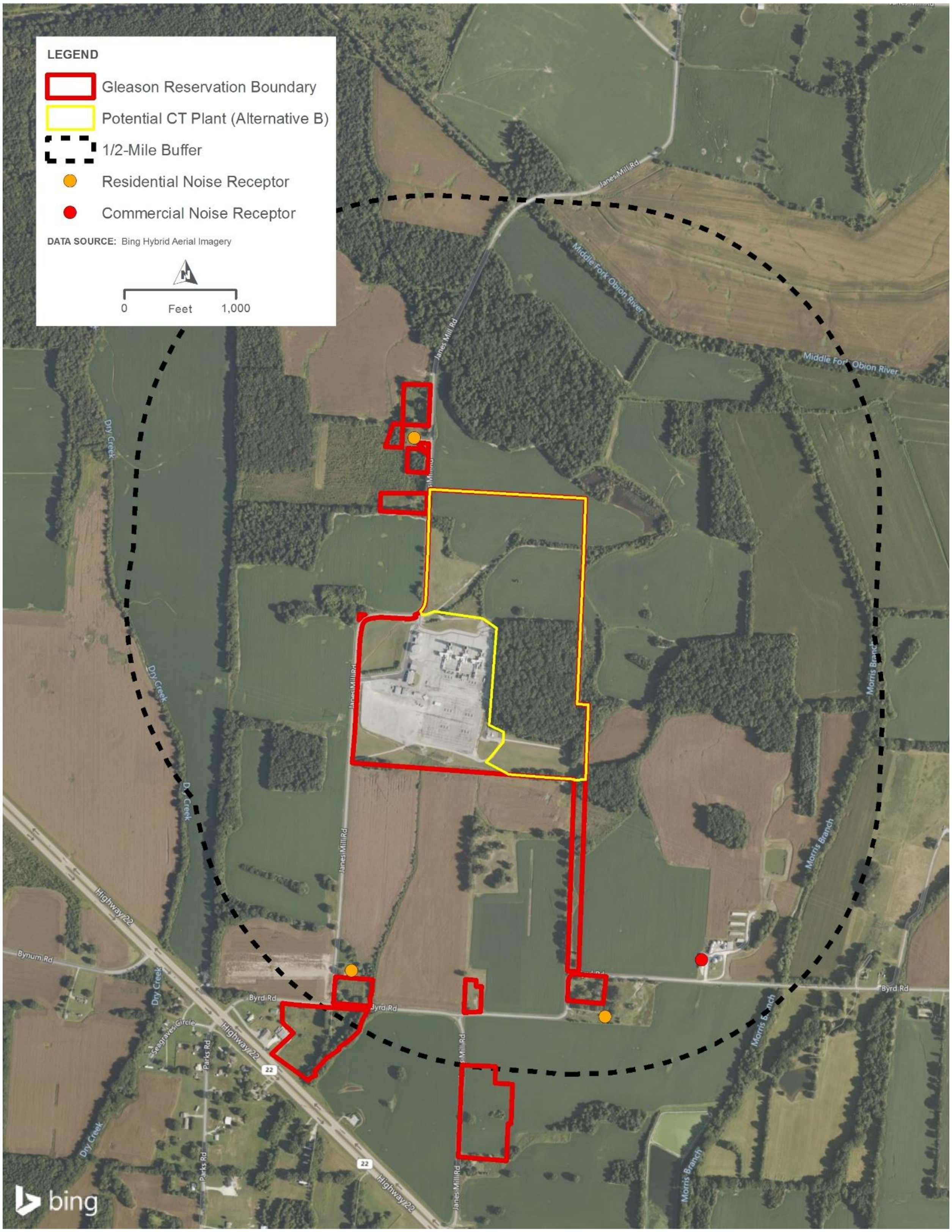

Figure 3.17-4. Noise Receptors within 0.5 mile of the proposed Gleason CT plant site

3.17.2.3.3 Transmission Corridors

Land use in the vicinity of the proposed new 40-mile TL is largely agricultural with smaller portions of forested area. The proposed TL line intersects several small, developed areas, including seven main roadways and multiple smaller rural roads. Therefore, current noise levels in the area are typical for rural areas, with interspersed residential receptors as well as noise from transportation corridors and farm operations.

3.17.2.4 Alternative C

3.17.2.4.1 Middle Tennessee TVA Power Service Area

The proposed solar and storage facilities would likely be located in agricultural, rural, and/or undeveloped areas, largely in Middle Tennessee. Ambient noise in these types of settings typically consist of agricultural sounds, such as noises from farm machinery; natural sounds, such as from wind and wildlife; and moderate traffic sounds. If sites are located in industrial areas or near transportation facilities, the setting may have higher ambient noise levels.

3.17.3 Environmental Consequences

3.17.3.1 The No Action Alternative

Under the No Action Alternative, TVA would continue to operate and maintain the CUF plant. TVA would implement all the planned actions related to the current and future management and storage of CCRs at the coal plants, which have either been reviewed or will be in subsequent NEPA analysis. Under Alternative A, regular operational noise would continue to contribute to daily ambient noise levels.

3.17.3.2 Retirement, Decommissioning, Decontamination, and Deconstruction of CUF Plant

Under all Action Alternatives, TVA would retire, decommission, decontaminate, and deconstruct the CUF units and site. Noise effects as a result of these actions would be associated with the removal of equipment and materials onsite, installation of bulkheads and/or fill tunnels, demolition via mechanical deconstruction and/or explosives, and demolition-related traffic to and from the CUF. There are 511 total noise receptors within a ½ mi of the CUF plant boundary, which largely consist of residences (Table 3.17-1). These receptors would experience temporary noise effects as a result of deconstruction activities.

Noise from demolition, which was assumed to be approximately 94 dB at a 50-foot distance based on blasting levels, would attenuate to 64 dBA at the River Bend Recreation Area, approximately 0.3-miles north of the CUF (FHWA 2017).[13] While this level is higher than the EPA noise guidance for Ldn of 55 dBA, it meets the HUD guidelines for Ldn of 65 dBA. Given the temporary and intermittent nature of demolition noise, the effect of noise generated is expected to be minor. Noise effects from demolition-related traffic are expected to be minor as construction related traffic would utilize interstate highways or major arterial roadways as much as possible and likely would not have a noticeable increase on traffic volume and consequently traffic noise near those major roadways.

Effects from additional vehicular traffic are expected to be minor as the roads within the plant are already predominately used by employees and for industrial activity. This small increase in

[13] $Lp(R2) = Lp(R1) - 20 \cdot Log_{10}(R2/R1)$

Where:

Lp(R1) = Known sound pressure level at the first location

Lp(R2) = Unknown sound pressure level at the second location

R1 = Distance from the noise source to location of known sound pressure level

R2 = Distance from noise source to the second location noise would be temporary and intermittent and only last until construction activities have been completed. Therefore, the increase in current noise levels is estimated to be less than 3 dBA and as such traffic noise is not anticipated to increase perceptibly.

In addition, vibrations associated with explosives would also occur. Vibrations from explosive demolition events can potentially affect nearby structures. Seismologic analyses carried out at recent demolitions of other tall industrial chimneys in the United States strongly suggest that the vibrations would not result in measurable effects on nearby structures (Protec 2008, 2009, and 2013). These seismological analyses were conducted to measure the effects from demolition-related vibrations on standing structures in the vicinity of the chimney demolitions. In each case, vibrations were below the recommended limits set by the U.S. Bureau of Mines Report (Siskind et al. 1980). The report authors in each case concluded the demolitions would not cause damage to structures within the radius of influence. Vibrations resulting from the demolition of the CUF structures would be of similar magnitude. The use of BMPs including wetting down the structure prior to felling, use of misting systems during stack felling, and use of berms during demolition would also serve as a form of noise/vibration control. Therefore, no damage to structures is anticipated. Due to the temporary nature of the operation, noise and vibration effects on the environment are expected to be minor and temporary.

Projects in vicinity to the D4 activities, such as the CCR management activities, could create short-term, cumulative increases in construction and traffic noise in the area.

