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ELORA SOLAR ENERGY CENTER

Lincoln County, Tennessee

DRAFT ENVIRONMENTAL ASSESSMENT

Prepared for:
Tennessee Valley Authority
Knoxville, Tennessee

Submitted By:
Elora Solar LLC

Prepared By:
HDR, Inc.

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For Information, contact:
Elizabeth Smith
Tennessee Valley Authority
400 W. Summit Hill Drive
Knoxville, Tennessee 37902
Phone: 865-632-3053
Email: esmith14@tva.gov

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SYMBOLS, ACRONYMS, AND ABBREVIATIONS

AADT	Annual Average Daily Traffic
AC	Alternating current
ACS	American Community Survey
APE	Area of Potential Effect
ARAP	Aquatic Resource Alteration Permit
AST	Above ground storage tank
ASTM	American Society for Testing and Materials
BCC	Birds of Conservation Concern
BCR	Bird Conservation Region
BG	Block Group
BGEPA	Bald and Golden Eagle Protection Act
BMP	Best management practice
B.P.	Before Present
CAA	Clean Air Act of 1970
CEC	Chickasaw Electric Cooperative
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act of 1980
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CO	Carbon monoxide
CT	Census Tract
CWA	Clean Water Act
dB	Decibels
dBA	A-weighted decibels
DBH	Diameter at breast height
DC	Direct current
DNL	Day-night average sound level
EA	Environmental Assessment
EDR	Environmental Data Resources, Inc.
EIS	Environmental Impact Statement
ESA	Environmental Site Assessment
EO	Executive Order
EPCRA	Planning and Community Right to Know Act
ESA	Endangered Species Act
ESS	Energy storage system
°F	Fahrenheit
FAA	Federal Aviation Administration
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FPPA	Farmland Protection Policy Act
GHG	Greenhouse gas
HUC	Hydrologic Unit Code

I	Interstate
IPaC	Information for Planning and Conservation
IRP	Integrated Resource Plan
kV	Kilovolt
L&N	Louisville and Nashville Railway Company
LIDAR	Light detection and ranging
M&C	Memphis and Charleston Railroad
M&O	Memphis and Ohio Railroad
MBTA	Migratory Bird Treaty Act
MGD	Million gallons per day
MPT	Main power transformer
MWh	Megawatt hour
MW	Megawatt
NAAQS	National Ambient Air Quality Standards
NEI	National Emission Inventory
NEPA	National Environmental Policy Act
NFIP	National Flood Insurance Program
NHPA	National Historic Preservation Act
NLCD	National land cover database
NRCS	Natural Resource Conservation Service
NRHP	National Register of Historic Places
No.	Number
NO_x	Nitrogen oxides
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NWP	Nationwide Permit
O_3	Ozone
OSHA	Occupational Safety and Health Administration
Pb	Lead
PEM	Palustrine emergent
PFO	Palustrine forested
PMT	Padmount transformer
$PM_{2.5}$	Particulate matter whose particles are less than or equal to 2.5 micrometers
PM_{10}	Particulate matter whose particles are less than or equal to 10 micrometers
PPA	Power purchase agreement
PPE	Personal protective equipment
PRT	Potential Roost Trees
PV	Photovoltaic
REC	Recognized environmental conditions
RNHD	Regional Natural Heritage Database
RCRA	Resource Conservation and Recovery Act

RFP	Request for proposal
ROW	Right-of-way
SHPO	State Historic Preservation Officer
SO_2	Sulfur dioxide
SMZ	Streamside management zone
SPCC	Spill Prevention, Countermeasure and Control
SR	State route
SWPPP	Stormwater Pollution Prevention Plan
TCA	Tennessee Water Quality Control Act
TDEC	Tennessee Department of Environment and Conservation
TDML	Total Maximum Daily Load
TDOA	Tennessee Department of Archaeology
TDOT	Tennessee Department of Transportation
THC	Tennessee Historical Commission
TL	Transmission line
TVA	Tennessee Valley Authority
TVARAM	TVA Rapid Assessment Method
TWRA	Tennessee Wildlife Resources Agency
U.S.	United States
USACE	U.S. Army Corps of Engineers
U.S.C.	United States Code
USCB	U.S. Census Bureau
USDA	United States Department of Agriculture
USEPA	U.S. Environmental Protection Agency
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Service
UST	Underground storage tank
WQC	Water quality certification
WMA	Wildlife Management Area
WWC	Wet weather conveyance
VOC	Volatile organic compound

CHAPTER 1

1 INTRODUCTION

The Tennessee Valley Authority (TVA) entered into a power purchase agreement (PPA) with Elora Solar, LLC (Elora Solar), an affiliate of NextEra Energy Resources, LLC (NextEra), on October 5, 2018, to purchase the electric power generated by a proposed solar photovoltaic (PV) facility in Lincoln County, Tennessee. The proposed Elora Solar Energy Center would be constructed and operated by Elora Solar and would have alternating current (AC) generating capacity of up to 150 megawatts (MW). To interconnect to TVA's existing electrical grid, Elora Solar would build the new Elora Solar 161-kV transmission line (TL) that would connect the proposed on-site Elora Solar 161-kV Substation, also built by Elora Solar, to TVA's proposed Mann Road 161-kV Switching Station at the northern extent of the new TL. TVA would connect the new Mann Road 161-kV Switching Station to TVA's existing Winchester-Fayetteville 161-kV TL and install fiber-optic overhead groundwire (OPGW) on this existing TL. Subject to satisfactory completion of all applicable environmental reviews, the PPA is for a 20-year period, during which TVA would purchase qualifying renewable energy at predetermined prices. Together, the proposed Elora Solar Energy Center, Elora Solar and TVA interconnection facilities, and the PPA between TVA and Elora Solar are herein referred to as the "Project;" the PPA and the associated construction and operation of the solar and interconnection facilities are herein referred to as the "Proposed Action."

The proposed Elora Solar Energy Center and Elora Solar 161-kV Substation would occupy portions of two individual tracts together encompassing approximately 1,504 acres of land. The proposed Elora Solar 161-kV TL and associated right-of-way (ROW) and TVA's proposed Mann Road 161-kV Switching Station and associated access road would occupy an additional 203 acres north of the Elora Solar Energy Center. Together, this 1,707-acre area is referred to as the "Project Site" (Figures 1-1, 2-1). The Project Site is adjacent to Winchester Highway (U.S. Highway [US] 64), approximately 1.3 miles north of the community of Elora. The Elora Solar Energy Center would consist of solar arrays containing PV panels attached to ground-mounted single-axis trackers, central inverters, medium voltage transformers and one main power transformer (MPT), internal site access roads, and all associated cabling and safety equipment (Figures 2-2 and 2-3). The MPT would be located within the proposed on-site Elora Solar 161-kV Substation, which would connect to approximately 3.6 miles of new 161-kV TL extending north from the Elora Solar Energy Center to the TVA-proposed Mann Road 161-kV Switching Station. The switching station would then connect with TVA's adjacent existing Winchester-Fayetteville 161-kV TL. Several pole structures would be replaced and approximately 9.8 miles of OPGW would be installed on this TL.

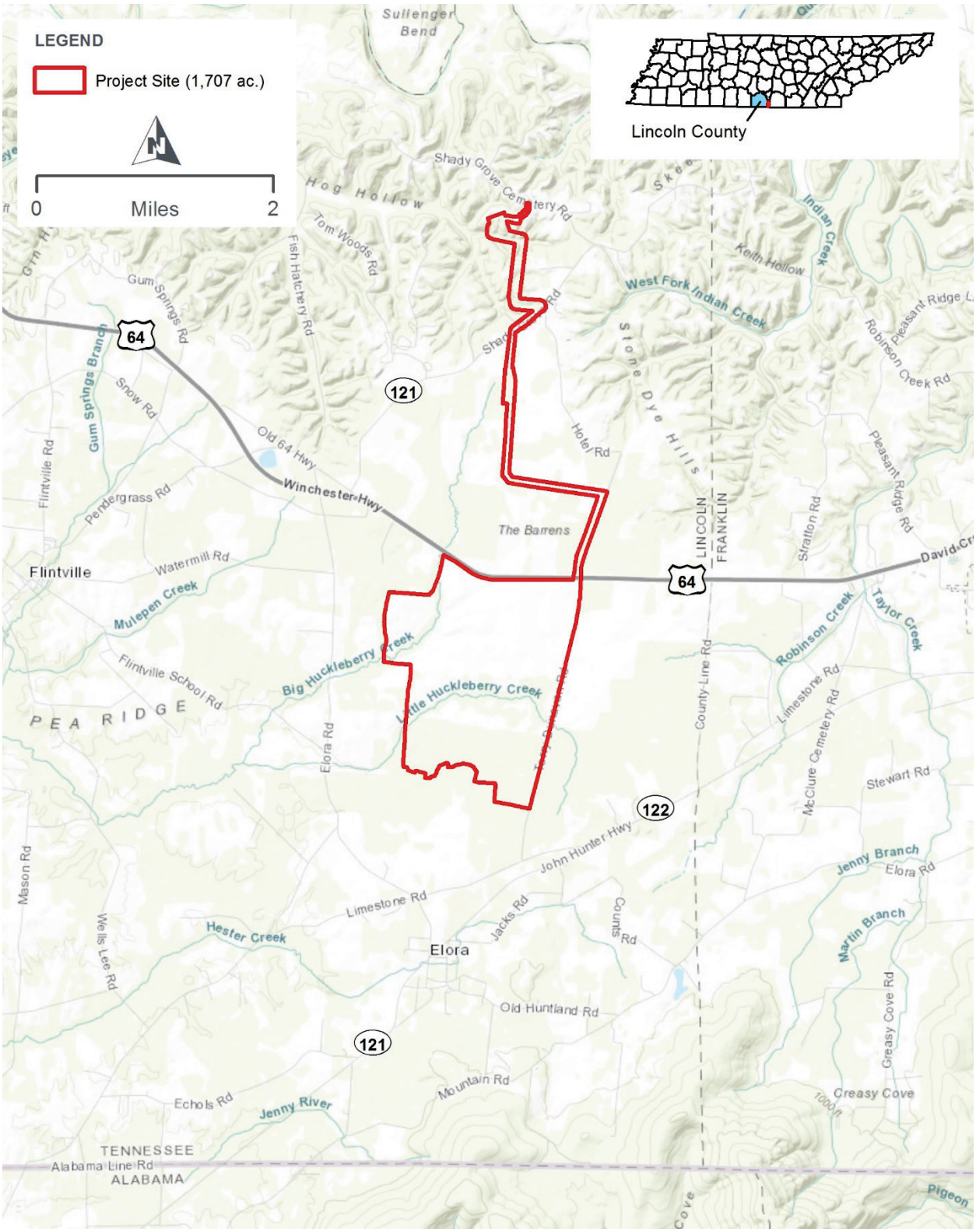

Figure 1-1. Elora Solar Energy Center Project Site in Lincoln County, Tennessee.

1.1 PURPOSE AND NEED FOR ACTION

TVA produces or obtains electricity from a diverse portfolio of energy sources, including solar, hydroelectric, wind, biomass, fossil fuel, and nuclear. In 2015, TVA completed an Integrated Resource Plan (IRP) and associated Environmental Impact Statement (EIS) (TVA 2015). The IRP identified the various resources that TVA intends to use to meet the energy needs of the TVA region over the 20-year planning period while achieving TVA's objectives to deliver reliable, low-cost, and cleaner energy while reducing environmental impacts. These energy resources included the addition of between 175 and 800 MW (AC) of solar capacity by 2023. In 2017, customer demand prompted TVA to release a Request for Proposal (RFP) for renewable energy resources (2017 Renewable RFP). The PPAs that resulted from this RFP, including the Elora Solar PPA, will help TVA meet immediate needs for additional renewable generating capacity in response to customer demands and fulfill the renewable energy goals established in the 2015 IRP. The Proposed Action would provide cost-effective renewable energy consistent with the IRP and TVA goals.

In June 2019, TVA released the final 2019 IRP and the associated EIS (TVA 2019a). This updated IRP provides further direction on how TVA can best deliver clean, reliable and affordable energy in the Valley over the next 20 years, and the associated EIS describes the natural, cultural and socioeconomic impacts associated with the IRP. The 2019 IRP recommends a solar expansion between 1,500 and 8,000 MW by 2028 and up to 14,000 MW by 2038 (TVA 2019a). While the Proposed Action was initiated in accordance with the 2015 IRP, it is consistent with the 2019 IRP.

1.2 SCOPE OF THIS ENVIRONMENTAL ASSESSMENT

Pursuant to the National Environmental Policy Act of 1969 (NEPA) and NEPA's implementing regulations promulgated by the Council on Environmental Quality ([CEQ]; 40 Code of Federal Regulations [CFR] §§ 1500–1508), federal agencies are required to evaluate the potential environmental impacts of their proposed actions. This environmental assessment (EA) was prepared in accordance with NEPA and TVA's procedures for implementing NEPA (TVA 1983) to assess the potential impacts of the Proposed Action.

TVA's Proposed Action would result in the construction and operation of the proposed solar facility by Elora Solar, including the actions taken by TVA to construct a new switching station and connect the proposed Elora Solar Energy Center to the TVA transmission system. The scope of this EA, therefore, covers not only impacts related to the construction and operation of the proposed Elora Solar Energy Center but also those impacts related to the associated modifications to the TVA transmission system.

This EA (1) describes the existing environment in the Project Area, (2) analyzes potential environmental impacts associated with the Proposed Action and the No Action Alternatives, and (3) identifies and characterizes potential cumulative impacts that could result from the Project in relation to other ongoing or reasonably foreseeable proposed activities within and surrounding the Project Site. The "Project Area" is the potentially affected areas within and beyond the Project Site and varies by each resource area as defined in Chapter 3.

Under the PPA, TVA's obligation to purchase renewable power is contingent upon the satisfactory completion of the appropriate environmental review and TVA's determination that the Proposed Action would be "environmentally acceptable." To be deemed acceptable, TVA must assess the impacts of the Project and determine that (a) no significant impacts to the human environment would result from the location, operation, and/or maintenance of the Project and (b) that all Project activities would be consistent with applicable federal, state, and local environmental laws and regulations.

Based on internal scoping and identification of applicable laws, regulations, executive orders (EOs), and policies, TVA identified the following resource areas for analysis within this EA: land use; geology, soils and prime farmland; water resources; biological resources; visual resources; noise; air quality and climate change; cultural resources; utilities; waste management; public and occupational health and safety; transportation; socioeconomics; and environmental justice.

This EA consists of six chapters discussing the alternatives, resources potentially affected, and analyses of these impacts. Additionally, this document includes appendices that contain best management practices (BMPs), supporting information, and correspondence. The organization of the EA is as follows:

- **Chapter 1:** Describes the purpose and need for the Project, the decision to be made, related environmental reviews and consultation requirements, public involvement, necessary permits or licenses, and the EA overview.
- **Chapter 2:** Describes the No Action and Proposed Action Alternatives, provides a comparison of the Alternatives, summarizes the proposed mitigation measures presented more fully in Chapter 3, and identifies the Preferred Alternative.
- **Chapter 3:** Discusses the affected environment and the potential direct and indirect impacts on specific resource areas. Mitigation measures are also proposed, as appropriate.
- **Chapter 4:** Summarizes unavoidable adverse impacts, the relationship between short-term uses and long-term productivity, and whether the Project makes irreversible and irretrievable commitments of resources. Chapter 4 also discusses the cumulative impacts in relation to other ongoing or reasonably foreseeable proposed activities within the Project Area.
- **Chapters 5 and 6:** Present the list of EA preparers and the references cited in preparation of this EA, respectively.
- **Appendix A:** TVA Environmental Quality Protection Specifications for Transmission Line Construction
- **Appendix B:** TVA Transmission Construction Guidelines near Streams
- **Appendix C:** TVA Environmental Quality Protection Specifications for Transmission Substation or Communications Construction
- **Appendix D:** Correspondence and Supporting Information

1.3 PUBLIC AND AGENCY INVOLVEMENT

Elora Solar publicly announced the proposed Elora Solar Energy Center at a community meeting between 6:00 PM and 7:30 PM on June 4, 2019, in Lincoln County. The meeting was advertised in *Elk Valley Times*, a local newspaper published in Fayetteville, on May 29, 2019. The intent of the meeting was to provide information on the Project. The shared details included the Project acreage, the Project's electrical output, an overview of tasks to implement the Project, and the potential economic benefits of the Project to the local community. A map showing the Project Site location and proposed Elora Solar 161-kV TL was also on display for the public to view.

TVA has notified government agencies, interested federally-recognized Native American Tribes, elected officials, and other stakeholders that the draft EA is available for review and comment for a 30-day period. An electronic version of the document has been posted on the TVA website where comments can also be submitted online. Public notices have been published in local newspapers soliciting comments from other agencies, the general public, and any interested organizations.

1.4 PERMITS AND APPROVALS

1.4.1 Elora Solar

Construction of the Project would require coverage under a Tennessee Department of Environment and Conservation (TDEC) General Construction Stormwater National Pollutant Discharge Elimination System (NPDES) permit (State of Tennessee Permit Number TNR100000). The process involves completing a Notice of Intent (NOI) 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, as governed by Section 402 of the Clean Water Act (CWA) (see Section 2.2.2).

In accordance with TDEC requirements, Elora Solar and the construction contractor would develop a site-specific Stormwater Pollution Prevention Plan (SWPPP) and submit it to TDEC along with the NOI. The SWPPP would address all construction-related activities from the date construction commences to the date of termination of permit coverage. The SWPPP must be prepared in accordance with good engineering practices and shall be consistent with the requirements and recommendations contained in the *Tennessee Erosion & Sediment Control Handbook* (TDEC 2012).

Section 404 of the CWA prohibits the discharge of dredged or fill material into Waters of the U.S. (jurisdictional waters), including wetlands and streams unless authorized by the U.S. Army Corps of Engineers (USACE). CWA Section 404 Nationwide Permits (NWPs) would be required for impacts to jurisdictional waters that are less than 0.5 acre. NWPs are issued by USACE to authorize the construction, expansion, or modification of certain activities that would discharge dredged or fill material into Waters of the U.S., provided the proposed activities meet specific criteria. Project impacts are expected to be authorized under Number 12 (Utility Line Activities), Number 14 (Linear Transportation Projects), and/or Number 51 (Land-Based Renewable Energy

Generation Facility). If the impacts were to exceed 0.5 acre, Elora Solar would apply for a USACE Individual Permit to authorize impacts to Waters of the U.S.

Section 404 permits require water quality certification (WQC) as set forth in Section 401 of the CWA prior to discharging fill materials into Waters of the U.S. Section 401 requires any applicant requesting a federal permit or license for activities that may result in discharges to first obtain a certification from the state that the permitted discharges comply with the state's applicable effluent limitations and water quality standards. In Tennessee, TDEC is responsible for the issuance of WQCs, pursuant to the Tennessee Water Quality Control Act (TCA § 69-3-108, 0400-40-07) and Tennessee's water quality criteria and anti-degradation statement (TCA 0400-40-03). The TDEC Division of Water Resources issues this Section 401 WQC in the form of an Aquatic Resource Alteration Permit (ARAP). Proposed Project impacts are expected to be authorized under the general and special conditions of the TDEC ARAP for Construction or Removal of Minor Road Crossings and the TDEC ARAP for Utility Line Crossings.

If determined necessary, Elora Solar would obtain a permit for a septic system or pump-out septic holding tank and follow standard procedures in installing any proposed Project wells. Pursuant to Tennessee Code Annotated §§ 68-221-401.414 and TDEC Rule 0400-48-01, the septic permit would involve submitting an Application for Ground Water Protection Services (Form CN-0971) to estimate water use amounts and to provide the proposed location of the septic system in relation to the proposed well and nearby water features such as drainage ways and streams (TDEC 2019a). Elora Solar would comply with this permit to appropriately site the septic system with consideration given to required setbacks and TDEC direction. Pursuant to the Tennessee Water Well Act of 1963 and TDEC Rule 0400-45-9, all persons drilling a water well must be licensed and follow standards that ensure groundwater resources are protected (TDEC 2019b). Like septic systems, the licensed well installer must adhere to required setbacks in siting the wells. Prior to installing the wells, a Notice of Intent (CN-1240) would be filed with TDEC to estimate water use amounts and to provide the proposed locations of the water wells. Elora Solar and its licensed well installer would comply with required setbacks in order to avoid contamination of groundwater and prevent runoff from entering the wells.

The Tennessee Department of Transportation (TDOT) regulates the installation, adjustment, and relocation of utilities in state highway rights-of-way (ROWs) to ensure the integrity, safety, and functionality of state roadways while accommodating utilities. Per the *Rules and Regulations for Accommodating Utilities within Highway Rights-of-Way* (Chapter 1680-6-1), if any portion of the Project requires aboveground or below ground installation within state, Federal-aid metro-urban, or State-aid highway system road ROWs, a TDOT permit must be obtained. Where utilities would be installed aboveground or below ground within U.S. highway ROWs, Elora Solar and/or its contractor would follow the U.S. Department of Transportation's *Highway/Utility Guide* (USDOT 1993).

Vegetative waste from clearing activities would be burned or chipped and ground. If open burning of debris from tree clearing on the site is planned, the appropriate open burning permits would be obtained from the Tennessee Division of Forestry. Information on open or surface burning issued by TDEC would be followed. Only trees and brush from the Project Site would be burned. Weather

conditions would be monitored and considered to ensure safety and minimize degradation to air quality during the open burning of any vegetation cleared from the site.

1.4.2 TVA

TVA would obtain an NPDES Construction General Permit from TDEC and develop a SWPPP for construction of the Mann Road 161-kV Switching Station and associated permanent access road. TVA would prepare the required SWPPP and coordinate with the appropriate state and local authorities. If applicable, TVA would obtain a Section 404 Nationwide or Individual Permit from USACE if switching station or access road construction activities result in the discharge of dredge or fill into waters of the U.S. An ARAP would be obtained from TDEC for any stream or wetland alterations located within the proposed switching station site or access road that may be necessary. A permit may also be required for burning trees and other combustible materials removed during construction. A permit would be obtained from TDOT for the installation of aboveground or below ground Project elements within state, federal-aid metro-urban, and state-aid highway system road ROWs.

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CHAPTER 2

2 DESCRIPTION OF THE ALTERNATIVES

This chapter explains the rationale for identifying the alternatives to be evaluated, describes each alternative, provides a comparison of alternatives with respect to their potential environmental impacts, and identifies the Preferred Alternative.

This EA evaluates two alternatives: the No Action Alternative and the Proposed Action Alternative.

2.1 NO ACTION ALTERNATIVE

The No Action Alternative provides a baseline of conditions against which the impacts of the Proposed Action Alternative are measured. Under the No Action Alternative, TVA would not purchase the power generated by the Project under the 20-year PPA with Elora Solar (i.e., TVA would not be involved with the Project), and Elora Solar would not construct or operate the Elora Solar Energy Center. Existing conditions (land use, natural resources, visual resources, physical resources, and socioeconomics) in the Project Area would not change as a result of the Proposed Action; however, the Project Site could be affected by other future developments. TVA would continue to rely on other sources of generation as described in the 2019 IRP (TVA 2019a) to ensure an adequate energy supply and to meet its goals for increased renewable energy and low greenhouse gas (GHG)-emitting generation.

2.2 PROPOSED ACTION

Under the Proposed Action Alternative, Elora Solar would construct and operate a 150-MW AC single-axis tracking PV solar power facility in Lincoln County, Tennessee, and TVA would purchase renewable energy from the facility under the 20-year PPA with Elora Solar. The solar facility would generate up to 150-MW AC output for transmission to the electrical network. The solar facility, along with the proposed Elora Solar 161-kV Substation, would be constructed within an approximate 1,445-acre fenced-in portion of two individual parcels together totaling 1,504 acres north of the Elora community, south of Winchester Highway (US 64). The entire 150-MW output would be sold to TVA, and the Project would connect to the TVA electrical network via approximately 3.6 miles of new 161-kV TL terminating at the proposed Mann Road 161-kV Switching Station. Together, these Elora Solar and TVA interconnection components would occupy approximately 203 acres and would connect to TVA's existing Winchester-Fayetteville 161-kV TL.

This EA assesses (1) the impact of TVA's action to enter into the PPA with Elora Solar, (2) the associated impacts of the construction and operation of the Elora Solar Energy Center by Elora Solar, and (3) the transmission interconnection components by Elora Solar and TVA.

2.2.1 Project Description

The proposed Elora Solar Energy Center and associated interconnection components would occupy an approximate 1,707-acre Project Site, part of which would be leased from landowners and part of which would be purchased by Elora Solar (Figures 2-1, 2-2, 2-3). The Project Site

generally consists of two portions: the 1,504-acre southern portion south of Winchester Highway, and the 203-acre northern portion north of Winchester Highway. The southern portion of the Project Site is east of Elora Road and north of Limestone Road and bounded by Terry Dunavan Road to the east and Winchester Highway to the north. The northern portion of the Project Site extends north-south between Winchester Highway and Shady Grove Cemetery Road. The Project Site is predominantly flat agricultural land with scattered forested areas north of the community of Elora. The perimeter of the 1,445-acre developed solar facility site, including the Elora Solar 161-kV Substation, would be enclosed by security fencing. The remaining 59 acres of the Project Site that are located south of Winchester Highway and outside of the fenced-in areas would be undeveloped apart from access roads.

The proposed Elora Solar 161-kV TL would extend north from the proposed Elora Solar 161-kV Substation nearly to Shady Grove Cemetery Road, where the new TL would connect with the proposed TVA Mann Road 161-kV Switching Station, which would be located on approximately 5 acres. Elora Solar would purchase easements from the landowners, whose land the proposed new ROW would cross. The fee simple ownership of the properties within the ROW would remain with the landowners, and many activities and land uses could continue to occur on the properties. However, the terms of the easement agreements would prohibit certain activities, such as construction of buildings and any other activities within the ROW that could interfere with the operation or maintenance of the TL or create a hazardous situation related to TL operation. This easement would give Elora Solar the right to (1) clear the ROW of trees, (2) construct, operate, and maintain the TL, and (3) remove “danger trees” adjacent to the ROW. The Mann Road 161-kV Switching Station would connect to TVA’s existing adjacent Winchester-Fayetteville 161-kV TL.

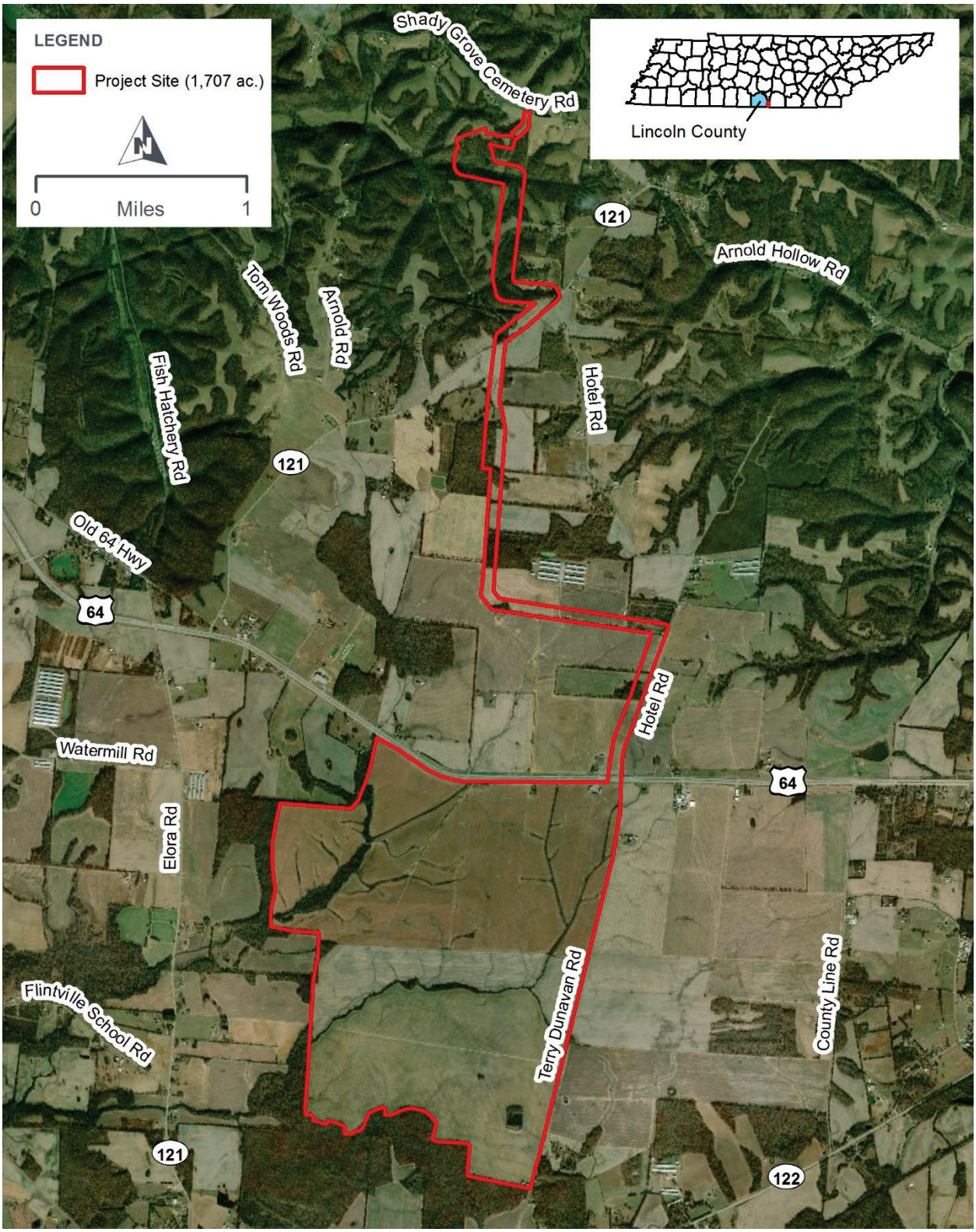

Figure 2-1. Aerial photograph showing the Elora Solar Energy Center 1,707-acre Project Site.

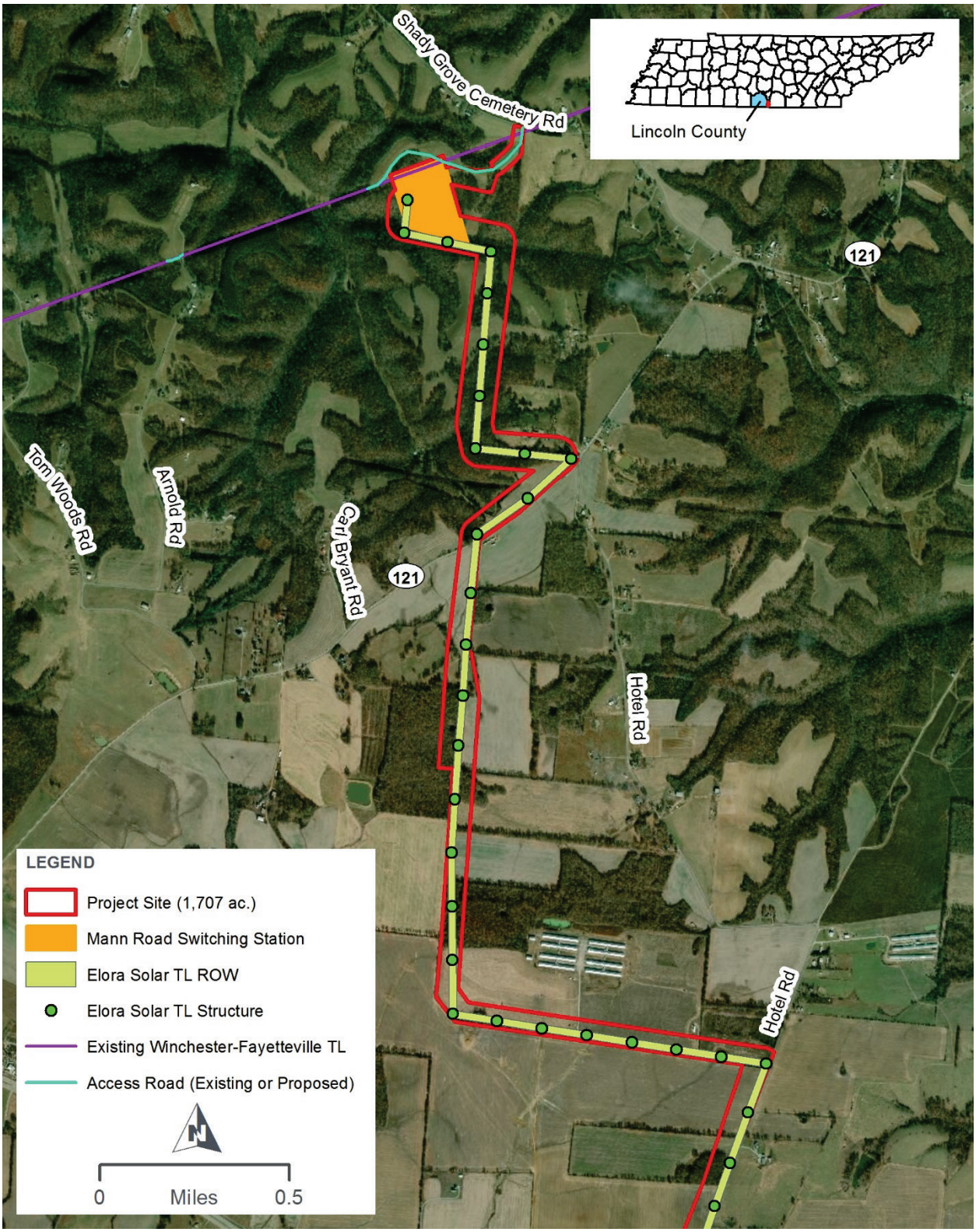

Figure 2-2 North. Aerial photograph showing the proposed layout of the Elora Solar Energy Center components.

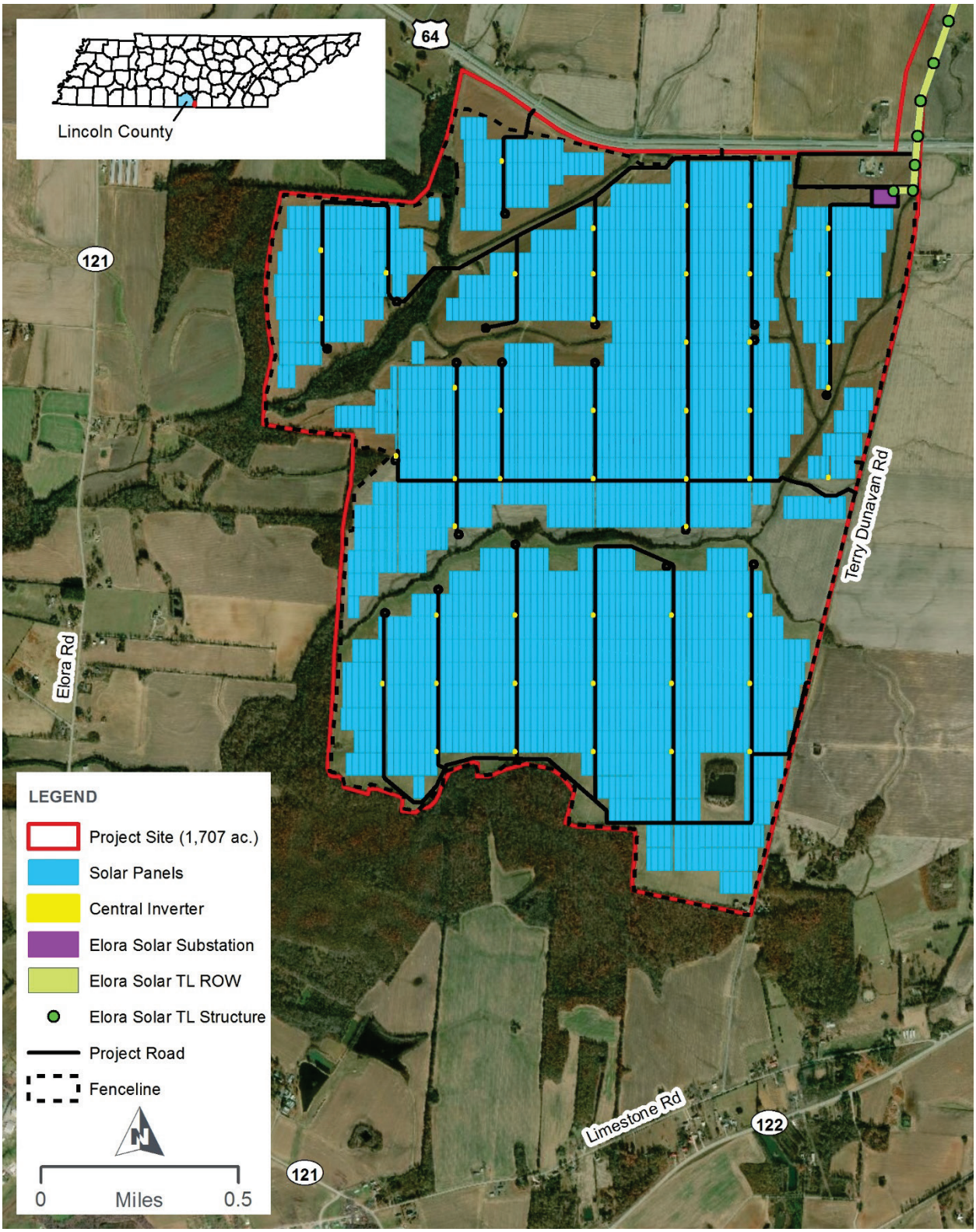

Figure 2-2 South. Aerial photograph showing the proposed layout of the Elora Solar Energy Center components.

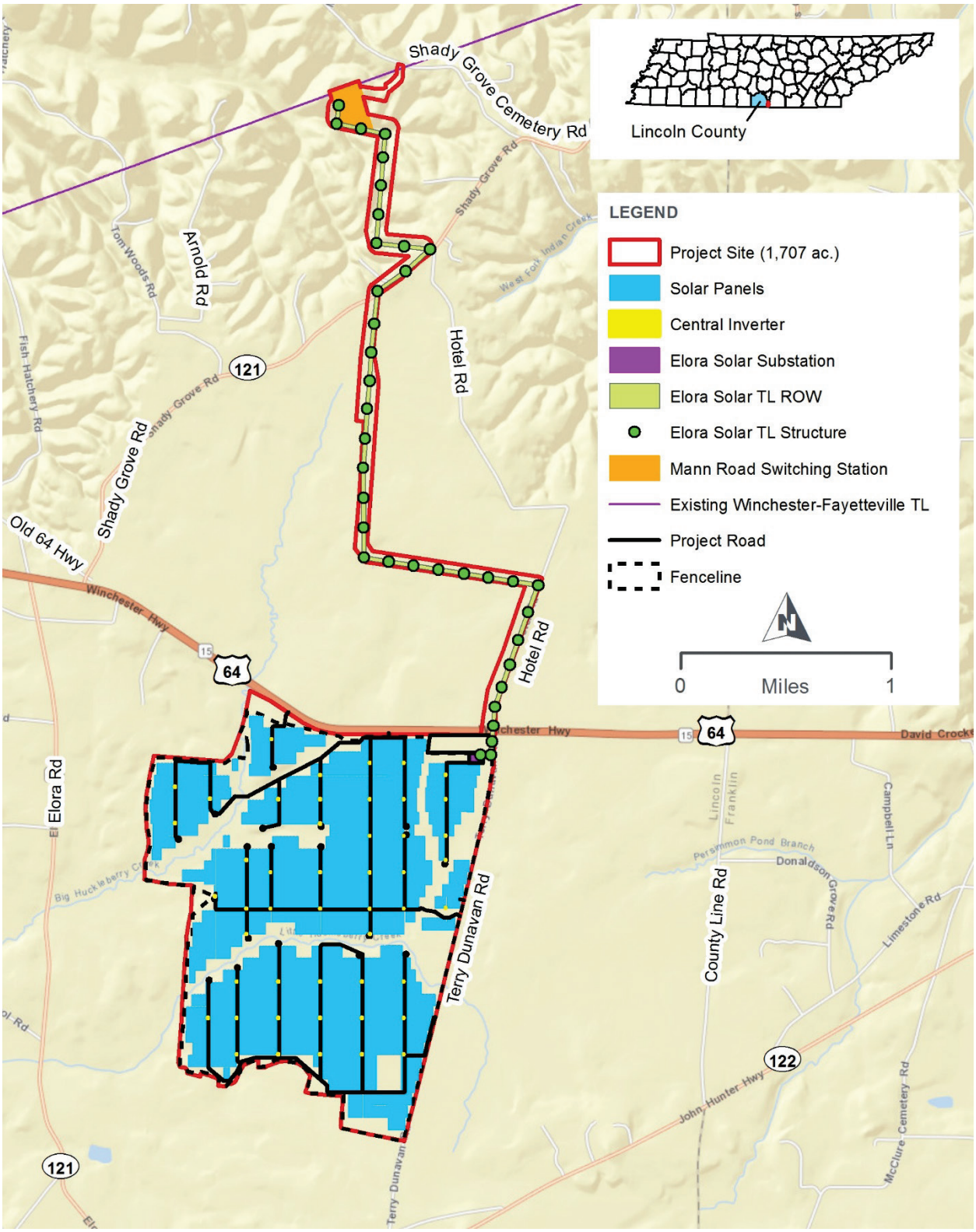

Figure 2-3. Street map showing the proposed layout of the Elora Solar Energy Center components.

