GOLDEN TRIANGLE SOLAR and BESS PROJECT
Lowndes County, Mississippi

DRAFT
ENVIRONMENTAL ASSESSMENT

Prepared for:
TENNESSEE VALLEY AUTHORITY
Knoxville, Tennessee

Submitted By:
MS Solar 5, LLC

Prepared by:
Burns & McDonnell

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To request further information, contact:
Ashley Pilakowski
NEPA Compliance
Tennessee Valley Authority
400 West Summit Hill Drive, WT 11B
Knoxville, Tennessee 37902-1499
Phone: 865-632-2256
E-mail: aapilakowski@tva.gov

Page No.

LIST OF TABLES

Page No.

LIST OF FIGURES

Page No.

LIST OF ABBREVIATIONS

Abbreviation	Term/Phrase/Name
AADT	Annual Average Daily Traffic
AC	alternating current
Alp	Airport Layout Plan
APE	Area of Potential Effects
BCC	Birds of conservation concern
BESS	battery energy storage system
BGEPA	Bald and Golden Eagle Protection Act
BMP	best management practice
BMS	Battery management system
BZA	Board of Zoning Appeals
CBMPP	Construction best management practices plan
CEQ	Council on Environmental Quality
CFR	Code of Federal Register
CLOMR	Conditional Letter of Map Revision
CO	Carbon monoxide
CRA	Cultural Resource Analysts
CWA	Clean Water Act
dBA	A-weighted decibel
dbh	diameter at breast height
DC	direct current
DNL	day-night sound level
EA	Environmental Assessment
EO	Executive Order
ESCP	Erosion and Sedimentation Control Plan
FAA	Federal Aviation Administration
F-A-R	Forestry-Agriculture-Recreation
FEMA	Federal Emergency Management Agency

Abbreviation	Term/Phrase/Name
FIRM	Flood Insurance Rate Map
FPPA	Farmland Protection Policy Act
GHG	greenhouse gas
GTR	Golden Triangle Regional Airport
HVAC	Heating, ventilation, and air conditioning
IRP	Integrated Resource Plan
kV	kilovolts
L_{dn}	Day-night sound level
L_{eq}	24-hour equivalent sound level
LFP	Lithium iron phosphate
Li-ion	Lithium ion
Lmax	maximum noise level
LTO	Lithium titanate oxide
$\mu g/m^3$	micrograms per cubic meter
MBTA	Migratory Bird Treaty Act
MDAH	Mississippi Department of Archives and History
MDEQ	Mississippi Department of Environmental Quality
MDOT	Mississippi Department of Transportation
MDWFP	Mississippi Department of Wildlife, Fisheries, and Parks
MFC	Mississippi Forestry Commission
MLRA	Major Land Resource Area
MPT	main power transformer
MS Solar 5	MS Solar 5, LLC
MVT	mid-voltage transformer
MW	megawatt
NAAQS	National Ambient Air Quality Standards
NCM	Lithium nickel cobalt manganese oxide
NEPA	National Environmental Policy Act

Abbreviation	Term/Phrase/Name
NFPA	National Fire Protection Association
NHL	National Historic Landmark
NHPA	National Historic Preservation Act
NO_2	nitrogen dioxide
NOI	notice of intent
NPDES	National Pollution Discharge Elimination System
NPS	National Park Service
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NSA	Noise sensitive areas
OSHA	Occupational Safety and Health Administration
PEL	Permissible exposure limit
PM_{10}	Particulate matter having a diameter of less than or equal to 10 microns
$PM_{2.5}$	Particulate matter having a diameter of less than or equal to 2.5 microns
PPA	power purchase agreement
ppb	parts per billion
ppm	parts per million
Project	The Golden Triangle Solar Project
PV	photovoltaic
ROW	right-of-way
RNHD	regional natural heritage database
RSO	Renewable Standard Offer
SGHAT	Solar Glare Hazard Analysis Tool
SHPO	State Historic Preservation Office
SO_2	sulfur dioxide
Solar Facility	A 200-MW AC single-axis tracking photovoltaic solar facility with a 50 MW battery energy storage system
SPCC	Spill Prevention, Control, and Countermeasures

Abbreviation	Term/Phrase/Name
STEL	Short-term exposure limit
SWPPP	Stormwater Pollution Prevention Plan
TLV	Threshold limit value
TVA	Tennessee Valley Authority
TVARAM	Tennessee Valley Authority Rapid Assessment Method
TWA	Time weighted average
USACE	U.S. Army Corps of Engineers
USCB	U.S. Census Bureau
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Service
WOTUS	Waters of the U.S.

GLOSSARY OF TERMS

Area of Potential Effect (APE): The APE includes any area within the Project Site where impacts could occur during construction, operation, or both. Because the Project layout is still preliminary and subject to change, MS Solar 5 has selected an APE that is larger than what would likely be needed. The APE for cultural resources also includes areas within a half mile radius that are within the visual line of sight of the parcels where above ground facilities are proposed.

Artesia Substation: The Artesia Substation is TVA's existing 161-kV substation, located along the western end of Mims Road.

Artesia Switching Station: The Artesia Switching Station is TVA's proposed switching station for the Project. TVA's proposed 0.85-acre Artesia Switching Station would be located directly east of the existing TVA Artesia Substation.

Collection Lines: Collection lines are typically buried (at least three feet under the surface) electrical connections that are installed between different sections of arrays and other facilities within the Project Site.

Fencerow: A fencerow is typically located along the perimeter of a parcel that is comprised of agricultural land, pastureland, or open space. It may actually contain a fence or did at one point in the past. There is typically a row of trees or shrubs that grow along the fencerow. Many of the parcels associated with the Golden Triangle Solar Facility have fencerows along the perimeter of the parcels.

Gen-Tie: Approximately 1,665-foot-long tie-in that would connect the proposed Golden Triangle Substation to TVA's proposed Artesia Switching Station.

Golden Triangle Solar and Batter Energy Storage System (BESS) Facility: The Golden Triangle Solar and BESS Facility includes the 30 parcels that would contain solar arrays, inverters, collection lines, permanent access roads, the BESS facility, and the Golden Triangle Substation. The Golden Triangle Solar and BESS Facility (or "Solar Facility") would result in 200 MW of AC generating capacity and an additional 50 MW of battery energy storage. It does not include the new gen-tie, or the new Artesia Switching Station, which would occur on two additional parcels.

Golden Triangle Substation: The Golden Triangle Substation is MS Solar 5's newly proposed substation for the Project. It would be located in the central portion of the Project Site, along the east side of Guerry Road. The BESS would be located in within the same area.

Project or Proposed Action: The Project or Proposed Action includes the proposed Golden Triangle Solar and BESS Facility, Collection Lines, Gen-tie, Golden Triangle Substation, TVA's Artesia Switching Station, and the PPA between TVA and MS Solar 5, LLC. Total land impacts for implementation of the Project or Proposed Action would be less than the overall Project Site (approx. 3,792 acres).

Project Area: The "Project Area" includes the Project Site, as defined below, and the land, roadways, businesses, and homes within approximately ½ mile of the Project Site.

Project Site: The "Project Site" includes all 32 parcels that would be affected during Project construction and/or operation. The total Project Site is approximately 3,792 acres. Only portions of the total Project Site would be impacted during construction and/or operation of the Project.

Survey Area: The Survey Area includes the proposed Project Site as well as additional areas that were surveyed by environmental and cultural resources specialists. The Survey Area applies to all parcels associated with the Solar Facility as well as some smaller areas outside the defined Project Site. Up to 3,980 acres were surveyed as part of the environmental and cultural surveys.

1.0 INTRODUCTION

The Tennessee Valley Authority (TVA) has entered into a Power Purchase Agreement (PPA) with MS Solar 5, LLC (herein referred to as "MS Solar 5") to purchase power and environmental attributes generated by the proposed Golden Triangle Solar Project (Project) in Lowndes County, Mississippi. The Project would be constructed by MS Solar 5 and is expected to generate up to 200 megawatts (MW) of alternating current (AC) capacity with a 50 MW AC – 200-Megawatt hour (MWh) Battery Energy Storage System (BESS). Under the terms of the conditional PPA between TVA and MS Solar 5, dated December 23, 2019, TVA would purchase the electric output and environmental attributes generated by the proposed Solar Facility for an initial term of 20 years, subject to satisfactory completion of all applicable environmental reviews. In addition to purchasing the electric output under the PPA with MS Solar 5, TVA also plans to install a switching station as part of the Project, referred to as the Artesia Switching Station.

The proposed Project is located north and east of the town of Artesia, Mississippi (Figure 1-1). The Project Site includes 33 individual parcels on approximately 3,792 acres of land, on which the solar array footprints, Golden Triangle Substation, BESS, connection lines, gen-tie, and the Artesia Switching Station and associated access roads would be constructed. The Solar Facility would consist of multiple parallel rows of photovoltaic (PV) panes on single-axis tracking structures, along with direct current (DC) and AC inverters and transformers. MS Solar would enter into long-term lease agreements or land purchases on 28 of the Project parcels.

TVA's connection with the Project would be at the existing TVA Artesia Substation, which would require network upgrades within TVA's existing system. Existing TVA transmission lines would be upgraded so that the Golden Triangle Solar Facility can generate the megawatts (MW) as studied during the planning phase. Details regarding the scope of work necessary for the network upgrades are not known at this time. As details become available, an additional supplemental environmental analysis will be completed. While it is desirable for upgrade work to be completed by the in-service date (ISD) of the Solar Facility, TVA can utilize a temporary operation guide so that solar generation can occur prior to completion of upgrade work. All upgrade work would occur at existing TVA substations and on existing TVA transmission lines within existing right-of-way (ROW). No new property or easement rights will be acquired for the required network upgrades.

1.1 Purpose and Need for Action

The Tennessee Valley Authority is a corporate agency of the United States that provides electricity for business customers and local power companies serving nearly 10 million people in parts of seven southeastern states called the Tennessee Valley. TVA's mission is to serve the people of the Tennessee Valley region, and it does that through three main areas of work – energy, the environment, and economic development.

TVA produces or obtains electricity from a diverse portfolio of energy sources, including solar, hydroelectric, wind, biomass, fossil fuel, and nuclear. In June 2019, TVA completed an Integrated

Resource Plan (IRP) and associated Environmental Impact Statement (EIS) (TVA 2019a and TVA 2019b). 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 and reducing environmental impacts. These energy resources from the 2019 IRP included the addition of between 1,500 and 8,000 MW (AC) of solar capacity by 2028 and up to 14,000 MW by 2038 (TVA 2019a). Customer demand for cleaner energy prompted TVA to release a Request for Proposal (RFP) for renewable energy resources (2019 Renewable RFP). The MS Solar 5 PPA that resulted from this RFP 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 2019 IRP. The Proposed Action would provide cost-effective renewable energy consistent with the IRP and TVA goals.

1.2 Scope of this Environmental Assessment

Pursuant to the National Environmental Policy Act of 1969 (NEPA), federal agencies are required to evaluate the potential environmental impacts of their proposed actions. This environmental assessment (EA) was prepared consistent with Council on Environmental Quality (CEQ) regulations for implementing NEPA at 40 CFR 1500-1508 issued in 1978 (43 FR 55990, Nov. 29, 1978), with minor revisions in 1979 and 1986, as well as TVA regulations at 18 CFR 1318 issued in 2020 (85 FR 17434, Mar. 27, 2020). Because TVA began this EA before CEQ issued revised NEPA regulations (85 FR 43304-43376, Jul. 16, 2020), TVA applied the previously promulgated 1978 CEQ regulations and TVA's 2020 NEPA regulations in the preparation of this EA (see 40 CFR 1506.13).

TVA's Proposed Action would result in the construction and operation of the proposed Solar and BESS Facilities by MS Solar 5, and actions taken by TVA to connect the Solar and BESS Facilities to the TVA transmission system and perform network upgrades on its existing system. Details regarding the network upgrades are still being developed. Therefore, additional supplemental environmental analyses will be completed at a later time. The scope of this EA therefore focuses on impacts related to the construction and operation of the proposed Solar and BESS Facilities, gen-tie, and associated Artesia Switching Station located within the Project Site.

This EA describes the existing environment at the Project Site (Figure 1-1), analyzes potential environmental impacts associated with the Proposed Action and the No Action Alternatives, and identifies and characterizes potential cumulative impacts from the proposed Project in relation to other ongoing and reasonably foreseeable future proposed activities within the surrounding area of the Project Site.

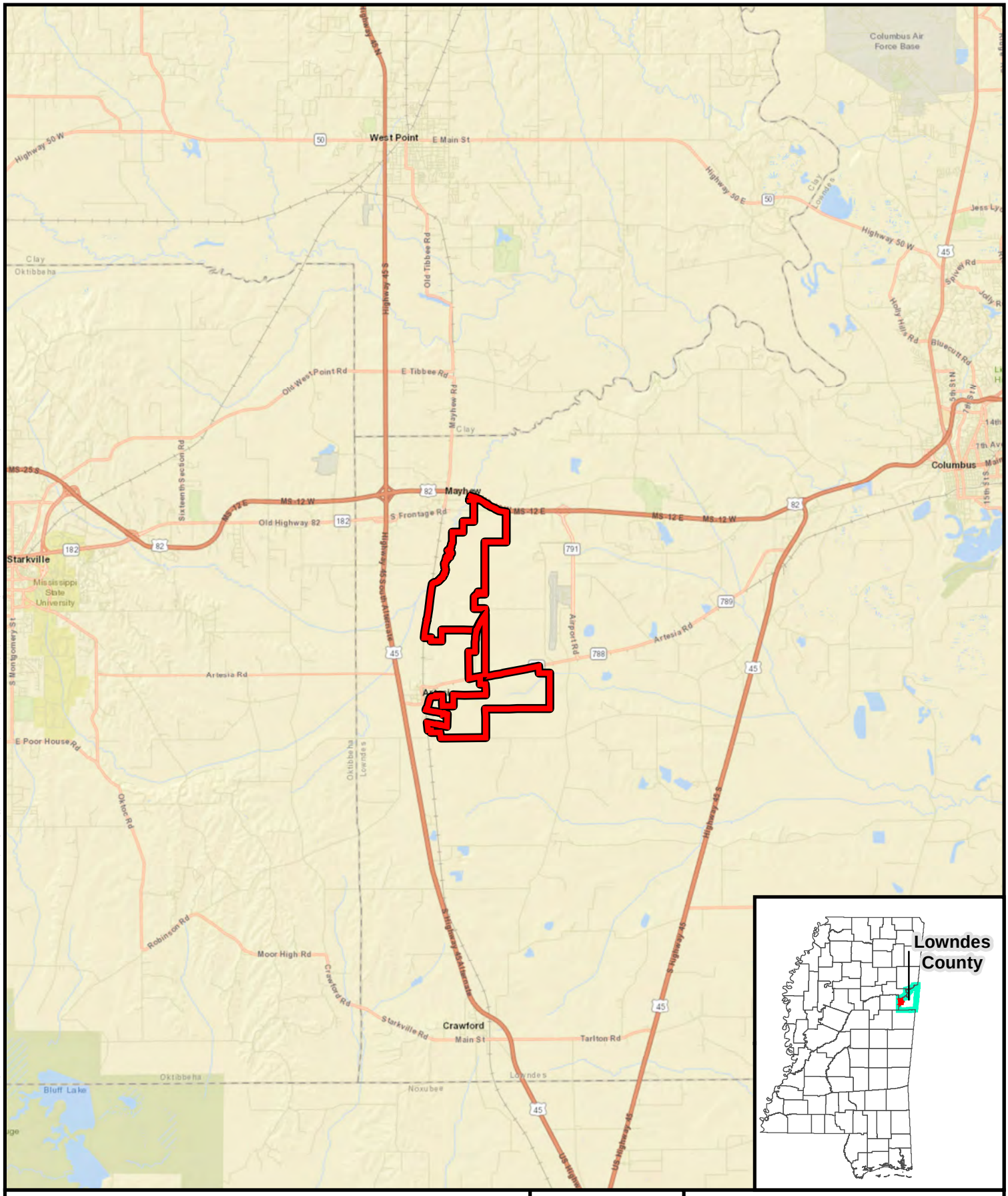
Under the PPA, TVA's obligation to purchase power is contingent upon the satisfactory completion of the appropriate environmental review and TVA's determination that the Proposed Action will be "environmentally acceptable." To be deemed "environmentally acceptable", TVA must assess the impact of the Project on the human environment to determine whether (1) any significant impacts would result from the location, operation, and/or maintenance of the proposed Project and/or associated facilities, and (2) the Project would be consistent with the purposes,

provisions, and requirements of applicable federal, state, and local environmental laws and regulations.

Based on internal scoping and identification of applicable laws, regulations, executive orders, and policies, TVA identified the following resource areas for analysis within this EA: Land Use (includes Natural Areas and Recreation); Geology, Soils, and Prime Farmland; Water Resources; Biological Resources; Visual Resources; Noise; Air Quality and Greenhouse Gas Emissions; Cultural Resources; Utilities; Waste Management; Public and Occupational Health and Safety; Socioeconomics; Environmental Justice; and Transportation.

This EA consists of six chapters discussing the Project alternatives, potentially impacted resource areas, and analyses of these impacts. Additionally, this document includes five appendices, which generally contain more detail on technical analyses and supporting data. The structure of the EA is outlined below:

- **Section 1.0**: Describes the purpose and need for the Project, the decision to be made, related environmental reviews and consultation requirements, necessary permits or licenses, and the EA overview.
- **Section 2.0**: Describes the Proposed Action and No Action Alternatives, provides a comparison of alternatives, and discusses the Preferred Alternative.
- **Section 3.0**: Discusses the affected environment and the potential direct and indirect impacts on these resource areas. Mitigation measures are also proposed, as appropriate.
- **Section 4.0**: Discusses the cumulative impacts in relation to other ongoing and reasonably foreseeable proposed activities within the surrounding area of the Project Site.
- **Section 5.0**: Provides the List of Preparers for the preparation of this EA.
- **Section 6.0: Provides the list of Literature Cited in this EA.**
- **Appendix A**: TVA's Site Clearing and Grading Specifications
- **Appendix B**: Golden Triangle Solar Project Wetland and Waterbody Delineation Report
- **Appendix C**: Golden Triangle Solar Project Hydrology Study
- **Appendix D**: Protected Species Information and Reporting for the Golden Triangle Solar Project
- **Appendix E**: Agency Consultations


West Point
E Main St
Highway 50 W
Highway 50 E
Columbus Air Force Base
Clay
Oktibbeha
Lowndes
Old Tibbee Rd
Highway 45 S
Old West Point Rd
E Tibbee Rd
Mayhew Rd
Mayhew
Columbus
MS-25 S
MS-12 W
MS-12 E
Sixteenth Section Rd
Old Highway 82
S Frontage Rd
Starkville
Mississippi State University
S Montgomery St
Artesia Rd
Airport Rd
E Poor House Rd
Oktibbeha Rd
Robinson Rd
Moor High Rd
Crawford Rd
Starkville Rd
Crawford
Main St
Tarlton Rd
Highway 45 Alternate
Highway 45 S
US Highway 45
Bluff Lake
Noxubee
Project Site
NORTH
3 1.5 0 3
Miles
Lowndes County
BURNS McDONNELL
Figure 1-1
General Location Map
Golden Triangle Solar Project
Lowndes County, Mississippi
Source: Esri, Burns & McDonnell
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Service Layer Credits: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

1.3 Public Involvement

A copy of this draft EA is being sent to local, state, and federal agencies and individuals who indicated an interest in the Project. TVA notified interested federally recognized Native American Tribes, elected officials, and other stakeholders that the draft EA was available for review and comment for a 30-day period. An electronic version of the document was posted on the TVA website where comments could also be submitted electronically. Public notices were published in local newspapers soliciting comments from other agencies, the general public, and any interested organizations. TVA will carefully review any comments received on the draft EA and address them, as appropriate, in the final EA.

1.4 Necessary Permits or Licenses

There are multiple permits, approvals, registrations, and consultations that would be required for the Project. Table 1-1, below, provides an overview of the anticipated permits and approvals. Further details on anticipated permits and approvals are provided in the following sections.

Table 1-1: Golden Triangle Solar Project Permit and Approval List

Permit/Approval	Associated Documentation	Lead Agency
Federal Permits, Approvals, Registrations, or Consultations		
Endangered Species Act Section 7 (ESA)	Informal consultation report presenting results of biological survey and protected species habitat assessment.	U.S. Fish and Wildlife Service (USFWS)
Migratory Bird Treaty Act (MBTA)		
Bald and Golden Eagle Protection Act (BGEPA)		
Farmland Protection Policy Act (FPPA)	None. FPPA applies to Projects receiving federal funding. The Solar Facility would be funded by MS Solar 5.	Natural Resources Conservation Service (NRCS)
Obstruction Evaluation/Airport Airspace Analysis	All T-Line structures, permanent or temporary (including construction cranes), to be checked using FAA Notice Criteria Tool	Federal Aviation Administration (FAA)
Section 404 of the Clean Water Act – Nationwide Permit 12	Pre-construction Notification (PCN) if improvements to T-Line structures results in loss of 1/10 acre or more	U.S. Army Corps of Engineers (USACE)
Section 404 Clean Water Act Nationwide Permit 51	Wetland and Waterbody Delineation Report	U.S. Army Corps of Engineers
State Permits, Approvals, Registrations, or Consultations		
Section106 National Historical Preservation Act Consultation	Phase I Cultural Resources Survey Report	Mississippi Department of Archives and History / State Historic Preservation Officer

Permit/Approval	Associated Documentation	Lead Agency
§401 Clean Water Act – Water Quality Certification	Wetland and Waterbody Delineation Report	Mississippi Department of Environmental Quality (MDEQ)
Construction General Permit No. MSR10 under the National Pollutant Discharge Elimination System (NPDES)	Stormwater Pollution Prevention Plan and Spill Prevention, Control, and Countermeasures Plan.	MDEQ
Natural Heritage Program Consultation	Protected Species Habitat Assessment Report	MDEQ, Dept. of Wildlife, Fisheries, and Parks
Driveway/Overhead Electrical Encroachment Permit	Site Plan/Driveway Access Plan	Mississippi Department of Transportation (MDOT)
Local Permits, Approvals, Registrations, or Consultations		
Floodplain Development Permit	Individual Elevation Certificates for each tracker array in floodplain	Lowndes County Building Inspection Department
Site Plan Permit	Construction Drawings, MDEQ NPDES Approval	Lowndes County Buildings and Grounds Office
Building Permit	Electrical/Structural Plans	Lowndes County Buildings and Grounds Office

1.4.1 Golden Triangle Solar and BESS Facilities

1.4.1.1 Clean Water Act and Rivers and Harbors Act

The U.S. Army Corps of Engineers (USACE) administers Section 404 of the Clean Water Act (CWA), which regulates dredge and fill activities in waters of the U.S. (33 USC 1344), as well as Section 10 of the Rivers and Harbors Act, which regulates the placement of structures in waters of the U.S. (33 USC 403). The Project is located within the Mobile District.