3.17.3.2.1 Environmental Justice Considerations

Noise-related effects that would occur as a result of CUF coal facility retirement and D4 activities are not anticipated to have disproportionate and adverse human health or environmental effects in the CUF Reservation EJ study area. These effects would be temporary and minor. Moreover, the effects are anticipated to be limited to the TVA-owned CUF Reservation or immediate vicinity, where EJ populations are not present and are removed by some distance (Figure 3.4-3). The effects would generally be experienced by other populations since they are more prominent in the immediate CUF vicinity..

3.17.3.3 Alternative A

3.17.3.3.1 Construction and Operation of CC Plant at CUF

Noise effects under this alternative would be associated with closure of the CUF units as detailed in Section 3.17.2.2, construction and operation of the CC plant, construction of a new switchyard and connecting two existing 500-kV TLs, and construction-related traffic (construction workforce and the shipment of goods and equipment) to and from the CC plant site. There are 511 total noise receptors within 0.5 mi of the CUF plant boundary, which largely consist of residences (Table 3.17-1). These receptors would experience temporary noise effects as a result of CC plant construction activities.

Typical noise levels from construction equipment used at the CUF for CC plant construction and operation are expected to be 85 dBA or less at a distance of 50 feet from the site (FHWA 2017). The nearest residence, the Henry Hollister House, is located within/directly adjacent to the CC plant site (Section 3.13.2). As the exact buffer within the CC Plant Site A2 boundary has not been determined, it was assumed that the noise could occur within proximity to the property line. Therefore, noise levels can be expected to reach 85 dBA at this residence during construction.

This does not meet the EPA noise guidance for Ldn of 55 dBA and the HUD guidelines for Ldn of 65 dBA. Given the temporary and intermittent nature of construction and operation noise, the effect of noise generated from construction and operation of the CC plant is expected to be minor. Noise effects from construction-related traffic are expected to be minor as construction related traffic would utilize rail or barge and likely would not have a noticeable increase on traffic volume and consequently traffic noise near major roadways.

Effects from additional vehicular traffic are expected to be minor as the roads within the plant are already predominately used by employees and for industrial activity. This small increase in noise would be temporary and intermittent and only last until construction activities have been completed. Construction is anticipated to occur over a period of approximately 3 years and would occur during daytime hours, typically during the weekdays but with potential weekend and night-time work on a limited basis. Therefore, the increase in current noise levels is estimated to be less than 3 dBA and as such traffic noise is not anticipated to increase perceptibly.

The six miles of OPGW would be installed via helicopter along an existing TL. Using this method, one reel of OPGW would be installed approximately every two working days, weather permitting, and should be completed during a two-week period. A temporary noise disturbance would result in nearby communities due to the use of a helicopter (105 dB).

Projects in vicinity to the proposed CC plant, such as the CCR management activities, could create short-term, cumulative increases in construction and traffic noise in the area.

3.17.3.3.2 Construction and Operation of Natural Gas Pipeline

Noise effects due to the construction and operation of the approximately 32-mile natural gas pipeline lateral would be associated with the construction of the gas system infrastructure on the CUF site to connect the plant to the new pipeline, the excavation and laying of the pipeline, and construction-related traffic (construction workforce and the shipment of goods and equipment) to and from the pipeline corridor. As part of the Environmental Report to be submitted with their certificate application that will be filed with the FERC for the proposed pipeline, TGP is conducting a detailed analyses of noise receptors and potential noise effects associated with the proposed pipeline. Based on TVA's desktop analysis, there are 1,515 total noise receptors within a 0.5-mi of the pipeline corridor boundary, which largely consist of residences and vacant properties (Table 3.17-3). These receptors may experience temporary minor noise effects as a result of pipeline construction activities.

Typical equipment used to construct and operate the pipeline would consist of bulldozers, excavators, side-booms, and over-the-road dump/haul trucks. Typical noise levels from construction equipment used along the corridor are expected to be 85 dBA or less at a distance of 50 feet from the site (FHWA 2017). Based on straight line noise attenuation, it is estimated that noise levels from these sources would not attenuate to at the nearest residences, due to their existence within and directly on the boundaries of the construction corridor.

This level is higher than the EPA noise guidance for Ldn of 55 dBA, and it does not meet the HUD guidelines for Ldn of 65 dBA. Given the temporary and intermittent nature of construction and operation noise, the effect of noise generated from construction and operation of the pipeline is expected to be minor. Noise effects from construction-related traffic are expected to be temporary and minor as construction related traffic would utilize interstate highways or major arterial roadways as much as possible and likely would not have a noticeable increase on traffic volume and consequently traffic noise near those major roadways. After the construction of the pipeline, there would be little to no noise during its operation aside from occasional maintenance activities, including the periodic mowing of the pipeline ROW.

RFFAs in vicinity to the proposed pipeline could create short-term, cumulative increases in construction and traffic noise in the area.

3.17.3.3.3 Environmental Justice Considerations

Noise-related effects that would occur as a result of the proposed CC plant and natural gas pipeline lateral are not anticipated to have disproportionate and adverse human health or environmental effects on EJ populations in the CUF Reservation or pipeline corridor EJ study areas. Noise-related effects would be temporary and minor. Further, the effects would be generally limited to the TVA-owned CUF Reservation and pipeline corridor, where EJ populations are either removed from the immediate vicinity, as with the CUF Reservation (two out of 16 census block groups are low-income EJ populations; see also Figure 3.4-3), or limited, as with the pipeline corridor (one out of 10 census block groups are low-income EJ populations; see also Figure 3.4-4). While effects may be experienced by EJ populations located in the far eastern extreme of the pipeline corridor EJ study area, these effects would be temporary and similar to those experienced by non-EJ populations and, thus, are not anticipated to be disproportionate.

3.17.3.4 Alternative B

3.17.3.4.1 Construction and Operation of CT Plant at Johnsonville Reservation

Noise effects under this alternative would be associated with closure of the CUF units as detailed in Section 3.17.2.2, construction and operation of a CT plant at JCT Reservation, construction of a 40-mile TL, and construction-related traffic (construction workforce and the shipment of goods and equipment) to and from the JCT. The proposed construction would occur within an existing developed area of the JCT. Typical equipment used during the construction phase would consist of trucks, truck-mounted augers and drills, excavators, as well as tracked cranes and bulldozers (Table 3.3-1). Typical noise levels from construction equipment are expected to be 85 dBA or less at a distance of 50 feet from the site (FHWA 2017). Given the existing industrial nature of this site and lack of nearby residential noise receptors, there would be minimal direct noise effects associated with the proposed construction and operation of a CT plant at JCT.

Transportation of workers and materials would utilize nearby roadways, as described in the Transportation section. The haul route has not yet been determined, but noise effects may occur to noise receptors within 500 feet of the roadways used on the haul route during construction. Construction is anticipated to occur over a period of three years and would occur during daytime hours, typically during the weekdays but with the potential for weekend and night-time work on a limited basis. Given the temporary and intermittent nature of construction and operation noise, the effect of noise generated from construction and operation is expected to be minor. Noise effects from construction-related traffic are expected to be minor as construction related traffic would utilize rail as much as possible and likely would not have a noticeable increase on traffic volume and consequently traffic noise near major roadways.

The increase in current noise levels is estimated to be less than 3 dBA and as such traffic noise is not anticipated to increase perceptibly. RFFAs in vicinity to the proposed CT plant, such as the JCT Aeroderivative plant, could create short-term, cumulative increases in construction and traffic noise in the area.

3.17.3.4.2 Construction and Operation of CT Plant at Gleason Reservation

Noise effects related to the construction of the CT plant at the Gleason Reservation would be comparable to those described in Section 3.17.3.4.1 for the JCT. A CT plant is currently operating on the Gleason Reservation; however, the proposed new CT plant would be constructed on undeveloped land adjacent to the existing CT plant. There are only four total noise receptors within a ½ mi of the plant site, including one commercial property and three residences (Table 3.17-4). These receptors would experience temporary noise effects as a result of construction activities. Due to the temporary and intermittent nature of construction and operation noise, the effect of noise generated from construction and operation is expected to be minor.