The Elora Solar Energy Center would convert sunlight into DC electrical energy within PV panels (modules) (Figure 2-4). 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).

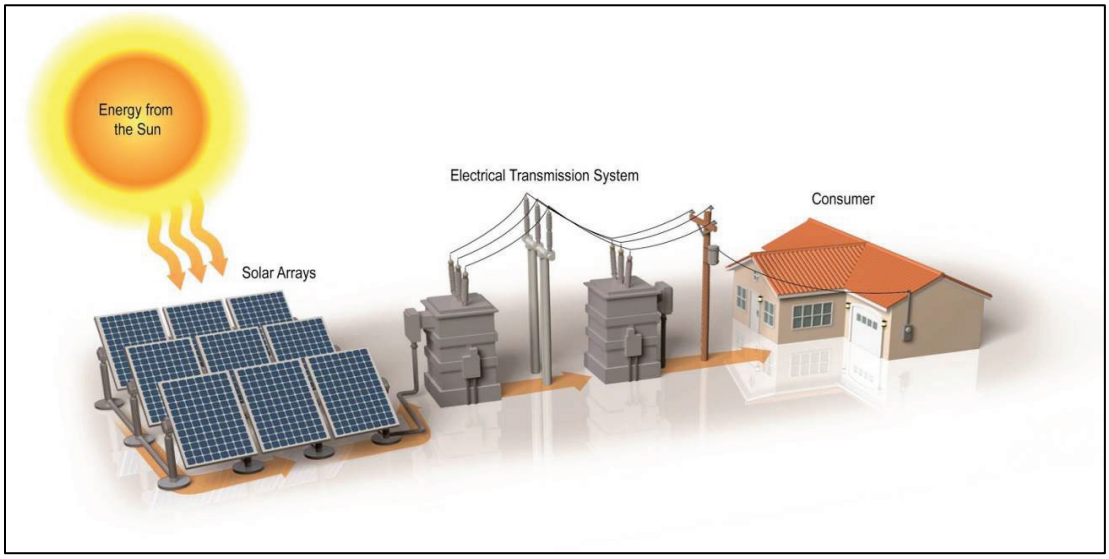

Figure 2-4. **General energy flow diagram of PV solar system (not to scale).**

The Project 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 Site'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 inverter blocks, access roads, and Project substation would be enclosed by chain-link security fencing. Apart from access roads extending south from Winchester Highway, the portions of the Project Site outside the fenced-in area would not be developed.

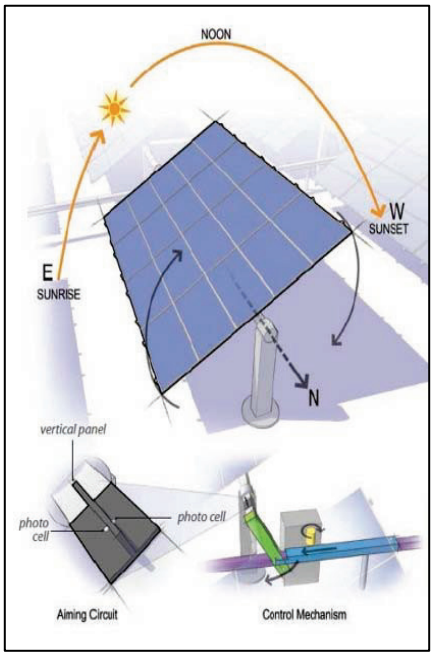

Figure 2-5. Diagram of single-axis tracking system (not to scale)

The modules would be attached to single-axis trackers. The axis trackers would likely be attached to driven steel pile foundations and would be designed to pivot the panels along their north-south axes to follow the path of the sun from the east to the west across the sky (Figure 2-5).

Collections of strings of panels would be connected by either underground or aboveground DC cabling to central

inverters, which would convert DC electricity from PV panels into AC so that the energy could be transmitted to the electrical grid. 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 mid-voltage transformer (MVT), which would step-up the AC voltage to 34.5-kV in order to minimize the AC cabling electrical losses between the central inverters and the proposed on-site Elora Solar 161-kV Substation. Underground AC power cables would connect all of the MVTs to the MPT, located within the Elora Solar 161-kV Substation.

Other Project components would include security equipment, access roads, communications/ Supervisory Control and Data Acquisition equipment, and meteorological stations. 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. Compacted gravel access roads would provide access to each inverter block for maintenance and repairs, and to the on-site substation and operations and maintenance building. Figure 2-2 and 2-3 show the Project Site with major proposed Project elements.

2.2.2 Solar Facility Construction

The solar facility site would be prepared by surveying and staking, light grading/clearing, installation of security fencing around the solar facility, erosion prevention and sediment control BMPs, and preparation of construction laydown areas prior to solar array assembly and construction of the solar facility.

Elora Solar would work with the existing landscape (e.g., slope, drainage, utilization of existing roads) where feasible and minimize or eliminate grading work to the extent possible. Grading activities would be performed with earthmoving equipment and would result in a consistent slope. Prior to any major grading, efforts would be made to preserve native topsoil, which would be removed from the area to be graded and stockpiled on site for redistribution over the disturbed area after the grading is completed. Silt fence, sediment traps, and other appropriate controls would be used in accordance with the SWPPP to minimize exposure of soil and to prevent eroded soil from leaving the work area. Disturbed areas would be seeded after construction using a mixture of certified weed-free, low-growing native and/or noninvasive grass and herbaceous plant seed obtained from a reputable seed dealer. Erosion control measures would be inspected and maintained until vegetation in the disturbed areas has returned to the preconstruction conditions or the site is stable.

During construction, water would be used for soil compaction and dust control as needed, as well as for sewer treatment, if determined necessary. Water in sufficient quantity and quality would be made available through the use of on-site groundwater wells or by delivery via water trucks. Water could be supplied by pumping groundwater from wells installed on the Project Site during geotechnical studies prior to construction. If selected, up to four on-site groundwater supply wells would be utilized for the Project, depending on flow capacity of each well. The wells would be located to provide access for construction water and to reduce the potential for any significant water level drawdown. Water quality is expected to be unsuitable for potable use without disinfection at a minimum, and a potable water treatment system would be installed. If needed,

Elora Solar would perform initial groundwater drilling and testing to gather information on aquifer characteristics and develop a plan for the production well design.

If selected, construction of production wells would involve conventional well drilling techniques. A truck-mounted drilling rig would set up at the identified location(s). If necessary, gravel would be used to temporarily stabilize the surface at these location(s). If required, water-based drilling muds would be collected and dewatered, with runoff occurring locally into nearby field areas. Dewatered muds would be non-toxic and may be spread as subsoil during site grading. If determined necessary, sewer treatment would be accomplished through use of a pump-out septic holding tank.

In accordance with TDEC and TVA requirements, minimum 50-foot buffers surrounding jurisdictional wetlands and streams not considered impaired would be established as an avoidance measure prior to any clearing, grubbing, grading, or boring activities conducted by the construction contractor. Two streams traversing through the Project Site, Big Huckleberry and Little Huckleberry creeks, are considered impaired and would require minimum 60-foot buffers as avoidance measures prior to clearing, grubbing, grading, or boring activities. Apart from removal of tall vegetation through nonmechanical means and leaving the roots in place, these buffered areas would be avoided during construction to the greatest extent practicable. Once the buffered areas are marked, construction areas would be cleared and mowed of vegetation and miscellaneous debris. Mowing would continue as needed to contain growth during construction.

To manage stormwater during construction, on-site temporary sedimentation basins, sediment traps, or diversion berms would be constructed within the 1,445-acre disturbed area. If needed, the berm would be constructed along portions of the Project Site perimeter to contain stormwater on site. Any necessary sedimentation basins and traps would be compliant with TDEC requirements. If necessary, sedimentation basins and traps would be constructed either by impoundment of natural depressions or by excavating the existing soil. The floor and embankments of the basins would be allowed to naturally reestablish native vegetation after construction (or replanted as necessary) to provide natural stabilization, minimizing subsequent erosion. All buffered streams and wetlands would be protected by erosion control silt fence, and sediment traps would be placed in strategic drainage areas to prevent sediment from entering on-site streams and wetlands. Off-site sediment migration would be moderated by the placement of silt fence around each area of ground disturbance within the Project Site. These stormwater BMPs would prevent sediment from entering on-site streams and wetlands and prevent sediment migration off site during construction, prior to achievement of final vegetative stabilization.

Grading would consist of the excavation, redistribution, and compaction of earth to meet the final design requirements. Due to the existing topography of the site and the use of single-axis tracking, cut-and-fill grading activities would be required to achieve the final design and maximum slope criteria. Efforts would be made to ensure grading at the site results in a net zero balanced cut and fill quantity of earthwork to the extent practical and therefore require no to minimal off-site hauling. The 1,445 acres proposed for development of the Elora Solar Energy Center would be cleared of tall vegetation to prevent shading of the solar panels and graded for construction and placement of the solar panels, gravel access roads, the proposed Elora Solar 161-kV Substation,

accompanying electrical components, and if determined necessary, an operations and maintenance building. Because the area to be graded is primarily open agricultural land, minimal vegetative waste would accumulate during site preparation. Any that does accumulate on site would be disposed of by open burning or chipping and grinding to minimize construction wastes. If burning is selected, only vegetation and untreated wood would be burned, and no burning of other construction debris is anticipated. One existing abandoned residence and any associated buildings would be demolished for construction of the solar facility if the Tennessee Historical Commission (THC), serving as the Tennessee State Historic Preservation Officer (SHPO), agrees that none are considered eligible for the National Register of Historic Places (NRHP) (see Section 3.8).

Approximately 20 acres of the Project Site would be used as construction assembly areas (also called laydown areas) for worker assembly, vehicle parking, and material storage during construction. Some of these would be staged within the areas proposed for the PV arrays. The laydown areas would be on site for the duration of construction. Temporary construction trailers intended for material storage and office space would be parked on site. Following completion of construction activities, all trailers, unused materials, and construction debris would be removed from the Project Site. If built, the operations and maintenance building would remain on site during the life of the Project.

The proposed Elora Solar 161-kV Substation would be constructed within an approximate 2-acre area of the Project Site located south of Winchester Highway. Tall vegetation would be removed within and immediately adjacent to the approximate 100-foot wide, 3.6-mile long ROW for the proposed Elora Solar 161-kV TL. Tree clearing during construction would be accomplished by mechanically cutting and trimming with large equipment. As with tree clearing associated with the solar facility, minimum 50-foot buffers surrounding jurisdictional streams and wetlands would be maintained as a minimization measure prior to these clearing activities. Vegetation removal within the buffer areas would be restricted to trees tall enough or with the potential to soon grow tall enough to interfere with conductors. Clearing in buffer areas would be accomplished using handheld equipment or remote-handling equipment to limit ground disturbance.

Pole structures for the proposed Elora Solar 161-kV TL would be installed to avoid jurisdictional stream and wetland impacts as much as possible, with the structure types and heights determined based on these avoidance measures that may warrant longer spans between the structures. Structures would be between approximately 90 and 150 feet high. Most pole structures would be directly imbedded in holes augured into the ground to approximate maximum depths of 30 to 45 feet. The holes would be backfilled with the excavated material; if warranted due to soil conditions, gravel or a concrete-and-gravel mixture would be used. Poles at angles (angle points) in the TL may require supporting screw-, rock-, or log-anchored guy wires. Access roads would be needed to allow vehicular access to each pole structure on the proposed Elora Solar 161-kV TL. Existing access roads would be used as much as possible, and any new access roads would be placed to avoid or minimize impacts to jurisdictional streams and wetlands. Access roads are typically about 12- to 16-feet wide and are surfaced with dirt, mulch, or gravel.

Construction would be sequenced to minimize the time that bare soil on the disturbed areas is exposed. In addition to the silt fencing described above, other appropriate controls such as temporary cover would be used as needed to minimize exposure of soil and to prevent eroded soil from leaving the work area. Disturbed areas, including but not limited to road shoulders, construction office and laydown areas, ditches, and other Project-specific locations, would be seeded post-construction, likely by hydroseeding. If conditions require, soil may be further stabilized by mulch or sprayable fiber mat. Where required, hay mulch would be applied at 3 tons per acre and well distributed over the area. Erosion control measures would be inspected and maintained until vegetation in the disturbed areas has returned to the preconstruction conditions or the site is stable. As part of NPDES permit authorization (see Section 1.4), the site-specific SWPPP would be finalized with the final grading and civil design and would address all construction-related activities prior to construction commencement.

The design of the tracker support structures could vary depending on the final PV technology and vendor selected. The trackers would likely be attached to driven steel pile foundations, depending on results of the upcoming geotechnical survey. The steel pile foundation is typically galvanized and used where high load bearing capacities are required. The pile is driven with a hydraulic ram. Soil disturbance is restricted to the pile insertion location to a depth typically less than 20-feet below grade with temporary disturbance from the hydraulic ram machinery, which is about the size of a small tractor. The tracker design and pile foundation design would be stamped by a registered Professional Engineer and Structural Engineer, respectively. Screw piles are another option for PV foundations. Screw piles are drilled into the ground with a truck-mounted auger and create a similar soil disturbance footprint as driven piles.

Solar panels would be manufactured off site and shipped to the site ready for installation. All final AC collection would be underground, and electricians and assistants would run the electrical cabling underground throughout the solar field. The trenches to hold the cabling would be approximately 3- to 4-feet deep and 2- to 12-feet wide. The trench would be backfilled with Project-site native soil and then appropriately compacted.

The MPT would be supported on a concrete foundation. An underground or aboveground transmission cable would be constructed to connect the MPT through a circuit breaker. After the equipment is electrically connected, electrical service would be tested, motors would be checked, and control logic would be verified. As the solar arrays are installed, the balance of the facility would continue to be constructed and installed, and the instrumentation would be installed. Once all of the individual systems have been tested, integrated testing of the Project would occur. Electrical interconnection details are provided in Section 2.2.5 below.

The perimeter of the Elora Solar Energy Center would be securely fenced during construction and for the duration of the Project operation with 7-foot-tall fencing consisting of 6-foot tall chain-link fencing topped with three strands of barbed wire. Access to the Project Site would be provided by double-swing gates and access roads. The site would be accessible only to TVA, Elora Solar, and their agents and contractors.

Construction activities would take approximately 14 months to complete using a crew that ranges at peak from 150 to 250 workers. Work would generally occur seven days a week during daylight

hours. Additional hours after dark could be necessary to make up schedule deficiencies or to complete critical construction activities. Night-time construction would require lighting in some areas of the Project Site. The lighting would be downward-facing and timer- and/or motion-activated to minimize impacts to surrounding areas.

2.2.3 Solar Facility Operations

During operation of the solar facility, no major physical disturbance would occur. Moving parts of the solar facility would be restricted to the east-to-west facing tracking motion of the solar modules, which amounts to a movement of less than a one degree angle every few minutes. This movement is barely perceptible. In the late afternoon, module rotation would start to move from west-to-east in a similar slow motion to minimize row-to-row shading. At sunset, the modules would track to a flat or angled stow position. Otherwise, the PV modules would simply collect solar energy and transmit it to the TVA power grid. With the exception of fence repair, vegetation control, and periodic array inspection, repairs, and maintenance, the Elora Solar Energy Center would have relatively little human activity during operation. Water service, sewer service, and permanent lighting are anticipated as an on-site need during operations. The lighting would be downward-facing and timer- and/or motion-activated to minimize impacts to surrounding areas.

During operation, the Elora Solar Energy Center would require up to four full-time staff to manage the facility and conduct regular inspections. Inspections would include identifying any physical damage of panels, wiring, central inverters, transformers, and interconnection equipment, and drawing transformer oil samples. Vegetation on developed portions of the Project Site, including the ROW for the proposed Elora Solar 161-kV TL, would be maintained to control growth. Near the solar facility infrastructure, vegetation management would be done to prevent overshadowing or shading of the PV panels. Trimming and mowing in these areas would likely be performed several times per year, depending on growth rate, to maintain an appropriate ground cover height of approximately 12 to 18 inches in order not to shade the panels. Grazing sheep may also be used to manage vegetation within the fenced-in, developed solar facility area.

Within the proposed new TL ROW, periodic vegetation management would be required to ensure access to pole structures and to maintain an adequate distance between TL conductors and vegetation. After tall trees and other tall-growing vegetation are removed from the ROW during construction, routine management of vegetation within nonagricultural portions of the cleared ROW would include an integrated vegetation management approach designed to encourage the low-growing plant species and discourage tall-growing plant species. During operations, selective use of spot herbicides may also be employed near the solar facility to control invasive weeds. Along the proposed ROW, U.S. Environmental Protection Agency (USEPA)-approved herbicides would be applied in areas where heavy growth of woody vegetation is occurring and mechanical or manual methods are not practical. Herbicides would be administered following label instructions and adhering to stream-side application guidelines.

Precipitation in the region is typically adequate to remove dust and other debris from the PV panels while maintaining energy production; therefore, manual panel washing is not anticipated unless a site-specific issue is identified. If identified as a need, module washing would occur no

more than twice a year and would comply with proper BMPs to prevent any soil erosion and/or stream and wetland sedimentation.

In addition to full-time staff, the proposed project facility would be monitored remotely from NextEra's operational headquarters in Juno Beach, Florida. Monitoring would occur 24 hours a day, seven days a week to identify any security or operational issues. In the event an immediate response is warranted during hours when local staff are not working, a local repair crew would be deployed or law enforcement personnel would be requested to respond.

2.2.4 Decommissioning and Reclamation

The Project would operate and sell power to TVA pursuant to the terms of the PPA for 20 years from the commercial operation date of the facility. At the end of the PPA term, Elora Solar would assess whether to cease operations at the Project Site, replace equipment and attempt to enter into a new PPA, or make some other arrangement to sell the power. If operations ceased, the facility would be decommissioned and dismantled, and the Project Site would be restored per Project decommissioning requirements. In general, the majority of decommissioned equipment and materials would be recycled. Materials that cannot be recycled would be disposed of at an approved facility. As the lease agreements with landowners are for 30 years with options to extend for an additional 10 years, site control would be maintained longer than the 20-year PPA period, and Elora Solar may choose to renegotiate further PPA terms with TVA. At the end of the 20-year contract period, TVA may also choose to purchase and operate the facility. If additional PPA terms are arranged or if TVA chooses to operate the facility, these activities would be evaluated through separate NEPA processes.

2.2.5 TVA Electrical Interconnection

Under the Proposed Action, TVA would construct the Mann Road 161-kV Switching Station to support the Elora Solar Energy Center interconnection. TVA would construct a 161-kV TL slack-span and connect the switching station between Structures 592 and 593 of TVA's adjacent Winchester-Fayetteville 161-kV TL (L5981), as illustrated in Figure 2-6. This new TL would be looped and connected between the existing TL ROW and the new Mann Road Switching Station. The expected duration of the work would be approximately 18 months. Twelve months of the construction period would overlap with construction of the Elora Solar Energy Center and associated interconnection components. Up to approximately 50 workers would be involved in construction.

To facilitate the operation of the Elora Solar Energy Center and TL connection, TVA proposes to undertake the following additional activities:

- Installation of approximately 9.8 miles of OPGW on the existing Winchester-Fayetteville 161-kV TL from the new Mann Road Switching Station to the Fayetteville Switching Station, which would require replacement of some pole structures and improvements to existing pole access roads;
- Installation of telecommunications connections at the Fayetteville, Winchester, and Elora Solar 161-kV substations; and
- Modification of TVA map boards to include names and numbers of the new Elora Solar 161-kV TL, the new Mann Road 161-kV Switching Station, and the new Elora Solar 161-kV Substation.

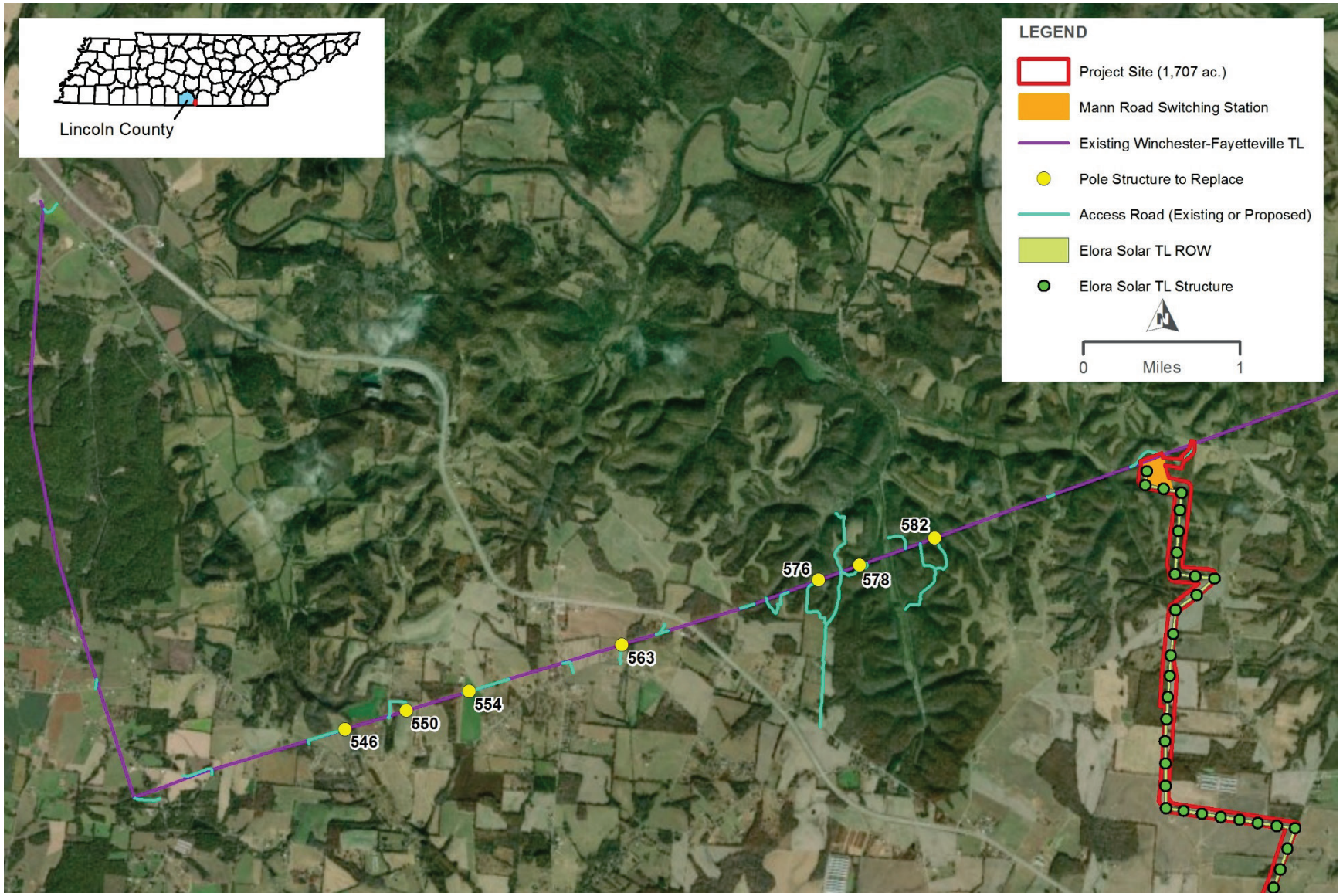

Figure 2-6. Detail of the proposed TVA Mann Road 161-kV Switching Station and proposed work areas along the existing Winchester-Fayetteville 161-kV Transmission Line.

2.2.5.1 TVA Transmission Best Management Practices

TVA utilizes standard practices for transmission and interconnection-related construction activities. These guidance and specification documents are taken into account when considering the effects of the Proposed Action and include:

- *TVA Environmental Quality Protection Specifications for Transmission Line Construction*,
- *TVA Transmission Construction Guidelines Near Streams*,
- *TVA Environmental Quality Protection Specifications for Transmission Substation or Communications Construction*, and
- *A Guide for Environmental Protection and Best Management Practices for Tennessee Valley Authority Construction and Maintenance Activities – Revision 3 – 2017* (2017b).

All of these documents are available on TVA's transmission system projects web page (TVA 2019b), and all but the final, more lengthy document are provided herein as appendices (Appendix A, Appendix B, and Appendix C). TVA transmission projects also utilize BMPs to provide guidance for clearing and construction activities.

2.2.5.2 Switching Station Construction

TVA proposes to construct the Mann Road 161-kV Switching Station encompassing approximately 5 acres adjacent to the Winchester-Fayetteville TL on land purchased by Elora Solar and transferred to TVA (Figure 2-6). Three 161-kV breakers would be installed in a ring bus configuration along with associated metering, communication, and protective equipment. TVA would also install a switch house. The 5-acre area would be fenced and graveled and would have lighting to facilitate night access.

TVA would clear vegetation on the switching station site, remove the topsoil, and grade the property in accordance with TVA's *Site Clearing and Grading Specifications* (TVA 2017a). Where there is a need to clear trees, equipment used could include chain saws, skidders, bulldozers, tractors, and/or low ground-pressure feller-bunchers. As necessary, any woody debris and other vegetation would likely be piled and burned, chipped, or taken off-site. Prior to burning, TVA would obtain any necessary permits. In some instances, vegetation may be windrowed along the edge of the Project Site to serve as sediment barriers. Further guidance for clearing and construction activities can be found in Appendix A, Appendix B, Appendix C, and TVA's BMP manual (TVA 2017b).

2.2.5.3 Structure Replacements for Fiber Installation

The existing Winchester-Fayetteville TL currently utilizes wood "H-frame" pole structures. Structures 546, 550, 554, 563, 576, 578, and 582 would be replaced with steel H-frame structures in order to support the new fiber line. Table 2-1 presents the required pole replacements along with the existing and proposed structure heights. Examples of the existing and proposed H-frame structures are shown in Photos 2.2-1 and 2.2-2.

Table 2-1. Pole Structures on the Winchester-Fayetteville TL to be Replaced.

Structure Number	Old Structure Type	Old Structure Height (feet)	New Structure Type	New Structure Height (feet)
546	HS-1	61	HS-1G	65.5
550	HS-1	56.5	HS-1G	61
554	H-1	61	HS-1G	65.5
563	HS-1	56.5	HS-1G	61
576	H-1	61	HS-1G	74.5
578	H-1	52	HS-1G	61
582	H-1	47.5	HS-1G	79

HS-1: Wood H-frame structure with steel cross arm; H-1: Wood H-frame structure with wood cross arm; HS-1G: Steel H-frame structure with steel cross arm

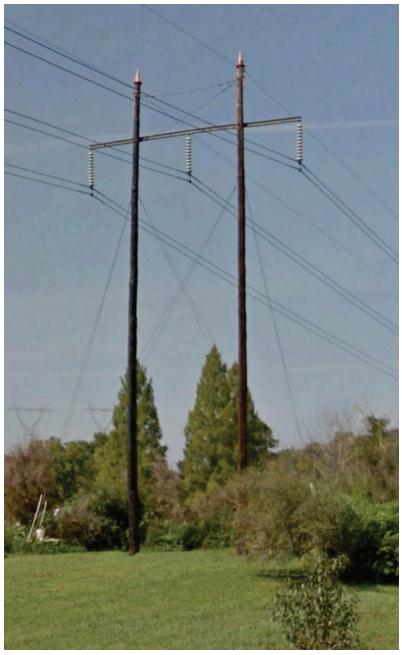

Photo 2.2-1. Existing wood H-frame pole structure

Photo 2.2-2. Proposed steel H-frame pole structure

Three conductors (the cables that carry the electrical current) are required to make up a single circuit in AC TLs. For a 161-kV TL, each single-cable conductor is attached to porcelain insulators

that are either suspended from the structure cross arms or attached directly to the structure. A smaller overhead ground wire or wires are attached to the top of the structures.

Poles at angles (angle points) in the TL may require supporting screw-, rock-, or log-anchored guys. Most poles would be directly imbedded in holes augured into the ground to a depth equal to 10 percent of the pole's length plus an additional 2 feet. Normally, the holes would be backfilled with the excavated material, but in some cases, gravel or a concrete-and-gravel mixture would be used, depending on local soil conditions.

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

2.2.5.4 Access Roads

Access roads would be needed to allow vehicular access to each pole structure and other points along the existing ROW associated with the Winchester-Fayetteville 161-kV TL. Typically, new permanent or temporary access roads used for TLs are located on the ROW wherever possible and are designed and located to avoid severe slope conditions and to minimize impacts to environmental resources such as streams. Access roads are typically about 12- to 16-feet wide and are surfaced with dirt, mulch, or gravel. Permanent access to the Mann Road 161-kV Switching Station would be a paved, 20-foot wide road off of Shady Grove Cemetery Road.

With the appropriate permits as described in Section 1.4.2, culverts and other drainage devices, fences, and gates would be installed as necessary. Culverts installed in any perennial streams would be removed following construction. However, in ephemeral streams, the culverts would be left or removed, depending on the wishes of the landowner or any permit conditions that might apply. If desired by the property owner, TVA would restore new temporary access roads to previous conditions. Additional applicable environmental quality protection specifications are provided in Appendix A, Appendix B, and Appendix C.

2.2.5.5 Construction Assembly Areas

A construction assembly area, or "laydown area," would be required for worker assembly, vehicle parking, and material storage. The proposed site is TVA's existing Nickajack Dam laydown yard located at 3255 TVA Road in Jasper, Tennessee, approximately one hour east of the Project Site. The dam and the laydown yard are the subject of existing TVA NEPA environmental reviews and permits; thus, use of the Nickajack Dam laydown yard for the Project would not require any additional environmental reviews or permits.

The proposed laydown yard has been previously disturbed. Trailers used during the construction process for material storage and office space could be parked at these locations. Following completion of construction activities, all trailers, unused materials, and construction debris would be removed.

2.2.5.6 Conductor and Fiber Installation

Installation of OPGW would be performed by helicopter. A lineman, secured to the outside of the helicopter, would work from structure to structure unclipping the existing overhead ground wire (OHGW) and installing a pulley. Equipment would be placed at predetermined points along the existing TL, based on the length of the OPGW to be newly installed, ranging from 10,000 to 15,000 feet of fiber per reel. The OHGW would be removed while a rope is pulled through the newly installed pulleys. The rope would then be used to pull the OPGW through the pulleys. Afterward, the lineman would revisit each structure to clip the OPGW to the structure and remove the pulley. 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 between May and early July.

2.3 ALTERNATIVES ELIMINATED FROM FURTHER CONSIDERATION

In determining the suitability for development of a site within TVA's service area that would meet customer needs and the goals of expanding TVA's renewable energy portfolio, multiple factors were considered. This process involved screening potential locations and ultimately eliminating those sites that did not have the needed attributes. This process of review and refinement ultimately led to the consideration of the Project Site.

The site screening process involves several iterations beginning with the general solar resource (the amount of insolation) and the availability of nearby appropriately sized electric infrastructure for interconnection with sufficient available transmission capacity for the proposed solar facility. This is followed by screening for suitable large-scale landscape features that would allow for utility-scale solar development including:

- Generally flat landscape with minimal slope, with preference given to disturbed contiguous land with no on-site infrastructure or existing tall infrastructure in the immediate vicinity;
- Land having sound geology for construction suitability, with minimal and/or avoidable floodplains or large forested or wetland areas;
- Large contiguous parcels of land with compatible local zoning and located away from densely populated areas; and
- Ability to avoid and/or minimize impacts to known sensitive biological, visual, and cultural resources.

As a result of this screening process, two potential project sites were selected: the current Project Site near Elora and another site near Big Sandy, Benton County, Tennessee. Based on additional desktop and field reviews, the Big Sandy site was eliminated from further consideration due to the presence of floodplains and the potential for impacts to federally and state-listed species and substantial impacts to wetlands and streams. The Big Sandy site is also adjacent to the Big Sandy Wildlife Management Area, and its development could adversely affect the wildlife and recreational use of the management area. Consequently, selection of the Big Sandy site would

likely have resulted in greater environmental impacts and higher development costs, including mitigation costs, than the Project Site.

2.4 COMPARISON OF ALTERNATIVES

This EA evaluates the potential environmental effects that could result from implementing the No Action Alternative or the Proposed Action Alternative at the proposed solar facility in Lincoln County, Tennessee. The analysis of impacts in this EA is based on the current and potential future conditions on the properties and within the surrounding region. A comparison of the impacts of the alternatives is provided in Table 2-2.

Table 2-2. Comparison of impacts by alternative.

Resource area	Impacts from the No Action Alternative	Impacts from Proposed Action Alternative
Land Use	No direct or indirect impacts anticipated.	Minor direct adverse impacts on land use due to change from agricultural to solar; however, renewable energy uses, including solar power, are permitted uses in this portion of Lincoln County; no indirect effects on land use.
Geology, Soils, and Prime Farmlands	No direct or indirect impacts anticipated.	Geology: Minor direct impacts to potential subsurface geological resources Soils: Minor direct impacts resulting from minor to minimal increases in erosion and sedimentation during construction and operations; while in operation, adverse impacts to soils would be partially offset by beneficial effects to soil health with the use of native and/or noninvasive vegetation. Farmlands: Direct adverse impacts from removal of 972 acres of prime farmland from agricultural use for the duration of the Project.
Water Resources	No direct or indirect impacts anticipated.	Groundwater: No direct adverse impacts anticipated; minor beneficial indirect impacts to groundwater due to reduction in fertilizer and pesticide use and planting of native vegetation. Surface water: Minor direct impacts to two perennial streams (0.14 acre), one ephemeral stream (0.07 acre), and approximately three WWCs for road crossings; minor direct impacts to seven ephemeral streams (0.03 acre), 10 wetlands (0.16 acre), and approximately 49 WWCs due to the placement of solar panels and/or pole structures. Floodplains: No direct or indirect impacts anticipated.

Resource area	Impacts from the No Action Alternative	Impacts from Proposed Action Alternative
Biological Resources	No direct or indirect impacts anticipated.	Vegetation: Minor direct impacts to vegetation by clearing of up to approximately 97 acres of trees and other tall vegetation within the 1,521-acre portion of the Project Site proposed for development and revegetating this portion of the Project Site and some small trees and limb trimming along existing access roads associated with the existing Winchester-Fayetteville 161kV TL. Wildlife: Minor direct and indirect impacts to common wildlife due to changes to habitat; the Project is not anticipated to significantly affect populations of migratory bird species of concern; minor impacts on common wildlife species due to the existence of Project components and increased human presence. Rare, Threatened and Endangered Species: With seasonal restrictions on suitable bat tree removal and use of BMPs, the Project is not likely to significantly affect federally or state-listed species.
Visual Resources	No direct or indirect impacts anticipated.	Temporary, minor impacts on visual resources due to altering the visual character of the Project Area and increased activity during the construction phase. During operations, minor to moderate adverse direct impacts in the immediate vicinity due to substantial tree buffers in some areas but mostly open agricultural fields in others; minor to minimal on a larger scale, due to variation of the visual attributes of the Project Area as distance from the Project increases.
Noise	No direct or indirect impacts anticipated.	Minor, temporary minor adverse impacts would occur during construction; minimal to negligible impacts during operation and maintenance.

Resource area	Impacts from the No Action Alternative	Impacts from Proposed Action Alternative
Air Quality and Greenhouse Gas Emissions	No direct or indirect impacts anticipated.	Air quality: Minor direct impacts to air quality would be anticipated as a result of construction of the Project; no negative impacts to air quality as a result of operations of the project. GHGs: Temporary impacts to GHG emissions expected during construction would be negligible; beneficial effects would also occur, due to the nearly emissions-free power generated by the solar facility, offsetting power that would otherwise be generated by the combustion of fossil fuels.
Cultural Resources	No direct or indirect impacts anticipated.	Archaeological Resources: No impacts on any NRHP-listed or eligible archaeological sites. Architectural Resources: Recommendation of no adverse effect on architectural resources.
Utilities	No direct or indirect impacts anticipated.	Potential short-term adverse impacts to local utilities (electricity, telecommunication connections) when bringing the solar facility on-line or during routine maintenance of the facility; no long-term adverse impacts are anticipated. Long-term beneficial impact to electrical services across the region.
Waste Management	No direct or indirect impacts anticipated.	No adverse effects to waste management are anticipated with the use of BMPs.
Public and Occupational Health and Safety	No direct or indirect impacts anticipated.	Minor, temporary adverse impacts during construction. No public health or safety hazards would be anticipated as a result of operations.

Resource area	Impacts from the No Action Alternative	Impacts from Proposed Action Alternative
Transportation	No direct or indirect impacts anticipated.	Direct impacts to transportation during construction would be anticipated to be minor to moderate and minimized or mitigated. Minimal direct impacts to transportation during operations; no indirect impacts to transportation.
Socioeconomics	No direct or indirect impacts anticipated.	Short-term beneficial economic impacts would result from construction, including the purchase of materials, equipment, and services and a temporary increase in employment, income, and population. Positive, long-term, direct impacts to economics and population from Project operations. The local tax base would increase from construction of the solar facility and would be beneficial to Lincoln County and the vicinity.
Environmental Justice	No direct or indirect impacts anticipated.	No disproportionately high or adverse direct or indirect impacts on minority or low-income populations.

2.5 BEST MANAGEMENT PRACTICES AND MITIGATION MEASURES

Elora Solar would implement minimization and mitigation measures in relation to resources potentially affected by the Project. These have been developed with consideration to BMPs, permit requirements, and adherence to the SWPPP.

In association with the proposed electrical interconnection, TVA would employ standard practices and specific routine measures to avoid and minimize impacts to resources. These practices and measures are summarized in this section.

2.5.1 Elora Solar Energy Center

Elora Solar would implement the following minimization and mitigation measures in relation to potentially affected resources:

- Land use and visual resources
    - Install anti-reflective, PV panel surfaces to minimize or eliminate negative visual impacts such as glare and reflection;
- Geology and 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,
    - Make an effort to balance cut-and-fill quantities to alleviate the transportation of soils off-site during construction;
- Water resources
    - Comply with the terms of the SWPPP prepared as part of the NPDES permitting process,
    - Use BMPs for controlling soil erosion and runoff, such as the use of 50- to 60-foot buffer zones surrounding intermittent and perennial streams and wetlands and the installation of erosion control silt fences and sediment traps,
    - Implement other routine BMPs as necessary, such as nonmechanical 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, and proper vehicle maintenance to reduce the potential for adverse impacts to groundwater;
- Biological resources
    - Revegetate with native and/or noninvasive vegetation to reintroduce habitat and limit the spread of invasive species;
    - Use timer- and/or motion-activated lighting to limit attracting wildlife, particularly migratory birds;
    - Instruct personnel on wildlife resource protection measures, including (1) applicable federal and state laws such as those that prohibit animal disturbance, collection, or removal, (2) the importance of protecting wildlife resources, and (3) avoiding plant disturbance in undisturbed and buffer areas;
    - Minimize impacts to nesting birds by clearing trees and shrubs outside of nesting season;

- 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
    - Emphasize BMPs for site safety management to minimize potential risks to workers; and
- Transportation
    - Implement staggered work shifts during daylight hours if needed to manage traffic flow near the Project Site.

2.5.2 TVA Electrical Interconnection

TVA employs standard practices in its transmission projects. These can be found on TVA's transmission website (TVA 2019b). Some of the more specific routine measures that would be followed to reduce the potential for adverse environmental effects during the construction, operation, and maintenance of the proposed switching station and access road are as follows:

- TVA would utilize standard BMPs, as described in *A Guide for Environmental Protection and Best Management Practices for Tennessee Valley Authority Construction and Maintenance Activities – Revision 3*, the TVA's BMP manual (TVA 2017b) , and TDEC's *Tennessee Erosion & Sediment Control Handbook* (TDEC 2012) to minimize erosion during construction, operation, and maintenance activities.
- To minimize the introduction and spread of invasive species in the access road and adjacent areas, TVA would follow standard operating procedures consistent with EO 13112 (Invasive Species) for revegetating with noninvasive plant species as defined by TVA (2017b).
- Ephemeral streams that could be affected by the proposed construction would be protected by implementing standard BMPs as identified in TVA (2017b) and TDEC's *Erosion & Sediment Control Handbook* (TDEC 2012).
- Perennial and intermittent streams would be protected by the implementation of Standard Stream Protection (Category A), Protection of Important Steams, Springs, and Sinkholes (Category B), or Protection of Unique Habitat (Category C) as defined by TVA (2017b).
- 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 impacts.
- To minimize adverse impacts on natural and beneficial floodplain values, the following standard mitigation measures would be implemented:
    - Construction and maintenance activities would occur during dry periods as much as possible;
    - ROW would be revegetated where natural vegetation is removed;
    - BMPs would be used during construction activities;

- Construction would adhere to the TVA subclass review criteria for transmission line location in floodplains; and
- Construction or improvement of access roads would be done in such a manner that upstream flood elevations would not be increased by more than 1.0 foot.