Impacts to jurisdictional waters of the U.S. (as defined in 40 CFR 230.3[s]) would require authorization from USACE under Section 404 of the CWA. Impacts resulting in a permanent loss of wetlands greater than 0.5 acre would require a Section 404 Individual Permit (IP), which may include mitigation and public involvement. The USACE established the Nationwide Permit (NWP) program to streamline the Section 404 permitting process for actions that would have no more than a minimal effect on the environment. If permanent wetland impacts (i.e. permanent fill resulting in the loss of wetland function) range from 0.1 to 0.5 acre, USACE notification and application is required to obtain an NWP. The Project would result in minimal impacts on wetlands, as discussed in greater detail in section 3.3.1 of this EA. Impacts on USACE-jurisdictional waterbodies would occur in areas where facility access roads and collection lines must cross streams within the Project Site. Based on conversations with the Mobile District USACE, approval under an NWP 12 is anticipated.

1.4.1.2 Endangered Species Act of 1973

The Endangered Species Act of 1973 (ESA), as amended, was enacted to protect, and recover imperiled species and the ecosystems upon which they depend. The law requires federal agencies, in consultation with the U.S. Fish and Wildlife Service and/or the NOAA Fisheries Service, to ensure that actions they authorize, fund, or carry out are not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of designated critical habitat of such species. The law also prohibits any action that causes a "taking" of any listed species of endangered fish or wildlife. Further details regarding species listed as Threatened and Endangered (T&E) under the ESA are included in section 3.4.1.

1.4.1.3 National Historic Preservation Act

Section 106 of the National Historic Preservation Act (NHPA) requires federal agencies to take into account the effects of their undertakings (including issuance of permits) on historic properties, and afford the Advisory Council on Historic Preservation a reasonable opportunity to comment. State Historic Preservation Officers (SHPOs) and Tribal Historic Preservation Officers (THPOs) serve a critical role in implementing many responsibilities under the NHPA. Central to this framework is the National Register of Historic Places (NRHP), which is the official list of historic properties worthy of preservation. The Mississippi Department of Archives and History (MDAH), which acts as the SHPO for the State of Mississippi, has reviewed and commented on potential Project impacts on resources of cultural significance within the state. A phase I cultural resources survey, utilizing pedestrian and shovel tests along pre-approved transects, was required for this Project. The SHPO does not issue permits; however, approvals by other federal agencies cannot be final without review by and clearance from the SHPO.

1.4.1.4 Mississippi Natural Heritage Program

The Mississippi-protected species list includes animal species for which legal protection is provided under the Mississippi Nongame and Endangered Species Conservation Act of 1974. The act declares that “Species or subspecies of wildlife indigenous to the state should be accorded protection in order to maintain and to the extent possible enhance their numbers.” Under state law, the Mississippi Department of Environmental Quality (MDEQ), Department of Wildlife, Fisheries, and Parks has responsibility for reviewing this list and providing recommendations for revisions as needed every two years.

Mississippi law specifically states that rules and regulations related to the protection of state protected species will not affect rights on private property. Prohibitions are limited to the capture, killing, or selling of protected species and the protection of the habitat of these species on public lands.

1.4.1.5 Mississippi Department of Environmental Quality

The MDEQ Stormwater and 401 Water Quality Branch administers the Section 401 Water Quality Certification program in conjunction with the USACE. MDEQ offers general permits for activities that would result in only very minor impacts on wetlands. Proposed minor wetland alteration activities may obtain coverage by submitting a signed and completed application for a general

permit, along with any other required information. Work shall not commence until a written Notice of Coverage (NOC) from MDEQ is received.

The MDEQ Stormwater and 401 Water Quality Branch also administers the National Pollution Discharge Elimination System (NPDES) construction stormwater permitting program in Mississippi. In compliance with the Mississippi Water Quality Control Act, MDEQ authorizes point source discharges of stormwater into waters of the state. A notice of intent (NOI) for General NPDES Permit for Stormwater Discharges from Large Construction Activities (permit no. MSR10) would be required for the Project. The NOI form, Stormwater Pollution Prevention Plan (SWPPP), and an Erosion, Sediment and Pollution Control Plan (ES&PCP) would be submitted at least 30 days prior to the commencement of land disturbing activities. Written approval through a NOC must first be received prior to initiating land disturbing activities. These documents will include specific information about the construction site, construction best management practices (BMPs), and stormwater discharge receiving waters.

1.4.1.6 County and Municipality Permitting

No ordinances or requirements specific to solar and BESS facilities exist in Lowndes County; however, Lowndes County does require a development review process. Based on initial coordination with the County, a building permit for the structural and electrical scope of the Project will be required. This review will be handled by the County Buildings and Inspection Department. The County will provide a site plan permit once the construction drawings are reviewed and approved by the County Board of Supervisors. A copy of the MDEQ NPDES approval must be provided to the County. Since portions of the Project would occur within a floodplain, MS Solar 5 would be required to acquire a floodplain development permit from Lowndes County. The County has coordinated with Mississippi Emergency Management Agency (MEMA) on what would be required. The County has indicated that it will require an individual elevation certificate for each tracker array located within the FEMA 100-year floodplain. The certificate must show that the elevation of the “drip line”, or lowest point of the individual array at full tilt, is a minimum of one foot above the 100-year base flood elevation.

Vegetative waste from clearing activities would be burned or chipped onsite. If open burning of debris from tree clearing on the site is planned, the appropriate open burning permits would be obtained from the Mississippi Forestry Commission (MFC). Information on open or surface burning issued by MFC 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 Project Site.

1.4.2 TVA’s Artesia Switching Station

TVA’s Artesia 161-kilovolt (kV) Switching Station and approximate 1,665-foot gen-tie would be included within the NOI and the SWPPP for the Golden Triangle Solar Project NPDES Construction General Permit (submitted by MS Solar 5) because these facilities are within the footprint for the proposed Solar Facility. TVA is not proposing any new aboveground transmission lines in association with this Project.

2.0 DESCRIPTION OF PROPOSED ALTERNATIVES

This section provides a description of the analysis and criteria used in identifying the Preferred Alternative. It provides a description of alternatives considered and compares the alternatives to the Proposed Action. 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 MS Solar 5 (i.e., TVA would not be involved with the Project). If TVA were to select this alternative and MS Solar 5 elected not to proceed with the Project, then MS Solar 5 would not construct or operate the Solar and BESS Facilities. Existing conditions (land use, natural resources, visual resources, physical resources, and socioeconomics) at the Project Site would remain unchanged. TVA would continue to rely on other sources of generation described in the 2019 IRP (TVA 2019a) to ensure an adequate energy supply and to meet its goals for increased renewable energy and low GHG-emitting generation.

2.2 Proposed Action Alternative

Under the Proposed Action Alternative, MS Solar 5 would construct and operate an up to 200-MW AC single-axis tracking PV solar facility with a 50 MW BESS in Lowndes County, Mississippi (referred to as the Solar Facility), and TVA would purchase renewable energy from the facility under the 20-year PPA with MS Solar 5. The Golden Triangle Solar Facility would generate up to 200 MW AC output for transmission to TVA's electrical network. MS Solar 5 would enter into long-term leases on approximately 3,565 acres of land on 28 individual parcels along the eastern town limits of Artesia and Mayhew, Mississippi. Four additional parcels that total about 225 acres would be used during construction and for the installation of collection feeders and cables along an easement that would be maintained by MS Solar 5. The power generated from the Solar Facility would be sold to TVA under the terms of the PPA. The Project would connect to the existing TVA electrical network via the approximate 1,665-foot-long gen-tie line to TVA's proposed Artesia Switching Station within the existing Artesia Substation. TVA would also perform additional network upgrades on the existing transmission system to support the new Solar Facility. Figure 2-1 provides an overview of the APE as well as the parcel boundaries of properties that would be affected during construction. As depicted in the figure, MS Solar 5 intends to avoid impacting portions of the overall land that would be leased.

As discussed in Section 1.2, this EA assesses (1) the impact of TVA's action to enter into the PPA with MS Solar 5, (2) the associated impacts of the construction and operation of the Solar Facility by MS Solar 5, and (3) the interconnection components by TVA. Project details regarding additional network upgrades necessary to support the Solar Facility are still under development and will be assessed under future supplemental environmental analyses.

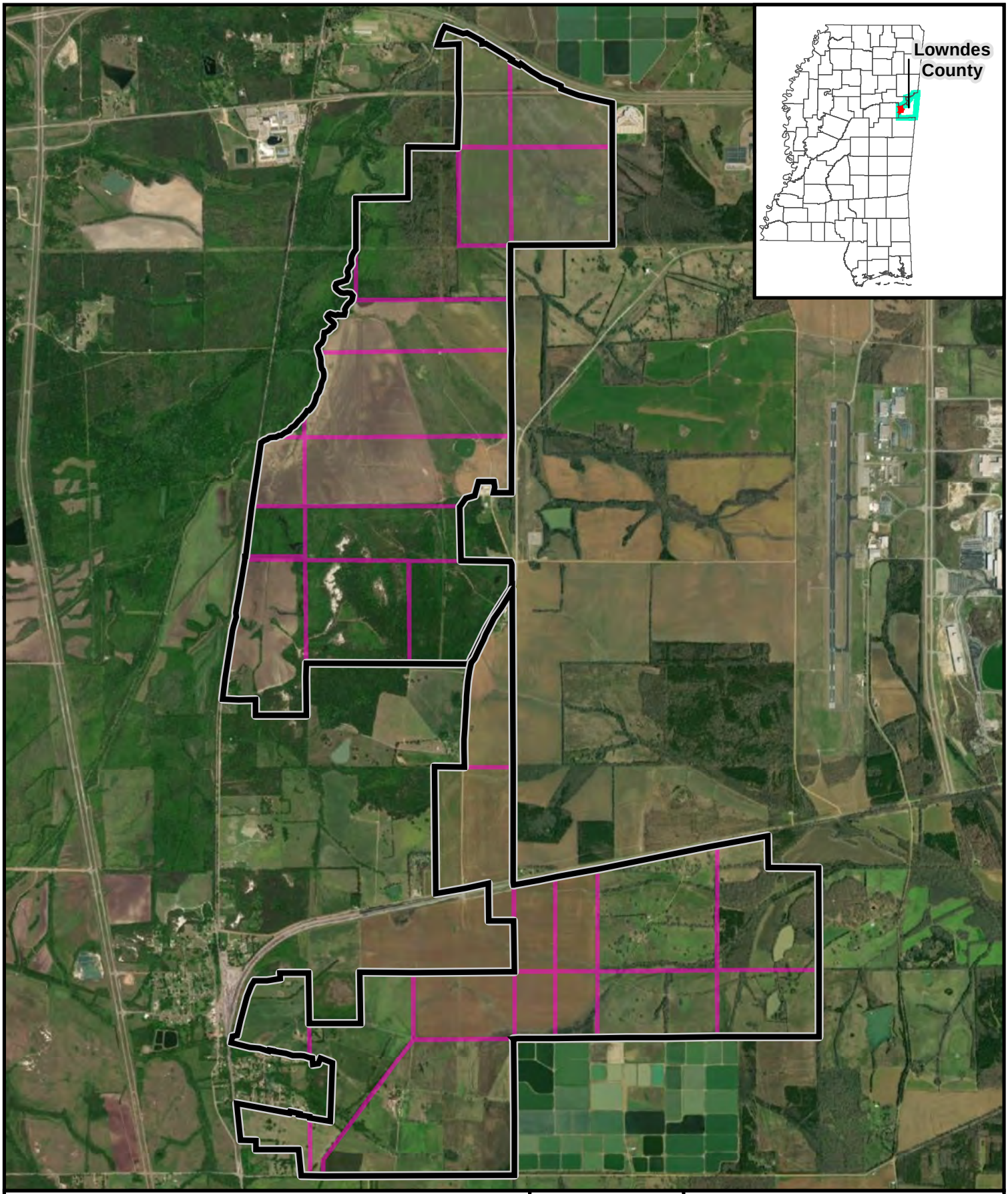


Figure 2-1
General Vicinity Map
Golden Triangle Solar Project
Lowndes County, Mississippi

BURNS McDONNELL

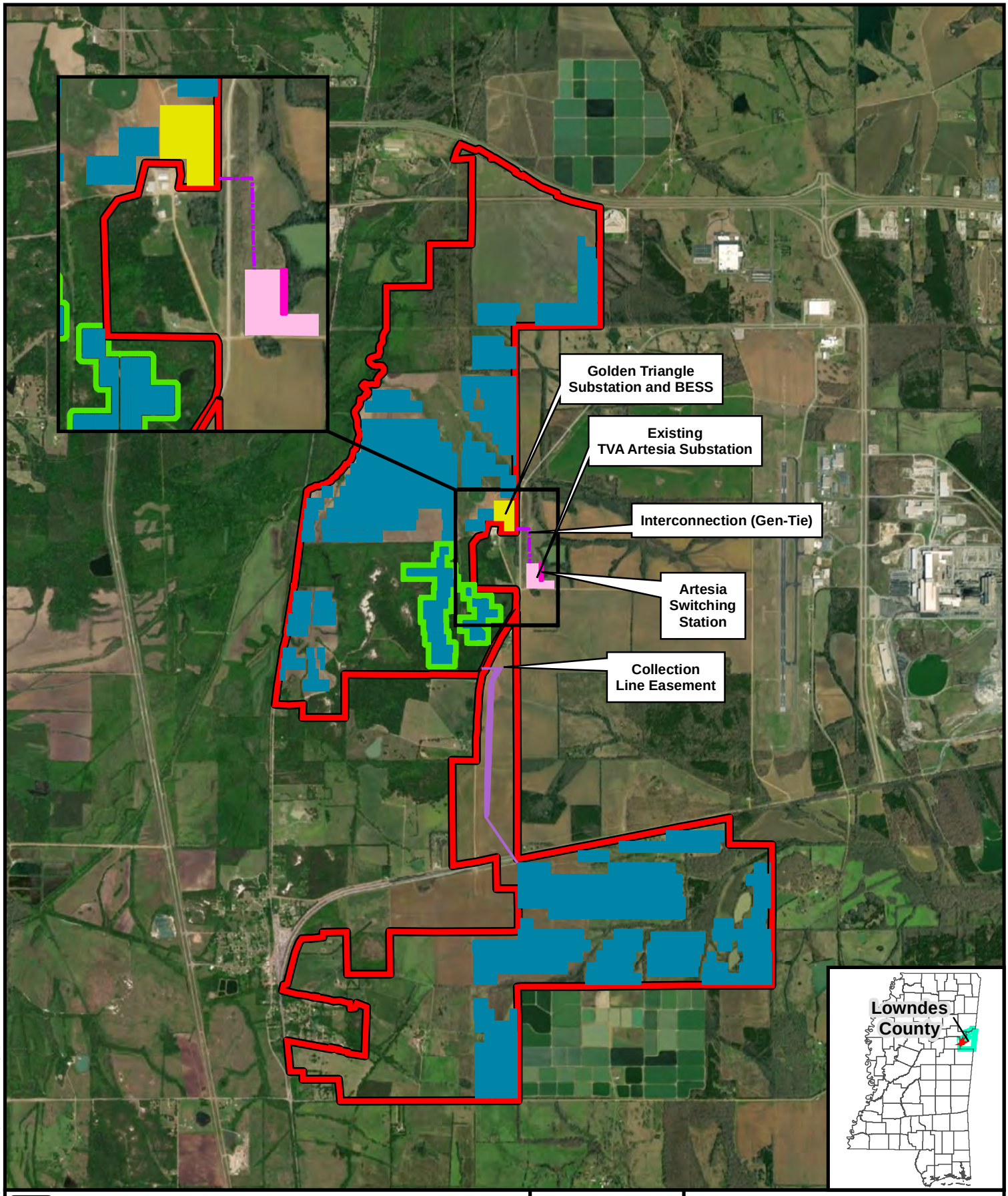
Path: C:\Users\olhaney\Desktop\Projects\GoldenTriangle\EA\MXDs\GenVicinityMap_Aerial_withParcels.mxd olhaney 10/18/2020
Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Source: Esri, Burns & McDonnell

Issued: 10/18/2020

2.2.1 Project Description

The proposed Solar Facility and associated TVA interconnection components would occupy portions of the Project Site that are predominantly comprised of cultivated agricultural fields and pastureland (Figure 2-1). The perimeter of the developed facilities would be enclosed with security fencing. Within the limits of the fenced facility would be the arrays of solar panels, inverters, battery storage, electrical cabling, and other related infrastructure such as the Project substation and access roads. The remaining portions of the Project Site would remain undeveloped. Additional information regarding existing land use conditions is detailed in section 3. Figure 2-2 shows the preliminary solar array layout within the Project Site.



Path: C:\Users\olhaney\Desktop\Projects\GoldenTriangle\EA\MXDs\GenVicinityMap_WithArray.mxd olhaney 10/21/2020
Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

BURNS McDONNELL

Figure 2-2

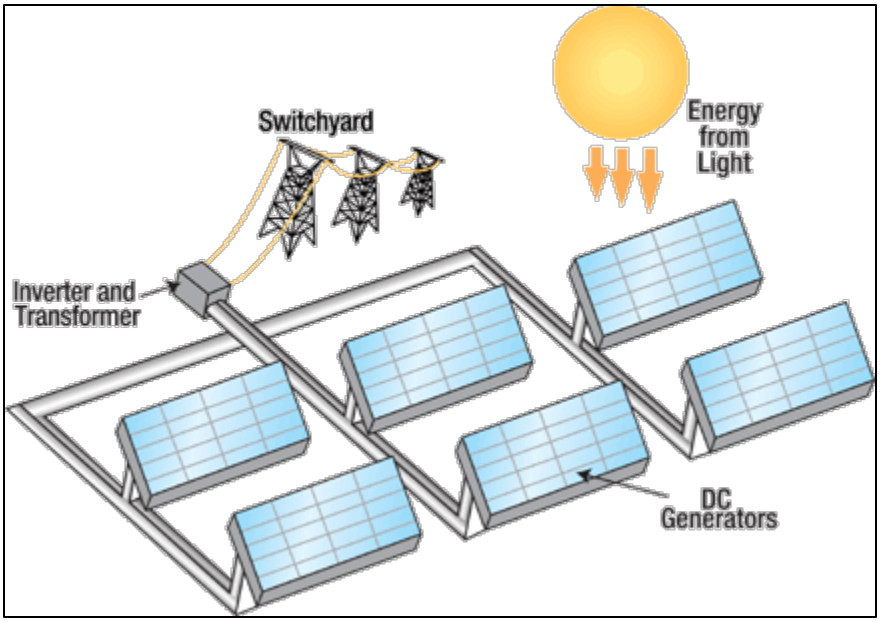
Proposed Solar Array
Golden Triangle Solar Project
Lowndes County, Mississippi

Source: Esri, Burns & McDonnell

Issued: 10/21/2020

The Golden Triangle Solar Facility would convert sunlight into direct current (DC) electrical energy within the PV panels (modules) as very generally depicted in Figure 2-3. 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 energy as photons of light and then release energy as electrons. When the free electrons are captured, an electric current is produced, which can be used as electricity (TVA 2014).

Figure 2-3: PV Solar System Energy Flow Diagram



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’s high design temperature. The panels would be located in individual arrays 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 portions of the Project Site outside the fenced-in areas would not be developed. The modules would be attached to single-axis trackers that allows all the panels to pivot along an axis to follow the path of the sun from east to west across the sky. The trackers would be attached to steel pile foundations.

Collections of strings or rows of panels would be connected by underground DC cabling to a central inverter that would convert the DC electricity into AC electricity so that it could be transmitted to the electrical grid. Each inverter would have a collocated mid-voltage transformer (MVT) which boosts the AC voltage to account for the standard electrical loss between the central inverters and the onsite Project substation. From the MVTs, a network of underground AC power cables would connect to a single main power transformer (MPT) which would be located within the 161-kV Golden Triangle Substation. Cables would be installed in trenches approximately 3- to 4-feet deep and 2- to 12-inches wide.

Other Project components would include security equipment, facility access roads, communications equipment, meteorological stations, and operations and maintenance building, and supporting Project water well and septic system located near the operations and maintenance building (within or near the Golden Triangle Substation). Earth-compacted roads would provide access to each inverter block for the purposes of operations, maintenance, and repairs. The existing Guerry Road would be utilized to access the substation and switching station. The locations of inverter blocks and access roads have not been finalized. Additional site information including layouts and collection line locations will be provided in the Final EA.

2.2.2 Solar Facility and BESS Construction

Construction activities would take approximately 17 months to complete using a crew that ranges from 300 to 450 workers. Work would generally occur up to 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, if determined necessary, would require lighting in some areas of the Project Site. Any additional night-time lighting would be downward-facing and timer- and/or motion-activated to minimize impacts to wildlife and any surrounding receptors, including nearby households.

Site preparation is generally required prior to construction of the Solar Facility and assembly of the solar arrays. Site preparation typically includes: surveying and staking, removal of tall vegetation/small trees, light grading, clearing and grubbing, installation of security fencing around components near one another and not separated by public roads, erosion prevention and sediment control BMPs, and preparation of construction laydown areas. Solar array assembly and construction includes driving steel piles into the ground for the tracker support structures, installation of solar panels, and electrical connections and testing/verification.