Noise effects from construction-related traffic are expected to be minor as construction related traffic would utilize interstate highways and major arterial roadways as much as possible and likely would not have a noticeable increase on traffic volume and consequently traffic noise near those major roadways. Based on the absence of RFFAs near the proposed CT plant, no cumulative increases in construction and traffic noise are expected in the area.

3.17.3.4.3 Transmission and Other Components

Construction of the 40-mile 500 kV TL would result in temporary, minor noise effects related to construction and construction-related traffic. After the construction of the TL, there would not be significant continued noise as a result of its operation aside from occasional maintenance activities.

3.17.3.4.4 Environmental Justice Considerations

Noise-related effects that would occur as a result of the proposed CT facilities and transmission line activities would be temporary, minor, and limited to the immediate TVA-owned reservations and transmission line corridor or nearby vicinity during the construction period. While there are no EJ populations in the immediate vicinity of the Gleason Reservation, minority EJ populations are present in the immediate vicinity of the Johnsonville Reservation. Noise-related effects from construction of the CT facilities would be short-term, localized, and minor. These short-term negative conditions would affect EJ populations given their proximity to the Johnsonville Reservation. As non-EJ populations are adjacent to the plant vicinity on the west and south sides, the negative effects from construction are not anticipated to be disproportionate on EJ populations. Noise-related effects from transmission line construction and upgrade activities are expected to be short-term and minimal. Thus, minimal to no effects are anticipated on EJ populations. Since EJ and non-EJ populations would experience these effects, they are not anticipated to be disproportionate on EJ populations.

RFFAs in vicinity to the proposed CT plant, such as the JCT Aeroderivative plant, could create short-term, cumulative increases in construction and traffic noise in the area if this project occurs at the same time as implementation of Alternative B. This could increase the noise effects on local populations, both EJ and non-EJ alike.

3.17.3.5 Alternative C

3.17.3.5.1 Construction and Operation of Solar and Storage Facilities

Typical direct and indirect noise effects associated with solar and storage facilities would primarily occur during construction. Construction equipment produces a range of sounds while operational. Noisy construction equipment, such as delivery trucks, dump trucks, water trucks, service trucks, bulldozers, chain saws, bush hogs, or other large mowers for tree clearing, produce maximum noise levels at 50 feet of approximately 84 to 85 dBA. Construction noise would likely cause temporary and minor adverse effects to the ambient sound environment around each project site. Nearby noise receptors would temporarily experience heightened noise during construction, primarily from pile-driving activities. If the site is located near commercial operations or agricultural complexes, these facilities likely produce ambient sounds that are at or higher than the typical 45 to 55 dBA, and these existing noises would help lessen effects from the construction of solar and storage facilities. Additionally, construction would primarily occur during daylight hours, between sunrise and sunset; therefore, project construction would not affect ambient noise levels at night during most of the construction period. Most of the proposed equipment would not be operating on site for the entire construction period but would be phased in and out according to the progress of the projects.

The activity likely to make the most noise for an extended time period would be pile driving during the construction of the solar array foundations. Standard construction pile drivers are estimated to produce between 90 to 95 dBA at a distance of 50 feet (FHWA 2011). Following completion of construction activities, the ambient sound environment on and surrounding the solar or storage facility sites would be expected to return to existing levels. The moving parts of the PV arrays would be electric-powered and produce little noise. The central inverters associated with solar sites would produce noise levels of approximately 65 dBA at 33 feet, and substations typically emit approximately 50 dBA at 300 feet. For storage facility sites, the average sound level is less than 82 dB from 10 feet surrounding the onsite transformers.

The periodic mowing of solar sites to manage the height of vegetation surrounding the solar panels would produce sound levels comparable to those of agricultural operations. Overall, Alternative C would likely result in minor, temporary adverse effects to the ambient noise environment during construction, and minimal to negligible effects during operation and maintenance of the solar facility. Detailed analyses of noise effects would occur for each solar and storage facility under future NEPA reviews.

Cumulative effects would also occur if Alternative C was combined with the 10,000 MW expansion of solar planned in the 2019 TVA IRP, which could create short-term, cumulative increases in construction and traffic noise in the region.

3.17.3.5.2 Transmission and Other Components

Construction of transmission lines and transmission line upgrades associated with solar and BESS sites would result in temporary, minor noise effects related to construction and construction-related traffic. After the construction of the TLs, there would not be significant continued noise as a result of its operation aside from occasional maintenance activities.

3.17.3.5.3 Environmental Justice Considerations

Noise-related effects that would occur as a result of the proposed solar facilities and transmission line activities are not anticipated to have disproportionate and adverse human health or environmental effects to EJ populations in the EJ study area for Alternative C. These effects would be temporary (primarily during the period of construction), minor, and limited to the immediate project sites and transmission line corridors.

These effects would be anticipated to be the same for EJ and other populations in the vicinity. To determine disproportionate effects for a given solar facility, detailed EJ analyses would occur for each solar facility and transmission line activity under future NEPA reviews..

3.18 Visual Resources

3.18.1 Affected Environment

Visual resources compose the visible character of a place and include both natural and human-made attributes. Visual resources influence how an observer experiences a particular location and distinguishes it from other locations. Such resources are important to people living in or traveling through an area and can be an essential component of historically and culturally significant settings. The visual 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 effects to cultural and historic resources are not included in this analysis as they are assessed separately in Section 3.9.

The subjective perceptions of a landscape's aesthetic quality and sense of place is dependent on where and how they are viewed. Views of the landscape are described in terms of what is seen in the foreground (within 0.5 miles), middleground (0.5-4 miles), and background (4-10 miles) distances. The resulting scenic value class of a landscape is determined by combining the levels of scenic attractiveness, scenic integrity, and visibility. Scenic attractiveness is a measure of the scenic beauty of a landscape and is based on perceptions of the visual appeal of landforms, waterways, vegetation, and the human-built environment. Scenic attractiveness is assessed as either distinctive, typical/common, or indistinctive. As adapted for this analysis, scenic integrity measures the degree of visual unity of the natural and cultural character of the landscape. Scenic integrity is evaluated as either low, moderate, or high.

3.18.1.1 CUF Reservation

The topography surrounding CUF ranges from relatively flat near the banks of the Cumberland River to moderately sloping in the western portion of the reservation. Industrial activities to the southeast are largely obstructed from view by forested buffer areas surrounding the plant. Cumberland City, a small residential area, exists to the east of the project area on the other side of Old Hwy 149. Night lighting is widespread at CUF and the nearby industrial plants.

Except for CUF and the other industrial plants to the southeast, the surrounding region is largely undeveloped with residential and commercial development in the vicinity of Cumberland City to the east and Erin to the south. Components of the existing CUF site are dominant elements in the landscape and include the two-unit plant, gypsum complex, the two 630-foot-high emissions stacks, and the two 1,000-foot high emissions stacks (Figures 3.18-1 and 3.18-2). Water vapor emitted by the stacks is also a prominent visual element during much of the time the plant is operating. Much of the area around the coal plant buildings is devoid of any vegetation, although there are some small patches of lawn and trees along roadways and forested areas on the perimeter.

The viewscape of the coal plant facility includes broadly horizontal buildings and industrial equipment and the four emissions stacks. Therefore, scenic attractiveness of these areas are minimal and scenic integrity ranges from low to very low. Scenic attractiveness of the area is considered common, and scenic integrity is considered moderate due to human alteration in the area. The ratings for scenic attractiveness assigned to the project sites are due to the ordinary or common visual quality. The forms, colors and textures in the affected environment are normally seen through the characteristic landscape and are not considered to have distinctive quality. In the foreground and middleground, the scenic integrity has been lowered by slight human alteration such as residential and industrial development. However, in the background these alterations are not substantive enough to dominate the view of the landscape (Figure 3.18-3). Based on the criteria used for this analysis, the overall scenic value class for the affected environment ranges from poor within the plant facility to good in the surrounding area.