2.6 THE PREFERRED ALTERNATIVE

TVA's preferred alternative for fulfilling its purpose and need is the Proposed Action Alternative. This alternative would generate renewable energy for TVA and its customers with only minor direct and indirect environmental impacts due to the implementation of BMPs and minimization and mitigation efforts, as described in Section 2.5.1 and Section 2.5.2. Implementation of the Project would help meet TVA's renewable energy goals and would help TVA meet customer-driven energy demands on the TVA system.

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CHAPTER 3

3 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This chapter describes the existing environmental, social, and economic conditions of the Project Area that might be affected if the No Action or Proposed Action Alternative are implemented. This chapter also describes the potential environmental effects that could result from implementing the No Action or Proposed Action Alternative.

3.1 LAND USE

This section describes an overview of existing land use in the Project Area and potential impacts to land use associated with the No Action and Proposed Action Alternatives.

3.1.1 Affected Environment

Land use is defined as the way people use and develop land, including leaving land undeveloped or using land for agricultural, residential, commercial, and industrial purposes. Lincoln County develops zoning ordinances and planning documents to control development and concentrate similar land uses in the county, including the Project Site. The county's Planning and Zoning Department classifies the Project Area, including the Project Site, as A1, Agriculture-Forestry-Rural Residential District (Lincoln County 2019a). In areas zoned A1, alternative renewable energy uses, including solar power, are permitted utility facility uses for the provision of public services (Lincoln County 2015).

Images generated with the National Land Cover Database (NLCD) evaluation, visualization, and analysis tool show the Project Site as primarily cultivated crops and pastures with scattered areas of woody wetlands and deciduous forest (Figure 3-1). On the 1,707-acre Project Site, large agricultural fields producing crops such as grain, tobacco, soybeans, corn, hay, and cotton are transected by several linear forested areas associated with streams. These include Big Huckleberry and Little Huckleberry creeks and associated tributaries that traverse the area in a general northeast-southwest direction. Together, the forested areas within the Project Site total approximately 123 acres (7 percent), while the agricultural fields encompass approximately 1,582 acres (93 percent). Approximately 2 acres of streams and ponds compose the remaining acreage on the Project Site.

The rural agricultural and residential area that includes the Project Site generally extends east-west between hilly, undeveloped, forested land to the north and south. The 1,707-acre Project Site generally consists of flat land that ranges in elevation from approximately 940 to 980 feet above mean sea level. No parks or other public outdoor recreation facilities occur in the Project Area. The closest city is Fayetteville, located approximately 16 miles to the northwest of the Project Site. Approximately 6,827 people reside in Fayetteville (U.S. Census Bureau [USCB] 2019).

Available historical topographic quadrangles document that land use in the Project Area has remained relatively unchanged at least since the mid-1930s but likely earlier (U.S. Geological Service [USGS] 2019a). Throughout this time, land uses in the Project Area have been primarily agricultural and rural-residential. Primary changes between the 1950s and 2010s include the addition or improvements of some local roads and creation of a few farm ponds. Over the years, some buildings have been moved or demolished on or near the Project Site.

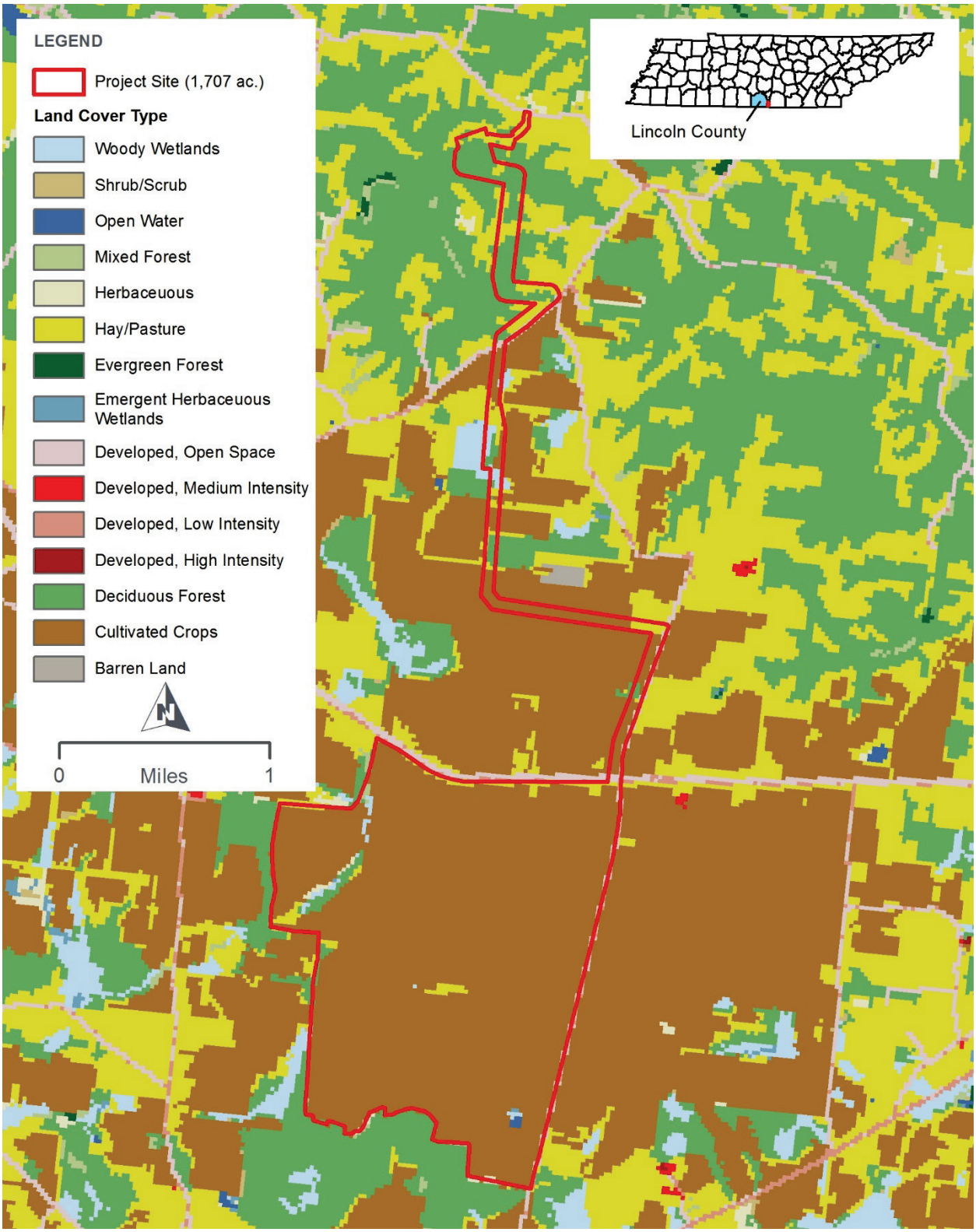

Figure 3-1. Land cover in the Project Area.

3.1.2 Environmental Consequences

This section describes the potential impacts to land use should the Proposed Action or No Action Alternative be implemented.

3.1.2.1 No Action Alternative

Under the No Action Alternative, the proposed solar facility would not be constructed; therefore, no Project-related impacts to land use would result. Existing land uses would be expected to remain a mix of agricultural, rural residential, and undeveloped land.

3.1.2.2 Proposed Action Alternative

Under the Proposed Action, the land use of the 1,471-acre area that would be converted to the solar facility, the Mann Road 161-kV Switching Station, and the associated access road would change from agricultural and forest to solar due to the construction and operation of the solar facility. Because the Project Site is zoned A1, Agriculture-Forestry-Rural Residential District, which includes alternative renewable energy uses as permitted uses, the development of the Project Site as a solar facility is compatible with Lincoln County's current zoning resolution (Lincoln County 2015). Overall, the Project would have minor direct adverse effects on land use due to the change in land use from agricultural and undeveloped to solar energy. Following decommissioning of the proposed Elora Solar Energy Center, a large portion of the Project Site could return to agricultural uses, depending on zoning ordinances in effect at that time.

Since the Project is proposed on primarily agricultural land and there are no outdoor recreation areas in the vicinity, development of the Project would have no impact on public recreation activities or facilities. The activities associated with the Project would not have any indirect effects on land use. The Project would convert agricultural land to nonagricultural uses in the short-term, but upon decommissioning of the solar farm, the landowners could return to agricultural uses of the land.

3.2 GEOLOGY, SOILS, AND PRIME FARMLAND

This section describes the existing geological resources in the Project Area and the potential impacts on these geological resources that would be associated with the No Action and Proposed Action Alternatives. Components of geological resources that are analyzed include geology, paleontology, geological hazards, soils, and prime farmland.

3.2.1 Affected Environment

3.2.1.1 Geology

The Project Site is located in the Interior Low Plateaus physiographic province of the Interior Plains division (Fenneman 1928). In the contiguous U.S., the Interior Low Plateaus extend from northern Alabama north through central Tennessee and Kentucky into southern Illinois, Indiana, and Ohio, spanning approximately 74,000 square miles (LandScope America 2019). The Project Site is in the Eastern Highland Rim section of the Low Plateaus province and is underlain by

carbonate bedrock of the Mississippian Period. The landscape of the Eastern Highland Rim is characterized by an undulating plateau surrounding the Nashville Basin (USGS 2019a).

3.2.1.2 Paleontology

Tennessee was a warm tropical sea during the Mississippian period. Significant paleontological resources are present in Middle and Eastern Tennessee regions. Limestone produced during this time is rich in fossils of bryozoans, brachiopods, and crinoids. Lincoln County is not typically associated with paleontological resources (Paleontology Portal 2019).

3.2.1.3 Geological Hazards

Geological hazards can include landslides, volcanoes, earthquakes/seismic activity, and subsidence/sinkholes. The Project Site 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 Project Site. The predominant geologic unit in Lincoln County near the Project Site is Mississippian age limestone. The Project Site is located on carbonate bedrock geology and karst landforms associated with a high risk for sinkholes.

Sinkholes are common where the rock below the land surface is limestone, carbonate rock, salt beds, or rocks that can naturally be dissolved by groundwater circulating through them. 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 be can vary greatly in size and shape (USGS 2019b). The Project Site does not have any mapped sinkholes, and none were observed during field investigations. However, sinkholes have been mapped to the east and west of the Project Site, as close as 2.5 miles away (TN Landforms 2019).

Seismic activity at the site could cause surface faulting, ground motion, ground deformation, and conditions including liquefaction and subsidence. The Modified Mercalli Scale is used within the United States to measure the intensity of an earthquake. The scale arbitrarily quantifies the effects of an earthquake based on the observed effects on people and the natural and built environment. Mercalli intensities are measured on a scale of I through XII, with I denoting the weakest intensity and XII denoting the strongest intensity. The lower degrees of the scale generally deal with the manner in which the earthquake is felt by people. The higher numbers of the scale are based on observed structural damage. This value is translated into a peak ground acceleration (PGA) value to measure the maximum force experienced. The PGA is the maximum acceleration experienced by a building or object at ground level during an earthquake on uniform, firm-rock site conditions. The PGA is measured in terms of percent of “g,” the acceleration due to gravity. The USGS Earthquake Hazards Program publishes seismic hazard map data layers that display the PGA with 10 percent probability of exceedance in 50 years (one in 475-year event). The potential ground motion for the Project Area is 0.1 g, for a PGA with a 2 percent probability of exceedance within 50 years (Figure 3-2; USGS 2014). A 0.1g earthquake would have a strong perceived shaking with light potential for damage. Based on the USGS 2014 seismic hazard map, the Project Site has low risk for earthquakes that would cause structural damage.

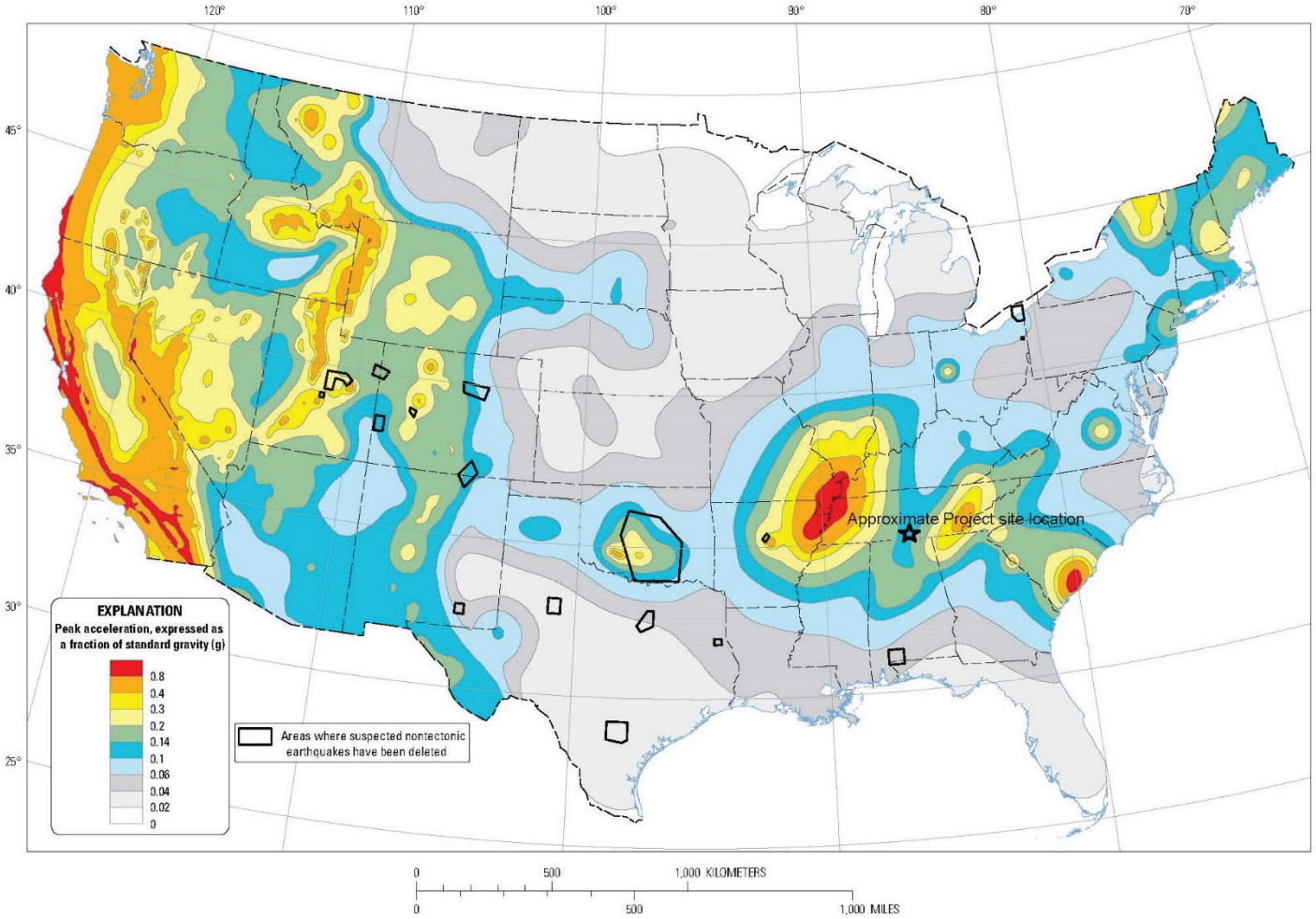

Figure 3-2. Closest seismic hazard areas to the Project Site (USGS 2014).

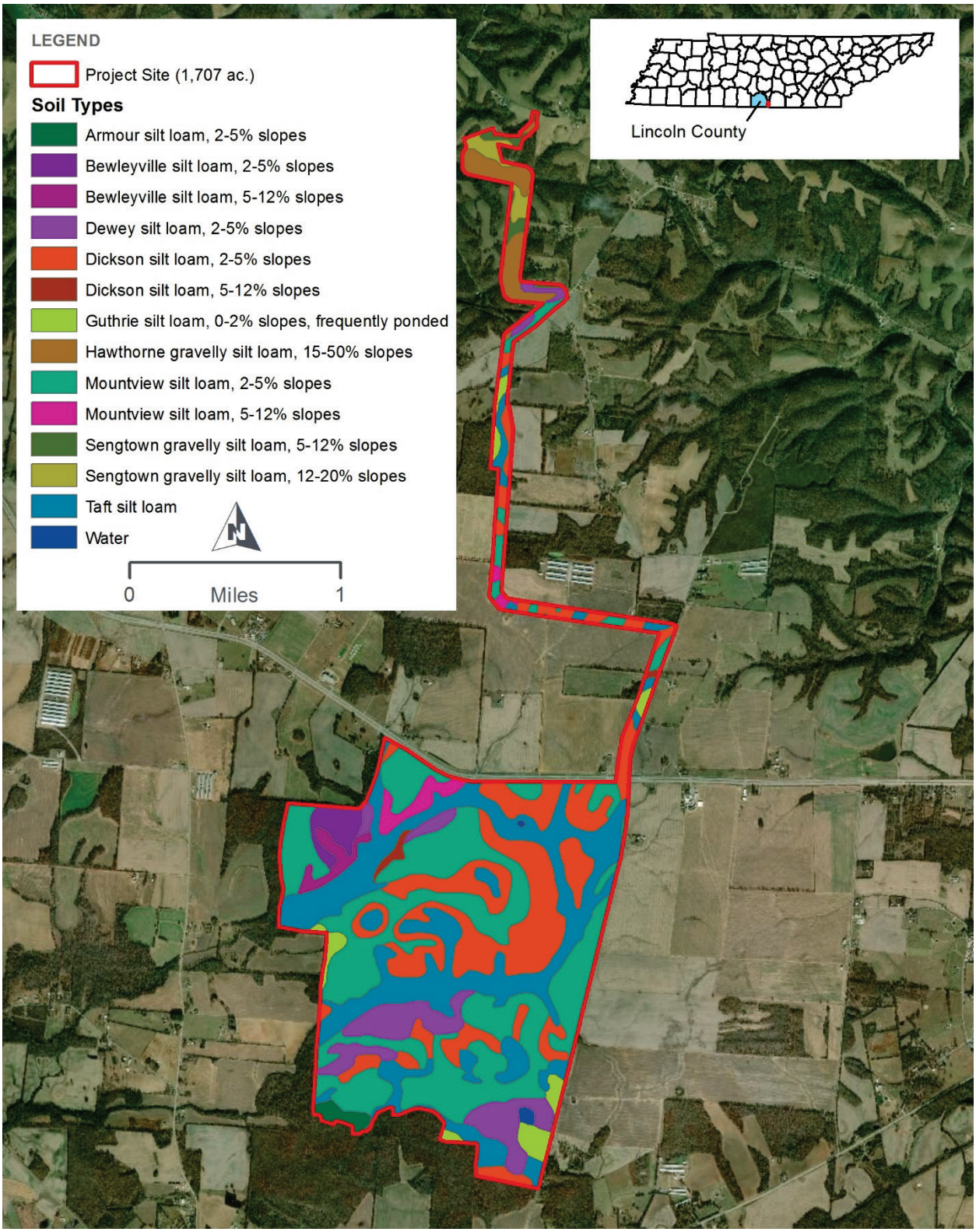

Figure 3-3. Soils on the Project Site.

3.2.1.4 Soils

The Project Site contains 13 soil types. The majority of the soils on the Project Site are composed of Mountview silt loams (34%), Taft silt loam (25.1%), and Dickson silt loams (22.2%) with other soil types consisting of less than 10 percent each (Figure 3-3 and Table 3-1). One of the two Mountview silt loams and one of the two Dickson silt loams are classified as prime farmland soils (USDA 2019a). The remaining prime farmland soil types are Armour silt loam, 2 – 5 percent slopes (0.8%), Bewleyville silt loam, 2 – 5 percent slopes (1.7%), and Dewey silt loam, 2 – 5 percent slopes, eroded (7.7%). These soil types are described in Section 3.2.1.5.

The Mountview series consists of moderately well drained soils formed in a silty mantle, with an underlying residuum of limestone or old alluvium. Most areas containing Mountview soils are used for growing hay, pasture, small grains, cotton, corn, and tobacco. In woodland areas, tree species consist primarily of oak, hickory, gum, and maple. The Taft series consists of very deep soils that are somewhat poorly drained and contain a fragipan in the subsoil. Taft soils are usually formed in a silty mantle of loess or alluvium. Planting on Taft soils usually consists of pasture, hay, soybeans, and some corn. In woodland areas, tree species usually consist of maple, elm, water oak, post oak, gum, beech, sycamore, and cottonwood. The Dickson series consists of very deep, moderately drained soils, with a slowly permeable fragipan at a depth of approximately 18 to 36 inches. These soils formed in a silty mantle 2 to 4 feet thick with an underlying residuum of limestone. Planting on Dickson soils usually consists of hay, pasture, small grains, corn, soybeans, and tobacco. In woodland areas, tree species usually consist of oaks, yellow poplar, hickories, gums, and maples (USDA 2019a).

3.2.1.5 Prime Farmland

Prime farmland is land that is the most suitable for economically producing sustained high yields of food, feed, fiber, forage, and oilseed crops. Prime farmlands have the best combination of soil type, growing season, and moisture supply and are available for agricultural use (i.e., not water or urban built-up land). The Farmland Protection Policy Act (FPPA; 7 U.S.C. § 4201 *et seq.*), requires federal agencies to take into account the adverse effects of their actions on prime or unique farmlands. 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.” Table 3-1 describes the soil types, including those classified as prime farmland, located on the Project Site.

Table 3-1. Soils on the Project Site.

Soil type	Farmland classification	Area (acres)	Percentage of area
Armour silt loam, 2 to 5 percent slopes (AmB)	All areas are prime farmland	13.9	0.8
Bewleyville silt loam, 2 to 5 percent slopes (BwB)	All areas are prime farmland	28.1	1.6

Soil type	Farmland classification	Area (acres)	Percentage of area
Bewleville silt loam, 5 to 12 percent slopes (BwC)	Not prime farmland	20.1	1.2
Dewey silt loam, 2 to 5 percent slopes, eroded (DfB2)	All areas are prime farmland	130.3	7.6
Dickson silt loam, 2 to 5 percent slopes (DkB)	All areas are prime farmland	370.3	21.7
Dickson silt loam, 5 to 12 percent slopes, eroded (DkC2)	Not prime farmland	7.9	0.5
Guthrie silt loam, 0 to 2 percent slopes, frequently ponded (Gu)	Not prime farmland	45.8	2.7
Hawthorne gravelly silt loam, 15 to 50 percent slopes (HwF)	Not prime farmland	46.7	2.7
Mountview silt loam, 2 to 5 percent slopes (MoB)	All areas are prime farmland	550.6	32.3
Mountview silt loam, 5 to 12 percent slopes (MoC)	Not prime farmland	28.6	1.7
Sengtown gravelly silt loam, 5 to 12 percent slopes (SeC)	Not prime farmland	14.3	0.8
Sengtown gravelly silt loam, 12 to 20 percent slopes (SeD)	Not prime farmland	17.9	1.1
Taft silt loam (Ta)	Not prime farmland	428.8	25.1
Total Prime Farmland		1,093	64.0

***Source*:** USDA 2019a

Prime farmland soils occur on approximately 1,093 acres, constituting approximately 64 percent of the 1,707-acre Project Site (Figure 3-4; USDA 2019a). Table 3-2 provides farm information in Lincoln County and overall in the State of Tennessee for comparison.

Table 3-2. Farming statistics for Lincoln County, Tennessee.

	Number of farms	Percentage of total area in farms	Land in farms (acres)	Average size of farms (acres)
Lincoln County	1,595	72.8	265,906	167
Tennessee	68,050	41.2	10,867,812	160

Source: USDA 2012

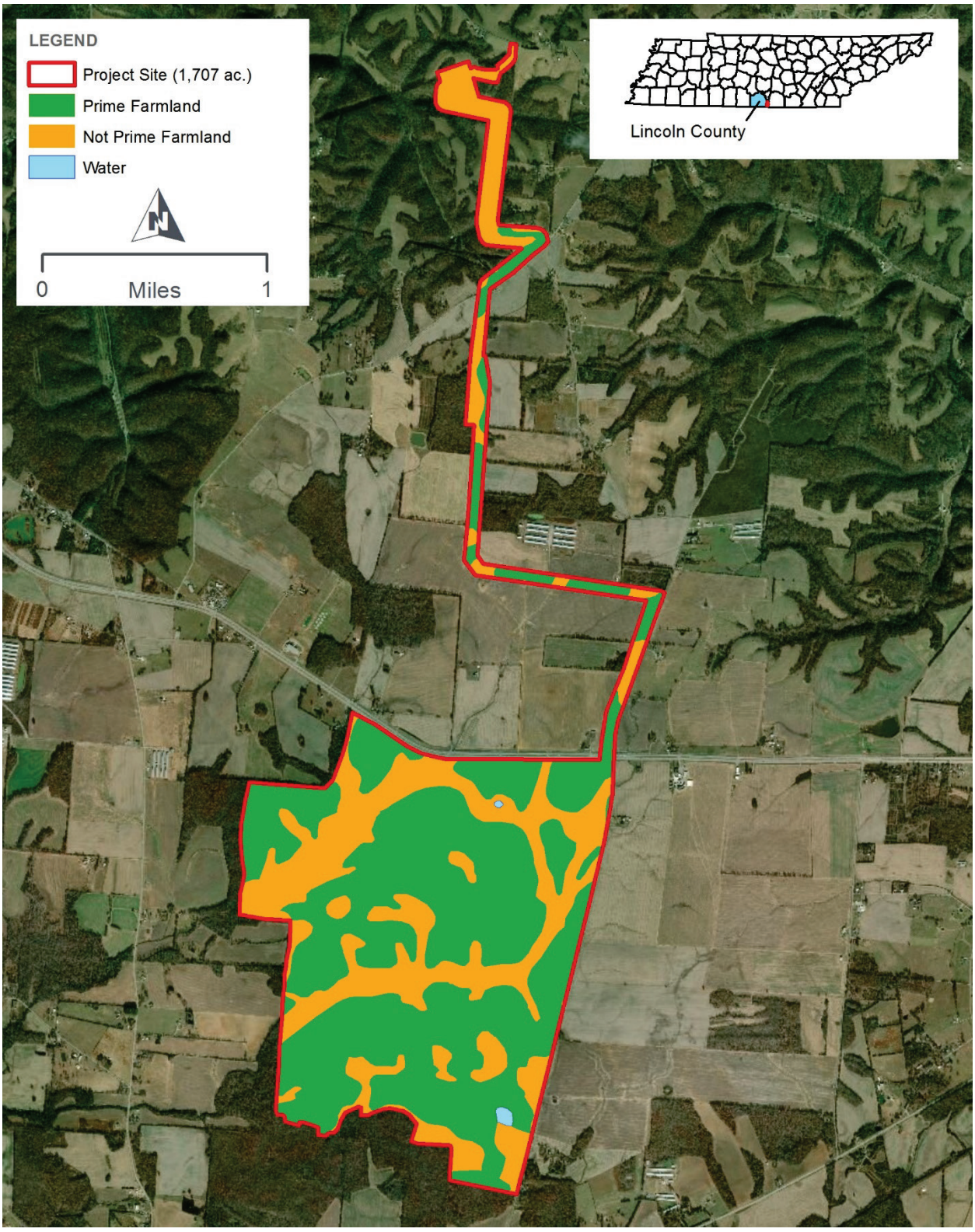

Figure 3-4. Soils classified as prime farmland on the Project Site.

3.2.2 Environmental Consequences

This section describes the potential impacts to geologic resources, soils, and prime farmlands should the Proposed Action or No Action Alternative be implemented.

3.2.2.1 No Action Alternative

Under the No Action Alternative, the proposed solar facility would not be constructed; therefore, no direct or indirect Project-related impacts on geological, paleontological, soil resources, or prime farmlands would result. Existing land use on the Project Site would be expected to remain a mix of agricultural and undeveloped land. Over time, impacts to soils and geology could occur if the current land use practices are changed. If the Project Site were to be developed, changes to the soils on site would occur.

3.2.2.2 Proposed Action Alternative

Under the Proposed Action, minor direct impacts to geology and soil resources would occur as a result of construction and operation of the Project. Approximately 89 percent (1,521 acres) of the 1,707-acre Project Site would be cleared and/or graded for the solar facility and associated interconnection facilities, with the exception of biologically sensitive areas such as those associated with jurisdictional streams and wetlands. Grading and clearing for the solar facility would cause minor, localized increases in erosion and sedimentation, resulting in minor impacts to geology and soils.

Geology and Paleontology

Under the Proposed Action, minor impacts to geology could occur. The solar arrays would be supported by steel piles, which would either be driven or screwed into the ground to a depth of 7 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 3- to 4-feet deep. Minor excavations would also be required for construction of the Project substation, each medium voltage transformer, the Elora Solar 161-kV Substation, the new 161-kV TL and associated ROW, and the Mann Road 161-kV Switching Station. Due to the small sizes of the subsurface disturbances, only minor direct impacts 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 impacts, and develop and implement a recovery plan/mitigation strategy.

Geologic Hazards

Hazards resulting from geological conditions may be encountered in the case of sinkholes. The Project Site does not have any mapped sinkholes. However, sinkholes have been mapped to the east and west of the Project Site, as close as 2.5 miles away (TN Landforms 2019). The Project Site is located over limestone bedrock that is susceptible to erosion and the creation of sinkholes.

The Project would be designed to comply with applicable standards. Geologic hazard impacts on the site would be unlikely to impact off-site resources.

Soils

As part of the site preparation, development, and interconnection processes, approximately 1,471 acres of the Project Site would be developed or temporarily affected. TVA's proposed improvements to existing access roads along the existing Winchester-Fayetteville TL and replacement of some pole structures for installation of OPGW would affect an additional approximately 68 acres of previously disturbed land where agricultural uses remain. Soils would be temporarily affected due to construction activities and tree-trimming during operation. Any stockpiled soils from the area where vegetation clearing and grading may occur would be replaced following cut-and-fill activities to the extent practical and, therefore, likely not require any off-Project 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, small amounts of sand and gravel aggregate may be obtained either from on-site activities within the 1,471-acre portion of the Project Site that would require clearing and some grading, or from local, off-site sources. The creation of new impervious surface, in the form of footings for pole structures along the proposed Elora Solar 161-kV TL and the foundations for the central inverters, Elora Solar 161-kV Substation, and the Mann Road 161-kV Switching Station would result in a minor increase in stormwater runoff and potential increase in soil erosion. Planting of native and/or noninvasive vegetation within the limits of disturbance along with use of BMPs described in the SWPPP (see Section 1.4.1), such as soil erosion and sediment control measures, 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 impacts during site operations.

During operation and maintenance of the solar facility and associated interconnection facilities on the 1,707-acre Project Site, very minor disturbance could occur to soils. Routine maintenance would include periodic motor replacement, inverter air filter replacement, fence repair, vegetation control, and periodic array inspection, repairs, and maintenance. The Project would implement mechanized landscaping using lawnmowers, weed eaters, etc. In the southern portion of the Project Site, where the developed solar facility would be located, trimming and mowing to maintain the vegetation at a height of approximately 18 inches would be performed as needed but estimated to occur no more than three times per growing season. In the nonagricultural portions of the proposed ROW associated with the Elora Solar 161-kV TL in the northern portion of the Project Site, Elora Solar would take an integrated vegetation management approach designed to encourage low-growing plant species and discourage tall vegetation. 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 impacts to soils on the Project Site during operations.

Prime Farmland

Should the Proposed Action be implemented, approximately 86 percent (1,471 acres) of the 1,707-acre Project Site would be developed into the Elora Solar Energy Center and associated switching station and removed from potential agricultural use; this would affect approximately 972 acres of prime farmland or approximately 89 percent of the total prime farmland soils at the Project Site.

The construction and operation of the solar facility would remove approximately 972 acres of prime farmland from potential agricultural use and would result in conversion of 1,471-acres from agricultural and undeveloped, forested land to a developed solar power facility. Apart from clearing of trees and the installation of pole structures associated with the proposed TL and access roads, the remaining 121 acres (approximately 11 percent) of prime farmland on the Project Site would remain undisturbed by the Project. Appropriate BMPs would be used to control erosion and limit sediment and soil from leaving the Project Site. During grading, topsoil would be removed and stockpiled and, as grading is nearing completion, redistributed over the graded areas. None of the soils on the Project Site have characteristics that would require special construction techniques or other non-routine measures. Upon decommissioning, once the facility components are removed and the site is stabilized, farming could resume with little long-term loss of soil fertility and potential agricultural production.

In accordance with FPPA evaluation procedures, a United States Department of Agriculture (USDA) Farmland Conversion Impact Rating Form (Form AD-1006) has been completed for the Project in coordination with the USDA Natural Resource Conservation Service (Appendix D). Form AD-1006 quantifies the potential impacts to prime farmland. The impact rating considers the acreage of prime farmland to be converted, the relative abundance of prime farmland in the surrounding county, and other criteria such as distance from urban environments, percentage of area currently being farmed, and compatibility with existing agricultural use. This form assigns a numerical rating between zero and 260 based on the area of prime farmland to be disturbed, the total area of farmland in the affected county, and other criteria. The impact rating score for the Project Site was 171 (Appendix D). Sites with a total score of at least 160 have a greater potential to adversely affect prime farmland and, thus, require more detailed consideration of alternative sites, including the evaluation of sites that may have less effects on prime farmland. The site selection criteria for the proposed solar facility are described in Section 2.3. Although the development of the potential alternative Big Sandy site may have resulted in less impact on prime farmland than the Project Site, impacts to wetlands and streams, federally and state-listed species, and public recreational uses on this site would likely have been greater than on the Project Site.

Based on the ratings for the Project Site, effects on prime farmland would be adverse for the duration of the solar facility. Impacts to soils would otherwise be insignificant due to Project measures to preserve topsoil and minimize erosion, such as installing silt fencing and balancing cut-and-fill quantities. Following the eventual decommissioning and removal of the solar facility, the Project Site could be returned to agricultural use with little loss of soil productivity and insignificant long-term effects on agricultural production. Adverse impacts to soil productively may

also be offset by the beneficial effects to soil health with the use of native and/or noninvasive vegetation.

3.3 WATER RESOURCES

This section provides an overview of existing water resources in the Project Area and the potential impacts on these water resources that would be associated with the No Action and Proposed Action Alternatives. Components of water resources that are analyzed include groundwater, surface water, and floodplains.

3.3.1 Affected Environment

3.3.1.1 Groundwater

Groundwater is water located beneath the ground surface, within soils and subsurface formations known as hydrogeological units or aquifers (USGS 1995). Aquifers have sufficient permeability to conduct groundwater and to allow economically significant quantities of water to be produced by man-made water wells and natural springs. The Project Area is located within the Interior Low Plateau physiographic province, which is mostly underlain by limestone aquifers in Mississippian rocks (USGS 1995).

These aquifers are part of the Appalachian Plateaus aquifer system that underlies central Tennessee as well as much of Illinois and Kentucky and parts of Indiana and Ohio. Principal aquifers in the Low Interior Plateaus physiographic province consist of unconsolidated, coarse-grained sand and gravel deposits of Quaternary age. Precipitation is the primary source of groundwater recharge in this province. Most of the rain and other precipitation becomes overland runoff to streams, while some precipitation percolates through the soils and residuum to the underlying limestone bedrock. Groundwater discharge through springs is common throughout the Interior Low Plateau province.

The water quality in Mississippi aquifers is generally suitable for most uses (USGS 1995). Mississippi aquifers tend to have hard water of a calcium magnesium bicarbonate sulfate type with large quantities of iron. Wells and springs originating in limestone aquifers can experience contamination from solid and liquid waste disposal. Contamination and turbidity issues can be exacerbated during periods to prolonged rainfall.

3.3.1.2 Surface Water

Surface water is any water that flows above ground and includes, but is not limited to, streams, ditches, ponds, lakes, and wetlands. Streams are classified as either perennial, intermittent, or ephemeral based on the occurrence of surface flow. Wetlands are those areas inundated by surface water or groundwater such that vegetation adapted to saturated soil conditions is prevalent. Examples of wetlands include swamps, marshes, bogs, and wet meadows.

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. (or jurisdictional waters) and are under the regulatory jurisdiction of USACE. The CWA is the primary federal statute that governs the discharge of pollutants and fill materials

into Waters of the U.S. under Sections 402, 404 and 401. The limits on activities affecting Waters of the U.S. are defined through a jurisdictional determination accepted by USACE. State agencies have jurisdiction over water quality.

The Project Site is located in the Dukes Creek-Elk River watershed (12-digit Hydrologic Unit Code [HUC] 060300030704) and State Rock Branch-Flint River watershed (12-digit HUC 060300020301). The on-site surface waters in the most northern portion of the site drain to the Elk River and the on-site surface waters in the southern portion of the site drain to the Flint River. The on-site surface waters are classified by the state for fish and aquatic life, recreation, livestock watering and wildlife, and irrigation (TDEC 2017). Big Huckleberry and Little Huckleberry creeks are considered impaired due to pollutants from non-irrigated crop production.

Field surveys of the Project Site were conducted February 6-8, 2019 to determine the presence of potentially jurisdictional wetlands and streams. WWCs regulated by TDEC were also identified. Wetlands on the Project Site were identified in accordance with methodologies described in the 1987 *Corps of Engineers Wetlands Delineation Manual* (1987 Manual) (USACE 1987) and the Atlantic and Gulf Coastal Plain regional supplement to the 1987 Manual (USACE 2010). Streams and WWC features were classified utilizing the methodology and guidance provided in Regulatory Guidance Letter (RGL) 05-05 and the TDEC Division of Water Pollution Control *Guidance For Making Hydrologic Determinations* (TDEC 2011). Descriptions of the on-site water resources identified during the field survey were initially submitted to USACE and TDEC for confirmation of their jurisdictional status in May and June 2019, respectively (Appendix D). Following from a verification visit with USACE in September 2019, descriptions of the on-site water resources identified during the field survey were resubmitted to USACE and TDEC, and the changes were confirmed by these agencies (Appendix D).

On the 1,707-acre Project Site, a total of 29 wetlands (46.6 acres), one pond (2.5 acres), nine perennial streams (24,741 linear feet), 11 intermittent streams (3,823 linear feet), 16 ephemeral streams (8,848 linear feet), and 65 WWCs (38,393 linear feet) were identified. Surface water locations on the Project Site are shown in Figures 3-5 and 3-6. In the submittals to TDEC and USCAE, the WWCs were recommended not to meet jurisdictional wetland criteria or the definition for classification as a jurisdictional stream.