Approximately 40 acres of the Project Site would be used as construction assembly areas (also called laydown areas) for worker assembly, safety briefings, vehicle parking, temporary offices, and material storage during construction. Some of these assembly areas, which would be spread out across many of the Project parcels, would be staged within the locations proposed for the PV arrays. The laydown areas would be onsite for the duration of construction. Temporary construction trailers for material storage and office space would be parked onsite. Following completion of construction activities, most trailers, unused materials, and construction debris would be removed from the Project Site. If appropriate, an operations and maintenance building would utilize one of the last remaining construction trailers. Construction materials would be transported by truck and/or rail to the Project Site, where materials would be staged, assembled, and moved into place.

MS Solar 5 would use the existing landscape, such as slope, drainages, and roadways where feasible, minimizing grading work where practicable. Grading activities that could not be avoided would be performed using mobile earthmoving equipment, resulting in a fairly consistent slope on land. Native topsoil would be preserved to the greatest extent practicable during grading. Native topsoil would be stockpiled onsite and preserved for redistribution over the disturbed area after

grading is complete. After construction, the disturbed areas would be seeded with a native seed mixture of certified weed-free, low-growing, noninvasive grasses, and herbaceous plants. Flowering vegetation also would be used, if available, to attract pollinator species such as honeybees and butterflies. Erosion control BMPs would be regularly inspected and maintained until vegetation in the disturbed areas has been established to the extent it meets permit restoration requirements. Water would be used for fugitive dust control and/or soil compaction during construction on an as-needed basis. Water used during construction would either be trucked in from a municipal source or withdrawn from an onsite water well.

To manage stormwater during construction, onsite temporary sedimentation basins, sediment traps, or diversion berms would be constructed within the disturbed area of the Project Site. If needed, a diversion berm would be constructed along portions of the Project Site perimeter to contain stormwater onsite. Any necessary sedimentation basins and/or traps would be compliant with MDEQ 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 and minimize subsequent erosion. Sediment traps would be placed in strategic drainage areas to prevent sediment from entering onsite jurisdictional streams and wetlands. Offsite sediment migration would be minimized by the placement of silt fence around each area of ground disturbance within the Project Site. These stormwater BMPs would minimize the potential for sediment to enter onsite jurisdictional streams and wetlands and to minimize sediment migration offsite during construction. Once sufficient revegetation cover is achieved, the Project Site would be considered stabilized and temporary construction BMPs would be discontinued and/or removed.

Construction activities would be sequenced to minimize the time that bare soil in 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 eroded soil from leaving the work area. Disturbed areas, including road shoulders, construction office and laydown areas, ditches, and other Project-specific locations, would be seeded post-construction. If conditions require, soil may be further stabilized by mulch or sprayable fiber mat. Where required, hay mulch would be applied at three tons per acre and well distributed over the area. As part of NPDES permit authorization (see section 1.4.1), 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. Based on preliminary geotechnical survey results for the Project Site, the trackers would be attached to driven steel pile foundations. The steel pile foundations are 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; there is also potential for temporary soil disturbance from the hydraulic ram machinery, which is about the size of a small tractor. The tracker design and pile foundation

design would be sealed by a registered Professional Engineer and Structural Engineer, respectively. Screw piles are another option for PV foundations which are drilled into the ground with a truck-mounted auger. Screw piles create a similar soil disturbance footprint as driven piles.

Solar panels would be manufactured offsite and shipped to the Project Site ready for installation. All final electrical collection cables would be underground, and electricians and assistants would run the electrical cabling throughout the Solar Facility. The trenches to hold the cabling would be approximately 3- to 4-feet deep and 2- to 12-inches wide. The trenches would be backfilled with native soil and appropriately compacted.

The MPT would be supported on a concrete foundation within MS Solar 5's proposed Golden Triangle Substation. An aboveground transmission cable would be constructed to connect the MPT through a circuit breaker.

Also, within the Golden Triangle Substation would be MS Solar 5's BESS Facility. There are numerous components that make up the BESS.

BESS Containers: The Containers, which are typically made of steel or concrete, house the batteries as well as other system components such as battery cabinets, battery management system (BMS), heating, ventilation, and air conditioning (HVAC) system, system controller, and electrical distribution panel. The BESS Containers are considered unoccupied structures, with access only granted to approved personnel for maintenance or repair activities. MS Solar 5 estimates there would be 34 BESS containers within the facility boundaries. Another option for the containment of batteries and other BESS components is the "Building Solution" which is described further below.

Batteries: Although the batteries have not yet been selected for this Project, Lithium ion (Li-ion) batteries are the most common batteries by installation, accounting for more than 90% of energy storage installations. Li-ion batteries use the exchange of lithium ions between electrodes to charge and discharge the battery. Li-ion batteries are typically characterized as power devices capable of short durations or stacked to form longer durations of power. This Project would be considered a long duration system. Li-ion energy storage systems are generally appropriate for serving energy applications, moderate power applications, and applications requiring a short response time (i.e. back-up power or supporting a black start). The three most common Li-ion chemistries are lithium nickel cobalt manganese oxide (NCM), lithium iron phosphate (LFP), and lithium titanate oxide (LTO). It should be noted that the battery component of the BESS has not yet been finalized and MS Solar 5 is also considering battery technology other than Li-ion batteries.

Pad-Mounted Inverter: These transformers are used to interface the underground medium voltage collection cables at points in which the BESS service drops are connected to step down the primary voltage on the collection system to a lower voltage that is supplied by the BESS inverters. MS Solar 5 estimates there would be 17 pad-mounted inverters within the boundaries of this facility.

BESS Inverter (PV Inverter): This inverter converts the variable DC output of the BESS to AC. MS Solar 5 estimates there would be 17 inverters within the boundaries of this facility.

AUX Transformer: Another type of power transformer that provides power to the auxiliary equipment of the BESS during its normal operation. Auxiliary equipment includes things like air conditioning units that keep batteries and other equipment cool, power for internal lighting, and other internal equipment needs for the Project to operate safely.

Fire Suppression Tank: The fire suppression tank provides a source of water that is dedicated to the fire suppression system and for use by first responders in case of a fire. The design of the fire suppression system is not yet finalized, but will be designed in accordance with federal, state, and local regulations.

HVAC Units: The HVAC units will be attached to each BESS container. The HVAC system maintains the BESS container internal temperature. The HVAC system design has not yet been finalized.

BESS Building Solution: MS Solar 5 is exploring the option of using a building to house the BESS. If proven to be economically prudent, the building solution may be selected as the final design for the BESS facility solution. The building could become economically viable particularly for a large BESS facility as the developers can take advantage of consolidation and scale of the peripheral systems such as HVAC, fire safety systems and other ancillary systems.

The size and construction of a building would be contingent on the battery chemistry, inverter blocks sizes, use cases and other parameters. The Building Solution would likely consist of a pre-engineered metal building on a concrete foundation. The building would be furnished with the fire suppression system, plumbing, HVAC, electrical, and electronic safety and security as required by the local building and fire codes. The BESS Building would be designed and constructed in compliance with all applicable standards and local laws. It would be located in an upland area, outside of the floodplain, and adjacent to the Golden Triangle Substation.

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 instrumentation would be installed. Following the testing of all of the individual systems, integrated testing of the Project would occur. Electrical interconnection details are provided in the following section.

2.2.3 TVA Electrical Interconnection

Under the Proposed Action, TVA would construct the Artesia 161-kV Switching Station (Artesia Switching Station) adjacent to the existing TVA Artesia Substation, resulting in an approximately 1,665-foot-long gen-tie line. The proposed Golden Triangle Substation would be located approximately 0.2 mile north-northwest of the Artesia Substation.

TVA proposes to construct the 0.85-acre Artesia 161-kV Switching Station immediately west of the existing Artesia Substation. 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. TVA would clear vegetation on the Artesia Switching Station site, remove the topsoil, and grade the property in accordance with TVA's *Site Clearing and Grading Specifications* (TVA 2017a) attached as Appendix A and the Solar Facility's NPDES general construction stormwater permit. Limited clearing would occur, as the site is predominantly cropland. As necessary, any woody debris and other vegetation would likely be piled and burned, chipped, or taken off-site. Prior to any 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.

2.2.3.1 Network Transmission Line Upgrades

In addition to the interconnection, existing TVA transmission lines would be upgraded so that the Golden Triangle Solar Facility can generate the MW as studied during the planning phase. The following upgrades would be needed:

- Upgrade the conductor to 1224 Amps minimum on the existing Okolona-Egypt Tap 161-kV transmission line (L5615) for an approximately 9.35-mile section.
- Upgrade the conductor to 1249 Amps minimum on the existing Okolona-North Shannon Tap 161-kV transmission line (L5616) for an approximately 14.6-mile section.
- Upgrade the conductor to 1138 Amps minimum on the North Shannon Tap-Tupelo 161-kV transmission line for an approximately 8.04-mile section.
- Upgrade the main and transfer buswork, replace an oil-containing breaker (OCB) with a new SF6 gas breaker, and install new surge arrestors at the Okolona, MS 161-kV substation.
- Reset relays to accommodate impedance changes at the Clay, MS 500-kV and Tupelo, MS 161-kV substations due to the transmission line upgrade work.
- Replace the existing circuit switcher for capacitor bank 2 at the West Point, MS 500-kV substation. This work will mitigate the cap bank switching transients impacted by the solar generator interconnection at the Artesia, MS 161-kV switching station.

All upgrade work would occur at existing TVA substations and on existing TVA transmission lines within existing ROW. No new property or easement rights would be needed. Bucket trucks would be utilized for access and stringing equipment. Reels of conductor would be delivered to various staging areas along the ROW, and temporary clearance poles would be installed at road crossings to reduce interference with traffic. The new conductor would be connected to the old conductor and pulled down the line through pulleys suspended from the insulators. A bulldozer and specialized tensioning equipment would be used to pull conductors to the proper tension. Crews would then clamp the wires to the insulators and remove the pulleys. Wire pulls vary in length but are limited to a maximum of 5-mile pulls. Pull point locations depend on the type of

structures supporting the conductor as well as the length of conductor being installed. Pull points are typically located along the most accessible path on the ROW (adjacent to road crossings or existing access roads). The area of disturbance at each pull point typically ranges from 200 to 300 feet along the ROW. After the work is completed, the ROW is revegetated using native, low-growing plant species where appropriate. Areas such as pasture, agricultural fields, or lawns are returned to their former condition. Additional details regarding the network upgrades, such as the exact locations of pull points or any potential pole replacements, are still being developed. Supplemental NEPA analysis would be conducted if there are changes or upgrades to the scope of this Project.

2.2.3.2 Access Roads

Access roads would be needed to allow vehicular access to each structure and other points along the ROW. 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. Information on access road siting is not available at this time, and additional (supplemental NEPA) analysis would be conducted if there are changes or upgrades to the scope of this Project. Access roads are typically about 12 to 16 feet wide and are surfaced with dirt, mulch, or gravel. 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 (also known as wet weather conveyances - streams that only flow following a rainfall) 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 following construction. Additional applicable ROW clearing and environmental quality protection specifications are listed in *TVA ROW Clearing Specifications*, *Environmental Quality Protection Specifications for Transmission Line Construction*, and *Transmission Construction Guidelines Near Streams*.

2.2.4 Operations

Operation of the Golden Triangle Solar Facility would require up to six full-time staff to manage the solar and BESS 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 would be maintained to control growth and prevent overshadowing or shading of the PV panels. Trimming and mowing would likely be performed several times per year, depending on growth rate, to maintain an appropriate ground cover height of no more than approximately 12 to 18 inches. During operation of the Solar Facility, selective use of U.S. Environmental Protection Agency (USEPA)-approved spot herbicides may also be employed around structures to control invasive weeds.

The proposed Solar Facility would be monitored remotely from Origis Energy's Control Center in Austin, Texas, 24 hours a day, seven days a week to identify security or operational issues. In

the event a problem is discovered during nonworking hours, a repair crew or law enforcement personnel would be contacted if an immediate response were warranted.

Moving parts of the Solar Facility would be restricted to the east-to-west tracking motion of the single-axis 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 Solar Facility would have relatively little human activity during operation. No significant physical disturbances would occur during operation. Permanent lighting is anticipated as a potential onsite need during facility operations, independent of the potential operations and maintenance building. Permanent lighting would be downward-facing and timer- and/or motion-activated to minimize impacts to surrounding areas.

The onsite operations and maintenance building would likely be located within proximity to the Golden Triangle Substation. It would require a reliable water source and a septic system.

Rainfall in the region should be adequate to remove dust and other debris from the PV panels while maintaining acceptable energy production; therefore, manual panel washing is not anticipated unless a site-specific issue is identified. If later identified, module washing would occur no more than twice a year and would comply with appropriate BMPs.

2.2.5 Decommissioning and Reclamation

MS Solar 5 would operate the Project and sell power to TVA under the terms of the PPA for the first 20 years of its life. At the end of the term of the PPA, MS Solar 5 would assess whether to cease operations at the Solar Facility or to replace equipment and attempt to enter into a new power purchase agreement or make some other arrangement to sell the power. If operations were ceased, the facility would be decommissioned and dismantled, and the Project Site would be restored. In general, the majority of decommissioned equipment and materials would be recycled. Materials that could not be recycled would be disposed of at an approved facility. As the lease agreement with the landowners are for at least 35 years, site control would be maintained for longer than the 20-year PPA period, and MS Solar 5 may attempt 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.

2.3 Alternatives Eliminated from Further Consideration

Numerous criteria were considered throughout the process of identifying a suitable site within TVA's service area that would meet the purpose and need of this Project as well as expanding TVA's renewable energy portfolio (TVA 2019a). The following is a list of key factors MS Solar 5 took under consideration during the site selection process.

- Site must be large-scale enough to accommodate enough PV panels to generate 200-MW AC output for transmission to the electrical network.
- Large contiguous parcels of land with at least 2,500 acres available for solar panel installation and additional acreage for related infrastructure.
- Availability of nearby electric infrastructure for interconnection to TVA's system with sufficient available transmission capacity.
- Generally flat landscape with minimal slope; preferably previously disturbed contiguous land with minimal existing infrastructure obstacles.
- Minimal presence of forested areas and wetlands.
- Parcels with appropriate local zoning regulations and located away from densely populated areas.
- Land that would allow developers to avoid and/or minimize impacts on known sensitive biological, visual, and cultural resources.

The process of screening potential locations and ultimately eliminating sites that did not possess the necessary attributes led to the selection of the Project Site.

2.4 Comparison of Alternatives

This EA evaluates the potential environmental effects that could result from implementation of the No Action Alternative or the Proposed Action Alternative at the proposed Project Site in Lowndes County, Mississippi. The analysis of impacts described in this EA is based on current conditions as well as potential future conditions on the parcels associated with the Project and the surrounding area. A comparison of potential impacts from each alternative is summarized in Table 2-1.

Table 2-1: Comparison of Impacts by Alternative

Resource Area	Impacts from the No Action Alternative	Potential Impacts from the Proposed Action Alternative
Land Use	No direct or indirect impacts anticipated.	Conversion of agricultural/pastureland to solar generation is consistent with Lowndes County's zoning. Minor changes from Project construction would not result in a long-term adverse direct impact.
Geology, Soils, and Prime Farmlands	No direct or indirect changes anticipated.	Geology: Minor direct impacts on potential shallow subsurface geological resources.
		Soils: Minor direct impacts on soils from potential minimal increases in erosion and sedimentation during construction. Once stabilized and facility is operational, impacts on soils would be offset by the beneficial effects to soil health with the use of native and noninvasive vegetation.
		Farmlands: direct impacts on farmland from the conversion of agricultural land to solar for the duration of the Project.

Resource Area	Impacts from the No Action Alternative	Potential Impacts from the Proposed Action Alternative
Water Resources	No direct or indirect changes to current conditions anticipated.	Groundwater: Negligible direct impacts on the supply from use of a new water well during operation of Solar Facility. Minor beneficial effects are anticipated from the reduction in fertilizer and pesticide application.
		Surface water: Minor beneficial impacts on surface water due to the reduction in fertilizer and pesticide application once agricultural operations are not occurring. Minor short-term impacts from erosion and sedimentation during construction (until site is stabilized).
		Wetlands: No permanent impacts on wetlands. No proposed placement of permanent structures within wetlands.
		Floodplains: There are approximately 1,076 acres of FEMA designated floodplain within the Project Site; however, MS Solar 5 would not install arrays within the entire floodplain. Required permits and approvals would be obtained for placement of PV panels within floodplains prior to initiating construction. The new Substation and BESS Facility and TVA's Switching Station would not be located within the floodplain.
Biological Resources	No direct or indirect impacts anticipated.	Vegetation: Three main vegetation communities would be affected: actively cultivated bean and corn fields, hay pastures, and forested uplands.
		Wildlife: Negligible adverse impacts on wildlife during construction. Some forested habitat would be permanently removed. Wildlife that can use early successional habitat is expected to return to the area once operational. The Project is not anticipated to have long-term significant impacts on migratory bird species of concern.
		Protected Species: By implementing tree clearing restrictions during northern long-eared bat pup season (June 1 – July 31) within suitable bat roosting habitat, the Project is not anticipated to significantly affect federal or state-listed species.
Visual Resources	No direct or indirect impacts anticipated.	During construction, minor temporary impacts on visual resources would occur due to the alteration of the existing agricultural viewshed and increased activity. During operation of the Solar Facility, moderate direct impacts in the immediate Project vicinity due to the presence and quantity of PV panels. Impacts on residents and visitors to the town of Artesia would be minimized through the presence of existing natural screening buffers including forest areas and topography. If existing buffers are not sufficient in shielding residents in Artesia from the Solar Facility, MS Solar 5 would install a privacy fence or shrubbery along the perimeter of the Project Site on a case-by-case basis.

Resource Area	Impacts from the No Action Alternative	Potential Impacts from the Proposed Action Alternative
Noise	No direct or indirect impacts anticipated.	Minor temporary noise impacts would be experienced during construction. Negligible adverse impacts from noise associated with operation.
Air Quality and Greenhouse Gas Emissions	No direct or indirect impacts anticipated. Continue using fossil fuels.	Air Quality: Minor direct impacts on air quality could occur during site preparation involving heavy, earth moving construction equipment (temporary emissions). No adverse impacts on air quality from operations.
		GHG: Temporary and minor increases in GHG emissions would be expected during construction from operation of equipment. However, a net positive impact would occur from operation of nearly emissions-free power generation 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: Due to TVA's Avoidance Agreements for known NRHP-eligible and NRHP-listed sites, no impacts on archaeological resources would be anticipated.
		Architectural Resources: Recommendation of no adverse effect on architectural resources.
Utilities	No direct or indirect impacts anticipated.	No direct or indirect adverse impacts are anticipated to utilities. The region would experience long-term benefits to electrical services.
Waste Management	No direct or indirect impacts anticipated.	With the implementation of appropriate BMPs, no impacts on waste management would be anticipated.
Public and Occupational Health & Safety	No direct or indirect impacts anticipated.	Minor, temporary impacts during construction. No public health or safety hazards would be anticipated during operation.
Transportation	No direct or indirect impacts anticipated.	Due to moderate increases from workers commuting to and from the Project Site during construction, a moderate impact on transportation would be anticipated during construction. Negligible direct impacts and no indirect impacts on transportation would occur during operation.
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 on economics and population from Project operation. The local tax base would experience an increase from construction of the Solar Facility which would benefit Lowndes County and the Golden Triangle region of eastern Mississippi.
Environmental Justice	No direct or indirect impacts anticipated.	There would not be disproportionately high or adverse direct or indirect impacts on EPA-designated minority or low-income populations.

2.5 Best Management Practices and Mitigation Measures

MS Solar 5 would implement minimization and mitigation measures for resources potentially affected by the Project. These measures would be developed in conjunction with industry-proven BMPs, requirements of regulatory permits, and adherence to the following plans:

- Stormwater Pollution Prevention Plan
- Spill Prevention, Containment, and Countermeasures Plan, and
- Unanticipated Discovery Plan.

Additional details are provided in sub-sections 2.5.1 and 2.5.2.

2.5.1 Golden Triangle Solar Facility

MS Solar 5 would implement the following BMPs and mitigation measures associated with potentially affected resources, as follows:

BMPs include actions to:

- Install anti-reflective, PV panel surfaces to minimize glare and reflection.
- Install silt fence along the perimeter of areas that would be cleared, consistent with local and state stormwater regulations.
- Maintain stormwater BMPs in each area until stabilization (adequate vegetation regrowth) has been achieved.
- Avoid direct impacts on perennial and intermittent streams by maintaining a riparian buffer at most perennial and intermittent streams and jurisdictional wetlands.
- The construction contractor would monitor the weather forecast for major rain events (greater than ½ inch in 24 hours). If major rain events are predicted, construction equipment would not be stored overnight within the floodplain.
- Temporary laydown areas, construction trailers, and parking areas would be placed outside the floodplain during construction.
- Plant or seed with noninvasive vegetation and include native and naturalized plant species to encourage beneficial habitat, reduce erosion, and limit the spread of invasive species.
- Utilize vegetation that benefits pollinator species to the extent practicable.
- Utilize timer- and/or motion-activated downward facing security lighting to limit attracting wildlife, such as migratory birds and bats.
- Use dust mitigation activities such as watering dry exposed soils, covering open-body trucks, and establishing a speed limit to minimize fugitive dust.
- Install temporary construction fencing around natural resources that should be avoided.