Figure 3.18-1. View from the Southwest of the CUF

Figure 3.18-2. View of CUF and surrounding land

Figure 3.18-3. Aerial view towards the southwest of CUF Reservation and surrounding area showing part of the switchyard, silos, CCR, and wastewater management facilities

3.18.1.2 Alternative A

3.18.1.2.1 Proposed CC Plant Site

To the south of the existing coal facility, the CUF Reservation consists of undeveloped land, including fields and forested areas. The proposed CC plant site is an area of common scenic attractiveness, as the site contains viewscapes comparable to the surrounding land use. The scenic integrity of this portion of the reservation is low to moderate in that the viewscape is interrupted by industrial elements associated with the existing coal plant and transmission infrastructure. The total number of visual receptors, which are receptors within the line of sight of the source, within 0.5 mile of CUF and their classifications can be seen in Table 3.18-1 and Figure 3.18-4. Some of the receptors identified within this section may be out of the line of sight due to changes in vegetation, air quality, or angles that were not accounted for in this analysis.

Table 3.18-1. CUF Plant Visual Receptors

VISUAL RECEPTOR TYPE	ALT A – CUF PLANT
COMMERCIAL	93
FARM BUILDING	22
INDUSTRIAL	11
RESIDENTIAL	380
VACANT	4
UNKNOWN	1
TOTAL	**511**

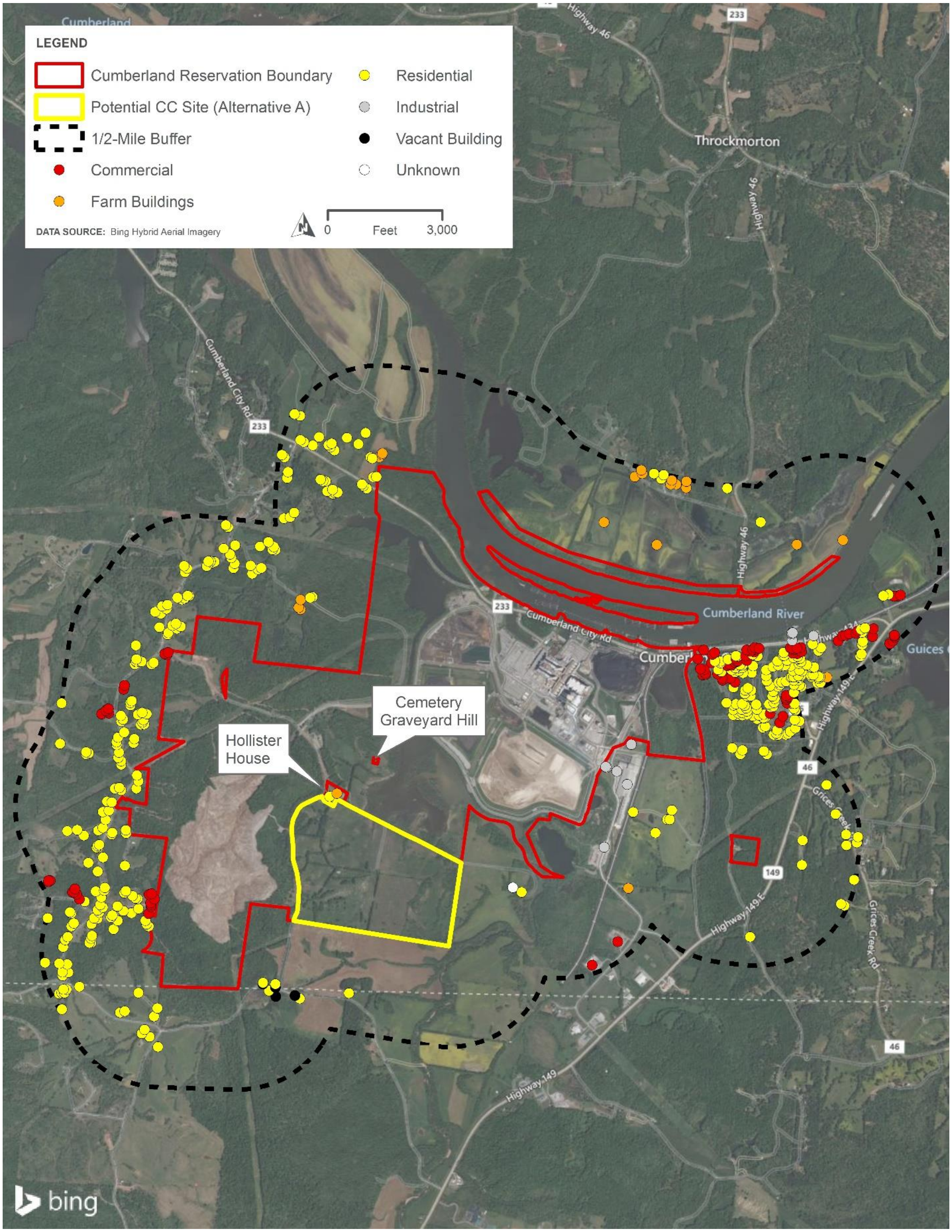

Figure 3.18-4. CUF Plant Visual Receptors

3.18.1.2.2 Natural Gas Pipeline Lateral Corridor

Industrial activities associated with CUF are visible from the western origin point of the corridor. Cleared open space associated with the existing TVA TL ROW would be seen across the length of the pipeline corridor, largely buffered by surrounding forest. Traffic and low-density residential areas can be seen in areas where the corridor crosses or comes near roadways, particularly near Highway 149, TN-13, Highway 235, TN-49, and Highway 250.

The affected environment includes the pipeline corridor as well as the physical and natural features of the landscape. The proposed pipeline begins on the southern border of CUF and continues southeast for 32 miles, terminating in Ashland City, Tennessee and consists of forested and pastureland. The viewscape of the corridor is largely pre-disturbed open space, elements associated with the TL, and forest buffering the TL corridor. Scenic attractiveness of the area is considered common, and scenic integrity is considered moderate due to human alteration in the surrounding area. The ratings for scenic attractiveness assigned to the corridor ROW are due to the ordinary or common visual quality. The forms, colors and textures in the affected environment are normally seen through the characteristic landscape and are not considered to have distinctive quality. In the foreground and middleground, the scenic integrity has been lowered by slight human alteration such as residential and commercial development. However, in the background these alterations are not substantive enough to dominate the view of the landscape. The total number of visual receptors within 0.5 mile of the pipeline corridor and their classifications can be seen in Table 3.18-2 and Figure 3.18-5.

Table 3.18-2. Alt A Pipeline Visual Receptors

VISUAL RECEPTOR TYPE	ALT A – PIPELINE
COMMERCIAL	38
RESIDENTIAL	659
CHURCH	3
SCHOOL	3
SPORTS FIELD	2
VACANT	606
UNKNOWN	204
TOTAL	**1515**