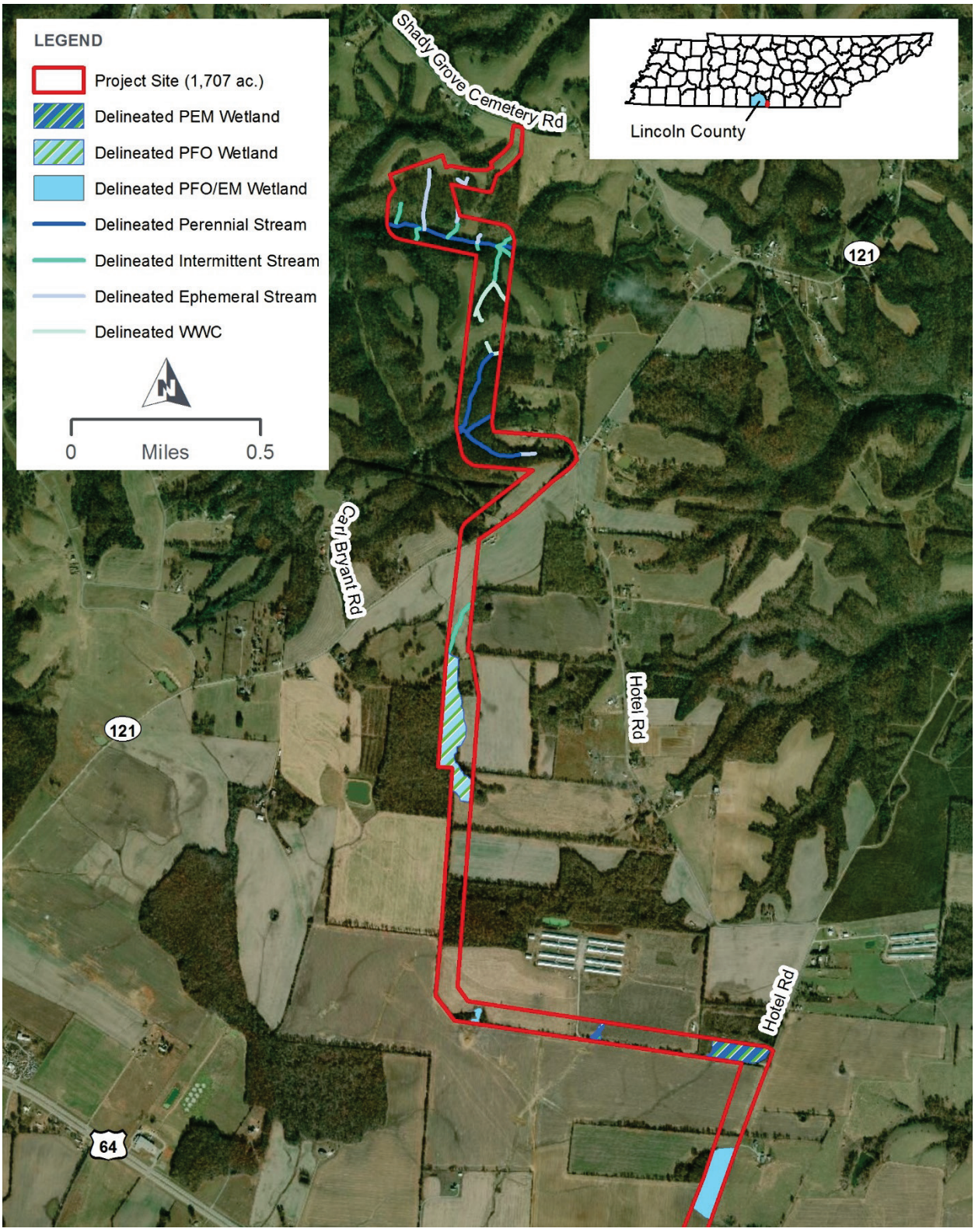

Figure 3-5 North. Aerial photograph showing wetlands, streams, and WWCs on the Project Site.

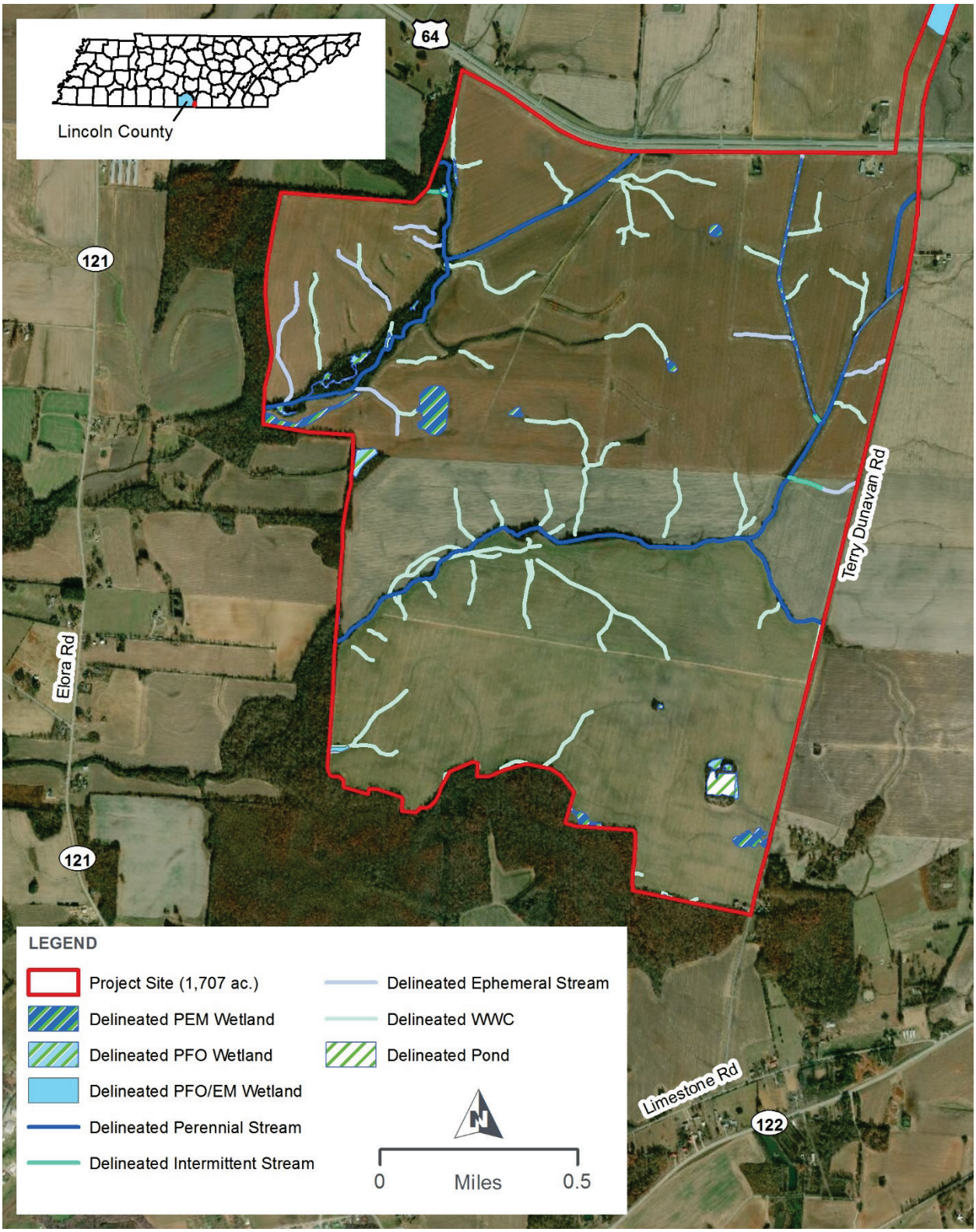

Figure 3-5 South. Aerial photograph showing wetlands, streams, and WWCs on the Project Site.

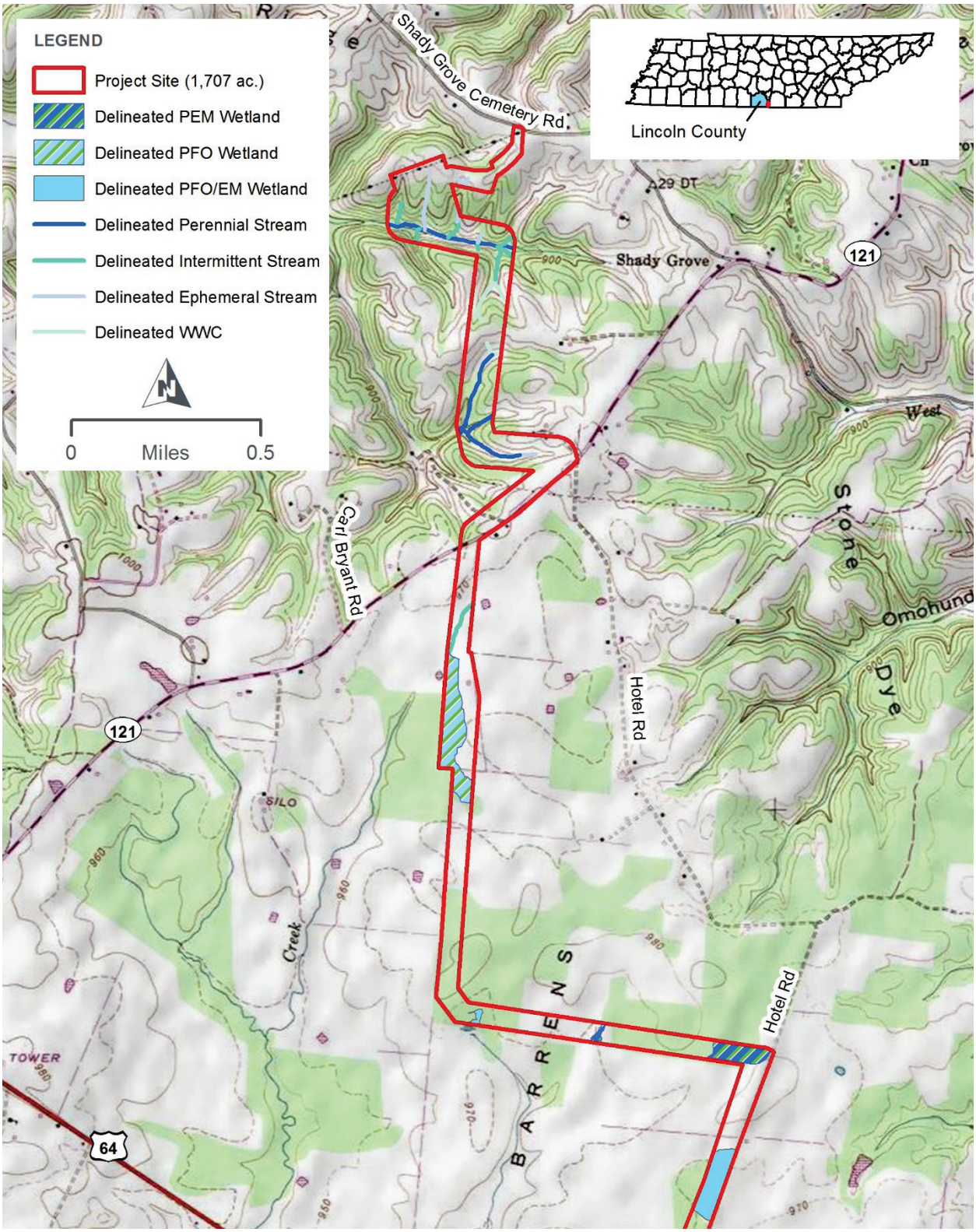

Figure 3-6 North. Topographic quadrangles showing wetlands, streams, and WWCs on the Project Site.

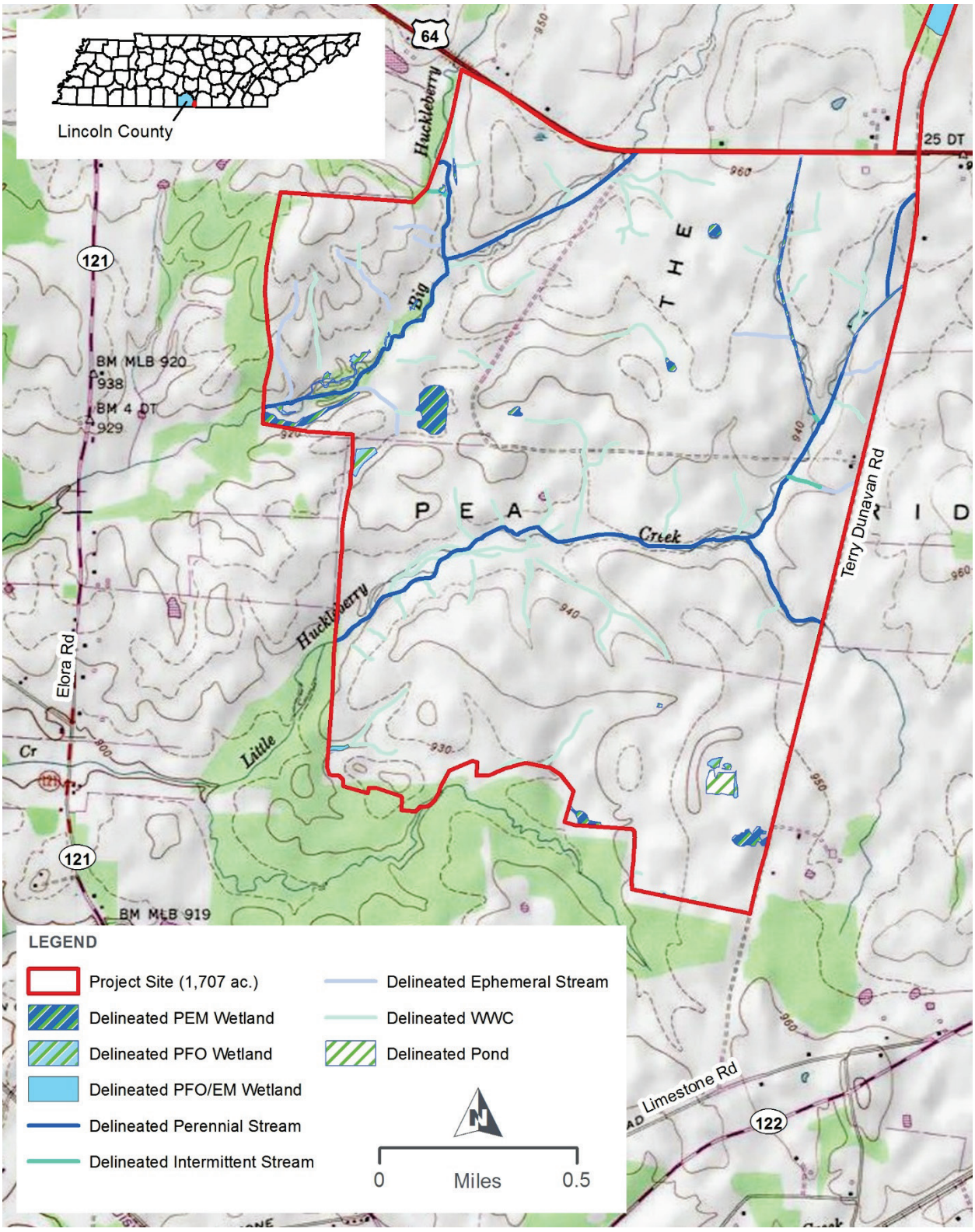

Figure 3-6 South. Topographic quadrangles showing wetlands, streams, and WWCs on the Project Site.

TVA is subject to EO 11990, Protection for Wetlands. EO 11990 states that unavoidable impacts to streams and wetlands should be compensated through a process known as compensatory mitigation. Wetlands on the Project Site were classified by hydrologic regime and vegetation cover type in accordance with the Cowardin Classification System (Cowardin et. al. 1979). Three wetland types were identified on the Project Site: palustrine emergent (PEM; 19.3 acres), palustrine forested (PFO; 22.8 acres), and palustrine shrub (PSS; 4.4 acres), for a total of 46.6 acres of potentially jurisdictional wetlands. PEM wetlands were typically found in agricultural settings and were highly disturbed by agricultural activities. PFO wetlands were typically dominated by various hardwood tree species such as American sweetgum and willow oak. The one PSS wetland was in an agricultural setting and was dominated by tussock sedge, reed canary grass, and curly dock.

3.3.1.3 Floodplains

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. The area subject to a 0.2-percent chance of flooding in any given year is normally called the 500-year floodplain. It is necessary to evaluate development in a floodplain to ensure that the project is consistent with EO 11988, Floodplain Management.

The Federal Emergency Management Agency (FEMA) produces maps that show the likelihood of flooding in a particular area. These maps are used to determine eligibility for the National Flood Insurance Program (NFIP). The NFIP intends to reduce the impact of flooding on private and public structures by encouraging communities to adopt and enforce floodplain management regulations to help mitigate the effects of flooding on buildings. These regulations typically limit development within the 100-year floodplain. Certain types of development may also be limited in the 500-year floodplain. EO 11988 requires federal agencies to “avoid to the extent possible the long- and short-term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative.”

Based on Flood Insurance Rate Map Panel 47103C0350D (effective date September 19, 2007), the Project Site is outside the FEMA-identified 100-year and 500-year floodplains (Figure 3-7; FEMA 2017). TVA’s proposed work areas along the existing Winchester-Fayetteville TL are also outside the FEMA-identified 100-year and 500-year floodplains. However, portions of the Project would cross the 100-year floodplains of several unmapped perennial streams, per the Lincoln County *Flood Damage Prevention Resolution* (2018).

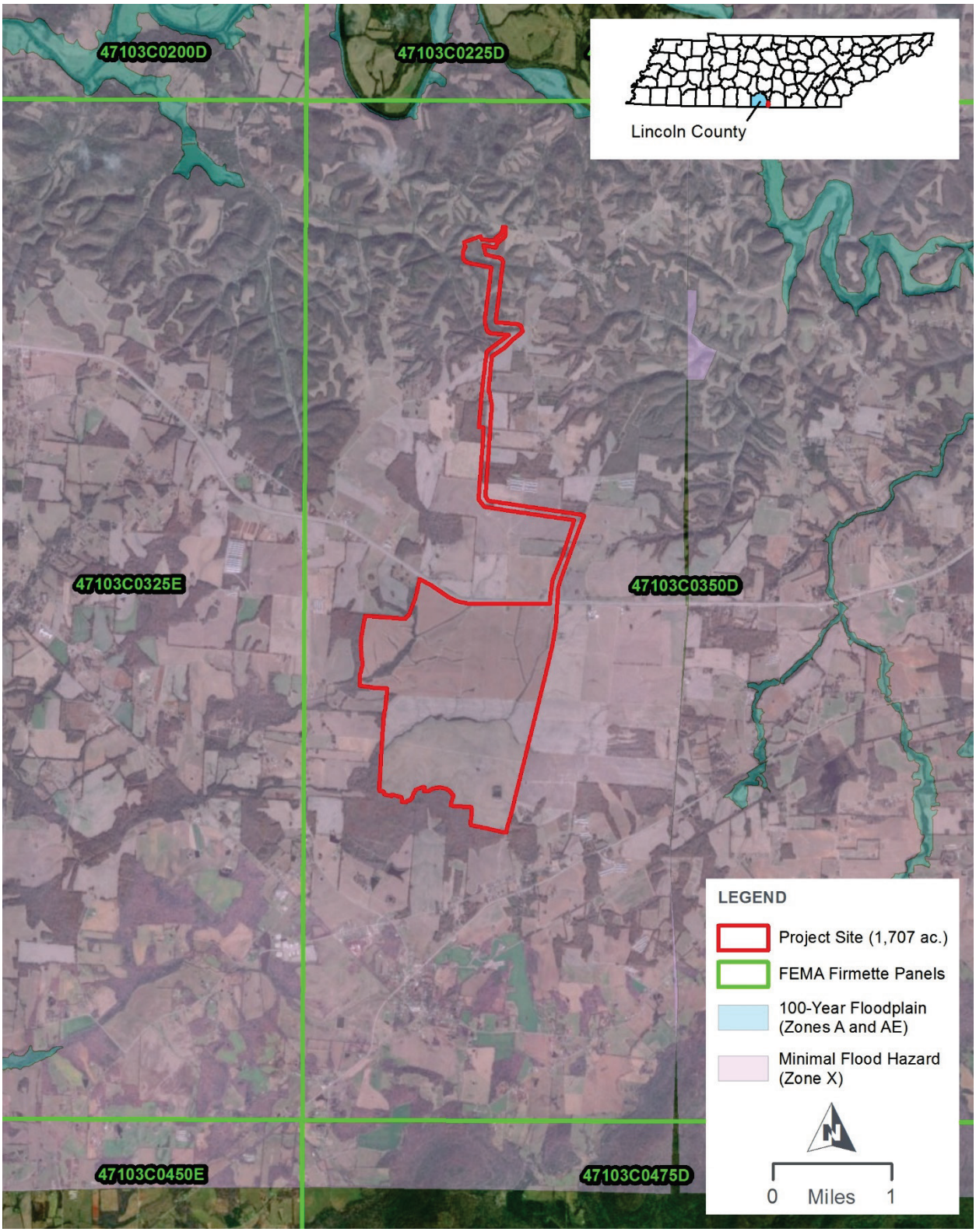

Figure 3-7. Floodplains in the Project Area.

3.3.2 Environmental Consequences

This section describes the potential impacts to water resources should the No Action or Proposed Action Alternative be implemented.

3.3.2.1 No Action Alternative

Under the No Action Alternative, the proposed Project would not be constructed; therefore, no direct Project related impacts to water resources would be expected to occur. Existing land use would remain a mix of agricultural and undeveloped land, and water resources would remain as they are at the present time. Indirect impacts to water resources could occur due to continuing agricultural use of the Project Site. Increases in erosion and sediment runoff could occur if farming practices were not maintained using BMPs. Erosion and sedimentation on site could alter runoff patterns on the Project Site and impact downstream surface water quality. In addition, if the local aquifers are recharged from surface water runoff, chemical fertilizer and pesticide use could impact both the surface water and groundwater.

3.3.2.2 Proposed Action Alternative

Under the Proposed Action, minor direct impacts to streams, wetlands, WWCs, and unmapped floodplains would be anticipated as a result of construction and operation of the Project. Beneficial, indirect impacts to groundwater and surface water could result from the change in land use and establishment of permanent vegetative cover on 1,471 acres of the 1,707-acre Project Site, including a reduction in fertilizer and pesticide runoff, the improvement of water quality by filtering through native and/or noninvasive vegetation, and the reduced likelihood of erosion and sedimentation.

Groundwater

No direct adverse impacts to groundwater would be anticipated as a result of the Proposed Action. The PV panels would have a relatively minor effect on groundwater infiltration and surface water runoff because the panels would not include a runoff collection system. Rainwater would drain off the panels to the adjacent vegetated ground. Hazardous materials that could potentially contaminate groundwater would be stored on the Project Site during construction. The minimal use of petroleum fuels, lubricants, and hydraulic fluids during construction and by maintenance vehicles would result in the potential for small on-site spills. However, the use of BMPs to properly maintain vehicles to avoid leaks and spills and procedures to immediately address any spills that did occur, would minimize the potential for adverse impacts to groundwater.

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 2017b), would be used to avoid contamination of groundwater from Project activities. Fertilizers and herbicides would be used sparingly and in accordance with manufacturer's recommendations to avoid contamination of groundwater. Additionally, beneficial indirect impacts to groundwater could result from the change in land use.

Construction-related Water Needs

Water and sewer treatment services are currently not available at the Project Site. 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, 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.

Water used during construction would be provided via proposed Project groundwater wells or by delivery via water trucks. If selected, up to four groundwater wells would be installed in different locations throughout the Project Site to provide access during construction and reduce the potential for any significant water level drawdown. Elora Solar would perform groundwater drilling and testing to gather information on aquifer characteristics and develop a plan for the production well design. If required, water-based drilling muds would be collected and dewatered, with runoff occurring locally into nearby field areas. Dewatered muds would be non-toxic and could be distributed as subsoil during site grading. If determined necessary, sewer treatment would be accomplished through use of a pump-out septic holding tank.

If installed, groundwater wells and the septic holding tank would be appropriately permitted and constructed to avoid impacts to groundwater. None of the proposed options for water and water-related needs would adversely affect available groundwater resources.

Operation and Maintenance-related Water Needs

The primary uses of water during operation and maintenance-related activities would be for possible dust control (the proposed PV technology requires no water for the generation of electricity) and bathrooms, if needed, for on-site staff. The internal access roads would not be heavily traveled during normal operations, and consequently, water use for dust control is not expected. Equipment washing and any potential dust control discharges would be handled in accordance with BMPs for water-only cleaning.

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. The panels would be cleaned if a specific issue is identified and depending on the frequency of rainfall, proximity of arrays to sources of airborne particulates, and other factors.

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.

Decommissioning and Site Reclamation-related Water and Wastewater Needs

Because conditions can change during the course of the Project, a final Decommissioning and Closure Plan would be based on conditions as found at the time of facility closure.

The Project would comply with the requirements of the NPDES through preparation and implementation of a SWPPP and filing of a NOI to comply with the General Construction Stormwater NPDES Permit. The plan would include procedures to be followed during decommissioning to prevent erosion and sedimentation, non-stormwater discharges, and contact between stormwater and potentially polluting substances.

Decommissioning and site reclamation would likely be staged in phases, allowing for a minimal amount of disturbance and requiring minimal dust control and water usage. It is anticipated that water usage during decommissioning and site reclamation would not exceed operational water usage.

Overall Groundwater Impacts

Due to the small volume of groundwater anticipated as necessary for the Project in comparison to the overall withdrawal rate for the Mississippian aquifers of approximately 64 million gallons per day (USGS 1995), impacts to the local aquifer and groundwater in general are not anticipated. The use of BMPs and a SWPPP would reduce the possibility of any on-site hazardous materials reaching the groundwater during operations or maintenance. Overall, impacts to groundwater are not anticipated.

Indirect beneficial impacts to groundwater could occur if panel placement and/or the use of buffer zones lead to fewer pollutants entering groundwater. Currently, most of the on-site land use is agricultural, which provides for the possibility of fertilizer and pesticide runoff entering groundwater. Thus, the conversion of the Project Site from cropland to native and/or noninvasive vegetative cover would eliminate a source of these impacts, resulting in a beneficial, though minor, indirect impact to groundwater.

Surface Water

During the facility design process, impacts to on-site streams, wetlands, and TDEC-regulated WWCs were avoided or minimized. Complete avoidance of surface water was not feasible, and the construction and operation of the Project would permanently affect two perennial streams (0.14 acre), one ephemeral stream (0.07 acre), and approximately three WWCs for road crossing improvements. The Project would additionally affect seven ephemeral streams (0.03 acre), 10 wetlands (0.16 acre), and approximately 49 WWCs due to the placement of solar panels and/or pole structures. Figure 3-8 shows the locations of streams, wetlands, and WWCs relative to project components. Impacts to potentially jurisdictional water features are not expected from the installation of buried cables due to the use of boring to install these Project elements.

Any pesticide or herbicide use as part of construction or operations activities would comply with the TDEC General Permit for Application of Pesticides, associated with Permit TNR100000 described in Section 1.4. Proper implementation and application of these products may result in minor impacts to surface water. As described above for groundwater, beneficial indirect impacts to on-site surface water is expected to result from the change in land use.

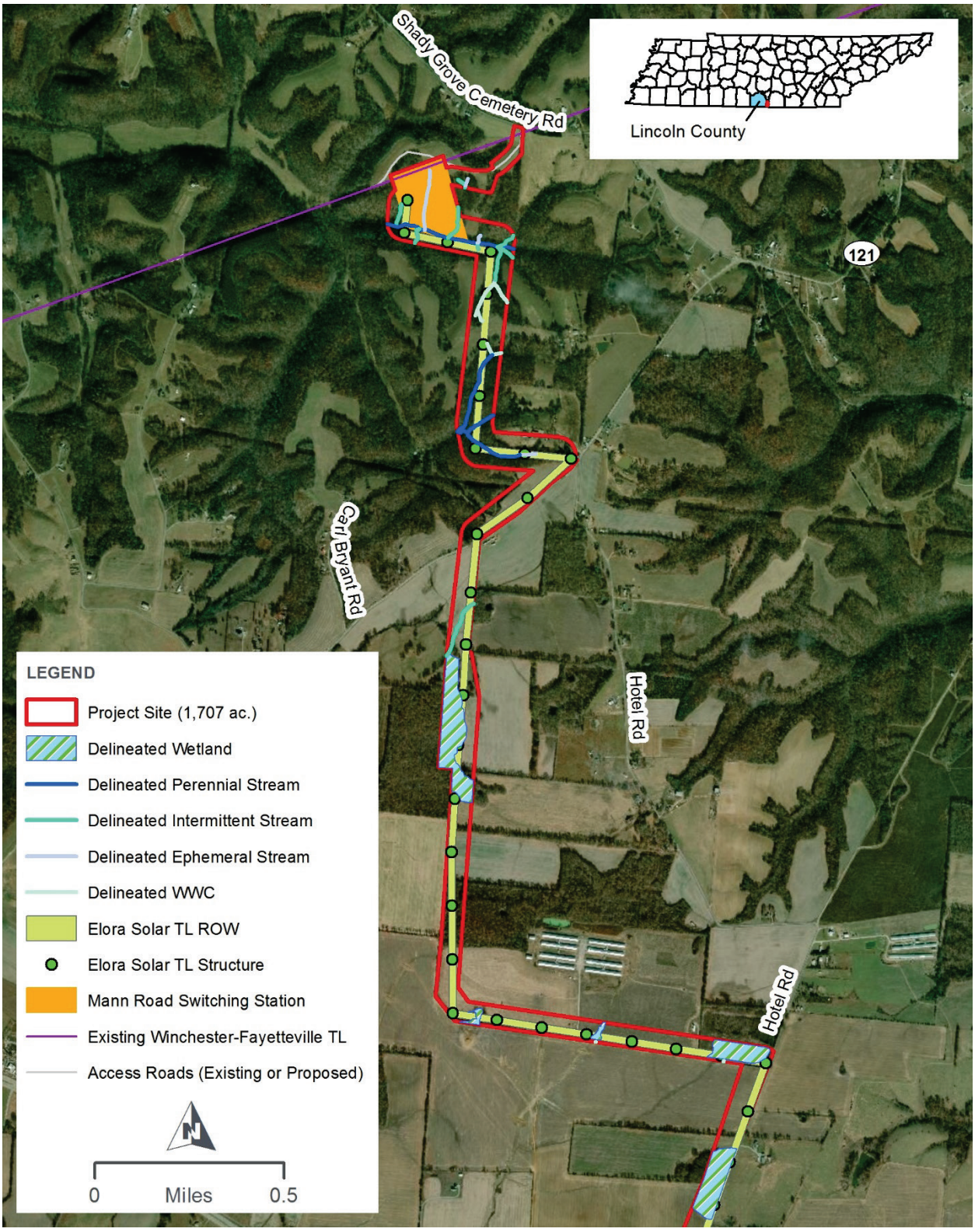

Figure 3-8 North. Locations of streams, wetlands, and WWCs relative to Project components on the Project Site.

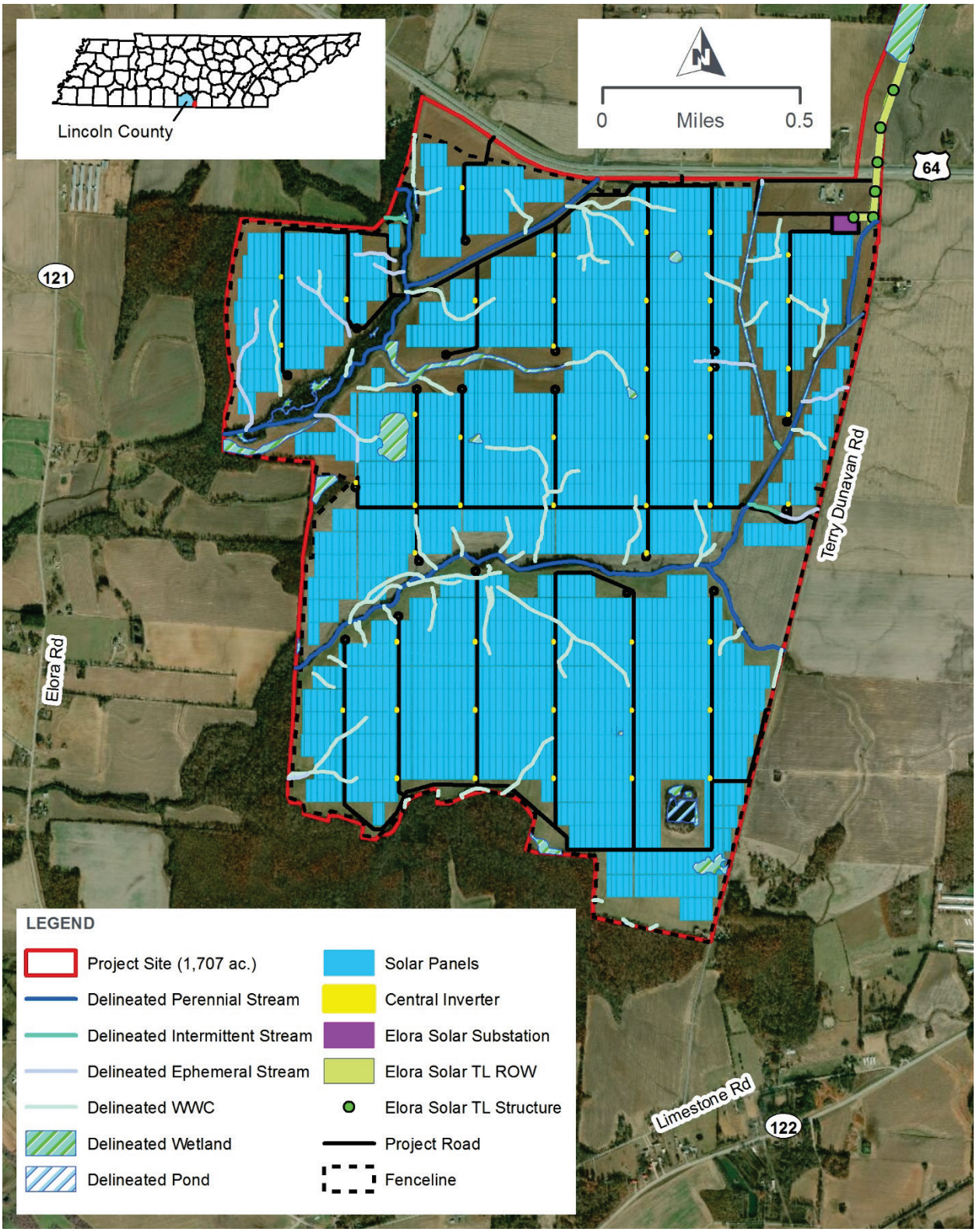

Figure 3-8 South. Locations of streams, wetlands, and WWCs relative to Project components on the Project Site.

Streams

Under the Proposed Action, minor, direct adverse impacts to potentially jurisdictional stream channels are expected to occur. Improvements to two existing road crossings would permanently affect an approximate 16-foot length of each of the two affected streams and would result in approximately 32 linear feet (0.14 acre) of stream impacts. Additionally, 0.07 acre of one ephemeral stream would be affected by a road crossing. Approximately 0.03 acre of seven ephemeral streams would be affected due to placement of solar panels and/or pole structures. Minor temporary direct adverse impacts during construction are anticipated, with the use of BMPs to minimize sediment runoff during construction.

These impacts would be subject to the conditions of the Section 404 and ARAP permits described in Section 1.4.

Wetlands

In the Project design process, care was taken to avoid impacts to wetlands where practicable by planning for Project components in areas without wetlands. Therefore, this Project is consistent with the requirements of EO 11990. However, complete avoidance of wetlands was not feasible due to the existence of several PEM wetlands where the solar facility and the new 161-kV TL are planned and the need to avoid other jurisdictional features, such as perennial streams and associated buffers.

Under the Proposed Action, minor, direct adverse impacts to potentially jurisdictional wetlands are expected to occur. The solar panel array racks would be mounted on steel pilings pushed into the ground with no footer. Installation of the pilings would not constitute a wetland fill from the perspective of USACE but are regulated by TDEC. These Project effects would impact six PEM wetlands and one PFO wetland. Each individual pile would be no larger than a 6-by-6-inch I-beam and would occupy up to approximately 0.0002 acre below grade. The impacted area would total approximately 0.1 acre. However, their placement in the wetlands would not constitute fill from the perspective of USACE but are regulated by TDEC.

The placement of pole structures for the new Elora Solar 161-kV TL would impact four additional PEM wetlands and two additional PFO wetlands. Each of the six pole structures would measure approximately 1 foot in diameter and would occupy no more than approximately 0.01 acre below grade. The impacted area would total approximately 0.06 acre. However, like the steel pilings, the placement of pole structures is not expected to constitute wetland fill from the perspective of USACE but are regulated by TDEC.

Trees and shrubs would be cleared from one PFO wetland for the placement of solar panels and from portions of two PFO wetlands for the placement of two pole structures in each wetland. These impacts would be subject to the conditions of the Section 404 and ARAP permits described in Section 1.4. Figure 3-8 North and South shows the water features on the Project Site in relation to the proposed Project components.

Cumulative Surface Water Impacts

Potential impacts to surface waters during construction would be minimized through the use of BMPs for controlling soil erosion and runoff. These BMPs include the use of 50-foot buffer zones surrounding potentially jurisdictional, unimpaired, intermittent and perennial streams and wetlands, the use of 60-foot buffer zones surrounding potentially jurisdictional intermittent and perennial streams that are considered impaired, and the installation of erosion control silt fences and sediment traps. Therefore, through the use of BMPs and avoidance measures, impacts to surface waters during construction would be minor. The operation and maintenance of the solar facility would have little impact on surface water, and BMPs would be used during any maintenance activities that have the potential to cause runoff of sediment or pollutants.

Due to the minimal impacts to on-site streams, minor runoff impacts expected to surface waters across the Project Site during construction, and the use of BMPs to prevent sedimentation, impacts to on-site jurisdictional waters would be insignificant. As needed, Elora Solar would obtain any necessary Section 404 and TDEC ARAP permits described in Section 1.4. Figure 3-8 shows the locations of streams, wetlands, and WWCs relative to project components.

Floodplains

As a federal agency, TVA adheres to the requirements of EO 11988, Floodplain Management. The objective of EO 11988 is "…to avoid to the extent possible the long- and short-term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative" (EO 11988, Floodplain Management). The EO is not intended to prohibit floodplain development in all cases, but rather to create a consistent government policy against such development under most circumstances (U.S. Water Resources Council, 1978). The EO requires that agencies avoid the 100 -year floodplain unless there is no practicable alternative.

The Project would be located outside FEMA-identified 100-year floodplains; however, portions of the Project would cross the 100-year floodplains of several unmapped perennial streams. Project components planned in these unmapped floodplains would consist of gravel access roads, buried collection lines, security fencing, and portions of the overhead wire associated with the proposed Elora Solar 161-kV TL. Manual trimming of tall vegetation, the removal of some trees, and light grading could also occur within the unmapped 100-year floodplains. Minor grading activity and the installation of utility lines, access roads, culverts, and fences are considered to be repetitive actions in the 100-year floodplain and would result in minor impacts (TVA 1981). These actions would therefore be consistent with EO 11988.

The following measures to be employed by the Project within the unmapped 100-year floodplains would minimize adverse impacts to floodplains and their natural and beneficial values:

1. To the extent practicable, construction and maintenance would be scheduled during dry periods.
2. The right-of-way would be revegetated where natural vegetation would be removed.
3. BMPs would be used during construction activities.
4. Construction in the floodplain would adhere to the TVA subclass review criteria for transmission line location in floodplains.
5. Road improvements crossing unmapped streams would be done in such a manner that upstream flood elevations would not be increased by more than 1.0 foot.

With implementation of the above mitigation measures, the Proposed Action would have no significant impacts on floodplains and their natural and beneficial values.

3.4 BIOLOGICAL RESOURCES

This section describes the existing biological resources within the Project Site or in the Project Area and the potential impacts to those resources that would be associated with the No Action and Proposed Action Alternatives. The components of biological resources analyzed below include natural areas, vegetation, wildlife, and rare, threatened, and endangered species.

The Project Area lies in the Interior Plateau Level III Ecoregion, which contains five Level IV ecoregions (USEPA 2019a). The Project Site is located within the Eastern Highland Rim Level IV ecoregion, which is characterized by tablelands of moderate relief and irregular plains. Many former barrens and prairie areas are now oak thickets or pasture and cropland. Vegetation is transitional between the oak-hickory forests dominant to the west and the mixed mesophytic forests of the Appalachian ecoregions to the east. Air temperatures in the Eastern Highland Rim subecoregion are coldest in January, when temperatures range between 30 and 50 degrees Fahrenheit, and warmest in July, when temperatures range between 68 and 90 degrees Fahrenheit (National Oceanic and Atmospheric Administration [NOAA] 2019a). The area experiences an average of 56 inches of precipitation per year.

Desktop surveys were performed prior to field investigations on the Project Site and in TVA's proposed work areas along the existing Winchester-Fayetteville 161-kV TL. Potential vegetation, wildlife, and threatened and endangered species were researched during the desktop surveys, and habitat assessments were conducted by HDR biologists in February and July 2019 to verify whether habitat for these species occurs on the Project Site and in TVA's proposed work areas along the existing TL. Field investigations included bat habitat assessments to determine the potential for bat habitat on the Project Site and map the results. The findings of the desktop surveys and field investigations are described in this section.

Biological resources are regulated by a number of federal and state laws. The laws and rules potentially relevant to the Proposed Action include:

- Endangered Species Act (ESA) (16 U.S.C. §§ 1531-1544);

- Migratory Bird Treaty Act (MBTA) of 1918 (16 U.S.C. §§ 703-712) (for actions of nonfederal entities);
- Executive Order for Migratory Birds (EO 13186 of January 10, 2001) (for actions of federal agencies);
- Bald and Golden Eagle Protection Act (BGEPA);
- Rare Plant Protection and Conservation Regulations, Chapter 0400-06-02 (based on authority provided in Tennessee Code Annotated §§ 70-8-105); and
- Rules of the Tennessee Wildlife Resources Agency, Chapter 1660-01-32 (based on authority provided in Tennessee Code Annotated §§ 70-1-206, 70-8-104, 70-8-106 and 70-8-107).