Mitigation Measures include:

- Avoid or minimize direct impacts on federally-listed species by clearing trees outside of the northern long-eared bat (NLEB) pup season (June 1 – July 31).
- Should traffic flow become a problem, consider implementation of staggered worker shifts during construction and a flag person along the roadside during deliveries that may coincide with heavy commute times to manage the flow of traffic near the Project Site.
- Where existing natural buffers are not sufficient in shielding residents in Artesia from the Solar Facility, MS Solar 5 would install a privacy fence or shrubbery along the perimeter of the Project Site (additional information in section 3.5.2).
- For residences that are within 500 feet of an inverter, a pre-construction sound study including an ambient survey would be conducted to quantify the existing ambient environment. After the project reaches commercial operation, MS Solar 5 would measure the sound levels at residential property lines and identify any equipment that generates a Ldn sound level that exceeds 55 dBA at the property line. If there are locations where noise levels exceed that threshold, MS Solar 5 would install sound buffers (walls, fences with screening, or vegetation) in order to minimize the noise levels from operating equipment

2.5.2 TVA Electrical Interconnection

TVA employs standard practices when constructing, operating, and maintaining transmission lines, structures, and the associated ROW and access roads. These can be found on TVA's transmission website at https://www.tva.com/energy/transmission/transmission-system-projects (TVA 2020a). Some of the more specific routine measures that would be taken to reduce the potential for adverse environmental effects during the construction, operation, and maintenance of the proposed Artesia Switching Station 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*, TVA's BMP manual (TVA 2017b), to minimize erosion during construction, operation, and maintenance activities.

- To minimize the introduction and spread of invasive species at the Project Site, access roads, and adjacent areas, TVA would follow standard operating procedures consistent with Executive Order (EO) 13112 (Invasive Species) for revegetating the areas with noninvasive plant species 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.

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.

3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This chapter describes the importance, nature, and extent of environmental resources in their current setting at the Project Site. This chapter also provides a measure for the assessment of potential effects of the alternatives described in Section 2.0. The scope of environmental consequences assessed in this EA for the Proposed Action focuses on impacts related to the construction and operation of the proposed Solar and BESS Facility.

3.1 Land Use

This section provides an overview of the existing and surrounding land use at the Project Site. Potential impacts on land use associated with the alternatives are described below.

3.1.1 Affected Environment

The U.S. Environmental Protection Agency (USEPA) defines "land use" as the human use of land for activities such as agricultural, residential, and recreational uses (USEPA, 2020a). The Golden Triangle Project Site is in the southeastern quadrant of the U.S. Hwy Alt 45 and Mississippi Hwy 182 intersection in Mayhew, Mississippi. Imagery data collected from the National Land Cover Database identify the Project Site as primarily cultivated crops and pastures.

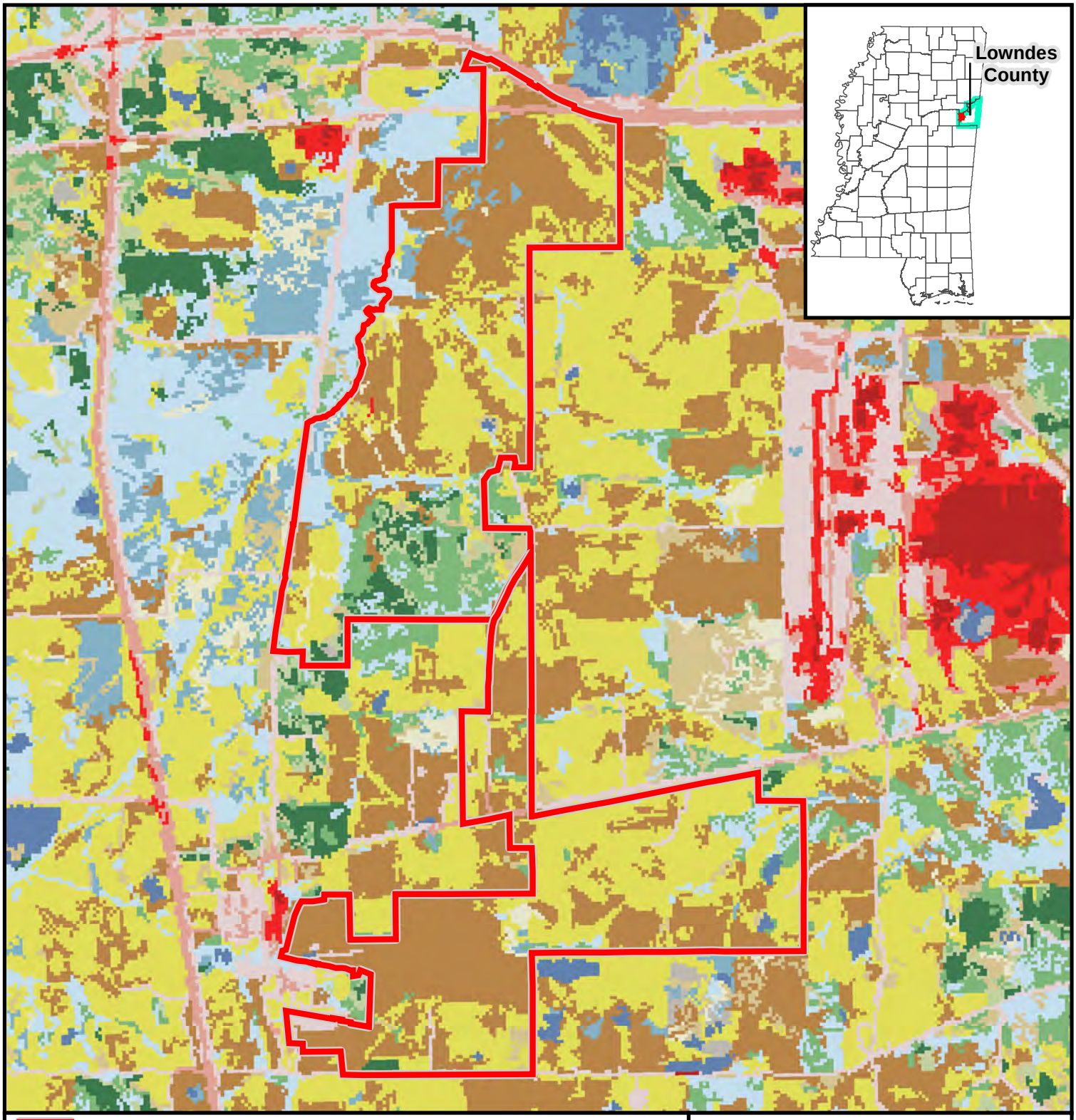
The Project Site is generally flat with minor changes in elevation and ranges from approximately 185 to 265 feet above mean sea level. Elevation is higher in the southern portion of the Project Site south of Artesia Road and gets lower toward the northern portion of the Project Site near Highway 82. MS Solar 5 intends to maximize the use of agricultural and pasturelands to the greatest extent practicable, thus minimizing tree clearing and impacts on wetlands. Table 3-1 provides a detailed breakdown of land use and land cover within the Project Site.

Table 3-1: Land Use and Percent Cover within the Project Site

Land Use	Approximate Area (acres)	% Cover
Open Water	<1	-
Open Space, Existing Rights-of-Way	18	<1%
Developed, Open Space	31	1%
Developed, Low Intensity	17	<1%
Upland Forest	400	11%
Hay/Pasture	428	12%
Cultivated Crops, Agriculture	2,328	58%
Emergent Wetlands (existing Rights-of-Way)	48	1%
Scrub-shrub Wetlands	20	<1%
Forested Wetlands	501	14%
Total	**3,792**	**100%**

The closest town to the Project Site is Artesia, which borders the southwest portion of the Project Site and has a small number of residential properties concentrated around a small railroad switching station. Artesia has a population of approximately 427 people (City-Data, 2020). The Project Site is located about halfway between the municipalities of Columbus and Starkville, Mississippi. Columbus and Starkville have populations of 23,573 and 25,653 people, respectively (USCB, 2020c). There are two residences within the Project Site, and both are south of Artesia Road. A satellite campus for East Mississippi Community College is adjacent to the Project Site in the northeastern corner along Frontage Road. The Golden Triangle Regional Airport and a variety of other industrial facilities are located north and east of the Project vicinity. The areas immediately surrounding the Project Site are similar in land use and are primarily agriculture/pasture or undeveloped.

According to historical aerial imagery and topographic quadrangle maps, the current land use of the Project Site has remained primarily undeveloped or used for agriculture/pasture with no significant land use changes in recent history. Figure 3-1 provides the land use classifications provided in the NRCS Land Use Land Cover Dataset.



Project Site

Land Use Land Cover

- Open Water
- Developed, Open Space
- Developed, Low Intensity
- Developed, Medium Intensity
- Developed, High Intensity
- Barren Land
- Deciduous Forest
- Evergreen Forest
- Mixed Forest
- Shrub/Scrub
- Herbaceuous
- Hay/Pasture
- Cultivated Crops
- Woody Wetlands
- Emergent Herbaceuous Wetlands

Figure 3-1
Land Use Land Cover Map
Golden Triangle Solar Project
Lowndes County, MS

BURNS McDONNELL

NORTH

0 0.38 0.76

Miles

Path: C:\Users\olhaney\Desktop\Projects\GoldenTriangle\EA\MXDs\LandCover_LandUse_V2.mxd olhaney 9/16/2020

Service Layer Credits:

Source: Esri, NRCS Land Use Land Cover Dataset, Burns & McDonnell

Issued: 9/16/2020

3.1.2 Environmental Consequences

3.1.2.1 No Action Alternative

Under the No Action Alternative, the proposed Golden Triangle Solar Facility would not be constructed; therefore, no Project-related impacts to land use would result. Existing land use would be expected to remain a mix of agricultural and undeveloped land for the foreseeable future.

3.1.2.2 Proposed Action

Implementation of the Proposed Action would result in construction and operation of the Solar Facility; therefore, the land use within the Project Site would change from primarily agriculture and pastureland to renewable energy production. The undeveloped forested portions of the Project Site would remain undeveloped. The undeveloped areas that are currently agricultural will either remain undeveloped with no farming or other activities occurring, or, depending on the size of the undeveloped area, MS Solar 5 may invite landowners to continue agricultural activities. The Project Site is in a rural area with limited zoning restrictions and would be compatible to land uses in the surrounding areas. Golden Triangle Regional Airport is approximately three miles to the east of the Project Site and an approximately 1,200-acre industrial megasite facility is four miles east of the Project Site along with a variety of other small industrial facilities east of the Project Site. Installation of the Solar Facility would increase industrial development westward where agriculture is currently the dominant land use. If the Solar Facility were to be decommissioned, the land could be returned to agriculture or used for a variety of other development strategies as allowed by local zoning legislation. Minor direct impacts are anticipated from the conversion of actively cultivated agricultural land and pasture/livestock grazing land to solar generation.

Construction and operation of the Solar Facility is proposed in an area primarily used for agriculture and pasture. There are no outdoor recreation areas in the vicinity of the Project Site and development of the Project would not impact public recreational activities or facilities associated with recreational activities. Additionally, the area where the proposed Project is sited has been zoned to encourage renewable energy development. Therefore, adverse direct or indirect impacts on land use are not anticipated.

Additional details regarding the network upgrades, such as the exact locations of pull points or any potential pole replacements, are still being developed. Supplemental NEPA analysis would be conducted if additional environmental resources are affected.

3.2 Geology, Soils, and Prime Farmland

3.2.1 Affected Environment

This section describes the existing geological resources at the Project Site 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, geological hazards, paleontology, soils, and prime farmland.

3.2.1.1 Geology

The Project Site is in the Alabama and Mississippi Blackland Prairie Major Land Resource Area (MLRA) in Northeast Mississippi. This Project Site is in the East Gulf Coastal Plain section of the Coastal Plain Physiographic Province (NPS, 2018). The Coastal Plain Province is generally underlain by poorly consolidated clastic rocks from the Mesozoic and Cenozoic (Jurassic to Quaternary) age.

3.2.1.2 Geological Hazards

Geological hazards can include landslides, volcanoes, earthquakes/seismic activity, and subsidence/sinkholes. The Project Site and surrounding areas are relatively stable without significant slopes within several miles, mitigating potential risk for landslides. There are no volcanoes within several hundred miles of the Project Site (U.S. Geological Service [USGS] 2019).

Sinkholes can be common when subsurface rock composition is evaporite rock (salt, gypsum, and anhydrite) and carbonates (limestone and dolomite) which can naturally be dissolved by groundwater circulating through them. When rock dissolves, spaces and caverns develop underground. These types of formations are referred to as karst topography. Land over sinkholes may stay intact until there is not enough support for the land above the spaces. Then, a collapse of the land surface can occur. Land collapses can vary greatly in size and shape (USGS, 2016). Human activities can also expedite cavity formation in more susceptible materials and trigger a collapse or collapse an existing sub-surface cavity site. A geotechnical survey was performed within the Project Site in May 2020. Based on the results of this survey, it was determined that no carbonate bedrock units underlie the Project Site. Therefore, the development of karst features, solution channels, or sinkholes is unlikely (GEOServices 2020).

Surface faulting, ground motion and deformation, liquification, and subsidence as a result of seismic activity were assessed at the Project Site. Susceptibility of structures or humans to experience seismic activity are often shown via the Modified Mercalli Scale. Values on the Mercalli scale are 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 as a percentage “g,” the acceleration due to gravity. The USGS Earthquake Hazards Program publishes seismic hazard map data layers that display the PGA with ten percent (one in 500-year event) probability of exceedance in 50 years. The potential ground motion for the Project Site is 0.1 g, for a PGA with a two percent probability of exceedance within 50 years (USGS 2014). A 0.1 g earthquake will have a weak to moderate perceived shaking with a low moderate potential for structural damage. The Project Site has a low to moderate risk for earthquakes that will cause structural damage (USGS 2020a).

3.2.1.3 Paleontology

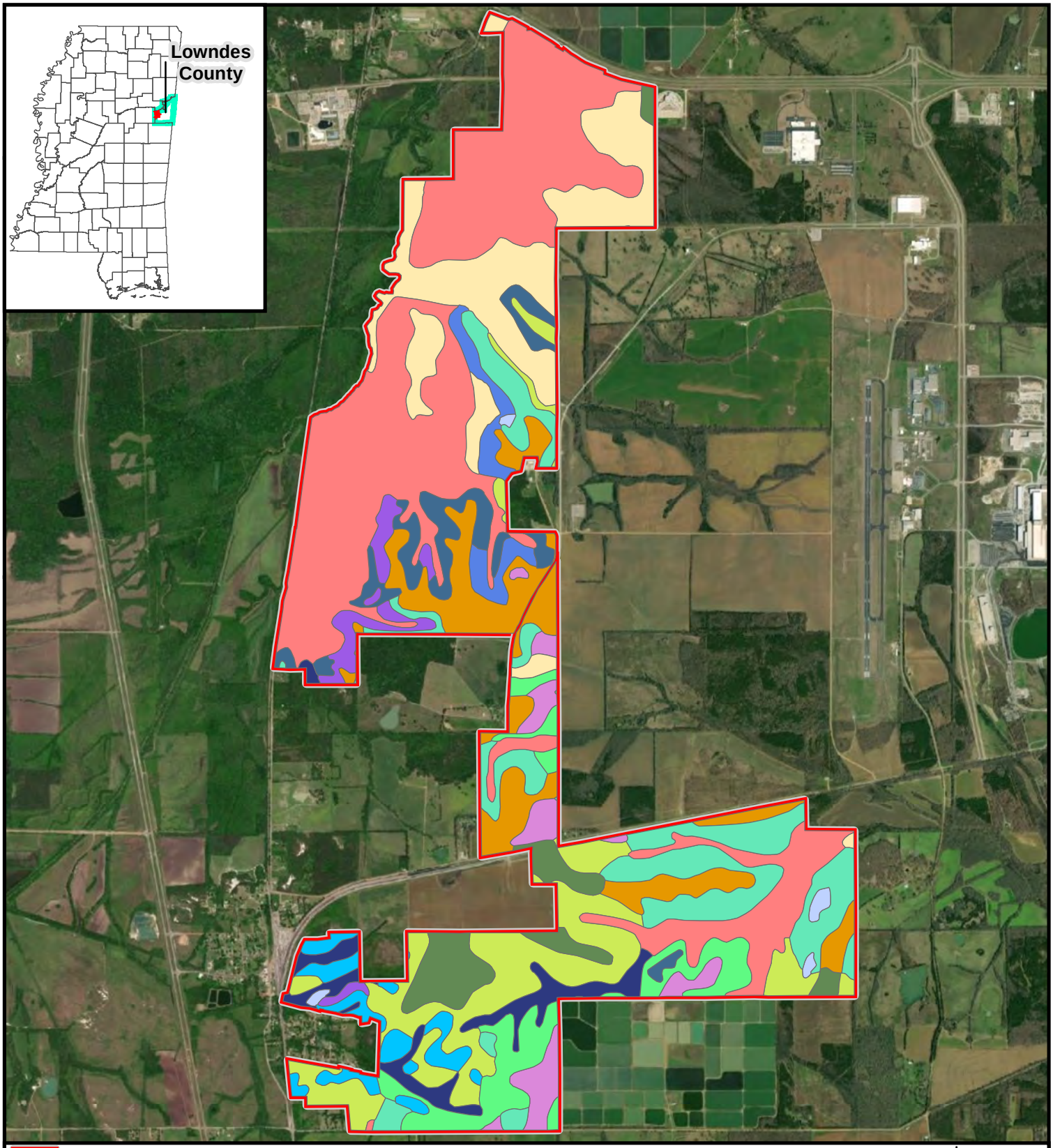
There are no Precambrian rocks in the Project Site because the land that is now the State of Mississippi did not exist during this period. During the Paleozoic Era, Mississippi was primarily

under the sea and provided habitat to organisms such as mollusks, crinoids, brachiopods, and trilobites. As water levels receded, broad coastal plains remained, and by the end of the Paleozoic era the entire state of Mississippi would have been above sea level and exposed to erosional pressures. Rocks deposited during flooding of the late Mesozoic Era can potentially contain fossils of invertebrates, vertebrates, and driftwood. Fluctuating sea levels from glacial influence on climate during the Cenozoic Era provided layers of windblown loess eroded from the Mississippi River to cover a large portion of the state to the northwest. Fossils of mollusks, other invertebrates, and large terrestrial mammals have been recovered from the loess deposits (Paleontology Portal, 2020).

3.2.1.4 Soils

There are 12 soil types mapped within the Project Site. Dominant soil types throughout the Project Site consist of Leeper silty-clay (33 percent), Vaiden silty-clay (29 percent), Catalpa silty-clay (14 percent), Okolona silty-clay (13 percent), and Brooksville silty-clay (7 percent). A complete list of soil types mapped throughout the Project Site is detailed in Table 3-2 and illustrated in Figure 3-2. Brooksville silty-clay, Okolona silty-clay, and Vaiden silty-clay soils are considered prime farmland and Catalpa silty-clay, Griffith silty-clay, and Leeper silty clay soils are considered prime farmland if protected from flooding or not frequently flooded during the growing season. Sumter-Demopolis-Chalk outcrop complex soils are considered farmland of statewide importance. Prime farmland and farmland of statewide importance are discussed further below.

The Project Site is located within MLRA-135A (Alabama and Mississippi Blackland Prairie). Therefore, upland soils exhibit a low chroma matrix, which is characteristic of the native parent material and is not necessarily caused by extensive soil saturation. The Leeper soil series is typically found in floodplains of MLRA-135A and consists of very deep, somewhat poorly drained soils. These soils have dark grayish brown “A” and “B” horizons and are derived from clayey alluvium parent material. The Vaiden soil series is typically found in uplands and old stream terraces of MLRA-135A and consist of very deep somewhat poorly drained, very slowly permeable soils that formed in clayey sediments over chalk or calcareous clays. These soils have yellowish brown “A” and “B” horizons and are principally used for cropland, pasture, hay production and woodland. The Catalpa soil series is also typically found in floodplains or low terraces of streams that drain areas of MLRA-135A. The Catalpa series soils are somewhat poorly to moderately well drained and derived from clayey alluvial sediments. These soils have color ranging from a very dark grayish brown “A” horizon to a dark grayish brown and olive brown “B” horizon. The Okolona series soils are deep, well drained very slowly permeable soils found in upland areas of MLRA-135A. These are generally level to gently sloping soils derived from calcareous clayey parent material underlain by marly clay and chalk. These soils have color ranging from a very dark grayish brown “A” horizon to olive “B” horizon. The Brooksville soil series are deep, somewhat poorly drained soils found in uplands of MLRA-135. Brooksville soils have an “A” horizon that is very dark grayish brown to dark olive gray and a dark grayish “B” horizon (USDA, 2018).