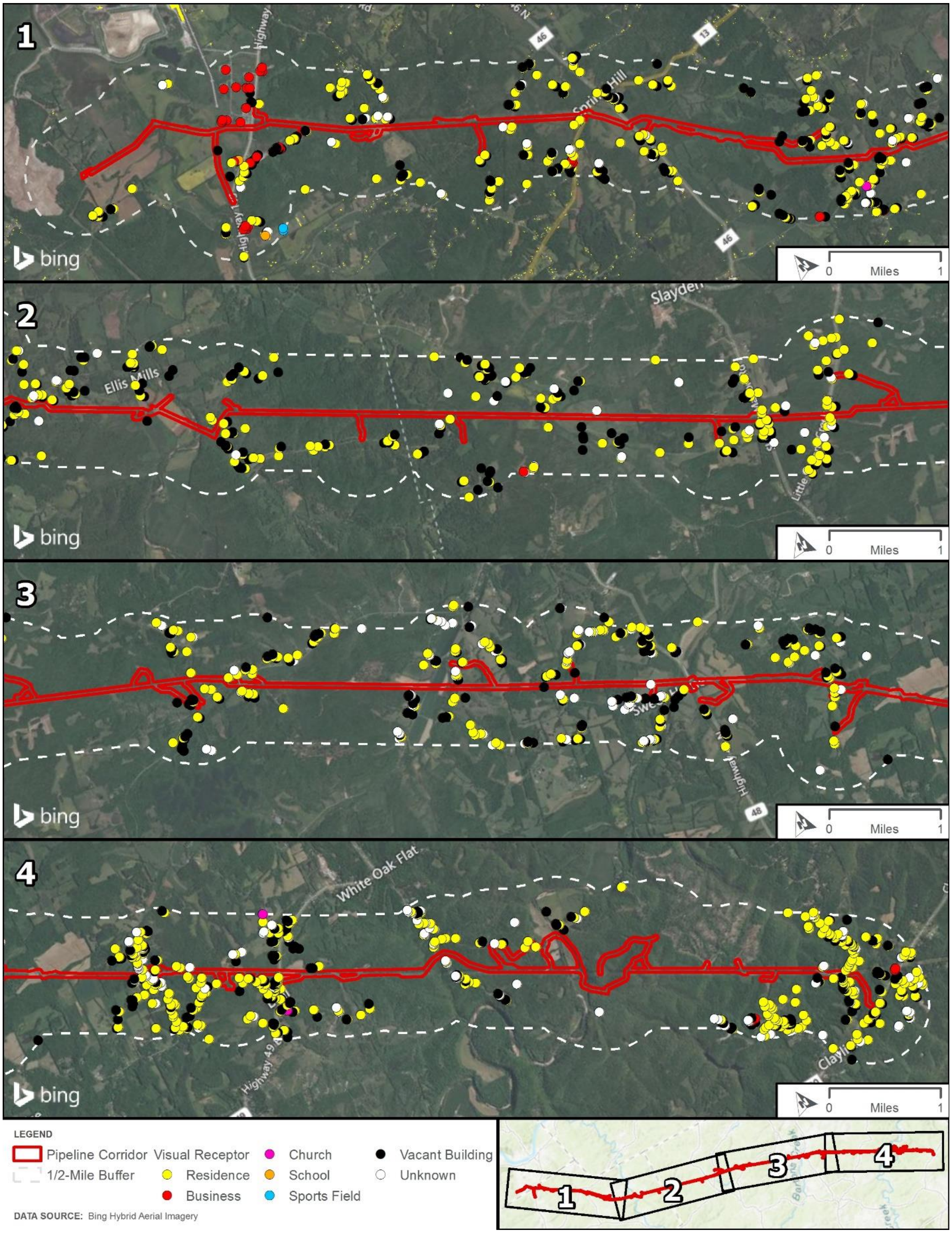

Figure 3.18-5. Alt A Pipeline Visual Receptors

3.18.1.3 Alternative B

3.18.1.3.1 Johnsonville Reservation

The surrounding topography ranges from relatively flat near the banks of the Tennessee River (Kentucky Reservoir) to moderately sloping at Johnsonville State Historic Park to the north. Industrial activities to the north are visible from the project area. Forested areas within Johnsonville State Historic Park are visible to the east and northeast. Low-density residential areas exist to the west of the project area across the Tennessee River (Kentucky Reservoir) and there is residential development south of the site. The proposed CT plant would be constructed on a previously developed area. Components of the retired power plant remain dominant elements in the landscape; however, these components are currently being demolished. Other major visual components of the industrial site include TLs and associated structures and the existing CTs already operating on site. Parts of the reservation are illuminated at night, as are the nearby industrial facilities. Much of the proposed CTC plant site is devoid of vegetation. Scenic attractiveness of these areas is minimal and scenic integrity ranges from low to very low.

Except for the retired Johnsonville coal plant and other industrial uses to the north, much of the surrounding region is largely undeveloped aside from residential and commercial development in the vicinity of New Johnsonville and along the major roadways. Scenic attractiveness of the area is considered common, and scenic integrity is considered moderate due to human alteration in the surrounding area. The ratings for scenic attractiveness assigned to the project sites are due to the ordinary or common visual quality. The forms, colors and textures in the affected environment are normally seen through the characteristic landscape and are not considered to have distinctive quality. In the foreground and middleground of the CT plant site, the scenic integrity has been lowered by extensive human alteration through industrial development. However, in the background these alterations are not substantive enough to dominate the view of the landscape. Based on the criteria used for this analysis, the overall scenic value class for the affected environment ranges from poor within the proposed plant facility to good in the surrounding project area.

The only visual receptors within ½ mile of the project area are industrial facilities, which are not considered sensitive receptors. These sites can be seen in Figure 3.18-6.

Figure 3.18-6. JCT Visual Receptors

3.18.1.3.2 Gleason Reservation

Flat, rural landscapes and power lines are visible in the area surrounding the Gleason Reservation. Small patches of forested area and tree lines are visible between agricultural fields. A few residences are scattered across the landscape to the north of Highway 22, with density increasing to the south of Highway 22 as proximity to the town of Gleason increases. The affected environment includes the existing CT plant site and associated roads, as well as the physical and natural features of the landscape. Except for the existing Gleason plant, the surrounding region is largely undeveloped with agricultural fields and forested areas, and residential and commercial development in the vicinity of Gleason. Components of the existing CT plant are dominant elements in the landscape and include the three generating units and powerlines. The existing CT plant is illuminated at night.

Scenic attractiveness of the area is considered common, and scenic integrity is considered moderate due to expansive agricultural fields with roads, scattered residences, and the Gleason Reservation. The ratings for scenic attractiveness assigned to the project sites are due to the ordinary or common visual quality. The forms, colors and textures in the affected environment are normally seen through the characteristic landscape and are not considered to have distinctive quality. In the foreground and middleground, the scenic integrity has been lowered by slight human alteration such as residential and industrial development. However, in the background these alterations are not substantive enough to dominate the view of the landscape. One commercial development and three residences, all potential visual receptors, are located with 0.5 mile of the Gleason site (Figure 3.18-7).