Lists from TVA's Regional Natural Heritage Database (RNHD) of federally and state-listed species potentially occurring in Lincoln County and/or within resources-defined radii of the Project Site or generally listed for the county were obtained on March 27 and July 31, 2019. A U.S. Fish and Wildlife (USFWS) Information for Planning and Consultation (IPaC) planning-level trust resources lists were obtained on March 27, April 15, and August 19, 2019. These lists were obtained to identify federally listed threatened and endangered species potentially occurring in the Project Area.

3.4.1 Affected Environment

Existing biological resources on the Project Site or in the Project Area include natural areas, vegetation, and wildlife. Some rare, threatened, or endangered species also have the potential to occur in the Project Area.

3.4.1.1 Natural Areas

According to the TVA RNHD, one natural area is known to exist within 3 miles of the Project Site. Flintville Hatchery State Wildlife Management Area (WMA) is located approximately 1 mile northwest of the Project Site and is a 704-acre natural area owned and managed by the Tennessee Wildlife Resource Agency (TWRA). This area is open for hunting of both small and big game. In addition, the Flintville Hatchery, Tennessee's oldest trout hatchery, is within the WMA.

3.4.1.2 Vegetation

Being transitional between two forest types, forests typical of the Eastern Highland Rim Level IV ecoregion are characterized by a broad diversity of trees (Smalley 1983). On undulating portions of this subecoregion, white oak, southern red oak, and black oak are abundant. Sugar maple, American beech, yellow poplar, hickories, and white ash are also prevalent tree species. Dogwood is typical of the understory. Where not converted to agricultural land, former prairie areas are dominated by post oak, black-jack oak, black oak, scarlet oak, and southern red oak. Mesophytic forests are prevalent in ravine areas, where eastern hemlock, American beech, yellow poplar, white oak, and sugar maple are predominant, with some yellow buckeye, white ash, white basswood, sourwood, and northern red oak. Like much of the Project Area, vegetation on the Project Site has been altered from these typical forest communities due to agricultural use. The

majority of the Project Site has been cleared for farming or grazing, and portions of the Project Site are actively planted in cotton, corn, or soybeans or maintained as pasture. The Project Site contains approximately 123 acres of deciduous forest and approximately 1,582 acres of cultivated crops, hayfield/pasture, or grassland/shrubland. There are several scattered stands of deciduous forest within the Project Site. These forested areas are located primarily along field margins and drainage ways. TVA's proposed work areas along the existing Winchester-Fayetteville 161-kV TL contain approximately 38 acres of agricultural land, 21 acres of primarily deciduous forest, 7 acres of TVA-maintained ROW, and 2 acres of developed residential land.

Deciduous forested areas on the Project Site and TVA's proposed work areas along the existing TL are characterized as mixed oak woodlands and dominated by white oak, northern red oak, southern red oak, willow oak, water oak, post oak, overcup oak, tulip poplar, sweetgum, black walnut, and hackberry in the canopy layer. The understory is composed primarily of red maple, sugar maple, black cherry, winged elm, sweetgum, and eastern red cedar. Several nonnative invasive species, including Japanese honeysuckle, Chinese privet, and Callery pear, were observed in the forested areas of the site. These invasive species were particularly prevalent in the bottomland areas of the Project Site, adjacent to the larger stream channels. Vegetation within the agricultural land consisted of harvested corn, soybean, and cotton crops. In addition, a number of herbaceous species were observed. These species included dock, clover, wild geranium, dead nettle, and foxtail grass.

Vegetation observed in the forest edges and field margins included a number of additional species including poison ivy, broomsedge bluestem, foxtail, pokeweed, greenbriar, sawtooth blackberry, elderberry, soft rush, and various species of sedges.

Vegetation within the TVA-maintained ROW consisted of a number of herbaceous weed species. These species included dock, clover, wild geranium, dead nettle, sawtooth blackberry, maypop, and dogfennel.

No federally listed plant species were observed during the pedestrian surveys. The presence of such species is unlikely due to the predominance of highly managed agricultural land and the presence of significant populations of nonnative invasive plants in much of the forested areas.

3.4.1.3 Wildlife

During the field investigations conducted in February and July 2019, HDR determined that each of the vegetative communities described in the prior section offers suitable habitat for animal species common to the region, both seasonally and year-round. Individual species and/or evidence of species incidentally observed during field investigations are listed in the Vegetation and Wildlife Assessment Report (HDR 2019a and 2019b; Appendix D).

Oak-hickory and mixed mesophytic forests typical of the Eastern Highland Rim Level IV ecoregion support a variety of common mammals, including the gray squirrel, fox squirrel, and eastern chipmunk. Other common mammals occurring within the ecoregion include the white-tailed deer, eastern cottontail, and raccoons (USFWS 1995). Birds in the region include the wild turkey and mourning dove. Many of these species are likely to be found or were observed in the forested

areas on the Project Site. Likely due to the fact that the Project Site and vicinity are largely in areas of agricultural production, most species that were observed during the field investigations are widespread and relatively common in the area.

Deciduous forests, which comprise approximately 7 percent of the Project Site and approximately 31 percent of TVA's proposed work areas along the existing TL, provide habitat for an array of terrestrial animal species (National Geographic 2002). Birds found in this habitat include the pileated woodpecker, red-tailed hawk, blue jay, cardinal, and American robin, all of which were observed during field investigations. Some forested areas also provide foraging and 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. Some examples of common bat species potentially found in this habitat are the big brown, eastern red, evening, hoary, and silver-haired. The coyote, eastern chipmunk, eastern woodrat, North American deermouse, and woodland vole are other mammals potentially present in deciduous forests (Kays and Wilson 2002). Common reptiles include the gray ratsnake, midland brownsnake, and scarlet kingsnake (Conant and Collins 1998). In forested portions with water features, amphibians may include the dusky marbled mole, the spotted salamander, and the barking tree frog and Cope's gray tree frog (Conant and Collins 1998; Niemiller and Reynolds 2011).

Wetlands and associated vegetation areas, which compose approximately 2 percent of the Project Site, 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 utilize this habitat include the American beaver, eastern harvest mouse, marsh rice rat, muskrat, nutria, 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 (Conant and Collins 1998). The eastern red-spotted newt and three-lined salamander, as well as the American bullfrog, bird-voiced tree frog, green frog, northern cricket frog, pickerel frog, and southern cricket frog are examples of some amphibians that may be present in wetlands on the Project Site (Niemiller and Reynolds 2011).

Agricultural fields, hayfields/pasture land, and other herbaceous areas such as lawns, which comprise approximately 93 percent of the 1,707-acre Project Site and approximately 56 percent of TVA's proposed work areas along the existing TL, offer habitat to such bird species as the blue grosbeak, brown-headed cowbird, brown thrasher, common grackle, common yellowthroat, dickcissel, 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 (Conant and Collins 1998).

Review of the TVA RNHD indicated that no caves were documented within a 3-mile radius of the Project Site. Two caves are within 3 miles of TVA's proposed work areas along the existing Winchester-Fayetteville 161-kV TL. However, no caves were identified during field investigations

of the Project Site or TVA's proposed work areas. In addition, no migratory or wading bird colonies were observed on the Project Site or the immediate vicinity.

Migratory Birds

EO 13186 (Responsibilities of Federal Agencies to Protect Migratory Birds) directs federal agencies to take certain actions to further implement the MBTA. The MBTA prohibits the "take" of migratory birds. The regulatory definition of "take" as defined by 50 CFR § 10.12, "means to pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to pursue hunt, shoot, wound, kill, trap, capture, or collect." The following prohibitions apply to migratory bird nests: "possession, sale, purchase, barter, transport, import and export, take, and collect." The MBTA is executed and enforced by USFWS. Elora Solar and its contractors would act in compliance with the MBTA.

The previous discussion of wildlife lists many migratory birds known or likely to occur on the Project Site. The Project Site is located within the Bird Conservation Region 24 (BCR 24), Central Hardwoods (NABCI 2019). There are 26 species of migratory birds of conservation concern (BCC) in this region, including various species of songbirds, shorebirds, woodpeckers, owls, and raptors (USFWS 2008). Five of the species have the potential to occur within the Project Area at some point during the year (Table 3-3). BCC are species not listed under the ESA but are a high conservation priority of the USFWS. Suitable habitat for some of these species may occur in forest edges and scrub/shrub portions on the Project Site. Some may also use agricultural or grassland habitats for foraging.

Table 3-3. Migratory bird species of concern potentially occurring in the Project Area.

Common Name	Scientific Name	General Habitat Description	Habitat on Project Site?
Migrant Species (transitory through the Project Area)			
Blue-winged Warbler	*Vermivora cyanoptera*	Open woodlands, shrublands, thorn forests, gardens, and parks	Yes
Breeding Season Migrants (may occur only during the breeding season)			
Cerulean Warbler	*Dendroica cerulea*	Large tracts of older deciduous forests with tall trees	No
Kentucky Warbler	*Oporornis formosus*	Deep shaded woods with dense, humid thickets; bottomlands near creeks and rivers, ravines in upland deciduous woods, and edges of swamp	Yes
Prairie Warbler	*Setophaga discolor*	Various shrubby habitats, including regenerating forests, open brushy fields, and Christmas-tree farms	Yes

Common Name	Scientific Name	General Habitat Description	Habitat on Project Site?
Wood Thrush	*Hylocichla mustelina*	Mature deciduous and mixed forests; most commonly those with American beech, sweet gum, red maple, black gum, eastern hemlock, flowering dogwood, American hornbeam, oaks, or pines	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, burned areas, recent clearings, beaver swamps, orchards, parks, farmland, grasslands with scattered trees, forest edges, and roadsides	Yes

Oak-hickory forest, bottomland forest, and other woodland areas within the Project Site provide potential breeding habitat for these species. Although hayfields and ponds with associated marsh habitats are only a small percentage of the Project Site, these may be used by the red-headed woodpecker where scattered trees are present. Shrubby habitats at woodland edges near hayfields, wooded fence lines, and powerline ROWs may provide suitable habitat for the prairie warbler.

3.4.1.4 Rare, Threatened, and Endangered Species

Threatened and endangered species are regulated by both the federal and state governments. Database research as described in Section 3.4 identified 22 federally listed species and 24 additional species with state ranks or statuses with the potential to occur on the Project Site and in TVA's proposed work areas along the existing TL. The USFWS IPaC report identified three federally listed bats, two federally listed fishes, and nine federally listed mollusk species (Table 3-4; USFWS 2019). Within the county or a 5-mile radius of the Project Site, TVA's RNHD included additional federally listed species, consisting of six mollusk species and two plant species. No designated critical habitats are present on the Project Site (USFWS 2019). Each federally and state-listed species is discussed in this section in relation to potential habitat on the Project Site.

Field surveys of biological resources were conducted by HDR, Inc. (HDR) on the Project Site from February 4 through 6, 2019, and in TVA's proposed work areas along the existing TL between July 8 and 11, 2019 (Appendix F). The surveys focused on the general characteristics of the land cover, vegetation communities, and wildlife habitats currently present within and adjacent to the Project Site and TVA's proposed work areas along the existing TL to support a preliminary evaluation of the potential for special status species to occur on the site. This section evaluates those biological resources.

Federally Listed Species

Federally listed species identified during database research as having the potential to utilize the Project Area are shown in Table 3-4. These consist of 15 mollusks, three mammal species, two fishes, and two plant species that are either threatened or endangered.

Table 3-4. Federally listed species potentially occurring in the Project Area

Common Name	Scientific Name	Status	Preferred Habitat	Potential Habitat on Project Site
Mammals				
Indiana bat	*Myotis sodalis*	E	Indiana bats spend winter hibernating in caves and mines, called hibernacula. Suitable summer migratory tree-roosting bat habitat consists of the presence of suitable (i.e., open enough for bats to access) drinking and foraging areas with Potential Roost Trees (PRT). A PRT has exfoliating bark, cracks, crevices or cavities that are greater than 5-inch diameter at breast height (DBH).	Yes
Northern Long-Eared bat	*Myotis septrentrionalis*	T	Northern long-eared bats spend winter hibernating in caves and mines, called hibernacula. Suitable summer migratory tree-roosting bat habitat consists of the presence of suitable (i.e., open enough for bats to access) drinking and foraging areas with PRT. A PRT has exfoliating bark, cracks, crevices or cavities that are greater than 3-inch DBH.	Yes
Gray bat	*Myotis grisescens*	E	Gray bats roost in caves year round. Various foraging habitats include wet meadows, damp woods, and uplands.	Yes
Fish				
Boulder darter	*Etheostoma wapiti*	E	Habitat includes deep, rocky, flowing pools in rivers and large tributaries.	No
Slackwater darter	*Etheostoma boschungi*	T	Pool areas of small streams. Slackwater darters mirgrate into flooded lowland areas to spawn.	No
Mollusks/Crustaceans				
Cumberlandian combshell	*Epioblasma brevidens*	E	Inhabits medium-sized streams to large rivers on shoals and riffles in coarse sand and gravel.	No
Tan riffleshell	*Epioblasma florentina walkeri*	E	Found in headwaters, riffles, and shoals in sand and gravel substrates. Possible suitable habitat on-site but all nearby occurrences are historic or known to be extirpated.	Yes

Common Name	Scientific Name	Status	Preferred Habitat	Potential Habitat on Project Site
Tubercled blossom pearlymussel	*Epioblasma torulosa torulosa*	E	Riffles or shoals in shallow water with sandy gravel substrate and rapid currents.	No
Turgid blossom pearlymussel	*Epioblasma turgidula*	E	Found in clear, unpolluted water; typically found buried in sand and gravel substrates of shallow, fast-flowing streams.	No
Shiny pigtoe	*Fusconaia cor*	E	Relatively silt-free substrates of sand, gravel, and cobbline in good flows of larger streams.	No
Finerayed pigtoe	*Fusconaia cuneolus*	E	Inhabits clear, high gradient streams in firm cobble and gravel substrates.	No
Cracking pearlymussel	*Hemistena lata*	E	Considered a large river mussel.	No
Pink mucket	*Lampsillis abrupta*	E/S2	Considered a large river mussel.	No
Alabama lampmussel	*Lampsillis virescens*	E/S1	Found in sand and gravel substrates in shoal areas of small to medium streams.	No
Birdwing pearlymussel	*Lemiox rimosus*	E/S1	Found in riffle areas with stable, sand and gravel substrates in moderate to fast currents in small to medium sized rivers.	No
Slabside pearlymussel	*Pleuronaia dolabelloides*	E	Primarly a large creek to moderately sized river species.	No
Fluted kidneyshell	*Ptychobranchus subtentum*	E	Inhabits small to medium/high-gradient rivers in areas with swift current or riffles.	No
Smooth rabbitsfoot	*Quadrula cylindrica cylindrica*	T/S3	Typically in small to medium rivers with moderate to swift currents.	No
Cumberland monkey face	*Quadrula intermedia*	E	Prefers clean, fast flowing water in shoal conditions. Not known from small streams.	No
Rayed bean	*Villosa fablis*	E	Riffle or shoal areas in small to medium-sized creeks. Often associated with vegetation such as *Justicia americana.*	No
Plants				
Price's potato-bean	*Apios priceana*	T	Lighly disturbed areas along roadsides or forest edges.	No
Morefield's leather-flower	*Clematis morefieldii*	E	Limestone bluffs within open red cedar hardwood forests, and near springs, seeps, and ephemeral streams in rocky limestone woods.	No

E = Endangered; T = Threatened

Mammals

Three species of federally listed mammals potentially occur in the Project Area: the gray bat, the northern long-eared bat (NLEB), and the Indiana bat. The gray bat prefers cave habitat year-round. Winter habitat for this species includes deep vertical caves with domed halls, and summer habitat includes warm caves with restricted ceiling access (USFWS 1997). The Indiana bat and NLEB prefer winter habitats that include caves and mines (USFWS 2006, 2015). During the summer, the Indiana bat and NLEB roost singly or in colonies underneath bark, in cavities, or crevices of both live and dead trees of varying size, age, and species (USFWS 2006, 2015).

In February and July 2019, HDR performed assessments of potential habitat for federally listed bat species on the Project Site and in TVA's proposed work areas along the existing TL (Appendix D). Forested areas were assessed for the presence of live trees that exhibit exfoliating bark and dead tree snags with cracks or crevices that could serve as suitable roost habitat. Photographs were also taken to visually document the assessment areas. A total of 13 forest stands (131 acres) were determined to provide potential summer roost and forage habitat for the NLEB and Indiana bat. The boundaries of potential suitable habitat were mapped using a combination of aerial photography, GIS, and sub-meter GPS field mapping. Below is a summary of habitat assessment findings.

No caves or mines are located on the Project Site or in TVA's proposed work areas along the existing TL. Suitable habitat for the gray bat within the Project Site is limited to foraging habitat.

Suitable summer roosting habitat for the Indiana bat and NLEB, consisting of trees of varying ages including dead snags, is located on the Project Site and in TVA's proposed work areas along the existing TL. There are approximately 109 acres of moderately to highly suitable summer roosting habitat located within the Project Site and approximately 15 acres of moderately to highly suitable summer roost habitat located in TVA's proposed work areas along the existing TL. Additionally, one abandoned residential building that could provide suitable summer roost habitat for NLEBs is present on the Project Site.

Foraging habitat for all three bat species occurs over ponds, wetlands, and streams located on the Project Site. Additional foraging habitat for Indiana bat and NLEB occurs over forested habitat, forest edges, and tree lines on the Project Site and in TVA's proposed work areas along the existing TL. Water resources for all three bat species include one pond primarily fed by rainwater and stream channels.

Fish

Two federally listed fish species have the potential to occur in the Project Area. The boulder darter prefers deep, rocky flowing pools in large tributaries and rivers (NatureServe Explorer 2019). The slackwater darter is known to occur in Alabama in the Flint River in Madison County (USFWS 2005). The slackwater darter prefers gravel-bottomed pools in sluggish areas of creeks or small rivers (NatureServe Explorer 2019). The perennial streams on the Project Site and in TVA's proposed work areas along the existing TL are small, exhibit slow-moving flows over a low gradient, exhibit substrate embeddedness, and are incised. Therefore, suitable habitat to support

the slackwater darter or the boulder darter does not occur on the Project Site or in TVA's proposed work areas along the existing TL.

Mollusks

There are 15 federally listed mollusk species that potentially occur in the Project Area. Thirteen of the listed mollusks, consisting of birdwing pearlymussel, cracking pearlymussel, Cumberland combshell, Cumberland monkeyface, finerayed pigtoe, fluted kidneyshell, pink mucket, rayed bean, shiny pigtoe, slabside pearlymussel, smooth rabbitsfoot, tubercled blossom pearlymussel, and turgid blossom pearlymussel, require medium-sized to large rivers, where most of the species occupy sand and gravel shoal areas with at least moderate current velocities and clean water. These suitable rivers are larger and with more flow than Big Huckleberry and Little Huckleberry creeks and their tributaries (NatureServe Explorer 2019). Based on NatureServe Explorer, the closest records of most of these species occur in the Elk River. The on-site perennial streams on the Project Site and in TVA's proposed work areas along the existing TL are too small, too low gradient, and exhibit flows too low to support these federally listed mollusks. Therefore, suitable habitat does not exist for these species.

While tan riffleshell and Alabama lampmussel are not known to occur in the same drainage as the Project Site or TVA's proposed work areas along the existing TL, the on-site streams are of the variety used by these species. However, known occurrences of these species are all historical and, in some cases, known to be extirpated. Therefore, while possible, it is unlikely that the tan riffleshell or the Alabama lampmussel occur on the Project Site or in TVA's proposed work areas along the existing TL.

Plants

Two federally listed plant species were included in the TVA RNHD results as potentially occurring within 5 miles of the Project Area. There are no known occurrences of the federally listed Price's potato bean or Morefield's leather flower in Lincoln County, Tennessee. There are extant populations of both these species in Madison County, Alabama. However, there is no suitable habitat for these species on the Project Site or in TVA's proposed work areas along the existing TL.

State-Listed Species

State-listed species identified during database research that have the potential to utilize the Project Area but are not federally listed species are shown in Table 3-5. These consist of 13 mollusks, seven plant species, and three fishes that have a state status or rank. One additional state-listed plant species, a population of *Carex bullata*, was identified during the field survey of the Project Site and is also included in Table 3-5.

Table 3-5. State-listed species potentially occurring in the Project area

Common Name	Scientific Name	State Status	Preferred Habitat	Habitat on Project Site
Fish				

Common Name	Scientific Name	State Status	Preferred Habitat	Habitat on Project Site
Ashy darter	*Etheostoma cinereum*	E	Inhabits clear, cool and warm, moderate gradient, small to medium upland rivers.	No
Tuscumbia darter	*Etheostoma tuscumbia*	--	Inhabits vegetated spring pools and runs with slow current. Usually associated with watercress or other aquatic plants.	No
Flame chub	*Hemitremia flammea*	--	Inhabits springs, shallow seepage waters, and spring-fed streams usually over gravel in areas where aquatic vegetation is abundant.	No
Mollusks				
Slippershell mussel	*Alasmidonta viridis*	--	Species typically found in small creeks and streams.	Yes
Channelled disk	*Discus clappi*	--	Inhabits riffle and shoal areas with moderate to swift current velocities.	No
Angled riffleshell	*Epioblasma biemarginata*	--	Extirpated.	No
Tennessee pigtoe	*Fusconaia barnesiana*	--	Inhabits riffle and shoal areas with moderate to swift current velocities.	No
Umbilicate river snail	*Leptoxis umbilicata*	--	Prefers rocky, fast flowing, medium sized rivers.	No
Ornate rocksnail	*Lithasia geniculata*	--	Large river species.	No
Warty rocksnail	*Lithasia lima*	--	Large river species.	No
Round hickorynut	*Obovaria surotunda*	--	Large river species.	No

Common Name	Scientific Name	State Status	Preferred Habitat	Habitat on Project Site
Southern cave crayfish	*Orconectes australis australis*	--	Pools of rapidly flowing subterranean streams, sometimes on rocky and gravel substrates of flowing parts.	No
Tennessee clubshell	*Pleurobema oviforme*	--	Requires at least moderate flow.	No
Kidney shell	*Ptychobranchus fasciolaris*	--	Prefers medium sized rivers with at least moderate flow.	No
Purple lilliput	*Toxoplasma lividus*	--	Found in riffle habitats in small to medium-sized rivers and creeks.	Yes
Painted creekshell	*Villosa taeniata*	--	Found in a substrate of mixed sand and gravel with good current in less than three feet of water in rivers of all sizes.	No
Plants				
American smoke tree	*Cotinus obuvatus*	S	Limestone outcrops in deciduous forests.	No
Button sedge	*Carex bullata*	S	Acidic soil of bogs and boggy meadows, open swamp forests, peaty or sandy pond and lakeshores, seeps	Yes
Wolf spikerush	*Eleocharis wolfii*	E	Wetland with suitable light penetration.	No
Florida hedge hyssop	*Gratiola floridana*	E	Wet ditches, swamps, seeps, and along spring runs.	No
Narrowleaf bushclover	*Lespedeza angustifolia*	T	Barrens.	No

Common Name	Scientific Name	State Status	Preferred Habitat	Habitat on Project Site
Alabama snow wreath	*Neviusia alabamensis*	T	Forested bluffs, tallus slopes and streambanks typically on thin soils over limestone.	No
Maryland milkwort	*Polygala mariana*	S	Prefers bogs and open wet areas.	No
Limerock arrowwood	*Viburnum bracteatum*	S	Rich limestone woods along steep slopes or stream banks.	No

E = Endangered; T = Threatened; S = Special Concern

Fish

Three state-listed fish species potentially occur in the Project Area: Ashy darter, flame chub, and Tuscumbia darter. The ashy darter prefers clear, moderate gradient, small to medium upland rivers (NatureServe Explorer 2019). The latter two species prefer clean, clear, spring pools with abundant aquatic vegetation. The perennial streams located on the Project Site and in TVA's proposed work areas along the existing TL are too small or do not have suitable characteristics to support any of these state-listed fish species that may occur in the Project Area.

Mollusks and Crustaceans

There are 12 state-listed mollusk species and one state-listed crustacean species that have the potential to occur in the Project Area. The perennial streams on the Project Site and in TVA's proposed work areas along the existing TL are too small, too low gradient, and exhibit flows too low to support the Tennessee pigtoe, round hickorynut, Tennessee clubshell, kidney shell, painted creekshell, umbilicate river snail, ornate rocksnail, and warty rocksnail (NatureServe Explorer 2019). Therefore, suitable habitat does not exist for these species on the Project Site or in TVA's proposed work areas along the existing TL.

While angled riffleshell is not known to occur in the same drainage as the Project Site or TVA's proposed work areas along the existing TL, the on-site streams are of the variety used by this species. However, known occurrences of this species are all historical and, in some cases, known to be extirpated. Similarly, the channeled disk is a terrestrial species with only one known population, which is outside of the Project Area (NatureServe Explorer 2019).Therefore, while possible, it is unlikely that the angled riffleshell or the channeled disk occur on the Project Site or in TVA's proposed work areas along the existing TL.

The southern cave crayfish live in pools of rapidly flowing water in subterranean stream complexes. There are no caves or subterranean streams on the Project Site (NatureServe Explorer 2019).

The slippershell mussel and purple lilliput are known to occur in riffle type habitat in smaller creeks and streams (NatureServe Explorer 2019). Therefore, potentially suitable habitat for these species exists in Big Huckleberry Creek on the Project Site.

Plants

Seven state-listed plant species were included in the TVA RNHD results as potentially occurring within 5 miles of the Project Site. Suitable habitat, as described in Table 3-5, does not exist on the Project Site or in TVA's proposed work areas along the existing TL for any of the state-listed plants potentially occurring in the Project Area. A population of *Carex bullata*, a species of special concern in Tennessee, was identified on the Project Site. There are approximately 64 known occurrences of *C. bullata* in eight known counties in Tennessee, including Lincoln County. As such, the species is considered rare and uncommon in the state. Globally, the species is ranked G5, which means the species is widespread and secure worldwide (TDEC 2016). Commonly known as button sedge, *C. bullata* occurs in bogs and forested wetlands and was identified in a forested wetland in the northern portion of the Project Site.

Eagles

Both bald and golden eagles are protected by the MBTA and the Bald and Golden Eagle Protection Act of 1940 (BGEPA, 16 U.S.C. 668-668d). Under the BGEPA it is illegal to kill, harass, possess (without a permit), or sell bald and golden eagles and their parts.

Bald eagles typically utilize forested areas adjacent to large bodies of water for nesting habitat. Tall, mature coniferous or deciduous trees that afford a wide view of the surroundings are used as nest trees and roost trees. Bald eagles typically avoid heavily developed areas. Suitable summer nesting habitat for bald eagles generally consists of prominent trees along riparian corridors on large bodies of water. Winter habitat in Tennessee includes reservoirs and large rivers. Bald eagles are known to nest in Tennessee, with 175 nesting pairs as of 2012 (TWRA 2019). Some large trees that may meet the needs for a nest or roost site occur in the Project Area, and portions of the Elk and Flint rivers are located within 10 miles of the Project Site. However, no bald eagles or bald eagle nests were observed during the field investigations, and the likelihood is low that bald eagles would be found on the Project Site due to the distance to large waterbodies, the interceding substantial forested areas that exist in between the Project Site and large waterbodies, and the relative lack of trees on the Project Site and surrounding vicinity. Therefore, bald eagles are unlikely to nest in the Project Site but could pass through the Project Site.

Golden eagles occur as rare winter residents in Tennessee. The Project Site encompasses suitable winter roosting and foraging habitat. Therefore, while the species is rare in the region, the golden eagle could potentially occur in or pass through the Project Site.

3.4.2 Environmental Consequences

This section describes the potential impacts to biological resources should the No Action Alternative or the Proposed Action Alternative be implemented.

3.4.2.1 No Action Alternative

Natural Areas

Under the No Action Alternative, there would be no Project-related impacts to the Flintville Hatchery State WMA, located approximately 1 mile northwest of the Project Site. It is assumed the area would continue to be managed as it is currently.

Vegetation

Under the No Action Alternative, there would be no Project-related impacts to the existing vegetation in the Project Area, and existing agricultural areas would likely remain in agricultural production. Over time, it is possible that the open-field areas on the Project Site could become developed, and the forested areas could become cleared if the resident population in the area increases or land uses change.

Wildlife

Under the No Action Alternative, there would be limited impacts to wildlife in the Project Area. Existing land use would remain as a mix of agricultural, developed, and undeveloped land. The agricultural fields on site would be expected to continue to be regularly used, limiting their use by wildlife.

Rare, Threatened, and Endangered Species

Under the No Action Alternative, no Project-related impacts to rare, threatened, and endangered species would occur.

3.4.2.2 Proposed Action Alternative

Under the Proposed Action, direct impacts to vegetation and wildlife would result from construction and operation of the Project.

Natural Areas

The Proposed Action is not anticipated to have any impacts on the biological resources associated with the Flintville Hatchery State WMA given the nature of the activities and the distance (1 mile) of the WMA to the Project Site.

Vegetation

Under the Proposed Action, the solar facility would have direct impacts to vegetation. While most of the site is agricultural fields, 97 acres of trees and other tall vegetation have the potential to be removed from the 1,707-acre Project Site. With the exception of some biologically sensitive areas associated with jurisdictional streams and wetlands, the trees within the fenced-in area of the Elora Solar Energy Center would be removed for grading and to prevent shading of the solar arrays. Forested acreage within the fenced-in area amounts to 14 acres. Tall vegetation would also be removed for the construction of the proposed Mann Road 161-kV Switching Station and associated access road and within and immediately adjacent to the approximate 100-foot wide ROW for the proposed Elora Solar 161-kV TL. A total of 83 acres of trees have the potential to be removed from this area. TVA's proposed work along the existing TL would require minimal to no

tree clearing and is expected to be limited to small trees and limb trimming only along existing access roads.

Following construction, disturbed portions within the fenced-in area of the Elora Solar Energy Center would be seeded with native grasses and/or noninvasive vegetation, and the solar facility would be maintained to prevent vegetation from growing taller than 18 inches, as described in Section 2.2.3. Routine management of vegetation within non-agricultural portions of the cleared Elora Solar 161-kV TL ROW would be conducted under an integrated vegetation management approach designed to encourage the low-growing plant species and discourage tall-growing plant species. This would result in the long-term conversion of approximately 1,471 acres of the Project Site from agricultural fields with scattered forested or scrub/shrub areas to a mix of native and/or noninvasive grass and herbaceous vegetation.

Invasive species on the Project Site would be removed or graded and cleared during construction and managed with selective herbicides as needed during operations. To minimize the introduction and spread of invasive species, standard operating procedures would be consistent with EO 13112 (Invasive Species) for revegetating the area with noninvasive plant species. It is likely that construction of the Project would result in localized increases of invasive plants, but the plants most likely to colonize the area are distributed widely throughout the region. Effects would be further reduced because revegetation of the site would be accomplished using native and/or noninvasive species. The Project would not significantly contribute to the spread of exotic or invasive species.

Approximately 97 acres of forested land, constituting approximately 79 percent of existing forested land on the Project Site, has the potential to be cleared for the Project. Except for the impacted jurisdictional water features as described in Section 3.3.2.2, Project components would not be constructed within a 50- to 60-foot buffer of the jurisdictional streams and wetlands, and the buffer area would generally be avoided during construction, as described in Section 2.2.2. Tree removal associated with the Project would be minimized to the extent possible, particularly to the north of proposed components, as trees in this vicinity would not shade the solar panels.

Taking into consideration the large amount of similar vegetation types in the area regionally and locally, clearing the existing vegetation and light grading would be considered minor impacts. Approximately 1,582 acres (93 percent) of the 1,707-acre Project Site are agricultural fields, pastures, or otherwise cleared, open land, while approximately 123 acres (7 percent) of the Project Site are forested. The surrounding area consists of similar vegetation communities of mostly agricultural land and some forested areas, including the state-owned and protected Flintville Hatchery State WMA; therefore, the effects of the conversion of portions of the Project Site in this context would be relatively small.

Wildlife

Under the Proposed Action, the proposed solar facility would be constructed on the Project Site with direct impacts to certain types of wildlife habitat. Approximately 97 acres of forest habitat may be cleared within the 1,707-acre Project Site. The forest generally occurs in linear patches along field borders or streams and in small patches within the agricultural landscape and consists of

mixed oak woodlands. Several nonnative invasive species were observed in the forested areas, particularly in the bottomland areas of the Project Site adjacent to the larger stream channels. Although these areas may be linear or in small patches, they represent patches of refuge or corridors for movement for forest-dependent wildlife. The removal of forested habitat from the site would have direct and indirect adverse effects on common wildlife species that utilize wooded habitat on the site. This would result in the temporary to long-term displacement of wildlife (primarily common native or naturalized species) using the area. Direct effects to some individuals may occur if those individuals are immobile during the time of vegetation removal.

Considering the amount of similar quality habitat in the Project Area, it is unlikely that any wildlife species would be unable to relocate successfully. Therefore, the Project would have minor impacts on populations of common wildlife species.

Migratory Birds

The clearing of forest would eliminate potential habitat for the wood thrush and Kentucky warbler, as well as other more common migratory birds inhabiting forests. The removal of wooded and brushy fencerows and scattered large trees would eliminate potential habitat for the red-headed woodpecker. Areas of the TL ROWs that are not maintained as grassland or cropland would provide habitat for the prairie warbler and, when adjoining woodland, the blue-winged warbler, particularly near the end of their vegetation management cycles when shrubs and tree saplings would be most prevalent. The Project would establish 50-foot buffers surrounding most wetlands and maintain the existing vegetation. The wetlands that would be impacted by the Project are farmed wetlands of low habitat quality; therefore, the Project effects to wetlands would not result in an impact to populations of migratory birds.

Although construction and operation of the Project may reduce the foraging potential on the Project Site and in TVA's proposed work areas along the existing TL, the Project is not anticipated to have a significant effect on populations of migratory birds that require open country with scattered trees and shrubs, such as the prairie warbler. The Project would minimize impacts to nesting birds by clearing trees and other tall vegetation during the nonbreeding season. Similar habitat type is available adjacent to the Project Site and would likely absorb displaced individuals.

Due to the maintenance of 50- to 60-foot buffers surrounding wetlands and intermittent and perennial streams, the Project would have minimal impacts on mature, deep, and shady bottomland forest, which provides habitat for species such as the wood thrush and Kentucky warbler. Therefore, the Project would have minor adverse effects on these species. Any effects would be limited in scale relative to the surrounding available habitat.

Rare, Threatened and Endangered Species

Suitable habitat exists for the federally listed NLEB, Indiana bat, and gray bat and for the state-listed slippershell mussel and purple lilliput. Since there is no suitable roosting habitat for gray bat on the Project Site, there is low potential for impacts to this species. In order to minimize the potential for effects to federally listed bat species, Elora Solar would limit tree clearing activities and demolition of one abandoned residential building to between October 15 and March 31 when

these species are not expected to be present. TVA would employ a similar approach for Project-related limb trimming and small tree removal along the existing Winchester-Fayetteville 161-kV TL; these activities would also be limited to October 15 through March 31. Consultation with the USFWS under Section 7 of the ESA is under way regarding the potential effects of the Proposed Action on federally listed bat species.

Impacts to potential habitat for slippershell mussel and purple lilliput would be avoided by limiting road crossings of Big Huckleberry Creek to an area previously disturbed by a ford crossing. Therefore, the Project would be unlikely to impact these species.

A population of *Carex bullata*, a special concern species in Tennessee, occurs in the ROW of the proposed Elora Solar 161-kV TL. Impacts to this population would occur due to the need to locate two to five pole structures and portions of necessary access roads associated with the proposed TL within the *C. bullata* habitat. These impacts would be minimized by the placement of the structures and roads in limited portions of the habitat. The impacts would be long term; however, the impacts are not significant because no individual populations would be extirpated, and the distribution of species would not be affected at the state level, where 64 populations are known to occur within eight counties.

Overall, implementation of the Proposed Action with identified seasonal tree clearing restrictions would not result in significant effects to any federally listed threatened or endangered aquatic or plant species or any state-listed species apart from *C. bullata*.

Bald and Golden Eagles

Some large trees that may meet the needs for a bald eagle nest or roost site occur within the Project Area, and portions of the Elk and Flint rivers are within 10 miles of the Project Site. However, bald eagles are unlikely to nest or forage on the Project Site due to the relative distance to large waterbodies, the existence of substantial interceding forested areas, and the relative lack of trees on the Project Site and surrounding vicinity. In addition, no bald eagle nests have been documented within 3 miles of the Project Site. Therefore, the Project would have no impact on bald eagles. Actions are in compliance with the National Bald Eagle Management Guidelines.

The Project Site encompasses suitable winter roosting and foraging habitat for golden eagles. No golden eagles have been documented within 3 miles of the Project Site. Due to the rarity of golden eagles in the region and the availability of suitable roosting and foraging in nearby similar habitat, the Project is not expected to impact golden eagles.

3.5 VISUAL RESOURCES

This section describes an overview of the visual resources in and surrounding the Project Area and the potential impacts on these visual resources that would be associated with the No Action and Proposed Action Alternatives.

3.5.1 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. For this analysis, the scenery management system (SMS) and associated analytical assessment procedures developed by the U.S. Forest Service are adapted for use within a natural and human-built environment and integrated with planning methods used by TVA (after TVA 2016; USDA 1995). The general Project Area viewshed is evaluated based on its scenic attractiveness and scenic integrity. Scenic attractiveness is a measure of the scenic beauty of a landscape 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. This analysis also considers the existing character of the Project Site as an important factor in understanding the affected environment.

The Project Site is located in a rural agricultural area adjacent to isolated single-family homes, residential farm complexes, and some fairly substantial agricultural complexes, such as large greenhouse and grain bin complexes. In the Project Area, the relatively flat agricultural area that encompasses the Project Site generally extends east-west between hilly, undeveloped, forested land to the north and south. Several linear forested areas associated with water features are scattered across the Project Site, situated between agricultural fields. The Project Site is bordered by predominantly forested land to the south, along the majority of its western boundary, and surrounding its northern extreme. The southern one-third of the Project Site is largely within relatively flat to gently sloping, open agricultural land with scattered forested strips, whereas the northern one-third of the Project Site is largely hilly and forested. The existing Winchester-Fayetteville 161-kV TL to the west of the Project Site, passes through a mix of hilly, forested, and agricultural land with a number of isolated single-family residences and several small single-family residential concentrations. The community of Elora is located approximately 1.3 miles to the south of the Project Site. Photos 3.5-1 and 3.5-2 present general views of the Project Site.

Scenic attractiveness of the general Project Area viewshed is rated as typical or common of a rural-agricultural and sparsely residential area. Scenic integrity is assessed as moderate to high due to the relative unity of the surrounding natural and cultural character.

Photo 3.5-1. Overview of the southern portion of the Project Site, looking south from Winchester Highway (US 64) (Google Streetview, June 2018).

Photo 3.5-2. Overview of the northern portion of the Project Site, looking northeast from the intersection of Winchester Highway (US 64) and Hotel Road (Google Streetview, June 2018).

Prominent visual resources surrounding the Project Site include scattered residential and nonresidential farm complexes, along or off of Winchester Highway (US 64), Terry Dunavan Road, Hotel Road, Shady Grove Road, Shady Grove Cemetery Road, and a private drive linking

Hotel Road and Shady Grove Road. Winchester Highway is a four-lane divided highway that extends east-west and bisects the Project Site a little south of its central portion. Terry Dunavan Road and Hotel Road generally extend north-south along the eastern boundary of the southern half of the Project Site. Shady Grove Road bisects the Project Site near its northern extent. The northern extent of the Project Site terminates at Shady Grove Cemetery Road. Major visual resources surrounding the Project Site are discussed below, in relation to their proximity to the southern portion of the Project Site, located south of Winchester Highway, or the northern portion of the Project Site, located north of Winchester Highway.

Prominent visual resources surrounding the southern portion of the Project Site include a small number of scattered residences, residential farm complexes and nonresidential agricultural complexes located along Terry Dunavan Road and Winchester Highway. Along Terry Dunavan Road, one agricultural complex consisting of one barn and several grain bins is located on the Project Site, in the southeast corner (Photo 3.5-3). The residence across the road from this complex (also shown in Photo 3.5-3) is surrounded by a mature tree buffer to the north, east, and south. To the north of these resources, three additional residences are located along the east side of Terry Dunavan Road. Two of these residences have substantial mature tree buffers surrounding them on all sides. The third residence has some maturing vegetative plantings to the west and north.