Project Site
Catalpa silty clay
Griffith silty clay
Brooksville silty clay, 0 to 1 percent slopes
Brooksville silty clay, 1 to 3 percent slopes
Sumter silty clay loam, 5 to 12 percent slopes, eroded
Leeper silty clay, 0 to 2 percent slopes, occasionally flooded
Demopolis-Binnsville complex, 2 to 8 percent slopes, eroded
Sumter-Demopolis-Chalk outcrop complex, 5 to 20 percent slopes, severely eroded
Okolona silty clay, 0 to 1 percent slopes
Okolona silty clay, 1 to 3 percent slopes
Vaiden silty clay, 0 to 2 percent slopes
Vaiden silty clay, 2 to 5 percent slopes, eroded
Vaiden silty clay, 5 to 8 percent slopes, eroded
Water

NORTH

0 0.35 0.7

Miles

BURNS McDONNELL

Figure 3-2
NRCS Soils Map
Golden Triangle Solar Project
Lowndes County, MS

Path: C:\Users\olhaney\Desktop\Projects\GoldenTriangle\EAMXDs\NRCS_MUNam_V2.mxd olhaney 9/16/2020
Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Source: Esri, NRCS Soil Survey Geographic Database, Burns & McDonnell

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Table 3-2: Soils within the Project Site

Soil Type	Farmland Classification	Hydric	Area (acres)	Percentage of Project Site
Brooksville silty clay, 0 to 1 percent slopes	All areas are prime farmland	Non-hydric	112.72	2.97%
Brooksville silty clay, 1 to 3 percent slopes	All areas are prime farmland	Non-hydric	202.26	5.33%
Catalpa silty clay	Prime farmland if protected from flooding or not frequently flooded during the growing season	Hydric	421.64	11.12%
Demopolis-Binnsville complex, 2 to 8 percent slopes, eroded	Not prime farmland	Hydric	101.01	2.66%
Griffith silty clay	Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season	Hydric	121.21	3.20%
Leeper silty clay, 0 to 2 percent slopes, occasionally flooded	Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season	Hydric	1,243.18	32.78%
Okolona silty clay, 0 to 1 percent slopes	All areas are prime farmland	Non-hydric	145.02	3.82%
Okolona silty clay, 1 to 3 percent slopes	All areas are prime farmland	Non-hydric	413.75	10.91%
Sumter-Demopolis-Chalk outcrop complex, 5 to 20 percent slopes, severely eroded	Not prime farmland	Hydric	75.61	1.99%
Sumter silty clay loam, 5 to 12 percent slopes, eroded	Farmland of statewide importance	Hydric	139.19	3.67%
Vaiden silty clay, 0 to 2 percent slopes	All areas are prime farmland	Hydric	336.58	8.88%
Vaiden silty clay, 2 to 5 percent slopes, eroded	All areas are prime farmland	Non-hydric	387.33	10.21%
Vaiden silty clay, 5 to 8 percent slopes, eroded	Not prime farmland	Hydric	75.67	2.00%
Water	Not prime farmland	Non-hydric	16.96	0.45%
		Total Area	**3,792.13**	**100.00%**
		Total Prime Farmland	**3,383.69**	**89.23%**
		Total Farmland of Statewide Importance	**139.19**	**3.67%**

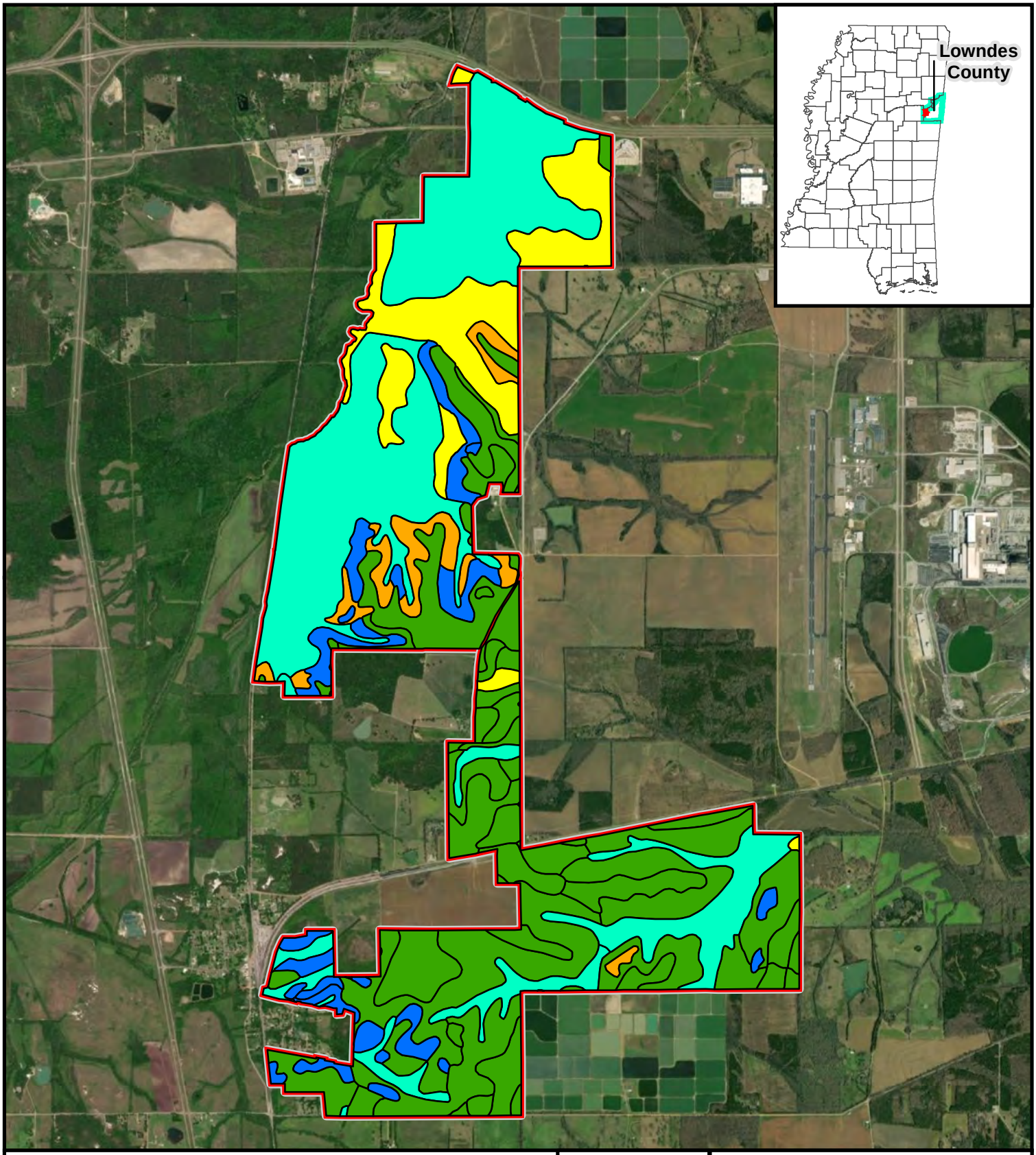
Source: NRCS 2020

3.2.1.5 Prime Farmland

Prime Farmland is a designation assigned by the United States Department of Agriculture – Natural Resources Conservation Service (USDA-NRCS) that identifies soils and land that has the best combination of physical and chemical properties for producing food, feed, forage, fiber, and oilseed crops. The land could be cropland, pastureland, rangeland, forest land, or other land, but not urban built-up land or water. The Farmland Protection Policy Act ([FPPA]; 7 United States Code [U.S.C.] 4201 *et seq.*) requires federal agencies to consider the 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." (USDA, 2020). Table 3-2 describes the soil types and farmland classification within the Project Site. The table is representative of soils that would be affected by the preliminary array layout (shown in Figure 2-2). Locations of prime farmland soils on the Project Site are shown in Figure 3-3. Data analysis from the NRCS indicates prime farmland soils and farmland of statewide importance soils make up just under 95% of the Project Site.

Hydric rating is an indicator of the percentage of a map unit that meets the criteria for hydric soils (USDA 2019b). Hydric soils are formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part. Each map unit is designated as follows:

- Hydric = All of the components that make up the map unit are rated as being hydric.
- Predominantly Hydric = 66 – 99 percent of the components that comprise the map unit are rated as being hydric.
- Partially Hydric = 33 – 66 percent of the components that comprise the map unit are rated as being hydric.
- Predominantly Nonhydric = Up to 33 percent of the components that comprise the map unit are rated as being hydric.
- Nonhydric = None of the components that comprise the map unit are rated as being hydric.



Project Site

Farmland Classification

- All areas are prime farmland
- Farmland of statewide importance
- Not prime farmland
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season

NORTH

0 0.35 0.7

Miles

BURNS McDONNELL

Figure 3-3

Farmland Classification Map
Golden Triangle Solar Project
Lowndes County, MS

Path: C:\Users\olhaney\Desktop\Projects\GoldenTriangle\EA\MXDs\NRCS_Farmland_V2.mxd olhaney 9/16/2020

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Source: Esri, NRCS Soil Survey Geographic Database, Burns & McDonnell

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3.2.2 Environmental Consequences

This section describes the potential impacts to Geology, Soils, and Prime Farmland from implementation of the Proposed Action or the No Action Alternative.

3.2.2.1 No Action Alternative

Under the No Action Alternative, the proposed Solar Facility would not be constructed; therefore, no Project-related impacts on geology, geological hazards, paleontological, soil resources, or prime farmlands would result. Existing land use would be expected to remain as a mix of agriculture and undeveloped land. If current land use remains unchanged, impacts to soils from continued agricultural use could cause a depletion of nutrients, causing a minor change to the Project Site.

3.2.2.2 Proposed Action

Under the Proposed Action, temporary, minor direct impacts to geology and soil resources would occur from construction and operation of the Project. Minor grading and clearing for the Solar Facility would cause temporary, minor, localized increases in erosion and sedimentation, resulting in minor impacts to geology and soils.

Geology

Implementation of the Proposed Action could result in minor impacts to geology. In addition to minor grading, minor excavations may occur for construction of the Golden Triangle Substation, Artesia Switching Station, gen-tie line, and stormwater retention areas. Excavations would be shallow and utilize existing topography to the extent practicable. Installation of pilings to support solar arrays would be mechanically driven to depths of up to six feet. Trenching up to approximately three feet for underground wiring connections between solar panels would also be required. Due to limited areas and potential shallow subsurface disturbances, minor direct impacts to subsurface geological resources are anticipated.

Geological Hazards

Geological hazards associated with potential sinkholes were investigated within the Project Site. The Project Site is in an area with carbonate bedrock geology and karst landforms associated with a risk for sinkholes. According to geotechnical investigations conducted for the Project Site, there are no known sinkholes anywhere within the Project Site, and the future formation of sink holes is unlikely (GEOServices 2020). There is also minor to moderate potential for small to moderate intensity seismic activity. The Solar Facility would be designed to comply with applicable standards. In the unlikely event that seismic activity and/or sinkholes would occur at the Project Site, only minor impacts to the Solar Facility and associated infrastructure would occur. Impacts to resources outside of the Project Site from geological hazards associated with construction of the proposed Solar Facility are unlikely.

Paleontology

If paleontological resources are identified during initial construction or operational activities, a qualified paleontologist will be consulted to recover and analyze the resources for potential impacts. MS Solar 5 would develop and implement a recovery plan and mitigation strategy.

Soils

During construction, all soils within the Project Site could potentially be disturbed from site preparation and construction activities. In areas where vegetation or tree removal is proposed, soil would be stockpiled and replaced to the greatest extent practicable. Due to the limited vegetation and tree clearing activities likely to occur, only a nominal amount of off-site soil may be required or hauling away of on-site soil may be necessary. If other borrow material such as sand, gravel, rip rap, or other aggregate is necessary during site preparation, these resources may be used from on-site sources within the Project Site or nearby previously permitted off-site sources.

A limited number of impervious surfaces from construction of foundations for the Golden Triangle Substation, Artesia Switching Station, and any maintenance facilities may result in a negligible to minor increase in stormwater runoff and a potential increase in erosion in those areas. Implementation of BMPs outlined in the Erosion and Sedimentation Control Plan (ESCP) during construction, in addition to a re-vegetation strategy of planting or seeding non-invasive vegetation, including native and naturalized plant species post-construction would minimize the potential for increased soil erosion. Activities associated with construction of the Proposed Action would not result in adverse impacts to soils on the Project Site.

Minor disturbance to soils would occur during operation of the Proposed Action. Activities ranging from routine and non-routine maintenance of the arrays, array inspections, facility maintenance, fence repairs, and vegetation control would be an on-going potential disturbance to soils within the Project Site. Vegetation control would be conducted using mechanized equipment such as tractors, mowers, and trimmers. MS Solar 5 proposes to re-vegetate the Project Site with low-growing native vegetation that would reduce the routine vegetation maintenance while also limiting interference with the solar arrays. Broad application of herbicides is not anticipated. However, if selective herbicides are necessary for small applications around problematic areas, they would be applied by a licensed contractor or qualified staff. Maintenance activities discussed in this section would not result in adverse impacts to soils on the Project Site during operation.

Prime Farmland

Implementation of the Proposed Action would result in a large portion of the Project Site being developed into the Golden Triangle Solar and BESS Facility, changing the land use to renewable energy from the existing agriculture and pastureland. Since the entire Project Site is essentially prime farmland or farmland of statewide importance, implementation of the Proposed Action would result in direct impacts to prime farmland from installation of the solar arrays and construction of permanent structures necessary for operation of the Solar Facility. Based on information provided by the local NRCS office, there is approximately 330,000 acres of farmable land in Lowndes county, of which 250,000 acres is FPPA-defined farmland. Any area within the

Project Site not developed for the Solar Facility would likely remain undeveloped. Depending on the size of undeveloped agricultural areas within the Project Site, MS Solar 5 may allow certain landowners to resume agricultural activities if they are interested. Based on the availability of farmable land in Lowndes County,

During site preparation and grading activities, topsoil would be stockpiled and re-applied to the respective surface areas once grading is complete. Soils within the Project Site do not have characteristics that would require specific construction requirements or techniques. If the Solar Facility is decommissioned and closure occurs, facility components would be removed, and farming could subsequently be resumed with limited long-term loss of agriculture production.

Implementation of the Proposed Action would result in temporary adverse effects to prime farmland during operation of the Solar Facility. Stockpiling topsoil for reuse and installing appropriate erosion control devices would preserve topsoil at the Project Site. Adhering to BMPs during construction and operation of the Solar Facility and revegetating the site with native plant cover would limit erosion. Implementation of these BMPs would result in minor impacts to prime farmland. If the Solar Facility is decommissioned and Project equipment is removed, the Project Site could be returned to agricultural and pastureland uses with a negligible loss to soil productivity. Beneficial impacts to soil health could result from a re-vegetation strategy using native and non-invasive species while terminating the need for broad application of herbicides, pesticides, and fertilizers. Based on the above mitigation measures as well as the availability of farmable land in Lowndes County, impacts on prime farmland soils would be minor and mostly reversible.

Additional details regarding the TVA network upgrades, such as the exact locations of pull points or any potential pole replacements, are still being developed. Supplemental NEPA analysis would be conducted if additional environmental resources are affected.

3.3 Water Resources

This section provides an overview of existing water resources in the Project Site, and the potential impacts on these water resources that would be associated with the No Action and Proposed Action Alternatives. Water resources discussed in this section include groundwater and surface water, including wetlands and floodplains.

3.3.1 Affected Environment

3.3.1.1 Groundwater

Groundwater supplies more than 38 percent of water needs for public water supply, agriculture, industry, mining, thermoelectric power, and domestic and commercial use in the Arkansas, Louisiana, and Mississippi area, which encompasses Lowndes County (Segment 5 of the Ground Water Atlas of the United States). In Mississippi, groundwater provides approximately 68 percent of the freshwater used in the state, most of which is used for agriculture (USGS, 1998). In Lowndes County, approximately 8.37 million gallons per day of groundwater is withdrawn from

public supply self-supplied groundwater, and an estimated 192 gallons per person per day are used (USGS 2018).

Major aquifers near the Project Site are the Southeastern Coastal Plains (Black Warrior River) aquifer system and the Mississippi embayment aquifer system. These aquifers consist primarily of an unconsolidated to poorly consolidated Coastal Plain strata of gravel, sand, clay, and some limestone of the Cretaceous and Holocene age. Specifically, the Mississippi embayment aquifer system consists of permeable sedimentary rock from the late Cretaceous to middle Eocene period and is the largest aquifer system in the Coastal Plain. In the mid-1980's, the Mississippi embayment aquifer system provided nearly six percent of the total groundwater withdrawn in Mississippi, Louisiana, and Arkansas. Large quantities of groundwater withdrawn via wells from the Coastal Plain aquifer systems during the last 100 years have not only lowered water levels, they have caused encroachment of salt water, decreased thickness of several aquifers, and even altered regional groundwater flow (USGS 1998).

Prior to the development of the Coastal Plain, regional groundwater flow was primarily driven topographically from elevated interstream recharge areas on the east and west sides of the Mississippi River to discharge areas in the valleys. Groundwater in the region is generally safe for most uses and quality in the aquifers correlate with groundwater flow, depth, and principal chemical constituents. Chemical constituents in groundwater below the Project Site are calcium bicarbonate, sodium bicarbonate, and sodium chloride where areas of the aquifer are deeply buried (USGS, 1998).

3.3.1.2 Surface Water

Surface waters are defined as water features that are on the Earth's surface, typically consisting of streams, lakes, ponds, and wetlands. Surface water features are further segregated into perennial, intermittent, and ephemeral. Perennial waters are permanent surface water features that have water present throughout the year. They typically exist as streams, rivers, lakes, springs, and swamps. During periods of little or no rain, the water level is maintained by groundwater contributions. Intermittent classification is generally restricted to streams that have a well-defined channel but only contain water part of the year, typically during winter and spring seasons when the stream bed is below the water table. Intermittent streams often do not support the diversity of biological and hydrological characteristics that perennial streams do. Ephemeral waters are features that only hold water for part of the year or flow as a result of stormwater events. Ephemeral streams (also known as wet-weather conveyances) are features that only flow in direct response to reciptiation events. Flow would only occur during and shortly after large precipitation events. These features typically lack the biological, hydrological, and physical characteristics of intermittent and prennial streams. Examples ephemeral streams/drainages include topographic swales and/ or dry drainages with poor bed and bank development.

Wetlands are those areas inundated by surface water or groundwater such that vegetation adapted to saturated soil conditions is prevalent. Examples include swamps, marshes, bogs, and wet meadows. Wetland habitat provides valuable public benefits including flood/erosion control, water quality improvement, wildlife habitat, and recreation opportunities.

Surface waters that meet certain physical and hydrologic criteria (defined bed and bank, ordinary high water mark, or specific hydrologic, soil, and vegetation composition) as defined in the Clean Water Act (CWA) are considered Waters of the U.S. (WOTUS) (or jurisdictional waters) and are under the regulatory jurisdiction of USACE. The CWA is the primary federal law that regulates discharges of pollutants and/or fill materials into WOTUS as outlined in Sections 402, 404 and 401. A jurisdictional determination by the USACE typically governs the activities affecting WOTUS.

The Project is within the U.S. Environmental Protection Agency (USEPA) Blackland Prairie Ecoregion (Level 4) and is within the Middle Tombigbee River [Hydrologic Unit Code (HUC) 03160106] and Tibbee Creek (8-digit HUC 03160104) sub-basins (USGS 2020b). The northern half of the Project Site generally drains west into Catalpa Creek which flows in a northerly direction eventually into Tibbee Creek which drains to the Tombigbee River. The southern half of the Project Site generally drains to Gilmer Creek, which eventually flows to the Tombigbee River. Neither Catalpa Creek nor Gilmer Creek (both with designated uses as “Aquatic Life Support”) are listed on Mississippi’s 2018 303(d) List (MDEQ 2018).

3.3.1.3 Wetlands

Field surveys were conducted on March 3-April 8, April 20-23, and May 4-8, 2020 to determine the presence of potentially jurisdictional wetlands and waterbodies within a prescribed Survey Area which encompasses the more refined Project Site (Appendix B). The delineation was conducted in accordance with the 1987 Corps of Engineers Wetlands Delineation Manual (1987 Manual) and the 2010 Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Atlantic and Gulf Coast Plain Region – Version 2.0 (Regional Supplement).

Wetlands are those areas inundated by surface water or groundwater such that vegetation adapted to saturated soil conditions is prevalent. Examples include swamps, marshes, bogs, and wet meadows. Wetland habitat provides valuable public benefits including flood/erosion control, water quality improvement, wildlife habitat, and recreation opportunities. Appendix B contains the *Golden Triangle Solar Project Wetland and Waterbody Delineation Report*. Environmental Field Surveys were performed over a large survey area that included approximately 3,980 acres. Based on the results of the surveys, MS Solar 5 refined the site design to minimize or avoid impacts on environmental resources, most specifically wetlands, waterbodies, and habitat that could be suitable for rare, threatened, or endangered plants and animals.

Under Executive Order (EO) 11990, federal agencies shall avoid, to the extent possible, the long and short term adverse impacts associated with the destruction or modification of wetlands, and avoid direct or indirect support of new construction in wetlands wherever there is a practicable alternative. Under Section 404 of the Clean Water Act, unavoidable impacts to 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 within the Survey Area: palustrine emergent (PEM; 48.2 acres), palustrine forested (PFO; 501.1 acres), and palustrine scrub-shrub (PSS; 20.33 acres), for a total of 569.63 acres of potentially

jurisdictional wetlands. The common overstory and understory vegetation of PFO wetlands consists of Osage orange (*Maclura pomifera*), green ash (*Fraxinus pennsylvanica*), sugarberry (*Celtis laevigata*), water locust (*Gleditsia aquatica*), box elder (*Acer negundo*), American sycamore (*Platanus occidentalis*), and red maple (*Acer rubrum*). Common vines, shrubs, and herbaceous vegetation consist of poison ivy (*Toxicodendron radicans*), butterweed (*Packera glabella*), Virginia creeper (*Parthenocissus quinquefolia*), blackhaw (*Viburnum prunifolium*), resurrection fern (*Pleopeltis polypodioides*), and soft rush (*Juncus effusus*). Common vegetation observed within the emergent wetlands included hollow joe-pye-weed (*Eutrochium fistulosum*), woolgrass (*Scirpus cyperinus*), prairie ironweed, curly dock (*Rumex crispus*), blackberries (*Rubus spp*.), and soft rush. Common vegetation observed within the scrub/shrub wetlands included osage orange, green ash, box elder, red maple, butterweed, bulbous bittercress (*Cardamine bulbosa*), and soft rush. The Project was designed to avoid surface water features to the extent practicable.