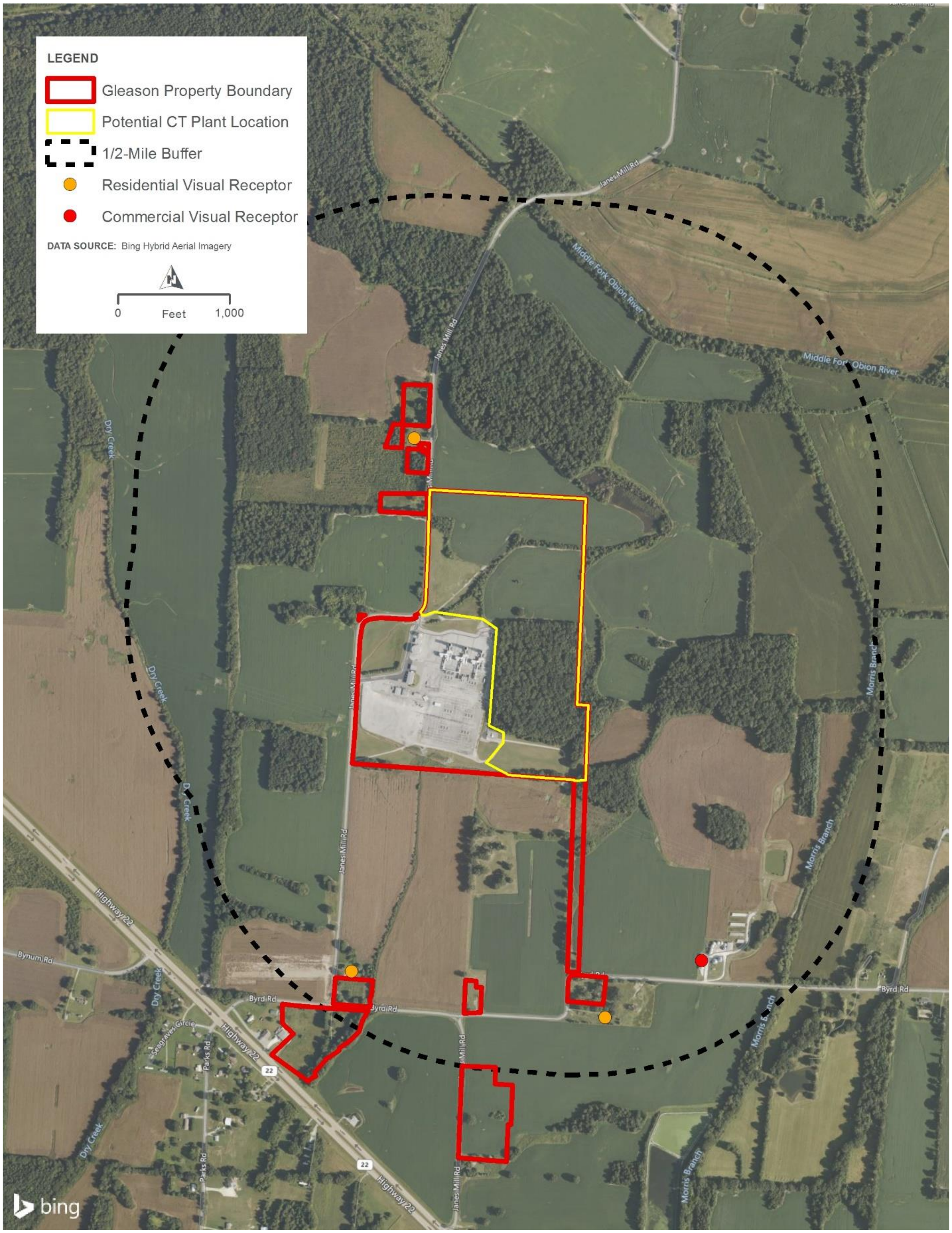

Figure 3.18-7. Gleason Visual Receptors

3.18.1.3.3 Transmission Corridors

Land use in the area of the proposed 40-mile, 500-kV TL is largely agricultural with smaller portions of forested area. The proposed TL line intersects a few developed areas, including seven main roadways and multiple smaller rural roads. The viewscape in the corridor is typical for rural areas, with interspersed residential receptors as well as transportation corridors.

Scenic attractiveness of the area is considered common, and scenic integrity is considered moderate due to human alteration in the surrounding area. Detailed analyses of visual resources would be conducted under supplemental NEPA reviews if Alternative B is selected as the preferred alternative.

3.18.1.4 Alternative C

3.18.1.4.1 Middle Tennessee TVA Power Service Area

Middle Tennessee Solar and storage facilities sites would likely be located in agricultural, rural, and/or undeveloped areas, largely in Middle Tennessee, with common scenic attractiveness and varying levels of scenic integrity. The affected environment of visual resources would be studied for each solar and storage facility under future NEPA reviews.

3.18.2 Environmental Consequences

3.18.2.1 The No Action Alternative

Under the No Action Alternative, TVA would continue to operate the CUF plant. TVA would implement all the planned actions related to the current and future management and storage of CCRs at the fossil plants, which have either been reviewed or will be in subsequent NEPA analysis. Under this alternative, the fossil plant would continue to operate and none of the physical infrastructure currently at the site would change. The primary features in the visual environment, including the stacks, plant buildings, and connecting transmission lines leaving the plant sites, would remain in place. Therefore, the overall scenic value class would remain fair.

3.18.2.2 Retirement, Decommissioning, Decontamination, and Deconstruction of CUF Plant

All buildings, structures, conveyers, and silos associated with plant operations would be decontaminated and demolished to three feet below final grade. All below-grade building areas would be backfilled and the site would be restored to grade, thereby changing the visuals in CUF. Demolition of the four emission stacks would cause a beneficial visual effect to receptors in the foreground, middleground, and background distance. Visibility of the remaining deconstruction actions is expected to be limited to receptors within the middleground and foreground viewing distances due to the screening effect of surrounding topography and vegetation. At the background distance, most of the deconstruction actions are not expected to be discernible due to the screening effects of terrain and overall distance, nor would they contrast with the overall landscape.

In order to mitigate visual effects, TVA would grade and revegetate after deconstruction activities. TVA will maintain the site until it is redeveloped at some time in the future. During the retirement and demolition of CUF, there would be slight visual discord from the existing conditions due to an increase in personnel, cranes, and other tall and colorful equipment in the area. As potential visual disturbances would only be visible to a few people with nearby vantage points, and due to the temporary nature of the activities, visual effects during demolition of the outlying facilities would be considered insignificant.

There would be an increase in vehicular traffic along Cumberland City Road and Old Highway 149 during the hauling of material from CUF, which would be noticeable to residents along those streets. Effects from additional vehicular traffic are expected to be minor as the roads within the plant are already predominately used by employees and for industrial activity. This small increase in visual discord would be temporary and intermittent and only last until construction activities have been completed.

Although many structures would be removed, the closed CUF and remaining operational structures would be visually similar to other industrial elements present in the current landscape with the exception of the removed silos. Therefore, the site would generally be absorbed by surrounding industrial components and would become visually subordinate to the overall landscape character associated with the plant site.

Cumulative effects caused by the retirement of CUF could include the eventual redevelopment of the site, providing a different visual experience for recreational river users, motorists, and area residents. Without knowing what development would occur, the extent or manner of visual effects is not known. However, it would likely result in an improved visual setting and minor cumulative, beneficial effects.

3.18.2.2.1 Environmental Justice Considerations

Visual effects that would occur as a result of CUF coal facility retirement and D4 activities are not anticipated to have disproportionate and adverse human health or environmental effects on EJ populations in the CUF Reservation EJ study area. These effects would be temporary and minor. Moreover, the effects are anticipated to be limited to the TVA-owned CUF Reservation or immediate vicinity, where EJ populations are not present and are removed by some distance (Figure 3.4-3). The effects would generally be experienced by other populations since they are more prominent in the immediate CUF vicinity.

3.18.2.3 Alternative A

3.18.2.3.1 Construction and Operation of CC Plant at CUF

Construction of a CC plant on the undeveloped portion (Site A2) of the CUF Reservation would result in direct visual effects. The new CC plant and accompanying equipment would be visually similar to other industrial elements present in the current landscape. Proposed final stack height will be an outcome of further engineering analysis and is not yet known; however, the proposed stacks would not exceed 199 feet high. The new stacks would likely be visible to rural residential receptors near the proposed CC plant site. With the exception of the stacks, visibility of the proposed CC plant construction is expected to be limited to receptors within the middleground viewing distance due to the screening effect of surrounding topography and vegetation. At the background distance, the proposed actions are not expected to be discernible due to the screening effects of terrain and overall distance, nor would they contrast with the overall landscape. The new CC plant would be mainly seen by employees and facility operators, as well as motorists on the adjacent Old Scott Road. Border trees and hedges may be planted as needed, and existing border vegetation would be maintained. Therefore, the site would generally be absorbed by surrounding industrial components and would become visually subordinate to the overall landscape character associated with the plant site. The use of downward and inward facing lighting will create a permanent visual effect within the project site.

During the construction of the CC plant, there would be slight visual discord from the existing conditions due to an increase in personnel and equipment in the area. There would also be an increase in vehicular traffic along Cumberland City Road and Old Highway 149 due to employee traffic as well as barge and rail traffic during the hauling of material to and from the CUF, which would be noticeable to residents along those streets. Effects from additional vehicular traffic are expected to be minor as the roads within the plant are already predominately used by employees and for industrial activity. This small increase in visual discord would be temporary and intermittent and would only last until construction activities have been completed. Cumulative visual effects could occur with the proximity of the RFFAs, including planned CCR management activities.

3.18.2.3.2 Construction and Operation of Natural Gas Pipeline

The planned pipeline corridor under Alternative A is located near previously disturbed areas due to its proximity to an existing TVA TL line but will directly intersect approximately 693 acres of forest. This will necessitate tree clearing in some areas, thereby changing the viewshed. TGP is conducting a detailed analysis of visual effects associated with the proposed pipeline as part of the Environmental Report to be submitted with their certificate application that will be filed with FERC for the proposed pipeline. While most of the pipeline would not be visible once buried and operational, based on desktop review of the 200-ft study corridor, the proposed pipeline would cause long-term visual effects due to the conversion of forest to fields. Cumulative visual effects could occur with the proximity of the RFFAs and the potential for land use conversions and viewshed changes in a rural region.

During pipeline construction, there would be temporary, slight visual discord from the existing conditions due to an increase in personnel and equipment in the area. There would also be an increase in vehicular traffic during the hauling of material to the corridor, which would be noticeable to residents near and along those roadways. Because materials would likely be transported on smaller roads in more rural areas along the corridor, this may create a more noticeable visual effect for nearby receptors rather than the effect of transporting materials via highway.