Photo 3.5-3. An agricultural complex along Terry Dunavan Road in the southeast corner of the Project Site (red boundary) (Google Earth 2018).

Along the south side of Winchester Highway, six visual resources exist in proximity to the Project Site. Two of these are to the east of the Project Site, two are to the west, and the remaining two are located on the Project Site. An isolated residence and a residential farm complex with several grain bins and large outbuildings are located to the east of the Project Site. Both the residence and the residential farm complex have mature trees immediately to their east and west. The two resources to the west of the Project Site consist of two residences with substantial mature tree buffers to the east and south. One agricultural complex consisting of a barn and several grain bins is located on the Project Site. To the west of the agricultural complex, an abandoned residence surrounded by mature trees is also located on the Project Site.

Photo 3.5-4. An agricultural complex and a nearby residence along Winchester Highway (US 64), within/adjacent to the Project Site, looking west along Winchester Highway (Google Streetview, August 2018).

Three prominent visual resources, consisting of residential farm complexes, exist along the north side of Winchester Highway, in proximity to the Project Site. One of these farm complexes is located across from the northwest corner of the southern portion of the Project Site and has mature tree buffers to the north and west (Photo 3.5-5). The second of these visual resources, the residence shown in Photo 3.5-4, is located north of the southern portion of the Project Site. Mature tree buffers abut this residence to the west and an agricultural complex is in view to the south. The third residence is located to the east of the Project Site. This residence has mature tree buffers to the north and west. Two additional residences are substantially set back from Winchester Highway; these have some vegetative plantings that have not yet matured.

Photo 3.5-5. Residence to the north of Winchester Highway (US 64), looking northwest from Winchester Highway (Google Streetview, June 2018)

Prominent visual resources surrounding the northern portion of the Project Site include scattered residences and some residential farm complexes located along Winchester Highway, Hotel Road, a private drive linking Hotel Road and Shady Grove Road, Shady Grove Road, and Shady Grove Cemetery Road. One residential farm complex is located along Hotel Road, to the east of the Project Site. Mature trees obscure long-range views to the north and southwest. Along a private drive extending west from Hotel Road, a residence and an associated greenhouse complex are located to the north of the Project Site. Mature trees flank these visual resources to the north, south, and west. Along Shady Grove Road, a small grouping of associated residences exists adjacent to the Project Site, to the south and east. A substantial tree buffer to the north of these resources obscures long-range views. Three additional residential farm complexes exist along Shady Grove Road adjacent to the Project Site. Nearby mature tree buffers surround two of these properties to the south. Long-range views to the south from the third complex are also obscured by these trees.

Several residences and agricultural buildings to the north of Snow Road, to the west of Benson School Road, to the north and west of Howell Hill Road, and along Lackey Road are in proximity to the areas where TVA is proposing improvements along an existing TL.

3.5.2 Environmental Consequences

This section describes the potential impacts to visual resources should the Proposed Action or No Action Alternative be implemented. For this analysis, the construction and operation phases are treated separately as construction would be temporary and have different visual impacts from the longer-term operation phase.

3.5.2.1 No Action Alternative

Under the No Action Alternative, the proposed solar facility would not be constructed; therefore, no Project-related impacts to visual resources would result. Existing views of the Project Site would be expected to remain relatively unchanged from the predominant mix of agricultural, rural-residential, and forested land. Impacts to visual resources are likely as the nearby communities of Elora, Huntland, and Flintville grow. Additionally, visual changes may occur over time as vegetation on the Project Site changes. For example, if the land were no longer cultivated or mowed, vegetation would change from low-profile plants to shrubs and trees.

3.5.2.2 Proposed Action Alternative

Visual concerns are often associated with both large- and small-scale solar facilities and their electrical infrastructure. The Project Site consists of relatively flat to gently sloping terrain, and the Project would convert what is largely now agricultural, rural-residential, and forested lands to an industrial use mostly consisting of low-profile PV arrays. Figures 2-2 and 2-4 show the proposed Project elements.

During February and July 2019 visits to the Project Site, the potential for visual impacts from the Proposed Action were assessed. Long-range views to the north from the community of Elora are obscured by forest south of the Project Site. Long-range views from the prominent visual resources near the Project Site, primarily along or off of Winchester Highway, Terry Dunavan Road, Hotel Road, Shady Grove Road, Shady Grove Cemetery Road, and a private drive linking Hotel Road and Shady Grove Road, are generally limited by mature trees, agricultural outbuildings and grain bins, and sloping terrain. Those resources that do not have substantial tree buffers, such as two residences along the north side of Winchester Highway, are generally set back from the proposed Project components with enough distance to obscure views to the Project Site.

Because of the relative openness of the surrounding land and proximity to the Project Site, the residential and agricultural properties along or near Winchester Highway and Terry Dunavan Road are expected to be more impacted than other properties near the Project Site. From Winchester Highway, the sloping terrain to the south, toward Big Huckleberry and Little Huckleberry creeks, would help obscure views to the Project Site. Additionally, the solar panels would be facing east, upward, or west and not to the north, where these residential properties are located. Three small residential complexes, located just outside the southeast portion of the Project Site, to the east of Terry Dunavan Road, have mature hardwoods that would partially obscure views from these properties toward the Project Site. Additionally, the proposed solar panels are set back several hundred feet to the west of Terry Dunavan Road in this area. Lighting associated with the proposed Project substation, near the intersection of Winchester Highway and Terry Dunavan Road, would be downward-facing and timer- and/or motion-activated to minimize impacts to surrounding areas. Thus, the visual impacts to the properties along Winchester Highway and Terry Dunavan Road are expected to be moderate to minor, depending on the existing tree buffers and slope of the terrain near these properties.

Travelers along Winchester Highway and Terry Dunavan Road, a two-lane local road, would view large portions of the Project to the south and west, respectively, as there are few trees to buffer views. The proposed solar panels would be set back between 50 feet to several hundred feet from these roadways. Additionally, the proposed anti-reflective, PV panel surfaces would minimize or eliminate negative impacts such as glare and reflection. Occupants of the approximate 3,365 daily vehicles (TDOT 2019) traveling east or west on Winchester Highway would likely view the solar facility to the south for approximately two minutes. Due to the east-west orientation of Winchester Highway, views during the majority of the two-minute travel time passing the Elora Solar Energy Center would be at an oblique angle, which would make the visual effects more minimal to travelers.

Construction of the proposed Project would temporarily alter the visual character of the Project Area. During construction, heavy machinery would be present, changing the visual aspects from Project Area vantage points. Currently, the southern portion of the Project Site is largely open agricultural fields, with the only trees generally along natural drainages. Within the 1,521-acre area to be developed or temporarily affected for the Project, trees and other tall vegetation would be removed, and portions of the area would be graded, changing the contour, color, and texture of the scenery attributes. The Project Site would appear as a mixture of neutral colors such as browns and grays due to earthmoving, road construction, and concrete activities. Water would be used to keep soil from aerosolizing; thus, dust clouds are not anticipated. Visual impacts from construction would be minimal at night, as most construction is anticipated to occur during the day. Erosion control silt fence and sediment traps would be removed once construction is complete, and bare areas would be promptly vegetated.

From Project Area vantage points along and off of Terry Dunavan Road and eastern portions of Winchester Highway, as well as westbound traffic on Winchester Highway, the manufactured, structured appearance of the Elora Solar Energy Center would be most apparent. The Project would likely be more visually intrusive in the morning, when the panels would be upright, approximately 8 feet from the ground at full tilt, facing east. This effect would be least at mid-day, when the panel profile would be lower (approximately 5-feet-tall when lying flat). Photos 3.5-6, 3.5-7, and 3.5-8 present representative views of the type of solar panels proposed for the Project. In the evening, when the panels would be upright facing west, the visual effects would largely occur from Project Area vantage points along and off of western portions of Winchester Highway, as well as eastbound traffic on this highway.

Indirect impacts to visual resources in the Project Area may occur due to increased traffic and movement of heavy machinery on the Project Site and along local roads. Overall, there would be minor direct and indirect impacts to visual resources during the construction phase of the Proposed Action. However, these impacts would be temporary (approximately 20 months).

Overall, the visual alteration from agricultural land in an area where scenic integrity is rated as moderate to high due to the relative unity of the surrounding natural and cultural character to a large solar facility is expected to result in moderate adverse impacts. Due to the relatively substantial mature tree buffers in some areas but mostly open agricultural fields in others, visual impacts during the operation phase of the Project would be minor to moderate in the immediate

vicinity and minor to minimal on a larger scale, due to variation of the visual attributes of the Project Area as distance from the Project increases.

The proposed Elora Solar 161-kV TL extending from the Elora Solar Energy Center, over Winchester Highway, and along the state and local roads in the northern portion of the Project Site would be constructed in substantially forested, hilly areas with scattered residences. The new TL would likely be visible from a few residences along Winchester Highway, Hotel Road, and Shady Grove Road as well as by travelers on these roadways. At the northern end of the proposed TL, the proposed Mann Road 161-kV Switching Station would be built. This hilly area is surrounded by mature trees, and it is unlikely that the proposed switching station or associated lighting would be visible from residences or other visual resources in the vicinity, the closest of which is approximately 1,000 feet to the north of the proposed switching station, along Shady Grove Cemetery Road. Travelers along Shady Grove Cemetery Road would also be unlikely to see the switching station.

To the west of the proposed switching station, seven wood H-frame pole structures (Structures 546, 550, 554, 563, 576, 578, and 582) along TVA's existing Winchester-Fayetteville TL are proposed to be replaced with taller steel H-frame structures to support the proposed OPGW, as described in Section 2.2.5. This existing TL extends through a mix of hilly, forested areas and agricultural areas with scattered residences and some small residential concentrations. Only four of the seven structures proposed for replacement are located in the vicinity of any visual resources. Structure 563 is located in the vicinity of several residences to the north of Snow Road. Structure 563 is currently 56.5 feet tall and is proposed to be replaced with a structure 61 feet tall. Structure 554 is in the vicinity of several residences and agricultural buildings located to the west of Benson School Road and may be visible from several buildings located to the north and west of Howell Hill Road. Structure 554 is currently 61 feet tall and is proposed to be replaced with a structure 65.5 feet tall. Structure 550 may be visible from several buildings located to the west of Lackey Road; however, the view of the proposed taller structure from these residences is largely blocked by mature trees. Structure 550 is currently 56.5 feet tall and is proposed to be replaced with a structure 61 feet tall. Structure 546 may be visible from several buildings located approximately 1,000 feet to the east, along Lackey Road. Structure 546 is currently 61 feet tall and is proposed to be replaced by a structure 65.5 feet tall. Each of the four structures proposed for replacement in the vicinity of residences would only be 4.5 feet taller than their current height and of the same style (H-frame) as the current structures. While the new structures would be steel rather than wood and would contrast more than wood when viewed against a background other than sky, the new structures are not expected to drastically change the visual effects to nearby residences. Therefore, the replacement of these structures would have a minimal to negligible impact to nearby visual resources.

Photo 3.5-6. Single-axis, tracking photovoltaic system with panels showing some tilt as viewed from the east or west

Photo 3.5-7. Photovoltaic system with panels showing some tilt as viewed from the north or south

Photo 3.5-8. Photovoltaic system with panels showing some tilt as viewed from the north or south (gravel ground cover is not representative of Project plans)

3.6 NOISE

This section provides an overview of the existing ambient sound environment in the Project Area, and the potential impacts to the ambient sound environment that would be associated with the No Action and Proposed Action Alternatives.

3.6.1 Affected Environment

Noise is generally described as unwanted sound, which can be based either on objective effects (hearing loss, damage to structures, etc.) or subjective judgments (such as community annoyance). Sound is usually represented on a logarithmic scale with a unit called the decibel (dB). Sound on the decibel scale is referred to as sound level. The threshold of human hearing is approximately 0 dB, and the threshold of discomfort or pain is around 120 dB.

Noise levels are computed over a 24-hour period and adjusted for nighttime annoyances to produce the day-night average sound level (DNL). DNL is the community noise metric recommended by the USEPA and has been adopted by most federal agencies (USEPA 1974). A DNL of 65 A-weighted decibels (dBA) is the level most commonly used for noise planning purposes and represents a compromise between community impact and the need for activities such as construction. The A-weighted sound level represents the approximate frequency response characteristic of the average young human ear. Areas exposed to a DNL above 65 dBA

are generally not considered suitable for residential use. A DNL of 55 dBA was identified by USEPA as a level below which there is no adverse impact (USEPA 1974). For reference, approximate noise levels (measured in dBA) of common activities/situations are provided in Table 3-6.

Table 3-6. Noise Levels of Common Activities/Situations.

Activity/Event	dBA
Lowest audible sound to person with average hearing	0
Quiet rural, nighttime	25
Quiet urban, nighttime	45
Large business office	60
Normal speech at 3 feet	70
Noisy urban area, daytime	75
Food blender at 3 feet	90
Gas lawn mower at 3 feet	100
Jet flyover at 1000 feet	110

***Source**:* Caltrans 2018.

Noises occurring at night generally produce a greater annoyance than do noises of the same levels occurring during the day. People generally perceive intrusive noise at night as being 10 dBA louder than the same level of noise during the day. This perception is largely because background environmental sound levels at night in most areas are about ten dBA lower than those during the day (USEPA 1974).

The Project Site is within an agricultural, rural-residential, and undeveloped area of southeastern Lincoln County. Ambient noise at the Project Site consists mainly of agricultural sounds, such as noises from farm machinery; natural sounds, such as from wind and wildlife; and moderate traffic sounds. Noise levels of these types generally range from 45 to 55 dBA (USDOT 2015).

The Project Site and a surrounding 0.5-mile radius were examined to identify potential noise-sensitive receptors. Noise-sensitive receptors are defined as those locations or areas where dwelling units or other fixed, developed sites of frequent human use occur. Approximately 171 noise-sensitive receptors are within the area examined (Figure 3-9). These primarily consist of residential farm complexes, associated outbuildings, and nonresidential agricultural complexes, with each building generally counted as one receptor. Two nonresidential agricultural complexes, one abandoned residence, and one agricultural outbuilding appear to be extant on the Project Site. Other residential and rural-residential concentrations of noise-sensitive receptors occur around the perimeter of the Project Site, ranging from less than 100 feet to approximately 2,600 feet from proposed PV array locations. Residential concentrations are primarily located near the southern portion of the Project Site, while concentrations of residences and associated outbuildings surround the northern portion of the Project Site.

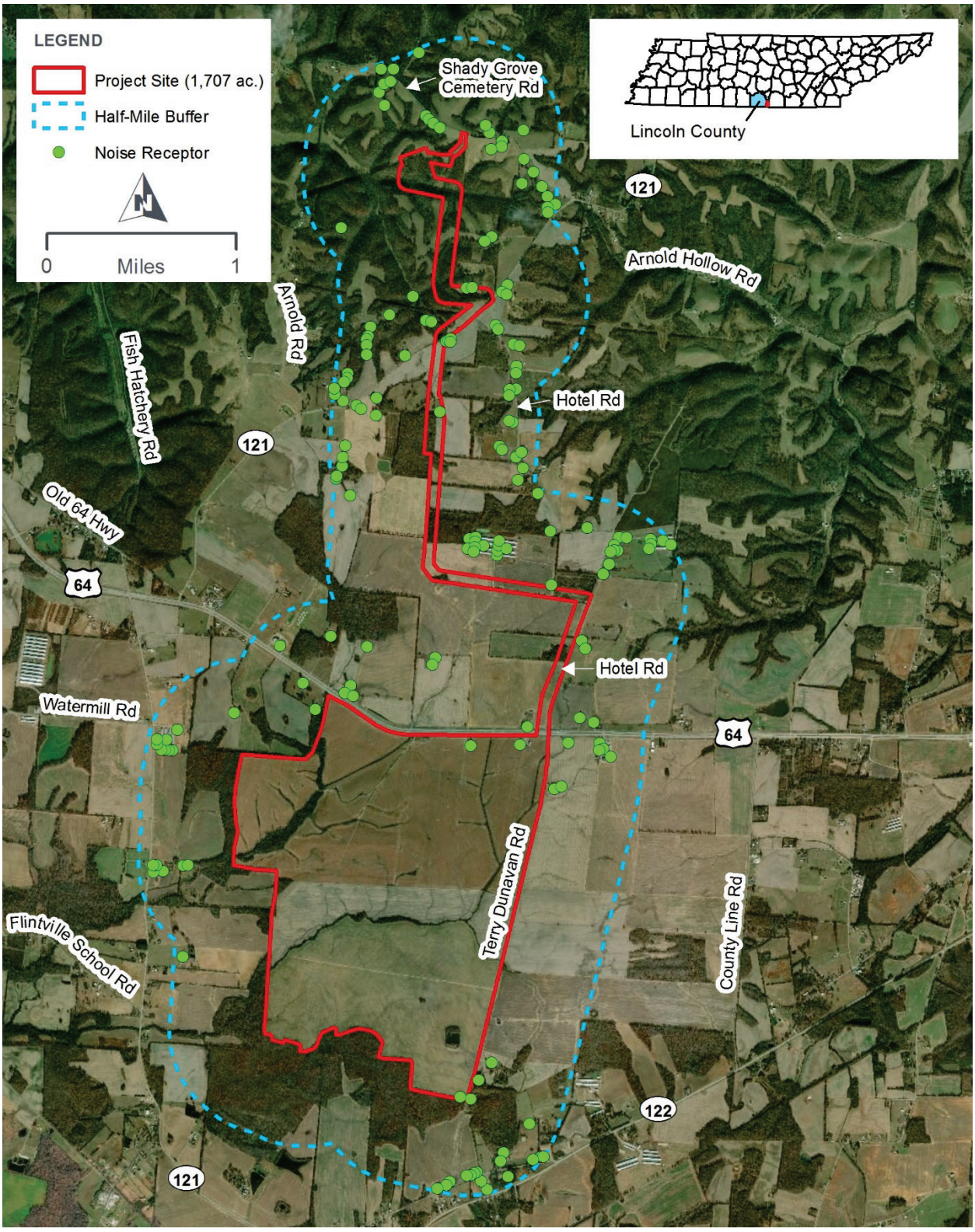

Figure 3-9. Noise-sensitive receptors in the Project Area.

3.6.2 Environmental Consequences

This section describes the potential impacts to the ambient sound environment should the Proposed Action or No Action Alternative be implemented.

3.6.2.1 No Action Alternative

Under the No Action Alternative, the proposed solar facility would not be constructed and no Project-related impacts on the ambient sound environment would occur. Existing land use would be expected to remain a mix of agricultural and undeveloped, forested land; therefore, the ambient sound environment would be expected to remain as it is at present.

3.6.2.2 Proposed Action Alternative

Direct and indirect noise impacts associated with implementation of the Proposed Action 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. This type of equipment may be used for approximately 20 months (approximately 600 days) at the Project Site.

Construction noise would cause temporary and minor adverse impacts to the ambient sound environment around the Project Area. Several residences and residential and nonresidential agricultural complexes are located within a 0.5-mile distance from the Project Site and would temporarily experience heightened noise during construction, primarily from pile-driving activities. However, when the agricultural complexes are active in the fall and early winter, these facilities likely produce ambient sounds that are at or higher than the typical 45 to 55 dBA in the Project Area, and these existing noises would help make effects from the Project more minimal. Additionally, construction would primarily occur during daylight hours, between sunrise and sunset; therefore, the Project 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 Project.

The activity likely to make the most noise for an extended time period would be pile driving during the construction of the array foundations, which would be completed in approximately six months. Standard construction pile drivers are estimated to produce between 90 to 95 dBA at a distance of 50 feet (USDOT 2015). The piles supporting solar panels are anticipated to be driven into on-site soils and potentially into limestone, depending on the depths of piles and on the underlying residuum of limestone in areas where piles would be installed; however, overburden soil thickness will not be confirmed until geotechnical studies occur prior to construction. Construction workers would wear appropriate hearing protection in accordance with Occupational Safety and Health Act (OSHA) regulations. Noise-sensitive receptors adjacent to the proposed Elora Solar 161-kV TL and those near TVA's proposed work areas along the existing Winchester-Fayetteville 161-kV TL would temporarily experience heightened noise primarily during pole drilling for the new TL pole structures during daylight hours. Noise receptors near the existing TL would also experience temporarily heightened noise during the two-week installation of OPGW by helicopter.

Existing ambient noise in the Project Area generally ranges from 45 to 55 dBA and consists mainly of agricultural sounds, such as noises from farm machinery; natural sounds, such as from wind and wildlife; and moderate traffic sounds. Within 50 feet of Winchester Highway, traffic sounds may reach 70 to 80 dBA during high traffic periods (Corbisier 2003). Since construction would only occur during the day for most of the construction period, at the same time that agricultural activities and more traffic would occur, there would not be a significant difference in noise levels with implementation of the Project other than pile and pole driving activities during construction.

Following completion of construction activities, the ambient sound environment would be expected to return to existing levels or below, by eliminating the seasonal use of some agricultural equipment. The moving parts of the PV arrays would be electric-powered and produce little noise. The central inverters would produce noise levels of approximately 65 dBA at 33 feet, and the proposed Elora Solar 161-kV Substation and Mann Road 161-kV Switching Station would each emit approximately 50 dBA at 300 feet. As no noise receptors are within 33 feet of the proposed inverter locations or within 300 feet of the proposed Mann Road 161-kV Switching Station, noise impacts from these Project components are anticipated to be minimal to negligible. An agricultural complex constitutes the only noise receptor within 300 feet of the proposed Elora Solar 161-kV Substation. When operating in the fall and early winter, the agricultural complex produces estimated noise levels at or higher than the approximately 50 dBA produced by the substation. Thus, noise impacts from the Project substation are not anticipated. The periodic mowing of the Project Site to manage the height of vegetation surrounding the solar panels would produce sound levels comparable to those of agricultural operations in the Project Area; however, Project-related mowing would occur at less frequent intervals than typical agricultural operations. Consequently, the Proposed Action would have minimal effects on noise levels as a result of normal continuous operation.

Overall, implementation of the Proposed Action would result in minor, temporary adverse impacts to the ambient noise environment in the Project Area during construction, and minimal to negligible impacts during operation and maintenance of the solar facility.

3.7 AIR QUALITY AND GREENHOUSE GAS EMISSIONS

This section describes existing air quality and GHG emissions in the Project Area and the potential impacts on air quality and GHG emissions that would be associated with the No Action and Proposed Action Alternative.

3.7.1 Affected Environment

Ambient air quality is determined by the type and concentration of pollutants emitted into the atmosphere, the size and topography of the air shed in question, and the prevailing meteorological conditions in that air shed. Through its passage of the Clean Air Act of 1970 (CAA) and its amendments, Congress mandated the protection and enhancement of our nation's air quality. USEPA established the National Ambient Air Quality Standards (NAAQS) for the following criteria pollutants to protect the public health and welfare: sulfur dioxide (SO_2), ozone (O_3), nitrogen dioxide, particulate matter whose particles are less than or equal to 10 micrometers (PM_{10}),

particulate matter whose particles are less than or equal to 2.5 micrometers ($PM_{2.5}$), carbon monoxide (CO), and lead (Pb).

The primary NAAQS were promulgated to protect public health, and the secondary NAAQS were promulgated to protect public welfare (e.g., visibility, crops, forests, soils, and materials) from any known or anticipated adverse effects of air pollutants. Areas in compliance with the NAAQS are designated "attainment" areas. Areas in violation of the NAAQS are designated as "nonattainment" areas, and new sources being located in or near these areas may be subject to more stringent air permitting requirements. Nonattainment areas are usually defined by county. Areas that cannot be classified on the basis of available information for a particular pollutant are designated as "unclassifiable" and are treated as attainment areas unless proven otherwise. Finally, areas that were formerly designated as nonattainment for a pollutant and later come into attainment, are then categorized as "maintenance" for that pollutant for the next 20 years, assuming they continue to meet the NAAQS for that pollutant. If an area remains in attainment for a 20-year maintenance period, the status reverts back to normal attainment.

3.7.1.1 Regional Air Quality

The Project Area in rural Lincoln County has little development in the vicinity apart from that related to rural-residential and agricultural uses. The nearest metropolitan area is Huntsville, Alabama, approximately 25 miles to the southwest of the Project Site. Lincoln County has no air quality monitoring sites listed in USEPA's national database for NAAQS-regulated pollutants and is considered to be in attainment for all NAAQS. There are monitoring sites for some pollutants (O_3, PM_{10} and $PM_{2.5}$) in the Huntsville metropolitan area, but that area and all of Alabama are also designated as in attainment for all NAAQS.

With respect to the newest NAAQS, issued in 2015 for 8-hour ozone concentration (70 parts per billion), the entire State of Tennessee was designated as "attainment/unclassifiable" by USEPA on January 16, 2018. The unclassifiable designation means there are not sufficient monitoring data available to prove that there are no nonattainment issues, but given that monitors in urban areas are showing compliance, rural areas such as Lincoln County are also likely in actual compliance with the 2015 ozone NAAQS and are officially treated as in compliance by USEPA.

Table 3-7 presents the most recent USEPA emission inventory data (USEPA 2019b) for the most prevalent NAAQS pollutants for Lincoln County. These data represent calendar year 2014 anthropogenic emissions from all stationary source and mobile source activities. The table also provides a comparison of Lincoln County emissions with the most populous county in Tennessee, Shelby County in the southwestern corner of the state. The table presents the percentage of Shelby County emissions that Lincoln County emissions comprise. The predominantly rural Lincoln County has relatively low emissions in comparison to Shelby County (which currently meets all NAAQS) and thus is expected to have generally good air quality.

Table 3-7. 2014 emissions of NAAQS pollutants in Lincoln County, and as compared with Shelby County.

Pollutant	Emissions (tons per year)	Percent of Shelby County Emissions
Carbon Monoxide	8,190	7%
Nitrogen Oxides (NO_x)	1,112	3%
PM_{10} Primary	3,477	30%
$PM_{2.5}$ Primary	888	21%
Sulfur Dioxide	28	0.2%
Volatile Organic Compounds (ozone precursor)	1,835	7%

Source: USEPA 2019b

3.7.1.2 Regional Climate

Weather conditions determine the potential for the atmosphere to disperse emissions of air pollutants. Based on climate data from Fayetteville, Tennessee, approximately 15 miles northwest of the Project Area, the coldest month is January, with average maximum and minimum temperatures of approximately 50 degrees Fahrenheit (°F) and 30°F, respectively. The warmest month is July, with average maximum and minimum temperatures of approximately 90°F and 68°F, respectively. Precipitation is highest from November through May, and averages 56 inches per year (NOAA 2019a). Average annual snowfall is around four inches per year. On average, approximately 26 tornados occur in Tennessee each year (NOAA 2019b).

Figure 3-10 presents annual average temperatures over the 84-year period of record for Fayetteville, Tennessee, based on data from Iowa Environmental Mesonet (IEM 2019). The trend line on the chart, as indicated by the embedded line slope equation, shows a slight increase in average temperature over the period of record, although the primary feature appears to be a cyclical variation. The weather station has undergone several relocations over the period of record, and it is unclear how or whether station siting has impacted the annual average temperatures. Based on data reported for Fayetteville, annual average precipitation has increased over the period of record by 10-15 percent (IEM 2019).

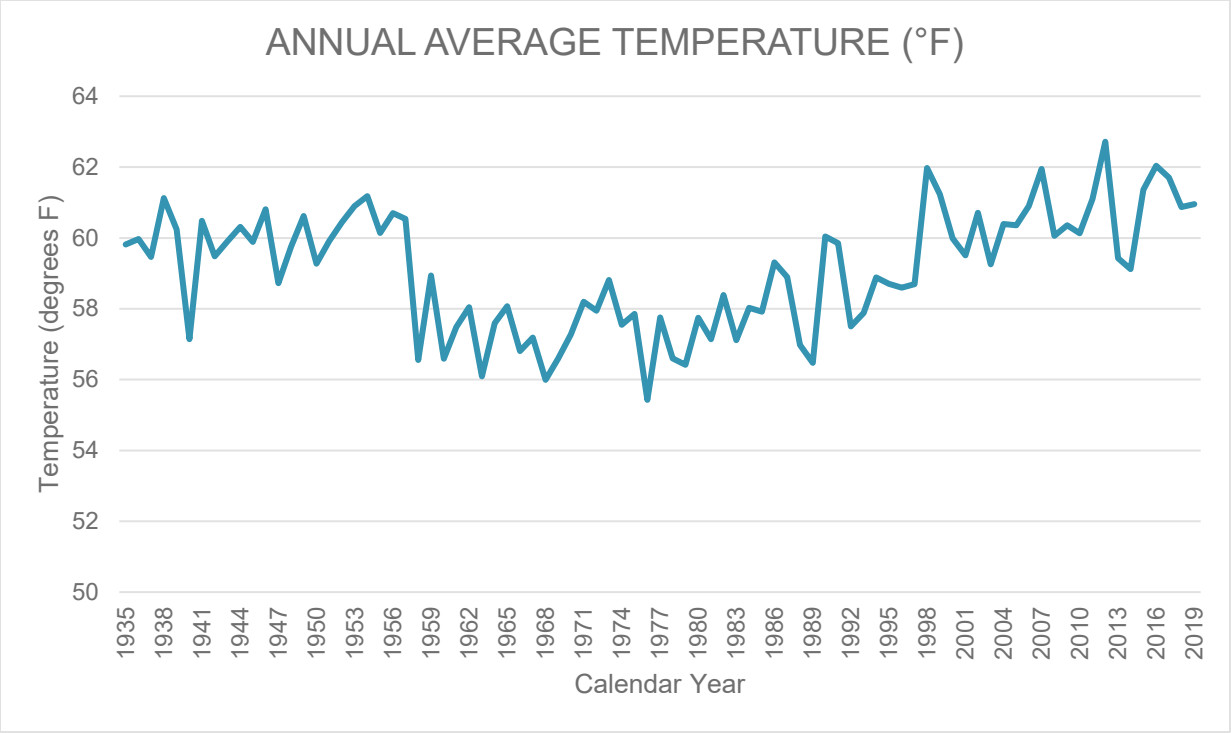

Figure 3-10. Annual Average Temperature for Fayetteville, TN over 84-Year Record (source: IEM 2019)

3.7.1.3 Greenhouse Gas Emissions

GHGs include natural and man-made compounds that disperse throughout the earth's atmosphere. These compounds absorb a portion of Earth's infrared radiation and reemit some of it back to the ground, thus keeping surface temperatures warmer than they would be otherwise. In this way, GHGs act as insulation and contribute to the maintenance of global temperatures. As the levels of GHGs in the atmosphere increase, the result is an increase in temperature on earth, commonly known as global warming. It is hypothesized that the climate change associated with global warming produces negative economic and social consequences across the globe through changes in weather (e.g., more intense hurricanes, greater risk of forest fires, flooding). As shown in Figure 3-10, there is a slight long-term upward trend in temperature over the past several decades for the Project Area in south-central Tennessee, although the most noticeable feature is an apparent cyclical pattern.

Apart from water vapor, the primary GHG emitted by human activities in the US is CO_2, representing approximately 82 percent of total GHG emissions in the US (USEPA 2019b). The largest source of CO_2 and of overall GHG emissions is fossil fuel combustion. US emissions of the GHG methane, which have declined from 1990 levels, result primarily from enteric fermentation (digestion) associated with domestic livestock, decomposition of wastes in landfills, coal mining, and leakage of natural gas from petroleum drilling and production activities. Agricultural soil management is the major source of GHG nitrous oxide emissions in the US, representing approximately 74 percent of its emissions from human activities (USEPA 2019c). GHG emissions from the TVA power system are described in TVA (2019a).

3.7.2 Environmental Consequences

This section describes the potential impacts to climate and air quality should the Proposed Action or No Action Alternative be implemented.

3.7.2.1 No Action Alternative

Under the No Action Alternative, the proposed solar facility would not be constructed. Therefore, no Project-related impacts on climate or air quality would result. Existing land use is expected to remain a mix of agricultural fields and forested land, and the existing habitat would be expected to remain as it is at present, with little effect on climate and air quality. The main source of emissions in the Project Area would continue to be from mobile sources such as automobiles and agricultural equipment. The No Action Alternative could also result in higher TVA system-wide emissions, as TVA may fulfill its power needs without this nearly emissions-free solar facility.

3.7.2.2 Proposed Action Alternative

Under the Proposed Action, minor direct impacts to air quality would be anticipated as a result of construction and operation of the Project. Temporary impacts to GHG emissions expected during construction would be negligible. The Proposed Action would have longer term, minor beneficial impacts to air quality by increasing the capacity of non-emitting generating facilities providing power to the TVA system and reducing TVA system-wide emission rates.

Regional Air Quality

The majority of potential air quality impacts associated with the Proposed Action would occur during construction. Construction activities would create emissions from construction equipment and vehicles, contracted employees' personal vehicles, and fugitive dust suspension from clearing, grading, and other activities. Tree debris from clearing would be removed by either burning or chipping and grinding. As burning may occur, this could generate temporary localized air quality impacts due to smoke particles and gases. Any such burning of vegetative debris would be done in accordance with any local ordinances or burn permits, and is not expected to have any health consequences for this sparsely populated rural area.

The use of construction equipment would cause a minor temporary increase in GHG emissions during construction activities. Combustion of gasoline and diesel fuels by internal combustion engines (haul trucks and off-road vehicles) would generate local emissions of PM, nitrogen oxides (NO_x), CO, volatile organic compounds (VOCs), and SO_2. The total amount of these emissions would be small and, overall, would result in negligible air quality impacts.

Approximately 95 percent (by weight) of fugitive emissions from vehicular traffic over paved and unpaved roads would be composed mainly of particles that would be deposited near the roadways, along the routes taken to reach the Project Site. As necessary, fugitive dust emissions from construction areas and paved and unpaved roads would be mitigated using BMPs including wet suppression. Wet suppression can reduce fugitive dust emissions from roadways and unpaved areas by as much as 95 percent. Therefore, direct impacts to air quality associated with construction activities would be expected to be minor.

Regional Climate

No noticeable direct or indirect impacts to the local or regional climate would be associated with the construction and operation of the proposed Project. Local or regional climate effects can occur, for example, with major changes in land use that affect the hydrological cycle, or that create large impervious surfaces, thus changing the radiative heat balance over a large area. The Project would change the surface characteristics somewhat, but it would have little effect on soil permeability and hydrologic characteristics of the developed area. Vegetation would still grow under and around the solar panels, tending to maintain a landscape with significant evapotranspiration of precipitation, as opposed to creating significant runoff of precipitation, as happens with urban development, which can create a "heat island" effect. Therefore, average temperatures of the developed area are not expected to change significantly due to the proposed development.

Greenhouse Gas Emissions

The use of construction equipment would cause a minor temporary increase in GHG emissions during construction activities. Combustion of gasoline and diesel fuels by internal combustion engines (trucks and off-road vehicles) at the site would generate emissions of CO_2 and very small amounts of other GHGs such as methane and nitrous oxide. Additional GHG emissions would be due to transporting materials and workers to the Project location, and GHGs would be emitted in the US or globally for production and transportation of the materials used for construction. The production of construction materials is expected to represent the largest portion of the Project-related GHG emissions. The total GHG emissions due to construction should eventually be offset by Project operation over the long term, assuming that the electricity generated by the Project would offset some fossil-fuel-based electricity generation and associated GHG emissions.

Tree and other tall vegetation removal during construction of the Project would represent a minor loss of potential carbon sequestration, especially given that the vast majority of the Project Area is currently fields and open land. Trees and other tall vegetation currently remove CO_2 from the air and sequester it as biomass. The loss of this carbon sink would constitute a minor adverse direct and indirect impact as sequestration would have continued for the life of the vegetation and long into the future, assuming that other changes on the Project Site did not result in any deforestation. The loss of the carbon sink from tree removal would be at least partially offset by the increased sequestration of CO_2 by the permanent grass-dominated vegetation that would be maintained on the solar facility site.

The operation of the Project is not anticipated to have any negative impacts to air quality or GHG emissions. No emissions would be produced by the operation of the solar facility or electrical lines. Minor emissions would occur during maintenance activities, including facility inspections and periodic mowing. Conversely, overall emissions of air pollutants from the TVA power system would decrease during operations as the nearly emissions-free power generated by the solar facility would offset power that would otherwise be generated, at least in part, by the combustion of fossil fuels. The reduction in GHG emissions resulting from the operation of the solar facility would have little noticeable effect on regional or larger scales. It would, however, be a component of the larger ongoing system-wide reduction in GHG emissions from the TVA power system. The

adverse impacts of GHG emissions and the beneficial impacts of TVA's reduction in GHG emissions are described in more detail in the TVA (2019a).

3.8 CULTURAL RESOURCES

This section describes an overview of existing cultural resources in the Project Area and the potential impacts on these cultural resources that would be associated with the No Action and Proposed Action Alternatives. Components of cultural resources that are analyzed include archaeological and architectural resources.

3.8.1 Affected Environment

Cultural resources are properties and places that illustrate aspects of prehistory or history or have long-standing cultural associations with established communities and/or social groups. Cultural resources may include archaeological sites; unmodified landscapes and discrete natural features; modified landscapes; human-made objects; structures such as bridges or buildings; and groups of any of these resources, sometimes referred to as districts.

Section 106 of the National Historic Preservation Act of 1966 (NHPA), as amended (54 U.S.C. § 300101 *et seq.*), is specifically designed to address the effects of federal and/or federally funded projects on tangible cultural resources—that is, physically concrete properties—of historic value. The NHPA provides for a national program to support both public and private efforts to identify, evaluate, and protect the nation's important cultural resources. Once identified, these resources are evaluated for inclusion in the NRHP maintained by the National Park Service. Tangible cultural resources may qualify for inclusion in the NRHP if they are 50 years of age or older (unless in exceptional cases) and if found to embody one or more of four different types of values, or criteria, in accordance with 36 CFR § 60.4:

- *Criterion A:* association with events that have made a significant contribution to the broad patterns of our history. Such events may include a specific occurrence or pattern of occurrences, cultural traditions, or historic trends important at a local, regional, or national level. To be considered in association with a cultural resource, events must be important within the particular context being assessed.

- *Criterion B:* association with the lives of persons significant in our past. People considered may be important locally, regionally, or nationally, and the cultural resources considered are limited to properties illustrating a person's achievements rather than commemorating them.

- *Criterion C*: embodiment of the distinctive characteristics of a type, period, or method of construction; representative of the work of a master; possessing high artistic values; or representative of a significant and distinguishable entity whose components may lack individual distinction. Cultural resources considered generally include architectural resources such as buildings, objects, districts, and designed landscapes.

- *Criterion D*: cultural resources that have yielded, or may be likely to yield, information important in prehistory or history. Considered cultural resources typically include

archaeological sites but may also include buildings, structures, and objects if they are the principal source of important information not contained elsewhere.

Cultural resources that are listed or considered eligible for listing in the NRHP are called "historic properties." Federal agencies are required by the NHPA to consider the possible effects of their undertakings on historic properties and take measures to avoid, minimize, or mitigate any adverse effects. NEPA requires federal agencies to consider how their undertakings may affect the quality of the human environment, including both cultural resources and those defined as historic properties, so that the nation may "preserve important historic, cultural, and natural aspects of our national heritage." An "undertaking" includes any project, activity, or program that has the potential to have an effect on a historic property and that is under the direct or indirect jurisdiction of a federal agency or is licensed or assisted by a federal agency.

Considering an undertaking's possible effects on historic properties is accomplished through a four-step review process outlined in Section 106 of the NHPA (36 CFR § 800). These steps are:

1. Initiation (defining the undertaking and the area of potential effect [APE] and identifying the parties to be consulted in the process);
2. Identification (studies to determine whether cultural resources are present in the APE and whether they qualify as historic properties);
3. Assessment of adverse effects (determining whether the undertaking would affect the qualities that make the property eligible for the NRHP); and
4. Resolution of any adverse effects (by avoidance, minimization, or mitigation).

A project may have effects on a historic property that are not adverse. However, if the agency determines that the undertaking's effect on a historic property within the APE would diminish any of the qualities that make the property eligible for the National Register (based on the criteria for evaluation at 36 CFR part 60.4), the effect is said to be adverse. Examples of adverse effects would be ground disturbing activity in an archaeological site, or erecting tall buildings or structures within the viewshed of a historic building in such a way as to diminish the structure's integrity of feeling or setting. Adverse effects must be resolved. Resolution may consist of avoidance (such as redesigning a project to avoid impacts or choosing a project alternative that does not result in adverse effects), minimization (such as redesigning a project to lessen the effects or installing visual screenings), or mitigation. Adverse effects to archaeological sites are typically mitigated by means of excavation to recover the important scientific information contained within the site. Mitigation of adverse effects to historic buildings and structures sometimes involves thorough documentation of the resource by compiling historic records, studies, and photographs.