3.3.1.4 Floodplains

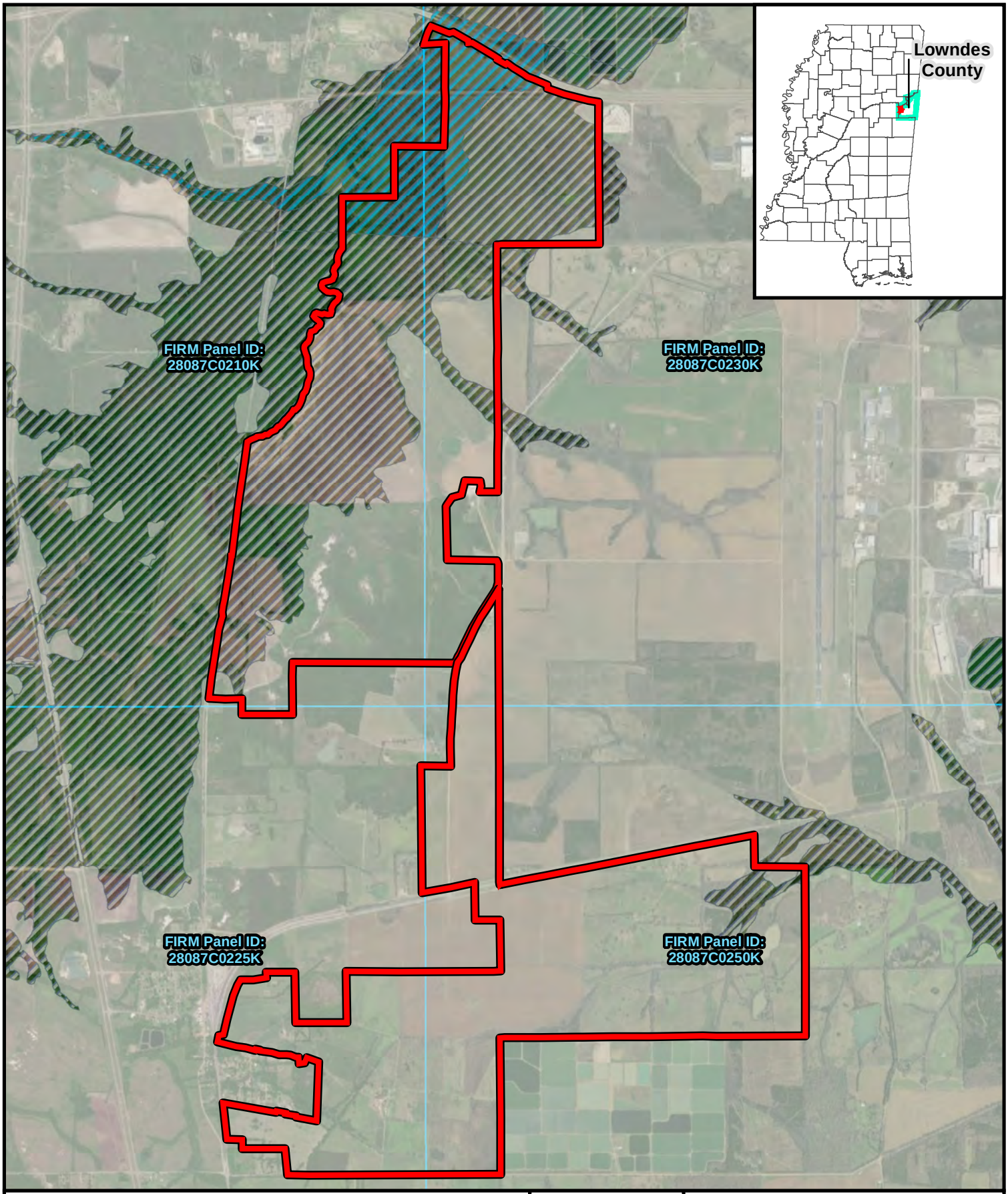
Floodplains are geographic areas that FEMA has defined according to varying levels of flood risk and type of flooding. The area subject to a one-percent chance of flooding in any given year is normally called the 100-year floodplain. The area subject to a 0.2-percent chance of flooding in any given year is normally called the 500-year floodplain. It is necessary to evaluate development in floodplains to ensure that the Project is consistent with the requirements of EO 11988, Floodplain Management. The northern and western areas of the Project Site are located within the FEMA-designated 100-Year Floodplain (Zone A/AE). Further, in the northwestern corner, a FEMA Regulatory Floodway exists where permanent aboveground structures should be discouraged.

Maps developed by FEMA show the likelihood of flooding in particular areas and help determine eligibility for the National Flood Insurance Program (NFIP). The purpose of the NFIP is to reduce impacts from flooding to private and public structures by supporting community level regulations to mitigate the effects of flooding to structures (FEMA 2020a). Lowndes County participates in the NFIP. EO 11988, Floodplain Management, 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 or indirect support of floodplain development wherever there is a practicable alternative…" The following floodplain/floodway requirements have been previously established by Lowndes County for the Project Site:

> Floodplains: Lowndes County requires that an elevation certificate be submitted for each individual solar panel tracking string. The elevation certificate must demonstrate that the lowest section of the module, at full tilt, is at least one foot above the 100-year base flood elevation.
>
> Floodways: Lowndes County requires that a no-rise condition be reflected through hydraulic analysis in order to avoid the requirement of a Conditional Letter of Map Revision (CLOMR). If a no-rise condition cannot be met, a CLOMR must be obtained as the best mitigation approach to prevent major impacts on flood heights.

Project development within the FEMA Regulatory Floodway is not anticipated.

The Solar Facility would be located between Catalpa Creek miles 6.97 to 9.63 on the northwest side of the Project Site. Two FEMA-designated floodplains, one associated with Catalpa Creek and one associated with Gilmer Creek (Lowndes County, Mississippi, Flood Insurance Rate Map [FIRM] Panels 28087C0210K, 28087C0230K, 28087C0225K, and 28087C0250K, all with an effective date of February 18, 2011), are located on the Project Site (FEMA 2020b). The floodplains are designated as Zone A (areas with a one percent annual chance of a flood event and no base flood elevations or flood depths have been determined) and Zone AE (areas with a one percent annual chance of a flood event where base flood elevations or flood depths have been determined) and are located in the southwestern and northeastern portions of the Project Site, as shown in Figure 3-4. The total acreage of land within the Project Site that is designated as a FEMA floodplain is approximately 1,076 acres.



Path: C:\Users\olhaney\Desktop\Projects\GoldenTriangle\EA\MXDs\FloodplainMap_V2.mxd olhaney 9/16/2020
Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

BURNS McDONNELL

Figure 3-4

FEMA Flood Hazard Map
Golden Triangle Solar Project
Lowndes County, Mississippi

Source: Esri, FEMA, Burns & McDonnell

Issued: 9/16/2020

3.3.2 Environmental Consequences

3.3.2.1 No Action Alternative

Under the No Action Alternative, the proposed Solar Facility would not be constructed; therefore, no Project-related impacts on water resources would occur. Existing land use would remain as farmland and surface waters would remain as they are at the present time. Increases in erosion and sediment runoff could occur over time if best-practices in agriculture were not maintained to prevent erosion and runoff. In addition, if broad applications of chemical fertilizers or pesticides are continually used it could result in nutrient-rich runoff that degrades the quality of surface waters within the site and throughout the broader drainage basin.

3.3.2.2 Proposed Action

Under the Proposed Action, minor short-term impacts from construction would be expected on streams, wetlands, and floodplains from sedimentation of exposed soils. Standard BMPs would be installed, inspected, and maintained until satisfactory stabilization is achieved. Beneficial, indirect impacts to surface water and groundwater would result from a reduction in broad applications of pesticides, herbicides, and fertilizers used in support of the current agricultural land use activities. Additionally, water quality may be improved through filtering by native plant cover as opposed to crop cover, which could reduce erosion and sedimentation from stormwater events.

Groundwater

During construction, hazardous materials would be on-site that could potentially contaminate groundwater resources, including petroleum products for fuel and lubrication of construction equipment, hydraulic fluids, and a variety of other chemicals commonly used for general construction projects. Implementation of BMPs would provide measures to minimize potential for leaks or spills from construction equipment and outline procedures and protocols to quickly address potential spills that may occur. Construction activities would be in accordance with BMPs outlined in TVA's *A Guide for Environmental Protection and Best Management Practices for Tennessee Valley Authority Construction and Maintenance Activities* (TVA, 2017b) to avoid contamination to groundwater. Fertilizers and herbicides are not proposed to be used during construction or operation of the Proposed Action which would be considered a direct long-term benefit to groundwater. However, if minor application of fertilizer is needed for initial re-vegetation, applications would be in accordance with the manufacturer's recommendation and would be short-term. Currently, most of the land proposed for use is actively cultivated cropland with frequent application of fertilizers, herbicides, and pesticides. Change in land use from agriculture to solar would be a long-term beneficial impact to groundwater.

Water needed for construction would be provided from existing or proposed temporary groundwater wells or water delivery trucks. The construction contractor would use water for the purposes of fugitive dust mitigation (during dry conditions), concrete mixtures, and other temporary construction needs. If practicable, groundwater wells and holding tanks would reduce and avoid impacts to groundwater. Construction activities requiring water would primarily be for

dust control and compaction during grading activities for access roads, pads, and foundations for structures.

Water usage within the Project Site during operations would be in accordance with BMPs outlined in TVA's *A Guide for Environmental Protection and Best Management Practices for Tennessee Valley Authority Construction and Maintenance Activities.* Local rainfall is generally consistent enough to avoid the need for dust control on PV arrays. Therefore, regular panel washing is not anticipated. Water needs during the operation and maintenance phase of the Proposed Action, would be addressed by new or existing groundwater wells. A water source would be required for the operations and maintenance building, which would be located within the Golden Triangle Substation and BESS Facility boundaries. Water also would be required for the fire suppression system as part of the BESS Facility. Groundwater withdrawal volumes are expected to be less than the existing volume needed for agricultural irrigation, thus resulting in a net positive impact on groundwater resources.

Broad application of fertilizers and herbicides are not proposed during construction or operation of the Project, which would be considered a direct long-term benefit to groundwater. However, if minor applications of fertilizer or herbicides are needed for initial re-vegetation or maintenance, applications would be in accordance with manufacturer's recommendations and would be short-term. Currently, most of the land proposed for use is actively cultivated cropland with frequent application of fertilizers, herbicides, and pesticides. Change in land use from agriculture to solar would therefore be a long-term beneficial impact to groundwater.

If the Solar Facility were to be decommissioned or closed, a Decommissioning and Closure Plan would be developed. The Decommissioning and Closure Plan would detail procedures to control erosion and sedimentation and maintain compliance with NPDES requirements and permits. Water usage for potential decommissioning and closure is not likely to exceed that used for operation and maintenance. Therefore, impacts to groundwater resulting from a decommissioning and closure of the Solar Facility are not anticipated.

There were no sinkholes identified within the Project Site, therefore the potential for direct surface to groundwater contamination from stormwater or chemical and solid waste runoff is not anticipated. Herbicide and pesticide applications are not expected to be used during construction or operation of the Project. However, if pesticides or herbicides would be required at any point during construction or maintenance activities, applications would be consistent with Mississippi Department of Agriculture and Commerce permit requirements. Proper application of herbicides and pesticides, if needed, may result in minor impacts to surface water but would be significantly less than applications from current land use.

Overall, impacts to local aquifers and groundwater are not anticipated due to the limited volume of groundwater required for initial construction, operation, and maintenance, or decommissioning and closure of the Solar Facility. BMPs and a Decommissioning and Closure Plan would reduce the potential for hazardous materials to reach groundwater resources during any stage of the Project.

Additionally, minor, indirect beneficial impacts to groundwater could occur from the discontinued use of broad applications of herbicides, pesticides, and fertilizers, due to change in land use from agriculture to solar.

Surface Water

Due to capacity requirements and land constraints, complete avoidance of jurisdictional water features was not practicable with the Proposed Action. Construction and operation of the Project would affect up to 300 linear feet of intermittent and perennial streams due to the construction of new access road stream crossings and improvements to culverts and bridges associated with existing access roads. During all stages of the design process, efforts have been made to avoid and minimize impacts to jurisdictional wetlands and waterbodies to the greatest extent practicable. New stream crossings would, to the extent practicable, occur at a 90-degree angle to the stream. Best Management Practices for stream crossings would be implemented, such as using a bridge span that avoids direct impacts to the stream beds and top of bank, placing geotextile fabric along bridges to minimize dirt and debris from entering the stream channel, and minimizing the width of each crossing to the smallest width allowable (within safety requirements).

The layout of PV panels, access roads, inverters, and other related Project components have not been finalized. MS Solar 5 would design the final layout so that panel placement would avoid impacts on streams. However, some linear Project components, such as tie-in lines and access roads would require a minimal number of stream crossings. The Proposed Action would result in minor, direct, permanent impacts to jurisdictional streams at locations where permanent culverts are installed for construction of access roads. The linear feet of culvert installation in total would not exceed 300 feet. While complete avoidance of stream features was not possible, with implementation of the above mentioned BMPs, the USACE and MDEQ Section 404 and 401 permit requirements, and the Project's MDEQ-approved SWPPP to control erosion and sediment runoff, impacts to streams would be short-term and minimal.

Table 3-3 provides a breakdown of potential impacts on streams due to facility access road crossings. Currently, 13 stream crossings, totaling approximately 215 linear feet of impacts have been identified. The exact crossing location along these streams is still preliminary; however, best management practices, such as keeping bridges or crossings to a 90 degree angle and utilizing existing bridges when available, would be implemented. MS Solar 5 intends to limit stream crossings to 300 total linear feet (or less) in order to comply with the USACE and MDEQ impact limits under NWP 12. Existing access roads and bridges would be prioritized with construction of new waterbody crossings and culvert installation only being used where necessary.

Table 3-3: Waterbodies Potentially Affected by the Golden Triangle Solar Project Access Road Crossings

Waterbody ID	Waterbody Type	Top of Bank Width (feet)	Length of Stream (feet) in Project Site	Impact Type	Length of Impact (feet)	Area of Impact Sq. ft.
S-005	Intermittent	2	5,645	Access Road Culvert	15	30 ft^2
S-012	Intermittent	2	1,094	Access Road Culvert	15	30 ft^2
S-014	Perennial	4	7,029	Access Road Culvert No. 1	15	60 ft^2
S-014	Perennial	4	7,029	Access Road Culvert No. 2	15	60 ft^2
S-017	Perennial	15	8,446	Access Road Culvert No. 1	20	300 ft^2
S-017	Perennial	10	8,446	Access Road Culvert No. 2	20	200 ft^2
S-017	Perennial	10	8,446	Access Road Culvert No. 3	20	200 ft^2
S-017	Perennial	25	8,446	Minor improvement to existing bridge	20	500 ft^2
S-023	Perennial	5	2,416	Access Road Culvert	15	75 ft^2
S-046	Intermittent	2	2,005	Access Road Culvert	15	30 ft^2
S-048	Intermittent	1	2,133	Access Road Culvert	15	15 ft^2
S-073	Intermittent	4	3,182	Access Road Culvert	15	60 ft^2
S-076	Perennial	5	6,468	Improvement to Existing Bridge	15	75 ft^2
				Total Impact	**215**	**1,635 ft^2**

Wetlands

Impacts on wetlands would be avoided to the extent practicable. As the current layout shows, the area of impact has been designed to avoid any impacts on wetlands. The placement of permanent aboveground facility components, such as PV panels, inverters, generators, substations, switching stations, and access roads were limited to upland areas. Minor impacts from stormwater discharges could occur to wetlands within the Project Site. However, buffers of at least 15 feet have been established around wetlands; and BMPs such as silt fencing would be installed, inspected, and maintained along the perimeter of the construction area where wetlands are present. In some cases, buried tie-in lines may be required to connect one area of panels to another. To avoid disturbances to wetland features at the Project Site, MS Solar 5 would bore under wetlands as necessary to install collection cables. If a wetland crossing were identified by the construction contractor, the appropriate permits and clearances would be obtained through the USACE Mobile Regulatory District and the Mississippi DEQ. Figure 3-5 shows the preliminary array layout and delineated features within the Project Site. As shown, MS Solar 5 would avoid jurisdictional wetlands and waterbodies to the greatest extent practicable.

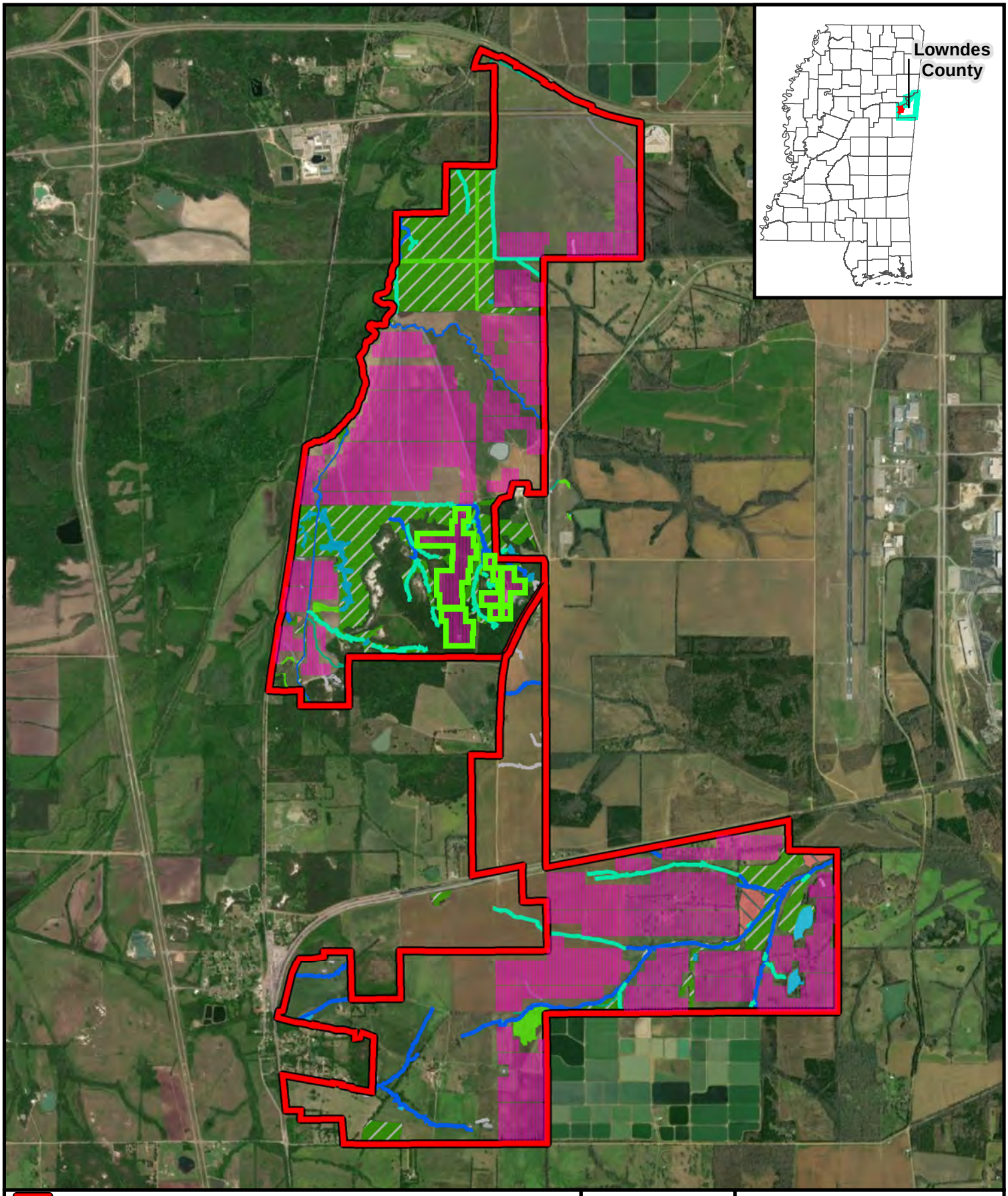


Figure 3-5

Delineated Features Map
Golden Triangle Solar Project
Lowndes County, Mississippi

Path: C:\Users\olhaney\Desktop\Projects\GoldenTriangle\EA\MXDs\DelineatedFeatures_Overview_withArray.mxd olhaney 10/18/2020

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Source: Esri, Burns & McDonnell

Issued: 10/18/2020

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 practicable 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…" 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 (United States 1978). The EO requires that agencies avoid the 100-year floodplain unless there is no practicable alternative.

Approximately 1,076 acres of floodplain were identified within the Project Site. As depicted in Figure 2-2, the preliminary layout of solar arrays has been designed to minimize the number of PV panels installed within floodplains. However, a small section of arrays would be installed within the floodplain. The location of arrays within the floodplain was determined based on the results on MS Solar 5's Hydrology Study (Appendix C).

Project components, such as buried collection lines, a small percentage of PV panels, security fencing, security lighting, and portions of the overhead wire may occur within the 100-year floodplain, which is currently utilized for active agricultural operations. Consistent with EO 11988, the installation of underground electric lines and fencing are considered to be repetitive actions in the 100-year floodplain, which would result in minor impacts (TVA 1981). Although present within the Project Site, no construction or operational activities or new facility components would occur within the FEMA regulated floodway.

During construction, the temporary laydown areas, construction trailers, and parking areas would be placed outside the floodplain. Additionally, the construction contractor would monitor the weather forecast; and, if a heavy rain event (greater than ½ inch) is predicted, construction equipment would not be stored overnight within the floodplain. The Golden Triangle Substation, BESS Facility, operations and maintenance building, and MPT would be located outside the floodplain. The 675-foot-long gen-tie and Artesia Switching Station, which would connect to the east side of TVA's existing Artesia Substation, also would be outside of the 100-year floodplain and floodway. As shown in Figure 2-1, these facilities are located along public roadways (Guerry Road and Mims Road). Both of these roads are outside of the floodplain.

MS Solar 5 would need new access roads throughout the Solar Facility in order to access arrays and inverters during construction and operation. MS Solar 5 would utilize existing farm roads to the greatest extent practicable. The exact location of any new compacted earth access roads is not yet final. However, it is anticipated that at least one new access road would be needed within the 100-year floodplain. MS Solar 5 has discussed with Lowndes County the potential Project activities within the 100-year floodplain. Prior to construction, a review by the Lowndes County Floodplain Administer would occur; and the appropriate permissions would be obtained for work and facilities within the floodplain. Any access roads would be designed and permitted as compacted earth facility roads. Panels would be placed at a height that would allow the lowest

point to occur at least one foot above the BFE (based on the Hydrology Study for the Project Site). Impacts on the floodplain are anticipated to be minor.

The support structures for the transmission line would not be expected to result in any increase in flood hazard, either as a result of increased flood elevations or changes in flow-carrying capacity of the streams being crossed. Construction in the floodplain would be consistent with EO 11988 provided the TVA subclass review criteria for transmission line location in floodplains are followed. Additional details regarding the network upgrades, such as the exact locations of pull points or any potential pole replacements, are still being developed. Supplemental NEPA analysis would be conducted if additional environmental resources are affected.

Lowndes County participates in the National Flood Insurance Program, and any development must be consistent with its floodplain regulations. To prevent an obstruction in the floodway: (1) any fill, gravel or other modifications in the floodway that extend above the pre-construction road grade would be removed after completion of the project; (2) this excess material would be spoiled outside of the published floodway; and (3) the area would be returned to its pre-construction condition.

To minimize adverse impacts if the Solar Facility is dismantled at the end of its useful life, non-recyclable and/or non-reusable debris would be disposed of at a location outside 100-year floodways.