3.18.2.3.3 Transmission and Other Components

The proposed transmission lines associated with Alternative A would be contained within the CUF Reservation and have the same effects to visual resources as described in Section 3.18.1.1.

3.18.2.3.4 Environmental Justice Considerations

Visual effects that would occur as a result of the proposed CC plant and natural gas pipeline lateral are not anticipated to have disproportionate and adverse human health or environmental effects on EJ populations in the CUF Reservation or pipeline corridor EJ study areas. These effects would be temporary and minor. Moreover, they would be limited to the TVA-owned CUF Reservation and pipeline corridor or nearby vicinity, where EJ populations are either removed from the immediate vicinity, as with the CUF Reservation (two out of 16 census block groups are low-income EJ populations; see also Figure 3.4-3), or limited, as with the pipeline corridor (one out of 10 census block groups are low-income EJ populations; see also Figure 3.4-4). While effects may be experienced by EJ populations located in the far eastern extreme of the pipeline corridor EJ study area, these effects would be similar to those experienced by non-EJ populations and, thus, are not anticipated to be disproportionate.

3.18.2.4 Alternative B

3.18.2.4.1 Construction and Operation of CT Plant at Johnsonville Reservation

During the construction of the CT plant, there would be slight visual discord from the existing conditions due to an increase in personnel and equipment in the area. There would also be an increase in rail and vehicular traffic along the existing rail spur, Industrial Park Road, and U.S. 70 during the hauling of material to and from the site, which would be noticeable to residents along those streets.

Construction of CT plant would result in short-term visual effects 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, which is a developed, industrial portion of the reservation, 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. Because of their temporary nature, construction-related effects to local visual resources are expected to be minor.

Long-term effects resulting from the construction of the CT plant would include visible alterations to the existing landscape associated with the plant, including stacks up to 199 feet tall and transmission structures. These elements would be visually similar to other industrial structures seen in the current landscape of the Johnsonville Reservation. These elements contribute to the landscape’s ability to absorb negative visual change and would minimize the visual effect of the proposed action. Furthermore, the proposed CT plant facilities would have minimal public visibility, with unobstructed views generally limited to employees and visitors to the Johnsonville Reservation and boaters on the nearby Kentucky Reservoir. The USFWS-recommended downward and inward facing lighting to limit attracting wildlife will create a permanent visual effect within the project site, but would minimize light pollution for the surrounding area.

Cumulative visual effects could occur from RFFAs, including the adjacent Aeroderivative CT project, but would be minor because of the current landscape of the reservation.

3.18.2.4.2 Construction and Operation of CT Plant at Gleason Reservation

Visual effects related to the construction of the CT plant at the Gleason Reservation would be similar to those discussed at the Johnsonville reservation. Unlike Johnsonville, however, the Gleason CT plant site would be located on undeveloped land adjacent to an existing CT plant. Long-term effects resulting from the construction of the CT plant would include visible alterations to the existing landscape associated with the plant, including stack heights up to 199 feet tall, as well as the proposed transmission structures. These elements would be visually similar to the existing Gleason CT plant. These elements contribute to the landscape’s ability to absorb negative visual change and would minimize the visual effect of the proposed action. The new structures may be visible to rural residences near the Gleason Reservation. The USFWS-recommended downward and inward facing lighting to limit attracting wildlife will create a permanent visual effect within the project site, but would minimize light pollution for the surrounding area.

The 60 acres that could be used as needed for vehicle and equipment parking, materials storage, laydown, and construction administration during construction of the proposed CTs are located on undisturbed areas. When construction is complete, they would be allowed to revert to their original use. Thus, visual effect because of laydown areas would be moderate but temporary.

During the construction of the CT plant, there would be slight visual discord from the existing conditions due to an increase in personnel and equipment in the area. There would also be an increase in vehicular traffic along Janes Mill Road and Highway 22 during the hauling of material to and from the site, which would be noticeable to residents along those streets. This small increase in visual discord would be temporary and intermittent and only last until construction activities have been completed.

The construction of the plant would contribute to a minor change in visual integrity of the landscape due to construction activities which affect the local viewshed. Scenic attractiveness may be reduced in the foreground during increased activity but would remain common in the middleground and background. Border trees and hedges may be planted as needed, and existing border vegetation will be maintained.

Cumulative visual effects could occur from RFFAs, but would be minor because of the current landscape of the reservation.

3.18.2.4.3 Transmission and Other Components

The proposed 40-mile, 500-kV transmission line has the potential to result in moderate adverse visual effects, as this would be a new line across a largely agricultural landscape. It would also result in a prominent cleared corridor where the line crosses forested areas. The transmission line may be visible at foreground, middleground, and background distances, depending on the extent of vegetation and topography.

During the construction of the TLs and other electrical system components, there would be slight visual discord from the existing conditions due to an increase in personnel and equipment in the area. There would also be an increase in vehicular traffic along Highway 45, 22, and 54 due to employee traffic. Effects from additional vehicular traffic are expected to be minor as these roads are already predominately used by employees and for industrial activity. This small increase in visual discord would be temporary and intermittent and only last until construction activities have been completed.

Detailed analyses of visual resource effects would be conducted under supplemental NEPA reviews if Alternative B is selected as the preferred alternative.

3.18.2.4.4 Environmental Justice Considerations

Visual effects that would occur as a result of the proposed CT facilities and transmission line activities are not anticipated to have disproportionate and adverse human health or environmental effects on EJ populations in the JCT or Gleason Reservation or pipeline corridor EJ study areas. These effects would be temporary and minor. Visual effects would also be limited to the immediate TVA-owned reservations or nearby vicinity, where EJ populations are either not present as in the case of Gleason (Figure 3.4-7 and Figure 3.4-8) or are present in varying percentages, as in the case of JCT where minority EJ populations and other populations are in the immediate JCT Reservation vicinity (Figure 3.4-5). Visual effects from transmission line construction and upgrade activities are expected to be short-term and minimal. Thus, minimal to no effects are anticipated on EJ populations. Since EJ and non-EJ populations would experience these effects, they are not anticipated to be disproportionate on EJ populations.

3.18.2.5 Alternative C

3.18.2.5.1 Construction and Operation of Solar and Storage Facilities

The construction of the proposed solar and storage facilities would result in localized visual effects as they would introduce industrial elements onto sites that are typically relatively flat and largely cropland, pasture, and/or hayfields. The solar and storage facility components are typically low profile and less than 15 feet tall except for taller structures supporting electrical lines that connect the facilities to existing nearby transmission lines. The solar facility sites are typically replanted with grasses and other low vegetation following construction, and low-profile vegetation is maintained during operation by periodic mowing or grazing. The solar and storage facility sites are enclosed by security fencing and any night-lighting is typically motion-activated.

Where visual effects are identified as a concern during facility design, or as required by ordinances in some communities, the facilities may be screened by planted trees and shrubs and/or constructed berms. Detailed analyses of visual effects would occur for each solar or BESS site under future NEPA reviews.

Cumulative visual effects would occur if Alternative C was combined with the 10,000 MW expansion of solar planned in the 2019 TVA IRP, which would create long-term, cumulative increases in viewshed changes in the region. Cumulative effects would be minimized through proper siting, setbacks, visual screening and buffers, and lighting.

3.18.2.5.2 Environmental Justice Considerations

Visual effects that would occur as a result of the proposed solar facilities and transmission line activities are not anticipated to have disproportionate and adverse human health or environmental effects on EJ populations in the EJ study area for Alternative C, as these effects would be localized, temporary, minor, and limited to the immediate project sites and transmission line corridors. These effects would be anticipated to be the same for EJ and other populations in the vicinity. To determine disproportionate effects for a given solar facility, detailed EJ analyses would occur for each solar facility and transmission line activity under future NEPA reviews.