Agencies are required to consult with the appropriate SHPO(s), federally recognized Indian tribes that have an interest in the undertaking, and any other party with a vested interest in the undertaking. Through various regulations and guidelines, federal agencies are encouraged to coordinate Section 106 and NEPA reviews to improve efficiency and allow for more informed decisions. Under NEPA, impacts to cultural resources that are part of the affected human environment but not necessarily eligible for the NRHP must also be considered by federal agencies. Generally these considerations as well as those of NRHP-eligible traditional cultural

resources (also called traditional cultural properties; see Parker and King 1998) are accomplished through consultation with parties having a vested interest in the undertaking, as described above. THC specifically addresses NHPA and NEPA coordination and suggests agencies initiate any Section 106 review early in the planning process.

3.8.1.1 Identification Survey and Field Findings Summary

As part of the evaluation process, a Phase I cultural resources survey was conducted by New South Associates (New South) on the Project Site and vicinity from May to August 2019 and October 16, 2019 to determine the presence of archaeological and architectural cultural resources that are listed or eligible for listing in the NRHP (Walls et al. 2019). The Project Area examined for archaeological resources, referred to herein as the APE, encompassed the 1,707-acre Project Site and TVA's proposed work areas along the existing Winchester-Fayetteville 161-kV TL. The Project Area examined for historic-age architectural resources, referred to herein as the Viewshed, included the 1,707-acre APE and the portions of a 0.5-mile radius surrounding the APE that are visually connected by direct line-of-sight (Figure 3-11). Areas within the survey radius that were determined not to be within view of the Project due to terrain, vegetation, and/or modern built environments, are not considered part of the Viewshed.

Cultural resources identification consisted of background research and architectural and archaeological field surveys; the associated report provides preliminary NRHP evaluations and a results summary. During the archaeological survey, New South excavated 2,762 shovel tests, identified a total of 22 newly recorded archaeological sites and 26 newly recorded isolated artifacts, and revisited two previously recorded archaeological sites within the APE. None of the sites or isolated finds are recommended eligible for listing on the NRHP. During the architectural survey, New South documented 47 historic-age architectural resources within the APE or Viewshed. Three resources were previously surveyed, and all three are no longer extant. Forty-three resources had not been previously surveyed. Two of the architectural resources are recommended eligible for listing on the NRHP.

The following section summarizes the prehistoric and historic contexts from the Phase I cultural resources survey report. The newly identified resources are described more fully in Section 3.8.1.3.

3.8.1.2 Cultural Context

The cultural context provides a basis for developing expectations of archaeological site potential and evaluating the NRHP eligibility of sites in the Project Area. This discussion presents previous research in the area along with the prehistoric and historic contexts for the region. The prehistoric overview describes significant developments in subsistence, settlement, and technology. The historic overview focuses on Lincoln County and the communities in the Project Area.

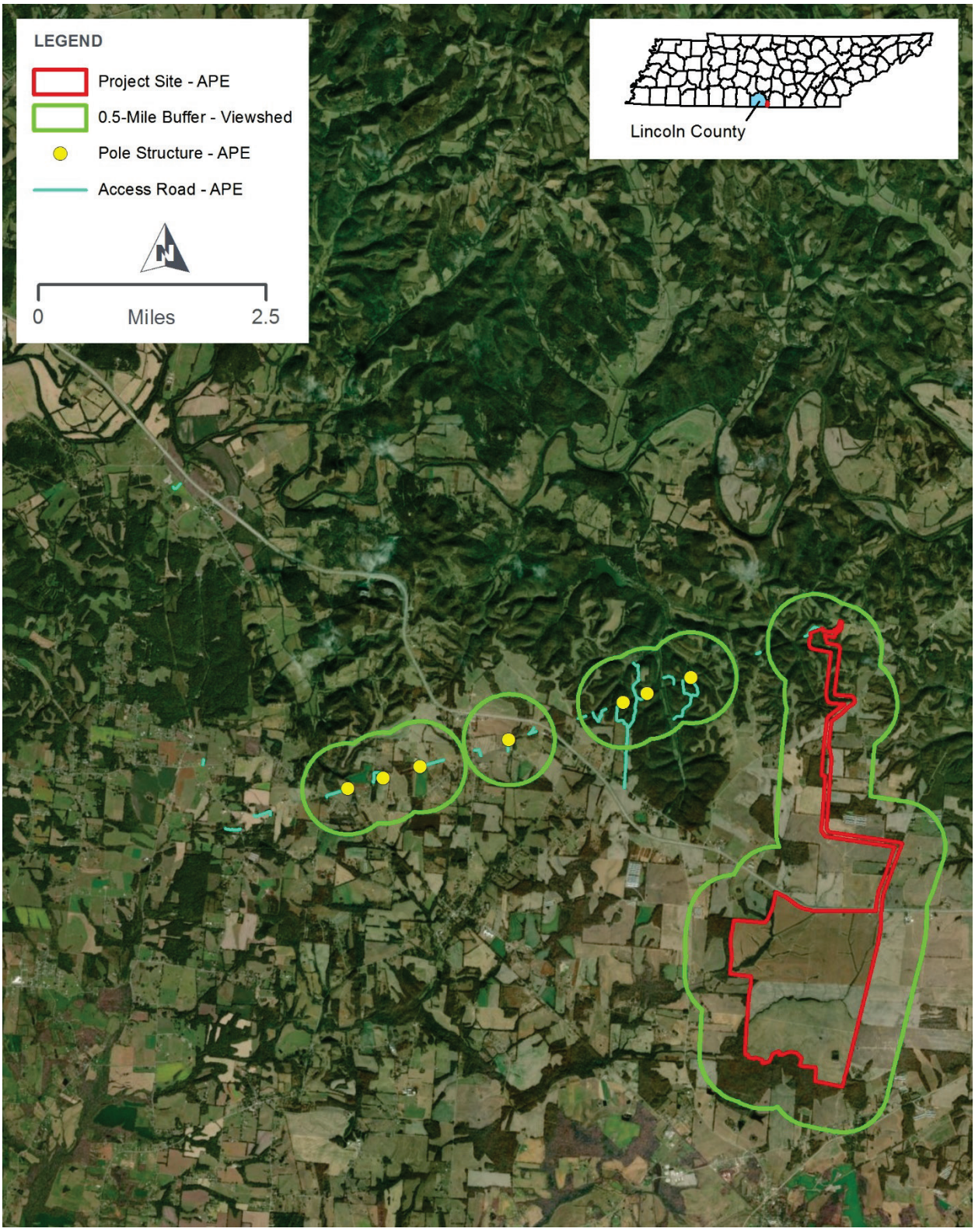

Figure 3-11. APE and Viewshed of cultural resources for the Elora Solar Energy Center.

Paleoindian Period (15,000 to 9,950 Before Present [B.P.])

Human occupation of eastern North America is thought to have first occurred between 15,000 and 11,000 B.P. (Anderson 1996) at the end of the last glacial era. Recent work at what are being termed pre-Clovis sites suggest that the date for human occupation of eastern North America may be much earlier than originally thought. To date, none of these pre-Paleoindian or "pre-Clovis" sites has been identified in the Cumberland River drainage, though the Johnson Site (40DV400) in East Nashville in Davidson County returned potential pre-Clovis dates (Broster et al. 1991; 2013). The Paleoindian period in the Southeast is part of a geographically diverse, though relatively homogenous, culture typified by lithic artifacts, particularly the fluted and unfluted lanceolate projectile points (Agenbroad 1988:63; Tankersley 1994:96). The majority of Paleoindian and Early Archaic projectile points are located within the central part of the state, with an overwhelming majority of these points coming from the Highland Rim (63.1 percent), while the Central Basin (14.5 percent) and the Coastal Plain (13.9 percent) representing roughly equal frequencies based on the Tennessee Fluted Point Survey (Tune 2016). Within Lincoln County, a number of Paleoindian projectile points have been found in eroded or disturbed contexts, but no intact Paleoindian sites have been excavated to date.

Archaic Period (9,950 to 2,950 B.P.)

The Archaic period in the eastern United States dates between 9,950 and 2,950 B.P. During this broad time span, prehistoric cultures in the eastern United States underwent considerable changes within the context of increasing population density, increasing intersocietal interactions, and changing environmental conditions. Deciduous forest and seasonally-dependent plants spread rapidly, contributing, in part, to mass extinctions of Pleistocene megafauna (Emery-Wetherell et al. 2017). Smaller animals filling the diverse, and newly vacant, ecological niches replaced megafauna. These changes altered human behavior as the consolidation of resources into specific zones allowed Archaic groups to procure subsistence more readily as it became available on a seasonal schedule. The Archaic period is divided into three subperiods: Early (9,950-7,950 B.P.), Middle (7,950-4,950 B.P.), and Late (4,950-2,950 B.P.) (Bense 1994; Brown 1994; Smith 1986; Steponaitis 1986). Each of these subperiods is defined and identified primarily on the basis of changes in a limited range of diagnostic artifacts (projectile points) but also on other facets of material culture and patterning in the archaeological record.

Woodland Period (2,950 to 1,100 B.P.)

The Woodland period in eastern North America is marked by the expansion of several characteristics, including increasing sedentism, more cultural complexity and social exchange, intensification of horticulture, and the widespread use of ceramic technology, that were noted at the close of the Late Archaic period. The development of an elaborate mortuary complex, including the construction of burial mounds and ceremonial earthworks, indicates the rise of a non-egalitarian social order (Brose 1979). Wide-ranging trade networks are evident in the exchange of both raw materials and finished objects between peoples across the Southeast and the Ohio Valley. A suite of wild plant foods, specifically a number of small starchy seeds, was being intensively utilized, and some species were brought under domestication (Yarnell and Black 1985). The Woodland period is subdivided into the Early Woodland (2,950-2,150 B.P.), the Middle

Woodland (2,150-1,350 B.P.), and the Late Woodland (1,350-1,100 B.P.) sub-periods. Traditionally, these subdivisions are demarcated by three trends: the first widespread use of pottery across the Southeast; the rise and then decline of a vast pan-regional ceremonially-based interaction network; and finally, "a period of political fragmentation, increasing agricultural intensification, and population growth in many areas" (Anderson and Mainfort 2002:1).

Mississippian Period (1,100 to 550 B.P.)

The Mississippian period dates between roughly 1,100 and 550 B.P.; although considerable regional variation is documented for the emergence and culmination of this period (Griffin 1967; Jennings 1974; Peebles 1978; Phillips 1970). Mississippian culture began in the American Bottom at the site of Cahokia (near St. Louis, Missouri) and spread mainly along major river systems to most parts of the Southeast. The Mississippian culture never spread to certain parts of the Southeast, including southern Florida, northeast North Carolina, or coastal Virginia. Mississippian period societies controlled local and regional territories along most of the larger rivers in the interior of the Southeast, including the middle section of the Cumberland River and the abutting areas of the Nashville Basin. Mississippian period occupations are underrepresented in the archaeological record of the Project Area. However, the vast number of Mississippian mound and village sites excavated to the north, within Davidson County and surrounds, has contributed to the current understanding of this period in the Project Area.

Protohistoric Period/European Contact (550 to 200 B.P.)

While there is evidence to suggest that Mississippian cultures were still active in the Lower Ohio and Mississippi River valleys up into the seventeenth century, evidence of the Mississippian culture in the Middle Cumberland region of Tennessee appears to have declined sharply or disappeared altogether by 550 B.P. (Pollack 2008; K. Smith 1992). When the first Europeans came into these areas early in eighteenth century, they found the land nearly devoid of native inhabitants. A number of historically known tribes such as the Shawnee, Chickasaw, and Cherokee claimed the region as part of their broad hunting territory but were expelled or removed by white settlers by A.D. 1800. Muscogee-speaking tribes have also claimed territory in Cheatham, Davidson, Stewart, and Williamson counties, Tennessee. On May 23, 1836, the Cherokee Indians formally ceded the Ocoee Land District to the U.S. government. Part of the Cherokee Removal Treaty, this Ocoee District transfer was negotiated with the U.S. government in 1835 by Cherokee leader Major John Ridge without approval from Principal Chief John Ross or his council. The Ocoee District included lands in southeast Tennessee along the Alabama, Georgia, and North Carolina borders, as well as all remaining Cherokee lands in Alabama, Georgia, and North Carolina (Hale 1974:3; Johnson and Reece 2015). Three years later the federal government forced the Cherokee Indians along what would be commonly known as the "Trail of Tears."

Settlement and Development of Lincoln County

The first white men to travel to the area now called Lincoln County arrived in 1784 to survey land grants that the State of North Carolina provided to Revolutionary War veterans. North Carolina originally issued the land grants in the 1780s and 1790; however, the recipients did not arrive until

1806, after the Cherokee and Chickasaw officially ceded the land to the U.S. government. The earliest arrivals traveled over land through dense canebrake or by flatboat. White settlers brought enslaved African Americans with them from North Carolina, Virginia, and elsewhere to Lincoln County (Dickey 1977:8; Towry and Towry 2018).

The Tennessee General Assembly created Lincoln County in 1809 and named the county for the Revolutionary War hero General Benjamin Lincoln (1733-1810), a major general from Massachusetts and George Washington's second in command during the American Revolutionary War. Shortly after the creation of the county, county commissioners were appointed to purchase 100 acres of land from Ezekiel Norris near the Elk River for the creation of the county seat at Fayetteville. The modern boundaries of the county were formed after Lincoln County ceded land to the newly established Marshall County in 1835 and Moore County in 1872 (Brandt 1995:325; Goodspeed 1886:771; Towry and Towry 2018).

Located along the Alabama state line, settlers were drawn to the fertile soil of Lincoln County. Farms worked by hundreds of enslaved people were created throughout the county. By 1833 the population was 10,788 free white persons and the largest crop was corn. By 1856 the 5,352 enslaved people living in Lincoln County accounted for approximately one quarter of the population. There were few large-scale plantations in the county, but the relatively large farms relied on the labor of slaves to plant and harvest the crops. Corn remained one of the most important crops, but wheat and cotton were also common (Dickey 1977:16; Towry and Towry 2018).

From May 1838 to March 1839, the federal government used military force to relocate more than 14,000 Cherokee Indians and their slaves from the Cherokee Nation, which encompassed parts of North Carolina, Georgia, Alabama, and Tennessee, to Indian reservations in Oklahoma, using a 2,200-mile long transportation network of overland trails and waterways. The deportation also included Creek Indians that lived in the Cherokee Territory. Historians estimate that over 4,000 American Indians died during the treacherous deportation journey, which is referred to as Nunna-da-ul-tsun-yi in the Cherokee language, interpreted as "the place where they cried": more commonly known as the "Trail of Tears" (McClary 2018).

During the Cherokee Removal in 1838, the Fort Cass/Cherokee Agency military depot at present-day Charleston, Tennessee, served as a deportation holding area for Cherokee Indian detachments. From August 23 to December 5, 1838, 10 detachments totaling 9,302 Cherokee were marched from Fort Cass to Indian reservations in Oklahoma. Nine detachments with more than 9,000 Cherokees followed the Northern Route via Nashville to Kentucky, Illinois, Missouri, and Arkansas to the Oklahoma Territory. From Fort Cass, John Bell of the Treaty Party led 660 Cherokee along the Southern Route via Ross's Landing and Memphis to present-day Evansville, Arkansas (Martin 2018; McClary 2018; Rogers and Toplovich 1983).

The Cherokee Trail of Tears traversed Lincoln County along Bell's Route, which connected Chattanooga with Memphis along the southern edge of Tennessee. In the Project Area, Bell's Route generally followed the Winchester Road, which evolved into SR-15 (U.S. 64) from the east, before turning onto what is now Snow Road and then across modern-day fields to Golden Hollow Road as it went west (Martin 2018; McClary 2018; Rogers and Toplovich 1983).

From 1875 to 1920, the county's economy depended on railroads. The national rail network expanded and strengthened during the early twentieth century and brought several small industries to Lincoln County as a result. The most important to the Lincoln County economy was the Ohio based Borden Milk, which established a powdered milk processing plant at Fayetteville in 1927. As a result, many of the farms in Lincoln County converted to dairy production to sell to Borden Milk.

An important federal make-work project in the Project Area was the Flintville Hatchery, which employed local builders as early as 1931. The workers constructed the hatchery building, a new channel for the creek, and fishponds. Construction continued with New Deal funding and agencies such as the Civilian Conservation Corps, which replanted the tornado-damaged forest. The Works Progress Administration improved the primary access road, built the entrance gate and bridges, and lined the creek with stone. In 1935, TVA built a transmission line which provided sufficient electricity to power the hatchery, as well as residents of the surrounding area (Brandt 1995:321; Nichols 1999:32; Towry and Towry 2018).

Lincoln County remains connected to its agricultural roots, producing more beef than most other parts of Tennessee. The county's farmers also produce dairy and soy products. The small communities that dot southeastern Lincoln County are generally home to commuters who work either in Fayetteville or Huntsville, Alabama. The population of Lincoln County was 34,117 in 2018 (Towry and Towry 2018).

3.8.1.3 Known Cultural Resources

New South conducted a search of the archaeological and architectural records maintained by the Tennessee Division of Archaeology (TDOA) and THC to determine the presence of recorded cultural resources within a 1-mile radius of the Project Site, herein referred to as the research radius. Research at TDOA and THC was conducted by New South on February 5, 2019.

A search of TDOA records revealed two previously recorded archaeological sites (40LN133 and 40LN176) partially within the Project Area and six additional archaeological sites (40LN46, 40LN110, 40LN133, 40LN170, 40LN171, and 40LN176) located within 1 mile of the APE.

Site 40LN133 is a small lithic scatter dating to the Late Paleoindian or Early Archaic subperiods. The site was recorded by a local informant following the discovery of a fluted projectile point on the surface within a cultivated cotton field. The boundary of the site was estimated based on informant reports and has never been formally delineated. As no subsurface testing had been conducted at this site, its depth and integrity were also unknown. Only the northeastern quadrant of the estimated site boundary overlaps the APE. Lithic debitage was noted on the surface within the open field outside the APE. The portion of 40LN133 that overlaps the APE contained no artifacts, either on the surface or within shovel tests. Given that its boundary was estimated and not delineated, 40LN133 may not actually overlap the APE. However, a nearby site (40LN221) within the APE may represent an extension of 40LN133. Site 40LN221was identified by surface finds and positive shovel tests approximately 180 meters east of 40LN133 along the same ridgetop. Artifacts were found in the plow zone and on the eroded ground surface on the west-facing slope. No buried cultural horizon is intact below the plow zone at 40LN221. Though a small

number of formal tools were recovered, none appear to date to the Late Paleoindian subperiod. The site appears to be an Early to Late Archaic campsite.

Site 40LN176 contains the Lincoln County section of Bell's Route, a portion of the Trail of Tears used during the Cherokee Removal of 1838. According to available records, Bell's contingent passed through the APE in October 1838 (Chapman 1999; Nance 2001). The site roughly follows the present-day route of Winchester Highway (US 64). Bell's Route also crosses the APE in two places. Shovel tests and pedestrian survey was conducted in all areas where site 40LN176 intersects the APE. No artifacts or features associated with 40LN176 were identified within the APE.

A search of THC records revealed three previously recorded historical structures (LN1844, LN2254, and LN2256) within the Viewshed; all three are no longer extant. TDOT previously surveyed resource HS-27, which is eligible for listing in the NRHP. In addition, there were no pending or in-process NRHP records for the APE or Viewshed or the 1-mile research radius, per the NRHP coordinator for THC.

During the archaeological survey, the entire APE was assessed via pedestrian walk-over and shovel testing. New South investigated 2,762 shovel test locations. Of these, 2,558 were negative, 133 were not excavated, and 71 were positive for prehistoric material. All historic materials were recovered from the surface of plowed fields within the APE; none of the shovel tests contained historic material.

A total of 22 archaeological sites were newly recorded and two previously recorded sites were revisited within the APE (Table 3-8). Additionally, 26 isolated individual artifacts or scatters were recorded within the APE. Due to their lack of integrity and limited data potential, the 22 newly recorded sites, as well as previously recorded site 40LN133, are unlikely to provide new knowledge about the prehistory or history of Lincoln County. Site 40LN176 contains the Lincoln County section of Bell's Route, a portion of the Trail of Tears used during the Cherokee Removal of 1838. Shovel tests and a pedestrian survey were conducted in all areas where site 40LN176 intersects the APE. No artifacts or features associated with 40LN176 were identified within the APE. TVA finds all of the archaeological sites not eligible or not contributing for the NRHP, and no further work is recommended at these sites prior to implementation of the Project.

Table 3-8. Newly Recorded and Revisited Archaeological Sites with the APE

Site Number	Cultural Affiliation	Site Type	NRHP Recommendation
40LN206	Undetermined prehistoric	Lithic scatter	Not Eligible
40LN207	Undetermined prehistoric	Lithic scatter	Not Eligible
40LN208	Undetermined prehistoric	Lithic scatter	Not Eligible
40LN209	Undetermined prehistoric	Lithic scatter	Not Eligible
40LN210	Undetermined prehistoric	Lithic scatter	Not Eligible
40LN211	Early Archaic prehistoric	Lithic scatter	Not Eligible
40LN212	Undetermined prehistoric	Lithic scatter	Not Eligible
40LN213	Undetermined prehistoric	Lithic scatter	Not Eligible

Site Number	Cultural Affiliation	Site Type	NRHP Recommendation
40LN214	Undetermined prehistoric	Lithic scatter	Not Eligible
40LN215	Undetermined prehistoric	Lithic scatter	Not Eligible
40LN216	Undetermined prehistoric	Lithic scatter	Not Eligible
40LN217	Undetermined prehistoric	Lithic scatter	Not Eligible
40LN218	Undetermined prehistoric	Lithic scatter	Not Eligible
40LN219	20th century historic	Scatter; demolished residence	Not Eligible
40LN220	Undetermined prehistoric	Lithic scatter	Not Eligible
40LN221	Middle Archaic prehistoric	Lithic scatter	Not Eligible
40LN222	Undetermined prehistoric	Lithic scatter	Not Eligible
40LN223	Undetermined prehistoric	Lithic scatter	Not Eligible
40LN224	Undetermined prehistoric	Lithic scatter	Not Eligible
40LN225	Undetermined prehistoric	Lithic scatter	Not Eligible
40LN226	Early Archaic prehistoric	Lithic scatter	Not Eligible
40LN227	Middle to Late Archaic prehistoric	Lithic scatter	Not Eligible

The historic architecture survey resulted in fieldwork documentation of 47 individual resources. Three resources were previously surveyed, and all three are no longer extant. TDOT previously surveyed resource HS-27, which is eligible for listing in the NRHP. Forty-three resources had not been previously surveyed. The 47 resources include 27 dwellings, 12 farmsteads, two barns, one commercial building, two cemeteries, two sections of the Trail of Tears, and one fish hatchery. The majority of the historic-age houses date to the middle twentieth century.

Two newly-recorded historic-age properties (HS-26 and HS-38), neither of which are considered eligible for the NRHP, are located within the APE. Resource HS-26, located along Old Highway 64, is a 1956 Ranch house with a prefabricated detached garage. Resource HS-38, located along Winchester Highway, is a 1968 Ranch house. (Table 3-9; Figure 3-12). The remaining properties documented during the field survey are located in the Viewshed.

Table 3-9. Newly and Previously Recorded Historic-Age Architectural Resources within the APE.

Field ID	Address	Description	NRHP Recommendation
LN-1844	Howell Hill Road, near Crystal Springs Camp Road	circa 1910 frame house in ruins when surveyed in 1979; demolished between 1997-2006	Not eligible
LN-2254	Snow Road	circa 1915 frame house; demolished and replaced with a dwelling in 2003	Not eligible

Field ID	Address	Description	NRHP Recommendation
LN-2256	622 Howell Hill Road	circa 1910 frame and log barn in ruins when surveyed in 1979; demolished between 1981 and 1997	Not eligible
HS-1	26 Crystal Springs Camp Road	1966 one-story Ranch dwelling	Not eligible
HS-2	32 Crystal Springs Camp Road	1967 one-story Ranch dwelling	Not eligible
HS-3	Howell Hill Road, near Crystal Springs Camp Road	Carter Cemetery; private family cemetery established 1903; uncommon example of a rural African American cemetery in Lincoln County	Eligible
HS-4	587 Howell Hill Road	circa 1900 one-story, frame T-plan cottage; property includes cement block shed, frame shed, and gazebo; significantly altered	Not eligible
HS-5	67 Lackey Road	circa 1950 rusticated concrete block dairy barn; associated farmhouse demolished between 1981-1993; poor condition	Not eligible
HS-6	1 Lackey Road	1940 gable-front bungalow	Not eligible
HS-7	609 Howell Hill Road	1962 one-story Ranch house; property features concrete block garage, frame shed and barns	Not eligible
HS-8	651 Howell Hill Road	1942 one-story Minimal Traditional house	Not eligible
HS-9	678 Howell Hill Road	1960 one-story Ranch house	Not eligible
HS-10	702 Howell Hill Road	1945 concrete block, side-gable Bungalow house; property features non-historic barns and outbuildings	Not eligible
HS-11	3 Flintville Road	1949 rusticated concrete block, one-story, commercial building	Not eligible
HS-12	9 Flintville Road	1960 one-story Ranch house, and non-historic garage enclosure and shed side addition	Not eligible
HS-13	13 Flintville Road	1961 one-story Ranch house and non-historic garage enclosure	Not eligible
HS-14	17 Flintville Road	1962 one-story Ranch house and non-historic garage enclosure; property features a frame garage	Not eligible
HS-15	27 Flintville Road	1953 one-and-a-half story gable-front Bungalow	Not eligible
HS-16	28 Flintville Road	1967 one-story Ranch house	Not eligible

Field ID	Address	Description	NRHP Recommendation
HS-17	44 Flintville Road	1966 one-story Ranch house	Not eligible
HS-18	45 Flintville Road	1964 one-story Ranch house	Not eligible
HS-19	46 Flintville Road	1963 one-story Ranch house	Not eligible
HS-20	49 Flintville Road	1962 one-story Ranch house	Not eligible
HS-21	40 Snow Road	1930 gable-front Bungalow; property features a frame shed and barn	Not eligible
HS-22	Snow Road	circa 1925 vacant side-gable Bungalow; circa 1950 addition; property features concrete block sheds, frame barns and springhouse	Not eligible
HS-23	Gum Springs Cemetery Road	Gum Springs Cemetery, established circa 1861 and associated with the Gum Springs Church (not surveyed)	Not eligible
HS-24	26 Gum Springs Church Road	1960 one-story Ranch house	Not eligible
HS-25	163 Gum Springs Road	1920 frame hall-and-parlor house; prefabricated garage, 1970s frame barns	Not eligible
HS-26	24 Old Highway 64	1956 one-story Ranch house and enclosed garage; property features a prefabricated detached garage	Not eligible
HS-27	Fish Hatchery Road	Established 1931 by the federal government as the first commercial fish hatchery in Tennessee; 700-acre property includes hatchery building, barns, sheds, residences, stone gateposts and culverts, food plots, cemetery, and fish tanks	Eligible
HS-28	122 Shady Grove Road	1964 one-story Ranch house; property features frame garage and barn	Not eligible
HS-29	90 Shady Grove Cemetery Road	1950 one-story Minimal Traditional house; property features frame barn and two circa 1975 Ranch houses	Not eligible
HS-30	59 Shady Grove Cemetery Road	1968 one-story Ranch house; property features two frame garages and a barn	Not eligible
HS-31	52 Shady Grove Cemetery Road	1963 one-story Ranch house; property features frame garage and barn and concrete block shed	Not eligible

Field ID	Address	Description	NRHP Recommendation
HS-32	255 Shady Grove Road	1954 one-story Ranch house; property features a frame shed and concrete block fence	Not eligible
HS-33	186 Shady Grove	1958 one-story Ranch house; property features a prefabricated carport	Not eligible
HS-34	40 Hotel Road	1932 one-story double-pen house; property features a frame barn and shed	Not eligible
HS-35	52 Hotel Road	1961 one-story Ranch house	Not eligible
HS-36	95 Hotel Road	1961 one-story Ranch house; property features a prefabricated carport and sheds	Not eligible
HS-37	3090 Winchester Highway	1968 one-story Ranch house; property features metal silos	Not eligible
HS-38	3115 Winchester Highway	1968 one-story Ranch house	Not eligible
HS-39	3131 Winchester Highway	1969 one-story Ranch house; property features four large prefabricated sheds and several silos	Not eligible
HS-40	172 Elora Road	1959 one-story Ranch house; property features two frame garages	Not eligible
HS-41	544 Limestone Road	1925 one-and-a-half story pyramidal cottage	Not eligible
HS-42	546 Limestone Road	1930 gable-front Bungalow	Not eligible
HS-43	Along Snow Road	Segment of Bell's Route of Trail of Tears (October 1838) within Lincoln County; this segment generally follows Snow Road through the western portion of the project APE	This portion is not eligible
HS-44	Along Winchester Highway	Segment of Bell's Route of Trail of Tears (October 1838) within Lincoln County; this segment generally follows Winchester Highway through the eastern portion of the project APE	This portion is not eligible

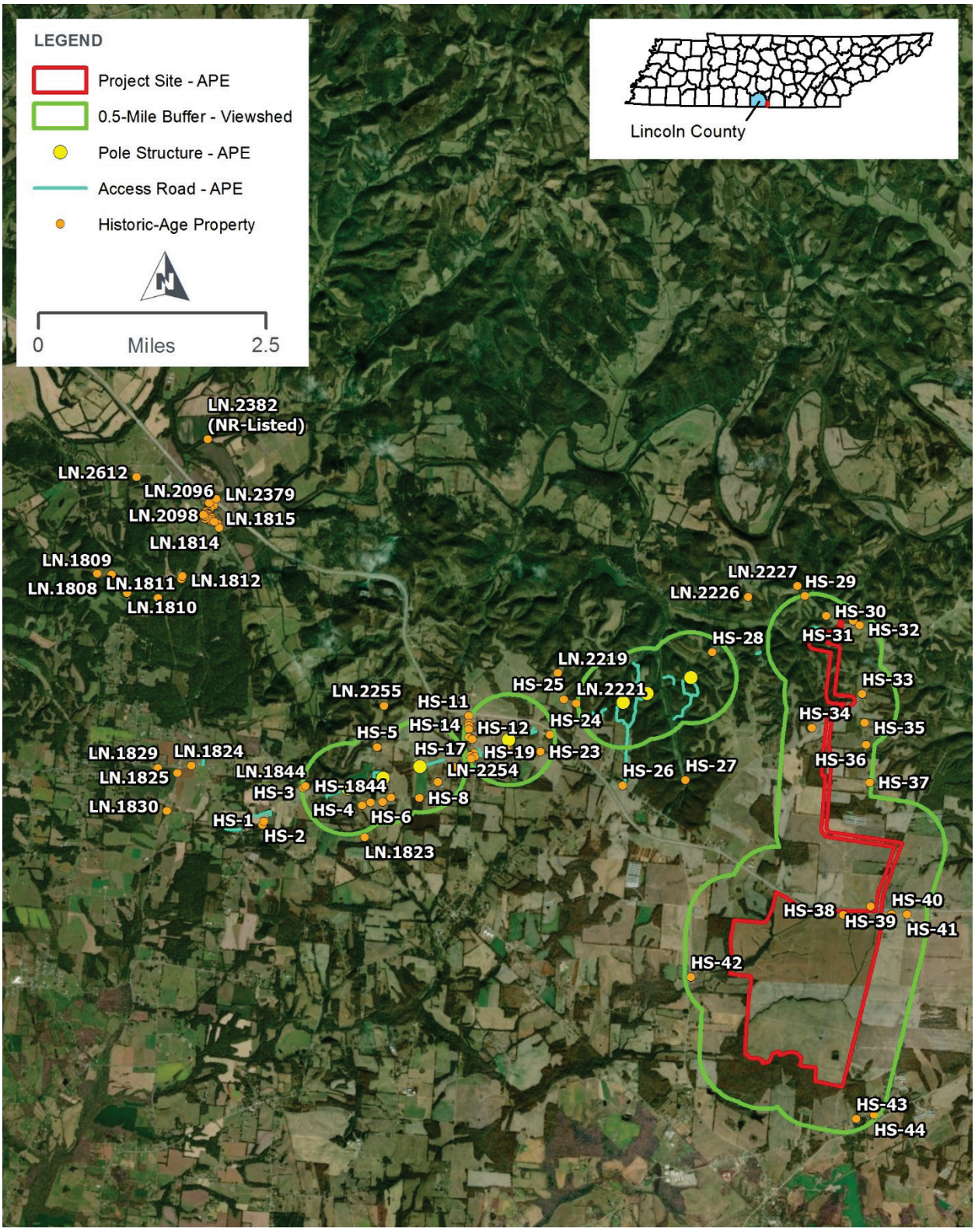

Figure 3-12. Location of previously and newly recorded architectural resources within the Elora Solar Energy Center APE and Viewshed.

Two of the 47 surveyed architectural resources are recommended eligible for listing on the NRHP under Criteria A, B, or C. These two resources include the Carter Cemetery (HS-3) and the Flintville Hatchery (HS-27). TVA agrees with the NRHP eligibility recommendations for the architectural resources and is consulting with THC on these agency determinations.

3.8.2 Environmental Consequences

This section describes the potential impacts to cultural resources should the Proposed Action or No Action Alternative be implemented.

3.8.2.1 No Action Alternative

Under the No Action Alternative, no Project related impacts to cultural resources would occur. The landscape in the Project Area would remain relatively unchanged from the present mix of agricultural fields and forested land.

3.8.2.2 Proposed Action Alternative

Following the archaeological survey of the APE, New South recommended the 22 newly-identified archaeological sites, two previously recorded archaeological sites, and 26 isolated finds not eligible for the NRHP. Due to the lack of research potential, New South recommended no further investigation of these archaeological resources in connection with the Proposed Action. Therefore, pending agreement from TVA and the consulting parties, proposed activities taking place within the APE would not affect any archaeological sites listed in, or eligible for listing in, the NRHP. TVA finds all of the archaeological sites not eligible or not contributing for the NRHP, and no further work is recommended at these sites prior to implementation of the Project.

Following the architectural survey of the APE and Viewshed, New South recommended that, of the 47 historic-age properties, two properties (HS-3 and HS-27) in the Viewshed have historical and/or architectural significance and retain enough integrity to be recommended eligible for listing in the NRHP.

Project activity in the vicinity of Carter Cemetery (HS-3), a private African American family cemetery established in 1903, would consist of constructing a slightly taller transmission line structure approximately 0.5 mile to the east. The new structure would only be 4.5 feet taller than the current one and of the same style (H-frame) as the current structure and would not further alter the viewshed surrounding the existing lines. The visual impact of this construction would be minimal to nonexistent due to the distance, rolling topography, and mature trees between the historic property and the structure. The presence of the taller transmission line structure would not impact the design, workmanship, materials, or rural setting of the cemetery. New South recommends that the Project would not diminish the overall integrity of the Carter Cemetery, and would, therefore, have no adverse effect on HS-3.

Project activity in the vicinity of the 700-acre fish hatchery property (HS-27), established in 1931 by the federal government as the first commercial fish hatchery in Tennessee, would consist of replacing three transmission line structures with slightly taller structures within and adjacent to the property, as well as constructing a temporary access road. The new transmission line structures

would be 9 to 31.5 feet taller than the current ones and of the same style (H-frame) as the current structures and would not further alter the viewshed surrounding the existing lines. The visual impact of this construction would be minimal to nonexistent due to the rolling topography and mature trees between the historic property and the structures. During Project construction, a portion of the north parking area within the NRHP boundary of the Flintville Hatchery will be used as a construction access road. The access road would be up to 16-feet wide and would run east from Fish Hatchery Road. The portion of the access road within the NRHP boundaries would measure approximately 100 feet in length and 16 feet in width. The access road location would be limited to the existing parking area. The presence of the taller transmission line structures and construction of the temporary access road would not impact the design, workmanship, materials, or rural setting of the fish hatchery. New South recommends that the Project would not diminish the overall integrity of the fish hatchery and would, therefore, have no adverse effect on HS-27.

Based on these recommendations on effects, TVA determined that the Project would not result in an adverse effect on these resources. TVA is consulting with THC and federally recognized Indian tribes regarding these findings and agency determinations (Appendix D).

3.9 UTILITIES

This section describes an overview of existing utilities within the Project Area and the potential impacts on these utilities that would be associated with the No Action and Proposed Action Alternatives. Specific utility components analyzed below include telecommunications, electricity, natural gas, water, and sewer.

3.9.1 Affected Environment

The Project Site is located in a rural, unincorporated area of southeast Lincoln County, Tennessee, approximately 1.3 miles north of the unincorporated community of Elora and 16 miles southeast of Fayetteville, Tennessee.

3.9.1.1 Telecommunications

In addition to various mobile providers, telecommunication services in the Project Area are provided by AT&T, Charter Communications, and Fayetteville Public Utilities (Fayetteville-Lincoln County Chamber of Commerce 2019; Tennessee Telecommunications Association 2019; TVA 2019c).

3.9.1.2 Electricity

In the Project Area, electrical service is provided by Fayetteville Public Utilities through TVA (Fayetteville-Lincoln County Chamber of Commerce 2019; TVA 2019c). Existing power lines are present in the Project Area along portions of Elora Road, Limestone Road, Terry Dunavan Road, Winchester Highway, and other major and minor roads in the vicinity.

3.9.1.3 Natural Gas

Fayetteville Public Utilities provides natural gas to Lincoln County, including the Project Site, and portions of surrounding counties (Fayetteville-Lincoln County Chamber of Commerce 2019).

3.9.1.4 Water and Sewer

Water service in the Project Area is provided through private wells or springs, and sewer service is provided by private septic systems.

3.9.2 Environmental Consequences

This section describes the potential impacts to utilities should the Proposed Action or No Action Alternative be implemented.

3.9.2.1 No Action Alternative

Under the No Action Alternative, the proposed solar facility would not be constructed; therefore, there would be no Project related impacts to utilities. Existing land use would be expected to remain a mix of agricultural and forested land, and existing on-site utilities would likely remain unchanged, with the exception of potential upgrades and maintenance.

3.9.2.2 Proposed Action Alternative

Under the Proposed Action, Elora Solar would construct and operate a single-axis tracking PV solar power facility. The solar facility would generate up to 150-MW AC output for transmission to the electrical network. The entire 150-MW AC output would be sold to TVA under the terms of the PPA, and the Project would connect to the existing TVA electrical network via the new Mann Road 161-kV Switching Station and TVA's existing Winchester-Fayetteville 161-kV TL.

Electrical service for the Project would be provided by Fayetteville Public Utilities and/or the Project distribution power system. If utilized, Fayetteville Public Utilities would coordinate with customers if outages were necessary. No other utility services would be required to construct and operate the Project.

Due to the installation of utility lines, there may be short-term adverse impacts to local utilities such as electricity connections when bringing the solar facility on-line or during routine maintenance of the facility. No long-term adverse impacts are expected to be associated with the Project. Implementation of the Proposed Action would result in additional renewable energy resources in the region and would, thus, constitute a beneficial impact to electrical services across the region.

3.10 WASTE MANAGEMENT

This section describes an overview of existing waste management within the Project Area and the potential impacts of managing wastes generated by the No Action and Proposed Action Alternatives. Components of waste management that are analyzed include solid and hazardous waste and materials.

3.10.1 Affected Environment

"Hazardous materials" and "hazardous waste" are substances that, because of their quantity, concentration, or characteristics (physical, chemical, or infectious), may present a significant danger to public health and/or the environment if released. These substances are defined by the

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA; 42 U.S.C. §§ 9601 *et seq.*) and the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act ([RCRA]; 42 U.S.C. §§ 6901 *et seq.*). Regulated hazardous wastes under RCRA include any solid, liquid, contained gaseous, or semisolid waste or combination of wastes that exhibit one or more of the hazardous characteristics of ignitability, corrosivity, toxicity, or reactivity, or is listed as a hazardous waste under 40 CFR part 261. Storage and use of hazardous materials and wastes are regulated by local, state, and federal guidance including the Emergency Planning and Community Right-to-Know Act (42 U.S.C. §§ 116 *et seq.*) and RCRA.

Available historical topographic quadrangles document that land use in the Project Area has remained relatively unchanged at least since the mid-1930s but likely earlier, based on historical trends (USGS 2019a). Throughout this time, land uses in the Project Area have been primarily agricultural and rural-residential. Primary changes between the 1950s and 2010s include the addition or improvements of some local roads and creation of a few farm ponds. Over the years, some buildings have been moved or demolished on or near the Project Site.