By implementing the following mitigation measures, the proposed Golden Triangle Solar and BESS Facility, TVA TL upgrades, TVA Artesia Switching Station, gen-tie line, access roads, and eventual decommissioning of the Solar Facility would have no significant impact on floodplains and their natural and beneficial values:

1. Any fill, gravel, or other modifications in the Catalpa Creek floodway that extend above the pre-construction road grade would be removed after completion of the project.
2. This excess material would be spoiled outside of the published floodway.
3. The area would be returned to its pre-construction condition.
4. Standard BMPs would be used during construction activities.
5. Road construction other than within the Catalpa Creek floodway would be done in such a manner that upstream flood elevations would not be increased by more than 1.0 foot.
6. Construction would adhere to the TVA subclass review criteria for transmission line location in floodplains; and
7. Non-recyclable and/or non-reusable demolition debris would be disposed of at a location outside 100-year floodways.

3.4 Biological Resources

This section provides an overview of the existing biological resources within the Project Site and the potential impacts to those resources from implementation of the Proposed Action and the No Action Alternative. Biological resources analyzed in this section include natural areas, vegetation, wildlife, and rare, threatened, and endangered species.

The Project is within the U.S. Environmental Protection Agency (USEPA) Blackland Prairie Ecoregion (Level IV) and is within the Middle Tombigbee River [Hydrologic Unit Code (HUC) 03160106] and Tibbee Creek (HUC 03160104) watersheds. Blackland prairie ecoregions usually consist of gently rolling hills with little bluestem (*Schizachyrium scoparium*), big bluestem (*Andropogon geradii*), Indianagrass (*Sorghastrum nutans*), eastern gamma grass (*Tripsacum dactyloides*), switchgrass and sidesoats grama (*Bouteloua curtipendula*) with sparse pockets of pecan (*Carya illinoinensis*), cedar elm (*Ulmus crassifolia*), hackberry (*Celtis occidentalis*), and a variety of oak trees (*Quercus sp.*). Average temperatures are usually between 66 and 70 degrees Fahrenheit and rainfall averages 30 to 40 inches annually (Texas Parks and Wildlife, 2020). Agriculture products such as corn, soybeans, and hay are produced in large quantities within the Project Site and surrounding area.

Prior to conducting field work, Burns & McDonnell biologists reviewed the U.S. Fish and Wildlife Service (USFWS) Information for Planning and Consultation (IPaC) for the Project Area (Appendix D) dated May 4, 2020, regarding special status species that may occur within the Survey Area (Consultation Code: 04EM1000-2020-SLI-0788, Event Code: 04EM1000-2020-E-01753) and assessed whether the proposed Project had potential to affect ESA species (i.e., ESA listed, proposed and candidate species), bald eagles (*Haliaeetus leucocephalus*), golden eagles (*Aquila chrysaetos*), migratory birds (including raptor species), and associated habitat within the Survey Area. Additionally, Mississippi Department of Wildlife, Fisheries, and Parks (MDWFP) Endangered Species of Mississippi report (Mississippi Museum of Natural Science, 2014) and Mississippi National Heritage Program Protected Species List (2018) data were reviewed to determine potential protected species and associated habitat that may occur within Lowndes County, MS.

Field surveys were conducted from March 3-April 8, April 20-23, May 4-8, and October 7, 2020. During the field surveys, data was collected on vegetative cover/land use and protected species habitats. Regulations for biological resources potentially relevant for 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); and
- Mississippi Nongame and Endangered Species Conservation Act (Miss Code Ann. § 49-5-101 to 49-5-119).

Additionally, TVA provided data from the regional Natural Heritage Database (RNHD) for federal and state protected species occurring within or near the Project Site or generally listed for Lowndes County, MS.

3.4.1 Affected Environment

Biological resources within the Project Site include natural areas, vegetation, wildlife, and the potential for rare, threatened, or endangered species.

3.4.1.1 Natural Areas

Natural areas include managed areas such as Wildlife Management Areas, National Wildlife Refuges and Habitat Protection Areas, ecologically significant sites, and river segments listed in the Nationwide Rivers Inventory. There are no natural areas within five miles of the Project Site. The closest natural areas to the Project Site are the Black Prairie Wildlife Management Area (approximately 7.5 miles to the south) and the Tennessee-Tombigbee Waterway, which is over ten miles to the east.

3.4.1.2 Vegetation

The Project Site is located within the Black Belt Prairie (also known as the “Blackland Prairie” and the “Cotton Belt”), which is a subdivision of the East Gulf Coastal Plain physiogeographic province. The Black Belt Prairie is best known for its dark, low chroma soils and high crop yield; however, prior to the influx of farming practices, there were three dominant plant communities that naturally occurred in this region: open prairie, chalk outcrop, and forests (MacGown, Brown, and Hill 2006). Naturally occurring, mature hardwood forests are found within and beyond the Project Site.

Figure 3-6: Chalk Outcrop on Parcel Associated with the Project

Chalk outcrops occur in areas within the Black Belt Prairie where erosion has exposed the underlying formation. Several chalk outcrops were identified within a parcel of land that would be leased to MS Solar 5 as part of the Project Site. These scattered outcrops, which have undergone severe erosion, add up to approximately 12 acres in total. Chalk outcroppings are known to support several endemic and rare species of plants and insects. The photo to the left in Figure 3-6 was taken within the Project Site in November 2019.

Portions of the Project Site on the south side of Artesia Road are within part of a prairie that is now in use as pastureland for cattle grazing (Phillips 2012).

Very little undisturbed prairieland still exists today due primarily to human disturbances such as agricultural practices, conversion to pastureland for livestock, and other developments (Phillips 2012).

There are presently four major vegetation communities currently within the Project Site: active agriculture (row crops and pastureland), bottomland hardwood forests, upland forests, and utility corridors or other open spaces.

Over 80% of the Project Site is comprised of agricultural fields and pastureland. Vegetation in these communities is maintained in an early successional state due to herbicide application, crop growth/harvesting, and cattle grazing. Soybeans and corn are planted in late spring and cover the row crop fields. Vegetation observed in pastures consists of primarily tall fescue grass (*Schedonorus arundinaceus*), Johnson grass (*Sorghum halepense*), annual bluegrass (*Poa annua*), scutch grass (*Elymus repens*), cheatgrass (*Bromus tectorum*), perennial ryegrass (*Lolium perenne*), rescuegrass (*Bromus catharticus*), butterweed, bulbous bittercress, soft rush, Cherokee sedge (*Carex cherokeensis*), Frank's sedge (*Carex frankii*), fox sedge (*Carex vulpinoidea*), path rush (*Juncus tenuis*), poorjoe (*Diodia teres*), red sorrel (*Rumex acetosella*), prairie fleabane (*Erigeron strigosus*), horseweed (*Erigeron canadensis*), dogfennel (*Eupatorium capillifolium*), jimsonweed (*Datura stramonium*), Carolina horsenettle (*Solanum carolinense*), spear thistle (*Cirsum vulgare*), sensitive partridge pea (*Chamaecrista nictitans*), and Palmer's pigweed (*Amaranthus palmeri*).

Bottomland hardwood forests are also present within the Project Site. These communities are composed of a tree canopy associated with a mature second-growth forest. Dominant vegetation observed consisted of water hickory (*Carya aquatica*), willow oak (*Quercus phellos*), cherrybark oak (*Quercus pagoda*), swamp chestnut oak (*Quercus michauxii*), silky dogwood (*Cornus amomum*), osage orange, green ash, eastern red cedar (*Juniperus virginiana*), water locust, southern shagbark hickory (*Carya carolinae-septentrionalis*), box elder, red maple, American sycamore, sugarberry, possumhaw (*Ilex decidua*), blackhaw, winterberry (*Ilex verticillata*), foxglove beardtongue (*Penstemon digitalis*), sharpscale sedge (*Carex oxylepis*), Mead's sedge (*Carex meadii*), Cherokee sedge manyhead rush (*Juncus polycephalos*), grassleaf rush (*Juncus marginatus*), wild petunia (*Ruellia humilis*), nodding fescue (*Festuca subverticillata*), poison ivy, greenbrier (*Smilax* spp.), Virginia spiderwort (*Tradescantia virginiana*), Virginia creeper, prairie ironweed (*Vernonia fasciculata*), hairy buttercup (*Ranunculus sardous*), resurrection fern, and hairy sedge (*Carex lacustris*).

The upland forests within the Project Site are composed of a canopy age ranging from approximately 20 to 70 years old. Dominant vegetation observed consisted of white oak (*Quercus alba*), southern red oak (*Quercus falcata*), post oak (*Quercus stellata*), blackjack oak (*Quercus marilandica*), mockernut hickory (*Carya tomentosa*), red hickory (*Carya ovalis*), shagbark hickory (*Carya ovata*), pignut hickory (*Carya glabra*), loblolly pine (*Pinus taeda*), eastern red cedar, American elm (*Ulmus americana*), honey locust (*Gleditsia triacanthos*), black locust (*Robinia pseudoacacia*), osage orange, Chinese privet (*Ligustrum sinense*), Devil's walkingstick (*Aralia spinosa*), Christmas fern (*Polystichum acrostichoides*), multiple greenbrier species (*Smilax spp*.),

wild grapes (*Vitus spp*.), Virginia creeper, blackberry, false indigo bush (*Amorpha fruticosa*), wooly panic grass (*Dichanthelium acuminatum*), hirsute sedge (*Carex complanata*), Canadian black snakeroot (*Sanicula canadensis*), and little quaking-grass (*Briza minor*).

There are smaller areas within the Project Site that are within existing and routinely mowed utility rights-of-way. In general, the vegetation is maintained in an early successional state due to herbicide application and routine mowing. Areas identified as ROW are typically maintained every one to three years. The vegetation in this land use community consists of prairie ironweed, Johnson grass, tall fescue, Palmer's pigweed, horse nettle, sensitive partridge pea, soft rush, perennial ryegrass, common wheat (*Triticum aestivum*), Cherokee sedge, Canadian black snakeroot, and little quaking-grass.

3.4.1.3 Wildlife

Surveys for protected species and habitat assessments were conducted March 3-April 8 and April 20-23, 2020. The entire Project Site was surveyed simultaneously during the wetland delineation survey. In addition to habitat assessment, detailed vegetative communities were described. Areas within the Project Site that are not currently used for agriculture may provide suitable habitat for wildlife common to the region both seasonally and year-round.

Mammals commonly found throughout Mississippi include coyotes (*Canis latrans*), white-tailed deer (*Odocoileus virginianus*), otters (*Lontra canadensis*), beavers (*Castor canadensis*), black bears (*Ursus americanus*), skunks (*Mephitis mephitis*), opossums (*Didelphis virginiana*), racoons (*Procyon lotor*), squirrels (*Sciurus* spp.), and armadillos (*Dasypus novemcinctus*) (MDWFP 2020). During field surveys for protected species and habitat assessments, evidence of deer, raccoon, squirrel, opossum, and armadillo were physically observed and generally confined to the forested areas. Observations of deer and deer tracks were made throughout the site.

Reptiles and amphibians commonly found in the region include a variety of turtles, lizards, frogs, and snakes. Fence lizards (*Sceloperus* spp.), five-lined skinks (*Plesitiodon fasciatus*), and anoles (*Anolis* spp.) are commonly observed lizards. Chorus frog (*Pseudacris* sp.), cricket frog (*Acris gryllus*), green tree frog (*Hyla cinerea*), bullfrog (*Lithobates catesbeianus*), American toad (*Anaxyrus americanus*), eastern spadefoot toad (*Scaphiopus holbrookii*), marbled salamander (*Ambystoma opacum*), spotted salamander (*Ambystoma maculatum*), and dusky salamander (*Desmognathus fuscus*) are often observed in the region. Non-venomous snakes include garter snake *(Thamnophis sirtalis*), king snake (Lampropeltis spp.), rat snake (*Pantherophis* spp.), and water snake (*Nerodia* spp.), while venomous species include coral snake (*Micrurus fulvius*), cottonmouth (*Agkistrodon piscivorus*), copperhead (*Agkistrodon contortrix*), pygmy rattlesnake (*Sistrurus miliarius*), and diamondback rattlesnake (*Crotalus adamanteus*) (MDWFP, 2020). Several cottonmouths were observed during field surveys. No other specific observations were noted for reptiles or amphibians.

Birds commonly found in the region include wild turkey (*Meleagris gallopavo*), northern mockingbird (*Mimus polyglottos*), red-winged blackbird (*Agelaius phoeniceus*), northern cardinal (*Cardinalis cardinalis*), American crow (*Corvus brachyrhynchos*), mourning dove (Zenaida

macroura), red-tailed hawk (*Buteo jamaicensis*), American robin (*Turdus migratorius*), starling (*Sturnus vulgaris*), brown thrasher (*Toxostoma rufum*), and turkey vulture (*Cathartes aura*) (Sibley, 2017). Flyovers from red-tailed hawk, American crow, and black vultures were observed during field surveys. No wading birds or colonies of wading birds were observed within the Project Site or surrounding areas.

No caves or mines were identified on the Project Site during field surveys. Additionally, in speaking with landowners during site visits, no known caves or mines exist in proximity to the Project Site (Susemihl 2019a and 2019b).

3.4.1.4 Threatened, Endangered, and Rare Species

The U.S. Fish and Wildlife Service (USFWS) IPaC result letter (Appendix D) was obtained from the IPaC website in regard to special status species that may occur within the Survey Area (Consultation Code: 04EM1000-2020-SLI-0788, Event Code: 04EM1000-2020-E-01753). This IPaC result letter assessed whether the proposed Project had the potential to affect (Endangered Species Act of 1973) ESA species (i.e., ESA listed, proposed and candidate species), bald eagles, golden eagles, and migratory birds (including raptor species), and associated habitat within a widely defined Survey Area. Additionally, MDWFP Endangered Species of Mississippi report (MMNS 2014) and Mississippi National Heritage Program Protected Species List (2018) data were reviewed to determine potential protected species and associated habitat that may occur within Lowndes County, MS.

Three federally listed species were identified as potentially occurring within the Survey Area: the northern long-eared bat (*Myotis septentrionalis*), the wood stork (*Mycteria americana*), and Price's potato-bean (*Apios priceana*). Critical habitat for federally protected species has not been designated within Lowndes County, Mississippi. The Mississippi Natural Heritage Program is managed under the MDWFP, Museum of Natural Science. The state of Mississippi does not have state-protected designations for plants; however, there are aquatic species (mussels, fish, crayfish), amphibians, snakes, and birds that hold special state-endangered status. Several state-listed species are identified as potentially occurring in the Survey Area. The federal and state protected species identified are listed in Table 3-4 and discussed in further detail below.

Table 3-4: Protected Species with Potential to Occur within the Survey Area

Common Name	Scientific Name	Federal Status	State Status	Preferred Habitat Description	Habitat Present
Mammals					
Northern long-eared bat	*Myotis septentrionalis*	LT	-	Summer roosts occur in tree cavities and under exfoliating bark, but this species has also been found in buildings and behind shutters. During the winter, northern long-eared bats hibernate in tight crevices in caves and mines. Foraging is done primarily on forested hillsides and ridges	Yes
Birds					
Wood Stork	*Mycteria americana*	LT	LE	Freshwater wetlands, including ponds, bayheads, flooded pastures, oxbow lakes, and ditches	Yes
Reptiles					
Black-knobbed Map Turtle	*Graptemys nigrinoda*	-	LE	Large streams and rivers with relatively fast current, numerous basking logs, and abundant sandbar areas for nesting	No
Invertebrates					
Delicate spike	*Elliptio arctata*	-	LE	Creeks and rivers with moderate current and are usually found in crevices and under large rocks in silt deposits	Yes
Monkeyface Mussel	*Quadrula metanevra*	-	LE	Medium to large rivers in relatively swift current in a stable clean-swept mix of coarse sand and gravel	Yes
Fish					
Crystal Darter	*Crystallaria asprella*	-	LE	Clean sand and gravel raceways of larger creeks and rivers; usually in water deeper than 2 feet with moderate to strong current	Yes
Frecklebelly madtom	*Noturus munitus*	-	LE	Stable gravel or rubble riffles and rapids in both the main river channels and in their larger tributaries	Yes
Plants					
Price's Potato Bean	*Apios priceana*	LT	-	Lightly disturbed areas such as forest openings, wood edges and where bluffs descend to streams	No

Key: Statuses are LE= Listed Endangered, LT= Listed Threatened
Sources: USFWS, 2020 and Mississippi Natural Heritage Program, 2018.

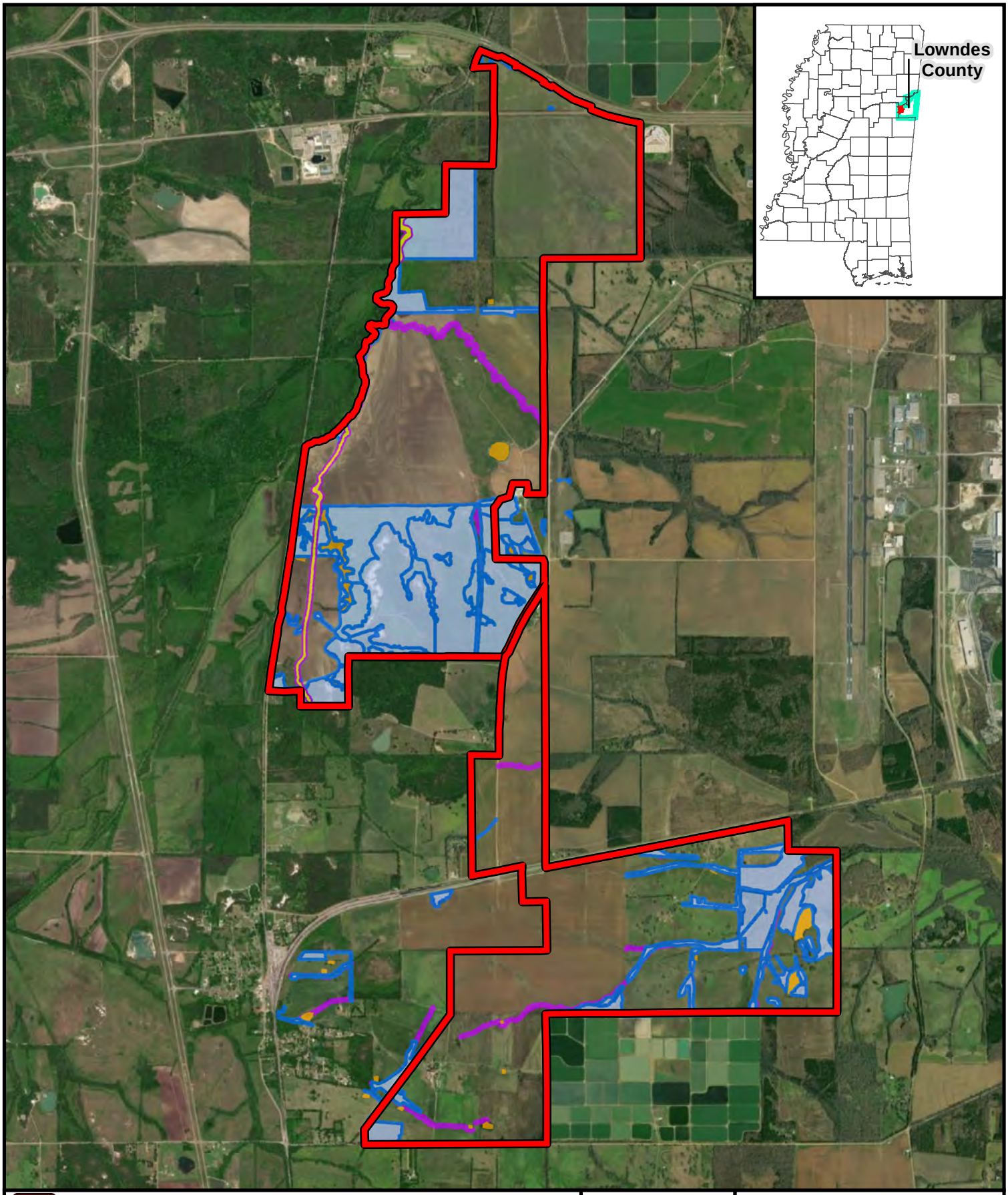
Federally Listed Species

Three species listed as threatened under the ESA were identified as having potential to occur within the Project Site (Figure 3-7). None of the species described herein were observed during environmental field surveys, and no critical habitats were identified on the IPaC report (Appendix D).

The **wood stork** (*Mycteria americana*) is a wading bird that is federally listed as threatened. It is found primarily in freshwater wetlands, including ponds, bayheads, flooded pastures, oxbow lakes, and ditches. No nesting records are known from this area of Mississippi (USFWS 2020b). Foraging habitat for the species was observed within all the open waters observed throughout the Survey Area.

The **northern long-eared bat** (*Myotis septentrionalis*) (NLEB) is federally listed as threatened under the ESA. It usually roosts in tree cavities and under exfoliating bark, but this species has also been found in buildings and behind shutters. During the winter, NLEBs hibernate in tight crevices in caves and mines. Foraging is done primarily on forested hillsides and ridges (USFWS 2015). No records of this species are known from Lowndes County, Mississippi. Suitable summer roosting habitat for the NLEB was observed within forested areas at the Project Site, and suitable foraging habitat was observed within the perennial stream corridors, fence rows, and forests throughout the Project Site.

Price's potato-bean (*Apios priceana*) is a plant that is federally listed as threatened under the ESA. It prefers lightly disturbed areas such as forest openings, wood edges and where bluffs descend to streams. It also grows along highway ROWs and powerline corridors (USFWS 2019). Potential habitat for Price's potato bean is present in central portion of the Project site within some ravines and hillslopes and the nearby forested bluffs along Gilmer Creek and its tributaries, adjacent to the central western portion the Project Site. Although potentially suitable habitat is present within the central portion of the Project Site, there were no observations of Price's potato bean during targeted botanical surveys.