3.19 Unavoidable Adverse Environmental Effects

Unavoidable adverse effects are the effects of the proposed action on natural and human resources that would remain after mitigation measures or BMPs have been applied. Effects associated with the retirement and deconstruction of the CUF coal plant, the construction and operation of the proposed CUF CC plant and natural gas pipeline lateral (Alternative A), the CT plants at JCT and Gleason (Alternative B), or solar and storage facilities (Alternative C) and associated TL lines and upgrades have the potential to cause unavoidable adverse effects to several natural and human environmental resources. TVA has reduced the potential for adverse effects through appropriate planning in designing replacement generation facilities. In addition, TVA would implement mitigation measures (Section 2.3) to further reduce potential adverse effects to certain environmental resources.

All the replacement generation alternatives would result in the permanent conversion of undeveloped land into an industrial use, with the exception of the proposed CT plant at JCT (Alternative B), which has been previously developed. The new pipeline built by TGP and TVA's transmission lines would also convert undeveloped land, including forest, into cleared, maintained corridors.

The construction of the replacement generation would also result in minor effects to surface water and wetland resources. These effects would be mitigated through adherence to permit requirements and the provision of appropriate compensatory mitigative measures, if needed. The proposed natural gas pipeline lateral (Alternative A) would likely avoid certain of these features by boring or directionally drilling beneath them, and new TLs (all alternatives) would likely span wetlands and waters to the extent practicable. Temporary effects to water quality from runoff during construction, as well as ongoing vegetation maintenance along the pipeline and TLs, could affect nearby receiving water bodies but would be reduced with application of appropriate BMPs.

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 affect onsite workers, users of adjacent recreational lands and water bodies, and residents located near the offsite TL segments and natural gas pipeline lateral. Potential noise effects also include traffic noise associated with the construction workforce traveling to and from the site. Emissions from construction activities and equipment would be minimized through implementation of BMPs including proper maintenance of construction equipment and vehicles. Low income and minority communities would not suffer any disproportionate air, dust, noise, transportation, or waste effects.

Temporary increases in traffic would be minimized or mitigated by specific measures designed to address traffic flow issues, if necessary. Temporary increases in health and safety risks would be minimized by implementation of the project health and safety plan. Construction and operation would have minor, localized effects on soil erosion and sedimentation that would be minimized by establishment and maintenance of stream and wetland buffers, soil stabilization, and vegetation management measures.

Construction of the proposed solar facilities would be the subject of CWA Section 404/401 permitting, and long-term effects would be mitigated through application of CWA permit conditions. Alternative C would result in the conversion of about 21,900 acres of largely agricultural land to industrial use, although livestock grazing is likely occurring now on at least some of the solar facility sites. Revegetation of solar sites with native and/or non-invasive grasses and herbaceous vegetation would help minimize effects to open, grassy habitats.

These habitat alterations would result in effects to localized plant communities and wildlife habitat on the affected lands. However, due to the abundant habitat of similar quality within the vicinity of the project sites, the overall effect to vegetation and wildlife is considered minor. Effects to federally listed endangered and threatened species would be mitigated in consultation with the USFWS. When actions fall under those addressed in TVA's Programmatic Consultation with USFWS addressing routine actions and federally listed bats, project-specific Conservation Measures would be identified on TVA's Bat Strategy Form. These Conservation Measures would minimize effects to federally listed bats and must be implemented during proposed actions. TVA and developers under power purchase agreements would also employ avoidance measures to avoid significant effects to any state-listed plants and any previously undocumented populations of federally or state-listed species identified during future surveys.

Consultation with TN SHPO and tribes is ongoing for Alternative A. While the retirement and deconstruction of the CUF plant would not result in adverse effects to cultural resources, the proposed replacement generation and associated pipeline or TL infrastructure may result in adverse effects and require development of mitigation measures through Section 106 consultation.

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.

3.20 Relationship of Short-Term Uses and 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 EIS focuses on the analyses of environmental effects associated with the retirement, decommissioning and deconstruction of the existing CUF plant, and replacement of power generated through construction of a CC plant on the CUF site (Alternative A), construction of CT plants at JCT and Gleason Reservations (Alternative B), or construction of solar and BESS facilities (Alternative C), as well as associated offsite natural gas pipeline laterals, TLs, 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 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.

All buildings and structures within the proposed CUF plant demolition boundary would be decontaminated and demolished to grade or to the top of the mooring cells. In the long-term, the site could become productive if commercial or industrial facilities were to be established, thereby producing employment opportunities and tax revenue and enhancing long-term productivity of the site.

Construction of the replacement generation plants, associated pipelines, and TL upgrades would cause a minor, short-term deterioration in existing air quality during construction. These effects would be mitigated through implementation of mitigative measures to reduce emissions from construction phase equipment and minimize emissions of fugitive dust. All of the action alternatives would result in a long-term beneficial effect on air quality and GHG emissions. Therefore, there would be no effect on the enhancement of long-term productivity related to air quality or climate change following decommissioning of the CUF plant.

Construction of the proposed CC plant, including the natural gas pipeline lateral (Alternative A), or CT plants and TL infrastructure (Alternative B), would reduce the long-term productivity of the land for other purposes while these facilities are in operation. The proposed generation facilities are located on existing TVA reservations, and in the case of the JCT CT plant, would be located in an area developed for heavy industrial use. Because the vicinity of the project area includes similar vegetation and habitat types, the short-term disturbance to support plant operations is not expected to significantly alter long-term productivity of wildlife, agriculture, or other natural resources. After decommissioning, the lands could be reused and made available for other uses.

Constructing solar facilities (Alternative C) would affect short-term uses of the project sites by converting them from agricultural and forested land to solar power generation. The effects on long-term productivity would be minimal, as existing land uses could be readily restored on the sites following the decommissioning and removal of the solar facilities.

3.21 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.

Resources required by decontamination and deconstruction activities, including labor and fossil fuels, would be irretrievably lost. Nonrenewable fossil fuels would be irretrievably lost through the use of gasoline and diesel-powered equipment during construction. However, it is unlikely that their limited use in these projects would adversely affect the overall future availability of these resources.

The land used for the proposed CC (Alternative A), CT (Alternative B), or solar/storage (Alternative C) 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 lateral 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.

Operation of the CC or CT plants would result in the irretrievable loss of natural gas, which would be used to fuel the CCs or 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 at this time and their use would not have an adverse effect upon continued availability of these resources.

The implementation of Alternative C would involve irreversible commitment of fuel and resource labor required for the construction, maintenance, and operation of the solar and BESS facilities. Because removal of the solar arrays and associated on-site infrastructure could be accomplished rather easily, and the facilities would not irreversibly alter the site, the project sites could be returned to their original condition or used for other productive purposes once the solar facility is decommissioned. Most of the solar facility components could also be recycled after the facility is decommissioned.

CHAPTER 4 - SUBMITTED ALTERNATIVES, INFORMATION AND ANALYSES

4.1 Submitted Alternatives, Information and Analyses

The EIS includes a summary that identifies all alternatives, information and analyses submitted by State, Tribal, and local governments, in Section 1.4, and other public commenters during the scoping process for consideration in developing the EIS (40 CFR 1502.17). During the scoping period, the Southern Environmental Law Center recommended that in addition to proposed Alternative C, the EIS should include these alternatives:

- Distributed solar;
- Onshore wind;
- Demand response and energy efficiency;
- Solar (distributed and utility-scale), onshore wind, energy efficiency, demand response, and battery storage; and
- Purchased carbon-free power.

Alternative C evaluates the potential for 3,000 MW of utility scale solar and 1,700 acres of energy storage facilities. This 3,000 MW would be in addition to the approximately 10,000 MW of solar additions by the mid-2030s that are currently included in TVA’s long-term plans. Section 2.1 provides additional information related to the proposed alternatives. Additionally, TVA’s 2019 IRP evaluates other recommendations in this proposed alternative, including onshore wind, and demand response and energy efficiency.

CHAPTER 5 – LIST OF PREPARERS

5.1 NEPA Project Management

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CHAPTER 6 – LITERATURE CITED

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Appendices Provided Separately Due to Size

Appendix A – CUF Surface Waters Technical Report

Appendix B – CUF Wetlands Report

Appendix C – Air Quality Emissions Tables

Appendix D – CUF Terrestrial Plant Communities and Botanical Resources Survey

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