Collection and disposal of solid waste outside of incorporated municipalities in Lincoln County is conducted by private trash collecting companies and by county residents via three drop-off facilities. Nonhazardous wastes are transferred and hauled to an operating Class I facility in Walter Hill, Tennessee. Construction/demolition materials are disposed of at a Class III landfill in Pulaski, Tennessee. Various vendors offer hazardous waste removal.

3.10.2 Environmental Consequences

This section describes the potential impacts to waste management should the No Action or Proposed Action Alternative be implemented.

3.10.2.1 No Action Alternative

Under the No Action Alternative, the proposed solar facility would not be constructed; therefore, no Project-related waste would be generated and no impacts to waste management resources would occur. Existing land use would be expected to remain a mix of agricultural and undeveloped land, and existing waste management conditions would be expected to remain as they are at present.

3.10.2.2 Proposed Action Alternative

Under the Proposed Action, storage and use of liquid materials in the form of 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 waste would occur.

Materials Management

During construction of the proposed solar facility, materials would be 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, 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 on-site personnel.

Fueling of some construction vehicles would occur in the construction area. Other mobile equipment would return to the on-site 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 approximately 20 months during construction of the Project. The total volume of the on-site tanks would exceed 1,320 gallons, the threshold above which a Spill Prevention, Countermeasure and Control (SPCC) plan may be required (40 CFR part 112). The facility would fall under USEPA's SPCC requirements of "oil-filled operational equipment" and a Tier I Qualified Facility; therefore, no double-walled protection would be required, and the SPCC plan would not have to be certified by a Professional Engineer (USEPA 2006, 2011). The SPCC plan would be prepared prior to construction to prevent oil discharges during facility operations.

During operations, 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. The quantities of these materials stored on site would be evaluated to identify the required usage and to maintain sufficient inventories to meet use rates without stockpiling excess chemicals.

In addition to the chemicals listed above, small quantities (less than 55 gallons, 500 pounds or 200 cubic feet) of janitorial supplies, office supplies, laboratory supplies, paint, degreasers, herbicides, pesticides, air conditioning fluids (chlorofluorocarbons [CFC]), gasoline, hydraulic fluid, propane, and welding rods typical of those purchased from retail outlets may also be stored and used at the facility. Flammable materials (e.g., paints, solvents) would be stored in flammable material storage cabinet(s) with built-in containment sumps. Due to the small quantities involved and the controlled environment, a spill could be cleaned up without significant environmental consequences.

Elora Solar would develop and implement a variety of plans and programs to ensure safe handling, storage, and use of hazardous materials (e.g., Hazardous Material Business Plan). Facility personnel would be supplied with appropriate personal protective equipment (PPE) and would be properly trained in the use of PPE as well as the handling, use, and cleanup of hazardous materials used at the facility and the procedures to be followed in the event of a leak or spill. Adequate supplies of appropriate cleanup materials would be stored on site.

Waste Management

Construction of the Proposed Action is estimated to result in the generation of approximately 36,500 cubic yards of solid waste (912 loads at 40 cubic yards each) consisting of construction debris and general trash, including pallets and flattened cardboard module boxes. Elora Solar

estimates that approximately 2,600 flatbed truck loads would be required for hauling equipment and removing waste during construction.

Information on universal wastes anticipated to be generated during Project construction is provided in Table 3-10.

Table 3-10. Summary of construction waste streams and management methods.

Waste stream	Origin and composition	Estimated frequency of generation	On-site treatment	Waste management method/off-site treatment
Construction waste	Empty material containers	Intermittent	None	Return to vendor
Construction waste	Used oil, hydraulic fluid, oily rags	Intermittent	None	Recycle, remove to off-site disposal location
Construction waste	Steel, glass, plastic, wood/pallets, cardboard, paper	Intermittent	None	Recycle wherever possible, otherwise dispose to Class I landfill
Sanitary waste	Portable chemical toilets – sanitary waste	Periodically pumped to tanker truck by licensed contractors	None	Ship to sanitary wastewater treatment plant

The anticipated quantities of waste produced during Project operations are summarized in Table 3-11. Universal wastes and unusable materials produced as a result of implementation of the Proposed Action would be handled, stored, and managed in accordance with Tennessee Universal Waste requirements.

Table 3-11. Summary of operation waste streams and management methods.

Waste stream and classification	Origin and composition	Estimated amount	Estimated frequency of generation	Waste management method	
				On site	Off site
Used hydraulic fluid, oils and grease– petroleum-related wastes	Tracker drives, hydraulic equipment	1,000 gallons/year	Intermittent	Accumulate for <90 days	Recycle

Waste stream and classification	Origin and composition	Estimated amount	Estimated frequency of generation	Waste management method	
				On site	Off site
Oily rags, oil absorbent, and oil filters– petroleum-related wastes	Various	One 55-gallon drum per month	Intermittent	Accumulate for <90 days	Sent off site for recovery or disposed at Class I landfill
Spent batteries	Lead acid/lithium ion	1,000	Every 10 years	Accumulate for <90 days	Recycle

Waste collection and disposal would be conducted in accordance with applicable regulatory requirements to minimize health and safety effects. To the extent permissible, waste would 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 Project Site.

If necessary, Elora Solar or its contractor would obtain a hazardous waste generator identification number from the State of Tennessee prior to generating any hazardous waste. Any spills related to the Project would be reported to TDEC. A sampling and cleanup report would be prepared for the solar 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. Records of the amounts generated would be provided to the designated Elora Solar environmental specialist.

Wastewater

Permanent toilets would be installed to support full-time staff during operations. These toilets would be connected to a Project septic system. The septic system and toilets would not be located within 100 feet of any stream or wetland and would be designed based on other local requirements. No adverse effects are anticipated from wastewater treatment and disposal associated with the permanent toilets and associated septic system.

3.11 PUBLIC AND OCCUPATIONAL HEALTH AND SAFETY

This section describes an overview of existing public health and safety and the potential impacts to public health and safety associated with the No Action and Proposed Action Alternatives.

Analyzed issues include emergency response and preparedness and occupational, or worker safety in compliance with OSHA standards.

3.11.1 Affected Environment

The Project Site is currently private property, and agricultural, rural-residential, and undeveloped land uses dominate. Public emergency services in the area include urgent care clinics, hospitals, law enforcement services, and fire protection services.

The Advanced Family and Urgent Care Clinic, located on Eldad Road in Fayetteville, approximately 17 miles (20 minutes) northwest of the Project Site, is the closest urgent care center to the Project Site. The Lincoln Medical Center is the closest hospital, also located in Fayetteville, approximately 17 miles (20 minutes) northwest of the Project Site.

Law enforcement services in Lincoln County are provided by the Lincoln County Sheriff's Department in the City of Fayetteville, approximately 16 miles (17 minutes) from the Project Site. Fire protection services are provided by the Lincoln County Volunteer Fire Rescue (Elora Station) and the Fayetteville Fire Department (Station 2), located approximately 2.5 miles (5 minutes) and 17.5 miles (19 minutes), respectively, from the Project Site.

The Tennessee Emergency Management Agency has the responsibility and authority to coordinate with state and local agencies in the event of a release of hazardous materials.

3.11.2 Environmental Consequences

This section describes the potential impacts to public and occupational health and safety should the No Action or Proposed Action Alternative be implemented.

3.11.2.1 No Action Alternative

Under the No Action Alternative, the proposed solar facility would not be constructed; therefore, no Project related impacts on public health and safety would result. Existing land use would be expected to remain a mix of agricultural, rural-residential, and forested land, and existing public health and safety issues would be expected to remain as they are at present.

3.11.2.2 Proposed Action Alternative

During construction, workers on the Project Site 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. 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 personal protective equipment; regular safety inspections; and plans and procedures to identify and resolve hazards.

Potential public health and safety hazards could result from increased traffic on roadways due to construction of the Project. Residential and other human use areas along roadways used by

construction traffic to access the Project 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).

Approximately 2,500 gallons of fuel for vehicles would be kept on site in storage tanks during construction of the proposed solar facility. An SPCC plan would be implemented to minimize the potential of a spill and to instruct on-site workers on how to contain and clean up any potential spills. The perimeter of each grouping of Project elements would be securely fenced during construction and for the duration of operation, 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 for the Project Site would be provided by the local, regional, and state law enforcement, fire, and emergency responders, as described in the prior section.

No public health or safety hazards would be anticipated as a result of operations. Overall, impacts to public health and safety in association with implementation of the Proposed Action would be considered temporary and minor.

3.12 TRANSPORTATION

This section describes an overview of existing transportation resources, and the potential impacts on transportation resources that would be associated with the No Action and Proposed Action Alternatives. Components of transportation resources that are analyzed include roads, traffic, railroads, and airports.

3.12.1 Affected Environment

3.12.1.1 Roads

The Project Area considered for transportation is located near the community of Elora, in the southeastern portion of Lincoln County. The southeast terminus of the Project Site is just over 1.5 miles from the intersection of SR 121 (Elora Road) and SR 122 (John Hunter Highway). SR 121 is a two-lane, paved public road that extends north-south, from Tims Ford Lake to the Alabama state line (approximately 4 miles south of the Project Site). SR 121 bisects the northern portion of the Project Site, intersects with Winchester Highway (US 64) approximately 1.2 miles west of the Project Site, and extends north-south approximately 0.6 miles west of the Project Site's southwestern boundary (Figure 2-3). SR 122 is a two-lane, paved public road that extends east-west, traversing through Lincoln and Franklin counties. SR 122 stretches between the intersection with Elora Road and Winchester Highway in the Town of Huntland, approximately 3.5 miles east of the Project Site. Winchester Highway is an east-west, four-lane divided highway. It bisects the central portion of the Project Site and forms the northern boundary of the solar facility.

Several local roads are adjacent to and, thus, provide access to the Project Site. Terry Dunavan Road/Hotel Road is a two-lane, paved public road that extends north-south and is adjacent to the eastern portion of the Project Site. Hotel Road intersects Elora Road approximately 50 feet east of the Project Site. Shady Grove Cemetery Road is a small local road that extends east-west north of the Project Site, adjacent to the northern terminus of the Project Site, and intersects with

Elora Road approximately 0.5 miles east of the Project Site. There are also several unnamed local gravel roads that extend through the Project Site.

Road Traffic

Existing traffic volumes on roads in the Project Area were determined using Average Annual Daily Traffic (AADT) counts measured at existing TDOT stations (TDOT 2019). The 2017 AADT count for Station 990, located on Winchester Highway approximately 1 mile northwest of the Project Site, was 3,365 vehicles. The 2017 AADT count for Station 51, on Winchester Highway approximately 3.4 miles east of the Project Site, was 5,540 vehicles. Station 57, located along SR 121 approximately 0.7 mile from the Project Site, experienced 1,410 vehicles daily in 2017. Station 87, located along SR 121 approximately 1 mile from the Project Site, experienced 670 vehicles daily in 2017. At Station 92, located on SR 122 approximately 1 mile southwest of the Project Site, there were 2,048 daily vehicles in 2017.

3.12.1.2 Rail and Air Traffic

The closest rail line is operated by CSX Transportation and is located approximately 16.5 miles northeast of the Project Site. The closest general aviation airport is the Fayetteville Municipal Airport in Fayetteville, located approximately 11 miles west of the Project Site. The closest regional airport is the Tullahoma Regional Airport in Tullahoma, located approximately 19 miles northeast of the Project Site. The closest major airport, and the only one in the vicinity with regular commercial passenger service, is the Huntsville International Airport in Huntsville, Alabama, approximately 35 miles southwest of the Project Site.

3.12.2 Environmental Consequences

This section describes the potential impacts to transportation resources should the No Action or Proposed Action Alternative be implemented.

3.12.2.1 No Action Alternative

Under the No Action Alternative, the proposed solar facility would not be constructed. Therefore, no Project related impacts on transportation resources would result. Existing land use would be expected to remain a mix of agricultural, rural-residential, and undeveloped, forested land, and the existing transportation network and traffic conditions would be expected to remain as they are at present.

3.12.2.2 Proposed Action Alternative

Construction and operation of the Project would have no effect on operation of airports in the region. The operation of the Project would not affect commercial air passenger or freight traffic in the region and would not adversely affect any aerial crop dusters operating in the vicinity of the Project Site.

During construction of the proposed solar facility, a crew of approximately 150 to 250 people would be present in the Project Area between sunrise and sunset, seven days a week. A majority of these workers would likely come from the local area or region. Other workers could come from

outside the region, and if so, many would likely stay in local hotels in the vicinity. It is anticipated that workers would drive personal vehicles to the Project Area. Some of the individual workers and work teams would likely visit local restaurants and other businesses during the construction phase of the Project. Additional traffic due to deliveries and waste removal would consist of approximately 15 to 20 vehicles per day during the peak of construction, as discussed in more detail below.

Traffic flow around the Project Site would be heaviest at the beginning of the work day, at lunch, and at the end of the work day. Deliveries and most workers would likely access the Project Site from the west on Winchester Highway and would utilize existing Terry Dunavan Road to access the proposed laydown area within the Project Site. Several businesses and residences are present alongside Winchester Highway, Elora Road, and John Hunter Highway in the vicinity of the Project Site. Some traffic to Flintville Elementary School and Flintville Junior High School on Flintville School Road would likely travel east and west on Winchester Highway and north and south on Elora Road, west of the Project Site. Some traffic to Huntland School on Gore Street would likely travel east and west on Elora Road and John Hunter Highway, east of the Project Site. Should substantial traffic congestion occur, Elora Solar would implement staggered work shifts during daylight hours to assist traffic flow near Project Site access locations. Implementation of such mitigation measures would minimize potential adverse impacts to traffic and transportation to negligible levels.

Construction equipment and material delivery and waste removal would require approximately 15 to 20 flatbed semi-trailer trucks or other large vehicles visiting the Project Site each day during the peak of the construction period. The Project Site can be accessed via routes that do not have load restrictions. These vehicles should be easily accommodated by existing roadways; therefore, only minor impacts to transportation resources in the Project Area would be anticipated as a result of construction vehicle activity.

Several on-site access roads would be maintained on the Project Site. Following construction, the compacted gravel roads would be maintained to allow access for inspection and maintenance activities. However, these roads would be closed to the public. Permanent access to the Mann Road 161-kV Switching Station would be off of Shady Grove Cemetery Road. Several existing unnamed gravel roads that extend through the Project Site are expected to remain open during construction and operation of the Project.

Due to the proximity of the Project Site to the community of Elora, possible minor traffic impacts along Winchester Highway, Elora Road, and John Hunter Highway could occur, as workers could commute from Fayetteville. However, the proposed workforce would consist of a maximum of 250 employees for only part of the construction period; therefore, the addition of these vehicles to the existing traffic on Winchester Highway, Elora Road, and John Hunter Highway would be considered moderate temporary impacts. However, use of mitigation measures, such as implementing staggered work shifts during daylight hours, would minimize potential adverse impacts to traffic and transportation to minor or negligible levels.

The Elora Solar Energy Center would be staffed by up to four full-time workers who would live in the area. The addition of vehicles for full-time staff on local roadways would be accommodated

by existing infrastructure; therefore, the operation of the Project would not have a noticeable impact on the local roadways.

Overall, direct impacts to transportation resources associated with implementation of the Proposed Action would be anticipated to be minor to moderate and minimized or mitigated. The Proposed Action would not result in any indirect impacts to transportation.

3.13 SOCIOECONOMICS

This section describes an overview of existing socioeconomic conditions in the Project Area, and the potential impacts to socioeconomic conditions that would be associated with the No Action and Proposed Action Alternatives. Components of socioeconomic resources that are presented include population, employment, and income.

3.13.1 Affected Environment

The Project Site is located in an unincorporated portion of southeastern Lincoln County, Tennessee, approximately 1.3 mile north of the community of Elora. The Project Site overlaps USCB 2010 Census Tract (CT) 9755 (Figure 3-13). Generally, CT 9755 encompasses the southeastern corner of Lincoln County and includes portions of east-west-oriented Winchester Highway (US 64) and the unincorporated communities of Elora and Flintville. Lincoln County as a whole is primarily rural and does not include any densely populated areas. CT 9755 overlaps the entire 1,707-acre Project Site, which encompasses 2.9 percent of the entire area of CT 9755.

3.13.1.1 Population and Demographics

The population of Lincoln County, as reported in the 2010 USCB decennial census (2010 Census), was 33,361 (USCB 2019). The 2017 population of CT 9755 was approximately 4,889, according to the 2013 to 2017 American Community Survey 5-Year Estimates (2017 ACS). This estimate represents an approximate 2 percent decrease from 2010. The Tennessee State Data Center (2019) projects that the population of Lincoln County will increase by approximately 2 percent by 2040. However, based on the location of more populated areas, population increases would likely concentrate in portions of the county outside the Project Area. Population trends for the entirety of CT 9755, as compared with Lincoln County and the state, are presented in Table 3-12.

Table 3-12. Population trends in the Project Area.

Geography	2010 Census	2017 ACS	Percent Change 2010-2017	Projection 2040	Percent Change 2017-2040
CT 9755	5,003	4,889	-2.3	--	--
Lincoln County	33,361	33,543	+0.6	34,263	+2.2
Tennessee	6,346,105	6,597,381	+4.0	7,853,224	+19.0

Sources: Tennessee State Data Center 2019; USCB 2019

The population of Lincoln County and CT 9755 had higher median ages (43.3 years and 45.8 years, respectively) than the state as a whole (38.6 years), according to the 2017 ACS (USCB 2019). Higher percentages of people in CT 9755 (an average of 67 percent) maintained the same residence from one year prior to the 2017 ACS than in the county (66 percent) or Tennessee as a whole (60 percent).

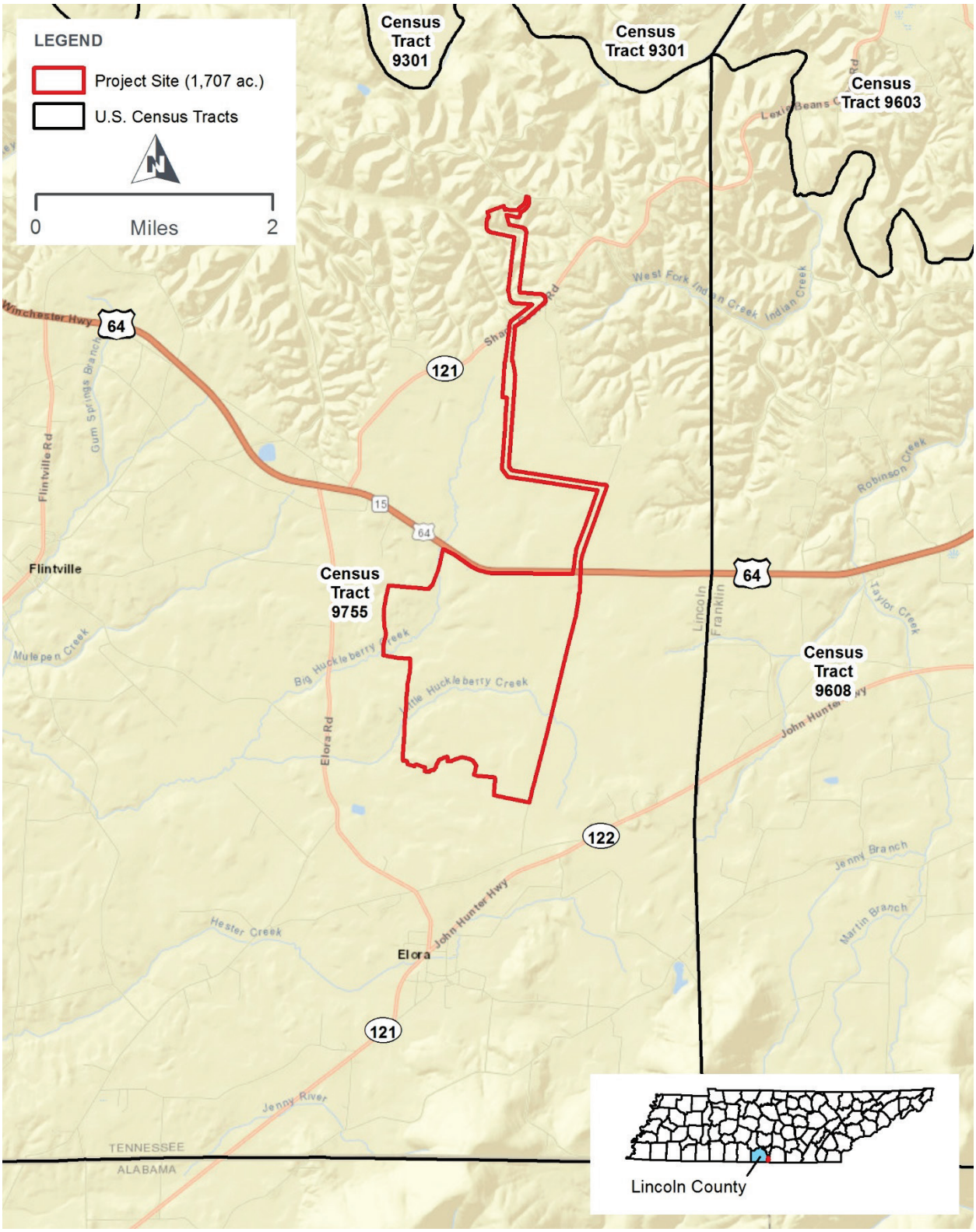

Figure 3-13. 2010 U.S. Census Bureau census tracts in the Project Area.

3.13.1.2 Employment and Income

According to the 2017 ACS, 55.9 percent of the CT 9755 population are in the labor force, slightly lower than the county and state percentages (56 percent and 61 percent, respectively). Within CT 9755 and Lincoln County, more civilians are employed in manufacturing than in other industries. In the state, educational services, health care, and social assistance employs the highest percentage of civilian workers. CT 9755 had an unemployment rate of approximately 8.0 percent (Table 3-13). This rate is higher than the county and state unemployment rates during the same period (5.9 percent and 6.6 percent, respectively). According to the 2017 ACS, the median household income for CT 9755 was $41,080, which was less than the county and the state as a whole ($42,153 and $48,708, respectively).

Table 3-13. Employment and income in the Project Area.

Geography	Unemployment Rate, 2017 ACS	Median Household Income, 2017 ACS
CT 9755	8.0	$41,080
Lincoln County	5.9	$42,153
Tennessee	6.6	$48,708

Source: USCB 2019.

3.13.2 Environmental Consequences

This section describes the potential impacts to socioeconomic resources should the Proposed Action or No Action Alternative be implemented. Social and economic issues considered for evaluation within the impact area include change in expenditures for goods and services and short- and long-term effects on employment and income.

3.13.2.1 No Action Alternative

Under the No Action Alternative, the proposed solar facility would not be constructed; therefore, no socioeconomic effects from the Project would occur. Existing land use would be expected to remain a mix of agricultural, rural-residential, and undeveloped, forested land, and existing socioeconomic conditions would be expected to remain as they are at present.

3.13.2.2 Proposed Action Alternative

Under the Proposed Action, a new solar facility would be built in the Project Area. Project construction activities would take approximately 20 months to complete with a crew of approximately 150 to 250 workers at the site, depending on construction activities. Workers would include general laborers and electrical technicians. Work would generally occur seven days a week during daylight hours. Short-term beneficial economic impacts would result from construction activities associated with the Project, including the purchase of materials, equipment, and services and a temporary increase in employment and income. This increase would be local or regional, depending on where the goods, services, and workers were obtained. It is likely some construction materials and services would be purchased locally in Lincoln County and/or in adjacent counties. Most of the other components of the solar and transmission facilities would be

acquired from outside the local area. Also, many of the construction workforce would likely be sought locally or within the region. The direct impact to the economy associated with construction of the Project would be short-term and beneficial.

The majority of the indirect employment and income impacts would be from expenditure of the wages earned by the workforce involved in construction activities, as well as the local workforce used to provide materials and services. Construction of the Project could have minor beneficial indirect impacts to population and short-term employment and income levels in Lincoln County.

During operation of the solar facility, a full-time workforce of up to four people would be on site five days a week for scheduled shifts between 7 A.M. to 5 P.M. This workforce would manage and maintain the Elora Solar Energy Center and conduct regular inspections. Grounds maintenance and some other operation and maintenance activities may be conducted by local contractors. Therefore, operations of the solar facility would have a small positive impact on employment and population in Lincoln County.

Overall, socioeconomic impacts for the operation of the proposed solar facility would be positive and long-term, while small relative to the total economy of the region. The local tax base would increase from construction of the solar facility and would be most beneficial to Lincoln County and the vicinity. Additionally, the local governments would not have to provide any of the traditional government services typically associated with a large capital investment, such as water, sewer, or schools.

3.14 ENVIRONMENTAL JUSTICE

This section describes an overview of environmental justice considerations within the Project Area and the potential impacts to environmental justice populations that would be associated with the No Action and Proposed Action Alternatives. Components of environmental justice that are presented include the proportions of the local population that are minority and low-income and the potential for effects to these populations.

3.14.1 Affected Environment

Environmental justice-related impacts are analyzed in accordance with EO 12898 to identify and address as appropriate disproportionately high and adverse human health or environmental effects of federal programs, policies, and activities on minority and low-income populations. While not subject to this EO, TVA routinely considers environmental justice in its NEPA review processes.

Council of Environmental Quality (CEQ) guidance directs identification of minority populations when either 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 other 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. Due to including one of these minorities, those indicating two or more races are also considered minorities. Minority populations were defined as those exceeding 50 percent.

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 USCB-provided 2017 poverty threshold for individuals under age 65 was $12,752, and the official poverty rate for the U.S. as a whole in 2017 was 12.3 percent (USCB 2018). Due to data availability, low-income populations were defined as those with poverty rates estimated for all people that are above the U.S. poverty rate of 12.3 percent.

Based on CEQ guidance, USCB data reported in the 2017 ACS were used to identify minority and low-income populations in the Project Area. As discussed in more detail in Section 3.14.1.1, the Project Site overlaps approximately 2.9 percent of the total area of USCB 2010 CT 9755 (Figure 3-13). The Project Site lies more specifically within approximately 7.2 percent of Block Group (BG) 2, CT 9755.

3.14.1.1 Minority Population

As of the 2017 ACS, minorities constituted approximately 13 percent of the total population in Lincoln County (Table 3-14). This percentage is lower than the state minority percentage of approximately 26. In the Project Area, BG 2, CT 9755 had a minority population of 0.7 percent. According to the USEPA EJSCREEN, an environmental justice screening and mapping tool, on the Project Site and within a 3-mile radius of the approximate center of the Project Site, the minority population is estimated to be 15 percent (USEPA 2019d). While the USCB and USEPA findings differ, both indicate a minority population in the Project Area under the 50 percent threshold noted in CEQ guidance.

Table 3-14. Minority population in the Project Area.

Geography	Minority Population[1]	% Minority Population
Block Group 2, CT 9755	11	0.7
Lincoln County	4,233	12.6
Tennessee	1,698,493	25.7

Source: USCB 2019

[1] Those reporting White Alone, Not Hispanic are those counted as nonminorities. All others, including White Alone, Hispanic, are included in the minority population.

3.14.1.2 Poverty

Based on the 2017 ACS, the poverty rate for all people in Lincoln County was 16.9 percent (Table 3-15). CT 9755 had a poverty rate for all people of 24.6 percent. This poverty rate is higher than the rates of the county and state. According to the USEPA EJSCREEN, on the Project Site and within a 3-mile radius of the Project Site, the low-income population is estimated at 80 percent, and the per capita income is approximately $21,015 (USEPA 2019d).[1] Within CT 9755, which

[1] EJScreen defines low-income populations as “Percent of individuals whose ratio of household income to poverty level in the past 12 months was less than 2 (as a fraction of individuals for whom ratio was determined).” The source of the minority data in EJScreen is USCB 2012 to 2016 ACS 5-Year Estimates.

encompasses the Project Site, the estimated poverty rate for all people was higher than the county, the state, and the official U.S. poverty rate (12.3 percent).

Table 3-15. Poverty in the Project Area.

Geography	Per Capita Income, People in Families	Poverty Rate, People in Families	Poverty Rate, All People
CT 9755	16,317	23.5	24.6
Lincoln County	24,029	14.8	16.9
Tennessee	$27,277	14.0	16.7

Source: USCB 2019

3.14.2 Environmental Consequences

This section describes the potential impacts on environmental justice populations should the Proposed Action or No Action Alternative be implemented. According to CEQ, adverse health effects to be evaluated within the context of environmental justice impacts may include bodily impairment, infirmity, illness, or death. Environmental effects may include ecological, cultural, human health, economic, or social impacts. Disproportionately high and adverse human health or environmental effects occur when the risk or rate of exposure to an environmental hazard or an impact or risk of an impact on the natural or physical environment for a minority or low-income population is high and appreciably exceeds the impact level for the general population or for another appropriate comparison group (CEQ 1997).

3.14.2.1 No Action Alternative

Under the No Action Alternative, there would be no changes to the Project Area attributable to the Proposed Action and, therefore, no disproportionately high and adverse direct or indirect impacts on minority or low-income populations.

3.14.2.2 Proposed Action Alternative

Based on the analyses presented in Section 3.14.1, including the results of the USEPA EJSCREEN analyses, low-income populations are present in the Project Area at higher rates than the county and state. The Project Area also has an estimated poverty rate that is higher than the official U.S. poverty rate of 12.3 percent.

The overall impacts of the Project, as described in other sections in this chapter, most of which would occur during the 20-month construction period, would be minor, and off-site impacts would be negligible. As such, no disproportionately high or adverse direct or indirect impacts on low-income populations due to human health or environmental effects are expected to result from the Proposed Action. Rather, the Project is expected to have beneficial effects to the local economy that would potentially benefit low-income populations.

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CHAPTER 4

4 ANTICIPATED ENVIRONMENTAL IMPACTS AND CUMULATIVE IMPACTS

This chapter summarizes the anticipated adverse environmental impacts of the Project and considers the relationship between short-term uses and long-term productivity and whether the Project makes irreversible and irretrievable commitments of resources. This chapter also considers the cumulative impacts in relation to other ongoing or reasonably foreseeable proposed activities within the Project Area.

4.1 UNAVOIDABLE ADVERSE ENVIRONMENTAL IMPACTS

The Proposed Action could cause some unavoidable adverse environmental effects (see Table 2-2). Specifically, construction activities would temporarily increase noise, traffic, and health and safety risks and temporarily affect air quality, GHG emissions, and visual aesthetics of the Project Site vicinity. Construction activities would primarily be limited to daytime hours, which would minimize noise impacts. Temporary increases in traffic would be minimized or mitigated by instituting staggered work shifts during daylight hours. Temporary increases in health and safety risks would be minimized by implementation of the Project health and safety plan. Construction and operations would have minor, localized effects on soil erosion and sedimentation that would be minimized by soil stabilization and vegetation management measures. The Project would change land uses on the Project Site from primarily agricultural to solar uses, where these practices are not presently occurring; however, renewable energy uses, including solar power, are permitted uses in this portion of Lincoln County.

With the application of appropriate BMPs, no unavoidable adverse effects to groundwater are expected. Minor unavoidable adverse impacts affecting up to two potentially jurisdictional streams (0.14 acre; 32 linear feet) due to road crossings, seven potentially jurisdictional wetlands (7.8 acres) for solar panel placement, and approximately 54 potentially nonjurisdictional WWCs (28,286 linear feet) due to the placement of solar panels and road crossings are anticipated. Long-term habitat loss would also occur due to alteration of land use on approximately 1,471 acres of the Project Site. Revegetation of the Project Site with native and/or noninvasive grasses and herbaceous vegetation would help minimize effects to open, grassy habitats. The Project is not expected to adversely affect any federally or state-listed species. Potential summer roosting habitat for federally listed NLEB and Indiana bats would be removed between October 15 and March 31, when these bats are roosting outside of the Project Area. Consultation with the USFWS under Section 7 of the ESA was initiated in November 2019, with the finalized wildlife and vegetation assessment (Appendix D).

4.2 RELATIONSHIP OF SHORT-TERM USES AND LONG-TERM PRODUCTIVITY

Short-term uses are those that generally occur on a year-to-year basis. Examples are wildlife use of forage, timber management, recreation, and uses of water resources. Long-term productivity is the capability of the land to provide resources, both market and nonmarket, for future generations. In this context, long-term impacts to site productivity would be those that last beyond the life of the Project. The Proposed Action would adversely affect current short-term uses of the

Project Site by converting it from agricultural and undeveloped land to a solar power generation facility. The effects on long-term productivity would be minimal as existing land uses could be readily restored on the Project Site following the decommissioning and removal of the solar facility.

4.3 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

An irreversible or irretrievable commitment of resources would occur when resources would be consumed, committed, or lost because of the Project. The commitment of a resource would be considered irretrievable when the Project would directly eliminate the resource, its productivity, or its utility for the life of the Project and possibly beyond. Construction and operation activities would result in an irretrievable and irreversible commitment of natural and physical resources. The implementation of the Proposed Action Alternative would involve irreversible commitment of fuel and resource labor required for the construction, maintenance, and operation of the Solar system. Because removal of the solar arrays and associated on-site infrastructure could be accomplished rather easily, and the facility would not irreversibly alter the site, the Project Site could be returned to its original condition or used for other productive purposes once it is decommissioned. Most of the solar facility components could also be recycled after the facility is decommissioned.

4.4 CUMULATIVE IMPACTS

Cumulative impacts are defined as the effects of the Proposed Action when considered together with other past, present, and reasonably foreseeable future actions. Chapter 3, Affected Environment and Environmental Consequences, presents information about past and present environmental conditions, as well as future trends, where appropriate. This chapter addresses the cumulative impacts of the Project and any reasonably foreseeable action in the vicinity.

Desktop research of potential past, present, and future actions in the Lincoln County, Tennessee area was conducted. Resources examined included:

- Local and regional news sources;
- Town of Fayetteville government website records, including planning commission meetings, city meeting minutes, and public notices;
- Chamber of Commerce websites and meeting minutes; and
- TDOT website.

The proposed Project would result in minor direct impacts to land use, geological resources and farmlands, water resources, biological resources, visual resources, noise, air quality, public health and safety, and transportation.

4.4.1 FEDERAL PROJECTS

This section addresses other projects with possible effects to land use, geological resources and farmlands, water resources, biological resources, visual resources, noise, air quality, public health and safety, and transportation.

Six federal projects were identified in Lincoln County, with the closest project located approximately 2.5 miles from the Project Site. These transportation projects are being funded by the IMPROVE Act. The act is providing funding for 962 road and bridge projects across the state (State of Tennessee 2019b). Five of the six projects are bridge replacements funded through the Local Bridges Program and one widening project funded through the Rural Accessibility Program, as follows:

- Kidd Lane Bridge over Elk River southwest of Fayetteville;
- Providence Road Bridge over Unnamed Tributary to Norris Creek northeast of Fayetteville;
- Providence Road Bridge over Mulberry Creek northeast of Fayetteville;
- Steelman Road Bridge over East Fork Mulberry Creek northeast of Fayetteville;
- Wells Lee Road Bridge over Big Huckleberry Creek northwest of Elora; and
- Huntsville Highway widening from south of Elk River to the intersection of SR-110 south of Fayetteville.

The nearby project is the bridge replacement over Big Huckleberry Creek northwest of Elora. Considering that the project would involve replacement of an existing bridge along an existing roadway and given the nature of the impacts of the proposed Elora Solar Energy Center, the Proposed Action is unlikely to contribute to cumulative adverse effects to the same resources affected by the IMPROVE Act-funded projects.

4.4.2 STATE AND LOCAL PROJECTS

The Project Area is outside of incorporated portions of Lincoln County and is largely within a rural agricultural and residential area. There are no known recent or planned state and local projects in the Project Site vicinity. Therefore, the Proposed Action would not contribute to cumulative adverse effects to the same resources affected by any state or local projects.

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CHAPTER 5

5 LIST OF PREPARERS

5.1 PROJECT TEAM

Table 5-1 presents the members of the Project team and summarizes the expertise of each member and their contributions to this EA.

Table 5-1. Elora Solar Energy Center Environmental Assessment Project Team

Name/Education	Experience	Project role
TVA		
Adam Datillo M.S. Forestry B.S. Natural Resource Conservation Management	20 years of experience in ecological restoration and plant ecology and 15 years in botany	Vegetation, Threatened and Endangered Species (Plants)
Elizabeth Smith B.A., Environmental Studies and Geography NEPA Specialist	10 years in environmental policy and NEPA compliance	NEPA Project Manager and Coordinator
Elizabeth B. Hamrick M.S., Wildlife; B.S., Biology Zoologist	19 years conducting field biology, 8 years in biological compliance, NEPA compliance, and ESA consultation for T&E terrestrial animals	Terrestrial zoology
Michaelyn Harle Ph.D., Anthropology; M.A. Anthropology; B.A. Anthropology Archaeologist	16 years in cultural resource management	Cultural resources, NHPA Section 106 compliance
Jessica Lyon B.S.E, Environmental Engineering; B.S.Ch.E., Chemical Engineering; M.S., Environmental Science	2 years in environmental permitting and transmission support, 2 years in air pollution controls	TVA Environmental Engineer, TPES
Kim Pilarski-Hall M.S. and B.S. Geography, Minor in Ecology	21 years of experience in wetlands assessment and delineation	Wetlands and Natural Areas

Name/Education	Experience	Project role
A. Chevales Williams B.S. Environmental Engineering	14 years in water quality monitoring and compliance; 13 years in NEPA planning and environmental services	Permits and Compliance – Surface Water and Erosion
Carrie Williamson, P.E., CFM M.S. Civil Engineering B.S. Civil Engineering	6 years in floodplains and flood risk, 3 years in River Forecasting, 11 years in compliance monitoring	Floodplains and Flood Risk
HDR		
Thomas Blackwell, PWS M.S., Environmental Resource Management; B.A. Natural Science (Geography)	14 years in stream and wetland delineations and restoration design, permitting, NEPA documentation, and project management	Environmental Planner, overall project management, field studies coordination, document preparation
Benjamin Burdette, EIT B.A., International/Global Studies M.S., Environmental/Environmental Health Engineering	5 years in NEPA coordination and document preparation, and GIS mapping	Environmental Scientist, document preparation, GIS mapping
Mark P. Filardi, P.G. M.S. and B.S., Geology	19 years in hydrogeology and contaminated site assessment and remediation	Sr. Environmental Scientist, Document preparation
Josh Fletcher, RPA M.A., Anthropology (Archaeology); B.S., Architectural Design	22 years in cultural resources management, regulatory compliance, NEPA documentation, and project management	Environmental Scientist/Planner, document preparation
J. Wayne Hall *B.S. Marine Science*	25 years in combined regulatory compliance, preparation of environmental review documents, and project management	Sr. Environmental Scientist, document preparation

Name/Education	Experience	Project role
Edward Liebsch M.S., Meteorology; B.A., Earth Science (Chemistry minor)	38 years in air dispersion analysis, air quality permitting, NEPA air quality analysis and climate assessments	Sr. Environmental Scientist, Document preparation
Jason McMaster, PWS M.S., Environmental Science; M.A., Biology; B.S., Business Administration	12 years in combined regulatory compliance, preparation of environmental review documents, and project management	Environmental Scientist, document preparation
Charles Nicholson B.S., Wildlife and Fisheries Science M.S., Wildlife Management PhD, Ecology and Evolutionary Biology	17 years in wildlife and endangered species research and management, 24 years in NEPA compliance	Document QA/QC
Harriet L. Richardson Seacat M.A., Anthropology (Cultural); B.A., Anthropology (Native American Studies minor)	19 years in anthropology, archaeology, history, NHPA and NEPA documentation, and project management	Project Manager and NEPA Lead/Environmental Planner, document preparation and coordination lead, GIS mapping
Miles Spenrath B.S., Environment and Natural Resources	7 years in NEPA compliance	Environmental Scientist, GIS mapping, document preparation
Kelly Thames. PWS B.A., Environmental Science M.S., Plant Biology	7 years in ecology, biology, stream and wetland delineations, permitting, habitat evaluation and restoration, and GIS mapping	Environmental Scientist, biological and water resource studies, document preparation
Blair Goodman Wade, ENV SP M.E.M., Environmental Management; B.S., Integrated Sciences and Technology (Environmental Science and GIS)	15 years in regulatory compliance, NEPA documentation, and mitigation planning	Sr. Environmental Planner, document preparation
Erica Wadl M.S. Forestry; B.S. Biology	13 years in environmental permitting, land management, and NEPA compliance	Environmental Scientist, document preparation

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CHAPTER 6

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Appendices

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Appendix A

TVA Environmental Quality Protection Specifications for Transmission Line Construction

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Appendix B

TVA Transmission Construction Guidelines near Streams

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Appendix C

TVA Environmental Quality Protection Specifications for Transmission Substation or Communications Construction

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Appendix D

Correspondence and Supporting Information

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