Project Site

Protected Species Habitat

Potential Freckle Habitat

Potential Woodstock Habitat

Potential Northern Long Eared Bat Forage Habitat

Potential Northern Long Eared Bat Roost Habitat

NORTH

0 1,750 3,500

Scale in Feet

BURNS McDONNELL

Figure 3-7

Protected Species Habitat Map
Golden Triangle Solar Project
Lowndes County, Mississippi

Path: C:\Users\olhaney\Desktop\Projects\GoldenTriangle\EA\MXDs\ProtectedSpecies.mxd olhaney 9/15/2020

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Source: Esri, Burns & McDonnell

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Bald Eagles and Migratory Birds

In Mississippi, the bald eagle is protected under the Bald and Golden Eagle Protection Act (BGEPA) and the Migratory Bird Protection Act (MBTA). No bald eagles or nests were observed during the environmental field surveys within the Survey Area or along public roadways near the Project. There are certain birds that are protected under the MBTA. In the USFWS IPaC Report for the Survey Area, eight Birds of Conservation Concern (BCC), including the bald eagle, were identified. Table 3-5 provides additional details regarding the BCCs identified as having a potential to occur within the Survey Area.

Table 3-5: Birds of Conservation Concern Potentially Occurring within the Survey Area

Common Name	Scientific Name	Probability of Presence (probability of presence / breeding season / survey effort / no data) JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC	Breeding Season
American Kestrel	*Falco sparverius paulus*		April 1 – August 31
Bald Eagle	*Haliaeetus leucocephalus*		September 1 – July 31
Lesser Yellowlegs	*Tringa flavipes*		Breeds elsewhere
Marbled Godwit	*Limosa fedoa*		Breeds elsewhere
Red-headed Woodpecker	*Melanerpes erythrocephalus*		May 10 – September 10
Rusty Blackbird	*Euphagus carolinus*		Breeds elsewhere
Short-billed Dowitcher	*Limnodromus griseus*		Breeds elsewhere
Willet	*Tringa semipalmata*		April 20 – August 5

Source: USFWS, 2020

The American Kestrel is a small member of the falcon family and prefers habitats consisting of open farmland, wood edges, and cities. It breeds from April through August most likely in areas outside the Project Site (Cornell 2019a). It is most commonly found in Lowndes County, Mississippi during December, and January.

The Bald Eagle would be most likely found near the Project Site in December and January. There are aquaculture ponds directly north and south of the Project Site. These ponds could provide a source of food for the Bald Eagle. No nests were observed during field surveys; however, it is likely that Bald Eagles exist near the Project Site due to the aquaculture ponds.

Lesser yellowlegs (*Tringa flavipes*) is a small “piper” bird that breeds in meadows and open woodlands in Canada. In North America, lesser yellowlegs typically occurs in marshes, shallow wetlands, shorelines, and flooded fields during migration. Most often, they prefer vegetated wetlands rather than bare habitats (Cornell 2019b). Marginal foraging habitat is present at PEM wetlands throughout the Project Site.

Marbled godwit (*Limosa fedoa*) is a small shorebird with a two-toned, long, slightly upcurved bill that breeds in the shortgrass prairies near wetlands in Canada and the northern central U.S. While migrating south, marbled godwits typically inhabit native grass prairies with green needle grass, western wheatgrass, blue gram, needle-and-thread, and blue stem. Wintering grounds typically consist of coastal mudflats, estuaries, and sandy beaches (Cornell 2019c). The migration corridor for the marbled godwit is further west of the Project Site, closer to Texas and Arkansas.

Red-headed woodpecker (*Melanerpes erythrocephalus*) is a medium-sized woodpecker with a bright red head, white buff, and black back. Red-headed woodpeckers breed in river bottoms, beaver swamps, burned areas, recent clearing, deciduous woodlands with oak or beech and groves of dead or dying trees. Dead or partially dead trees are important for nest cavities in areas where they breed. In Mississippi, red-headed woodpeckers typically inhabit pine and pine-oak forests (Cornell 2019d). Most of the undisturbed forested areas within the project site would provide suitable habitat for red-headed woodpeckers.

As its name entails, the rusty blackbird (*Zanata canadiense*) has distinctively rusty feather edges and pale-yellow eyes. Rusty blackbirds typically breed in wet forests, swamps, bogs, and beaver ponds. They also winter in swamps, woodlands, and pond edges. This species is considered a common bird in steep decline due to habitat loss (Cornell 2019e). Potentially suitable habitat for rusty blackbird is present near the pond edges and riparian woodlands to the open ponds.

Short billed dowitcher (*Limnodromus griseus*) is a full-bodied orange, brown, and golden shorebird with a long bill used for rhythmic probing of mudflats and flooded field for food. Short-billed dowitchers breed in the taiga shield ecotone, nest in wetlands usually near edges of bogs, small lakes, or wet meadows. During winter months, short-billed dowitchers are founds in saltwater and brackish environments such as estuaries and lagoon with tidal influences (Cornell 2019f). Marginal foraging habitat for migrant short-billed dowitchers is present in some of the shallow ponds and potentially flooded farm fields from excessive precipitation.

Willet (*Tringa semipalmata*) is a straight billed, mottled brown, shorebird with distinct wing markings and a piercing call. Willets typically inhabit open beaches, marshes, mudflats, and rocky coastal zones. During the breeding season eastern willets are typically found in saltmarshes, barrier islands, and barrier beaches (Cornell 2019g). Marginal foraging habitat for migrant willets is present in some of the shallow ponds and potentially flooded farm fields from excessive precipitation.

Mississippi State-Listed Species

Five state-listed species were identified as having potential to occur within the Project Site. Each of the five species and a description of its preferred habitat is provided below.

The **black-knobbed map turtle** (*Graptemys nigrinoda*) is a state-listed (endangered) species that prefers large streams and rivers with relatively fast current, numerous basking logs, and abundant sandbar areas for nesting. Streams must be wide enough to allow sunlight to reach the water level for several hours per day. No black-knobbed map turtles or suitable habitat was observed

at the Project Site. Catalpa Creek is large enough for the black-knobbed map turtle; however, the reach of Catalpa Creek within the Survey Area does not receive enough direct sunlight preferred by the species to bask due to the dense canopy of vegetation surrounding the creek. Catalpa Creek has been excluded from the boundaries of the Project Site. The remaining streams identified within the Project Site are smaller than those inhabited by the species. Additionally, distribution information indicates black knobbed map turtle is typically found within the state further to the south and west of the Project Site (Blankenship et al 2008).

The **crystal darter** (*Crystallaria asprella*) is a state-listed (endangered) fish that inhabits clean sand and gravel raceways of larger creeks and rivers. It is usually found in water deeper than 2 feet with moderate to strong current. In the altered main channel of the Tennessee-Tombigbee Waterway, crystal darters are known to occur over remnant gravel patches that are often near tributary confluences (FFWCC 2020). No crystal darters were observed during the field surveys; however, suitable habitat is present within Catalpa Creek. Although included within the Survey Area limits, Catalpa Creek has been excluded from the Project Site.

The **frecklebelly madtom** (*Noturus munitus*) (state-listed endangered) is a type of catfish that prefers stable gravel or rubble riffles and rapids in both the main river channels and in their larger tributaries (MMNS 2014). No frecklebelly madtoms were observed during the field surveys; however, suitable habitat is present within Catalpa Creek. Although initially included in the Survey Area limits, Catalpa Creek has been excluded from the Project Site.

Delicate spike (*Elliptio arctata*) is a state listed (endangered) mollusk that inhabits creeks and rivers with moderate current and is typically found in crevices and under large rocks in silt deposits (MMNS 2014). No delicate spikes were observed during the field surveys; however, suitable habitat may be present within Catalpa Creek. Although initially included in the Survey Area limits, Catalpa Creek has been excluded from the Project Site.

Monkeyface (*Quadrula metanevra*) is a state-listed (endangered) mollusk found to inhabit medium to large rivers in relatively swift currents in a stable clean-swept mix of coarse sand and gravel. The monkeyface is a typical riffle species (MMNS 2014). No monkeyface mussels were observed during the field surveys; however, suitable habitat may be present within Catalpa Creek. Although initially included in the Survey Area limits, Catalpa Creek has been excluded from the Project Site.

Rare Plants

As of 2018, there are 495 plants of special concern in Mississippi. The designation of plants of special concern in Mississippi was developed for flagging sensitive species that may be adversely affected by proposed projects, determining protection priorities of natural areas that contain special plants, and determining priorities for inventory and protection for special plants to include proposing special plants for federal protection (Mississippi Natural Heritage Program, 2018b).

Thirty-seven rare plant species (one of which is also federally listed) were included in the results of the TVA Heritage Database search as potentially occurring within five miles of the Project Site.

Because MS Solar 5 eliminated most of the natural areas from the proposed Project Site, suitable habitat only exists for 11 of these plant species within the Project Site. The table below provides additional details for these 11 species.

Targeted botanical surveys were conducted for rare plants within the Project Site on October 7, 2020, by a professional botanist from Mississippi State University. A copy of Dr. Maddox's findings is provided in Appendix D. During the survey, five state listed species were observed in or adjacent to the Project Site. While the MNHP maintains a Tracking List and a Watch List, TVA only considers species on the Tracking List (state ranking S1-S3). Species observed within the Project Site during the October 2020, survey that also are tracked by the MNHP included bur oak (*Quercus macrocarpa* - state ranking S2) and Great plains ladies' tresses (*Spiranthes magnicamporum* - state ranking S2) .Bur oak were observed in the large forested portion of the central part of the Project Site and were limited to lower elevations along streams in the same general area. Within that area, there were approximately 100 individual bur oaks ranging from seedlings to larger trees with dbh's ranging from three to four feet. Within the chalk outcroppings, nine individual flowering Great Plains ladies'-tresses were observed in lower vegetated areas adjacent to the chalk. The nine individuals were clustered in two separate locations along the chalk outcrop fringes in areas that would be excluded from Project-related development due to several factors including: unfavorable topography, potential to support rare plant communities, and provide important pollinator habitat. Since these areas would be avoided during construction and operation of the proposed Project, no adverse impacts on these species are anticipated as a result of the Project.

Other rare plants observed during the survey included nutmeg hickory (*Carya myristiciformis*), tall bellflower (*Campanula americana*), and mullein foxglove (*Dasistoma macrophylla*). All three have a state rank of S3S4. Nutmeg hickory was observed scattered throughout the forested parcel. Nutmeg hickory individual sizes ranged from seedlings to larger trees with dbh's of approximately 1½ feet. Approximately 30 individual fruiting tall bellflowers were observed in lower elevations along the edges of the woodland area and along the existing maintained Kinder Morgan natural gas pipeline right-of-way. The occurrences of tall bellflower continued to the west along the fencerow. Approximately 20 individual fruiting mullein foxgloves were observed in the Project Site in areas along the woodland edge and within the maintained Kinder Morgan right-of-way. The Project layout would avoid natural riparian areas along streams to the greatest extent practicable; therefore, many of these occurrences would be avoided during construction. There are likely other occurrences of these species within areas that may be cleared for the placement of arrays, which would result in a minor adverse impact on these plants.

According to TVA's natural heritage database, observations of the state tracked Canada moonseed (*Menispermum canadense*) (state ranking S3) and bur oak were reported along a fence line in the northern portion of the Project Site near the existing TVA transmission line. During the botanical survey, an effort was made to locate and identify the presence of these individuals. The plants were no longer present in this area, and the habitat was no longer suitable to support either species. No additional rare plants were observed (Maddox 2020).

Table 3-6: TVA Heritage Database Plants Occurring and Potentially Occurring within the Golden Triangle Project Site

Common Name	Scientific Name	Rank	Preferred Habitat Description
Ridgestem false foxglove	*Agalinis oligophylla*	S2	Typically found from east Texas to southwest Louisiana on coastal plains primarily in prairies – Prefers moist to dry sand or clay soils and also found in pine hardwood forest and pine savannahs (USGS 2020c)
Wild hyacinth	*Camassia scilloides*	S2	Black soil prairies, moist savannas, moist open woodlands along stream banks, rocky wooded slopes, and limestone glades – Typically prefer moist conditions to full sun to light shade in rich loamy soil (Hilty 2020a)
James's Sedge	*Carex jamesii*	S1S2	Mesic woodlands, wooded slopes, wooded groves, and edges of woodland paths – May also occur in upland woods and swampy woodlands and occasionally found in degraded woodland habitats (Hilty 2020b)
Small-toothed sedge	*Carex microdonta*	S3	Dry to moist, calcareous substrates in open rocky or wet prairies, swales, seeps, and ditches – Relic patches of Blackland prairies, limestone glades, and chalk openings (FNA 2020)
Kingnut Hickory	*Carya laciniosa*	S2	Bottomland woodlands, upland woodlands, swamps, savannas, and limestone glades. Usually not far from rivers (Hilty 2020c)
Scarlet Indian-paintbrush	*Castilleja coccinea*	S1	Sandy soils in prairies and open woods (USFS 2020)
Pumpkin ash	*Fraximus profunda*	S3	Moist wet conditions often in swamps or floodplains, wet bottomlands, river valleys, and low areas. Often in bald cypress swamps, cottonwood, and tupelo swamps (MBG 2020a)
Canada moonseed [a/]	*Menispermum canadense*	S3	Deciduous woodlands, woodland borders, thickets, semi-shaded riverbanks, cleared powerline ROWs, overgrown fencerows, and hedges (Hilty 2020d)
Prairie pleatleaf	*Nemastylis geminiflora*	S2	Glades, prairies, and rocky slopes, on calcareous substrates – Occasionally on glades in the shade of eastern red cedars or Ashe's junipers (MDC 2020
Bur oak [b/]	*Quercus macrocarpa*	S2	Bottomland soils in woodland and stream valleys (MBG 2020b)
Great Plains ladies'-tresses [b/]	*Spiranthes magnicamporum*	S2	Grassy areas on limestone cedar glades and prairie openings (Chafin 2007)

Common Name	Scientific Name	Rank	Preferred Habitat Description
Heath aster	*Symphyotrichum ericoides*	S2	Mesic to dry black soil prairies, gravel prairies, dolomite prairies, hill prairies, savannas, openings in dry rocky forests, limestone glades, roadsides and railroad sides, and pastures (Hilty, 2020d)
Southern Meadow Rue	*Thalictrum debile*	S1S2	Floodplain forests over calcareous substrates – prefers rich, rocky limestone woods often near streams (Chafin 2007).

[a/]Historically documented within Project Site.
[b/]Documented within the Project Site during surveys in 2020.

S1 = Critically Imperiled in Mississippi because of extreme rarity (5 or fewer occurrences or very few remaining individuals or acres) or because of some factor(s) such as very steep declines making it especially vulnerable to extirpation.
S2 = Imperiled in Mississippi because of rarity (6 to 20 occurrences or few remaining individuals or acres) or because of some factor(s) making it vulnerable to extirpation.
S1S2 = Rank range between S1 and S2.
S3 = Vulnerable in Mississippi due to a restricted range (on the order of 21 to 100 occurrences), relatively few populations or occurrences, recent and widespread declines, or other factors making it vulnerable to extirpation.

Source: TVA's Heritage Database "Botany within 5 Miles"

3.4.2 Environmental Consequences – Biological Resources

3.4.2.1 No Action Alternative

Under the No Action Alternative, there would be no impacts to biological resources at the Project Site. It is assumed that existing agricultural operations would continue, and the undeveloped land would remain as is. There would be no Project related impacts to existing vegetation at the Project Site. The forested areas within the Project Site could eventually be cleared for other development or landowner preference. Additional minor impacts to vegetation and wildlife could occur through continued applications of pesticides, herbicides, and fertilizers. No Project related impacts would occur.

3.4.2.2 Proposed Action

Natural Areas

The Proposed Action is not anticipated to have any impacts on the biological resources associated with natural areas, given the nature of the activities and distance from the Project Site to the natural areas.

Vegetation

Under the Proposed Action the Solar Facility would be constructed and put into service, which would lead to direct adverse impacts to vegetation. Up to 150 acres of forested upland areas could be removed during initial construction clearing and grading activities to increase available land used for arrays and to reduce shading to the PV arrays.

Rare & Protected Plant Species

Most of the forested areas that provide habitat for protected species or species that are biologically sensitive are present within avoidance buffers established for riparian areas along jurisdictional water features. Other areas have been excluded from the Project Site during planning and design stages because of topographic and constructability concerns. In areas that may not be excluded from Project impacts, targeted botanical surveys were conducted for protected and rare species in areas deemed suitable to support these species. During targeted botanical surveys, approximately 100 individual bur oaks were observed ranging in age from seedings to large trees with a dbh of 3 – 4 feet. Approximately 80 percent of the bur oaks observed on site were found along riparian areas that would be avoided during construction. The remaining 20 percent, which were substantially younger individuals with a much smaller dbh were identified in areas that are subject to tree clearing during construction. Avoidance areas will be established onsite with signage or temporary construction fencing as well as identified on constraints/avoidance plans. The Project could result in a minor adverse and permanent impact on the approximately 20 smaller and less established bur oaks.

Other rare plants, such as the Great Plains ladies' tresses, observed during the survey as discussed above in section 3.4.1 were all within avoidance areas that have been excluded from Project impacts such as vegetation clearing activities Avoidance areas will be either be flagged on-site with signs and/or isolated using temporary construction fencing. Further, these areas will be included on engineering/constraints drawings provided to the construction contractor.

The federal noxious weed, cogon grass (*Imperata cylindrica*), was observed during botanical surveys in areas that will be excluded from development for the Project. Historical observations of cogon grass have also been made on existing TVA transmission lines that intersect the Project Site. No other observations of federal noxious weeds were documented within the Project Site. During construction, invasive species would be removed with grading and clearing activities and managed with spot treatment of selective herbicides as needed during operation. Upon completion of construction, the site would be planted or seeded with non-invasive vegetation, including native and naturalized plant species to encourage beneficial habitat, reduce erosion, and limit the spread of invasive species as part of the revegetation strategy, in accordance with EO 13112. Seed selection for the re-vegetation strategy would be developed to plant lower growing species in effort to reduce the amount of maintenance required below the PV arrays. If the construction of the Project increases growth of invasive species, these effects would be reduced once the re-vegetation process is initiated and native and non-invasive species are established. MS Solar 5 would spot treat areas where invasive species/weeds begin growing until the native and non-invasive species are established throughout the site. MS Solar 5 would not implement an invasive species control plan or cogon grass plan within areas that were pre-established as avoidance areas during construction and operation as the intent of the avoidance area is to limit access to these areas by workers and equipment. Implementation of the Proposed Action would not significantly contribute to the introduction or spread of invasive species.

Of the approximately 400 acres of forested uplands within the Project Site, up to 150 acres of forested habitat could be developed for the Solar Facility and may be cleared to reduce shading

for the PV arrays. Riparian areas would remain intact at and around jurisdictional streams and wetlands and avoided during construction to the greatest extent practicable. Tree removal in general would be minimized to the greatest extent practicable.

A majority of the Project Site is either disturbed, maintained, or actively cultivated cropland. There is potential to remove a minor amount of forested area within the Project Site (<6.5 percent) during clearing and grading activities. Additionally, the surrounding areas consist of similar vegetation communities and have also been mostly converted to cropland. Adverse impacts associated with vegetation removal resulting from implementation of the Proposed Action would be minor but permanent.

Wildlife

Under the Proposed Action, the Solar Facility would be constructed, and negligible direct and indirect impacts could occur to wildlife. Most of the area proposed to be cleared is land currently used for agriculture and/or livestock grazing. Minor clearing of forested habitats could have negligible to minor direct and indirect effects on wildlife utilizing those habitats. Impacts resulting from construction and operation of the Solar Facility would be temporary due to displacement of native species during construction. Direct effects on less mobile species or life stages of wildlife occurring at the site (i.e., nestlings, eggs, larvae, and burrowed animals) could occur during initial land clearing and grading activities. As mentioned above, forested riparian areas would be avoided to the greatest extent possible. Wildlife present are expected to disperse to suitable habitat nearby when construction activities commence. Wildlife species would be able to return to the Project Site once construction activities are complete.

There is limited habitat for wildlife within the Project Site, which is similar to the landscape and land use in surrounding areas. It is expected that wildlife in the Project Site would be able to relocate successfully to nearby areas of similar habitat and food resources during construction. Because the Project Site would be revegetated with native and/or naturalized non-invasive herbaceous plants maintained without the extensive use of harmful herbicides and pesticides, the site would provide a small amount of potentially suitable nesting and long-term foraging habitat for some species of songbirds and small mammals. Therefore, short-term direct and indirect impacts to wildlife during construction of the Proposed Action would be minor. Minor long-term benefits would be realized for some species such as insects, small mammals, and reptiles and amphibians as frequently disturbed crop fields are established with native and non-invasive vegetation after construction.

Mississippi State-Listed Species

Suitable habitat for four of the five state-listed species was identified at Catalpa Creek: the crystal darter, frecklebelly madtom, delicate spike, and monkeyface mussel. The segment of Catalpa Creek that occurs within the Survey Area would not be affected by the Project. MS Solar 5 would avoid both Catalpa Creek and the existing riparian corridor that separates it from the existing agricultural fields. Additionally, suitable habitat was not observed for the black-knobbed map turtle. Since suitable habitat is neither present within the Project Site, nor would it be affected by the Project, no direct or indirect impacts on Mississippi state-listed species is anticipated.

The Project was designed to minimize impacts on natural vegetation communities to the extent practicable. Specifically, most of the chalk prairie complex has been designated as a "no build area" for several reasons, including its potential as habitat for protected species. The chalk outcroppings at the Project Site would be completely avoided. Additionally, where construction impact areas overlapped with areas identified as potentially suitable habitat for rare and protected plants, targeted botanical surveys were conducted to confirm presence or absence of these species. During the targeted botanical survey, no rare plants were identified within area where construction impacts would occur. All rare plants observed during surveys were within areas that would be excluded from development. Therefore, many rare plant or insect species that may occur within those habitats would remain unimpacted by the Project. There were 11 species on TVA's Heritage Database that could occur within the Project Site. However, MS Solar 5 has eliminated most natural areas from development activities. Known occurrences of bur oak and Canada moonseed within the Project Site were confirmed no longer present and the habitat is now unsuitable to further support those species at those locations. Appendix D contains confirmation of absence as well as other details reported by Dr. Maddox from Mississippi State University.

Federally Listed Species

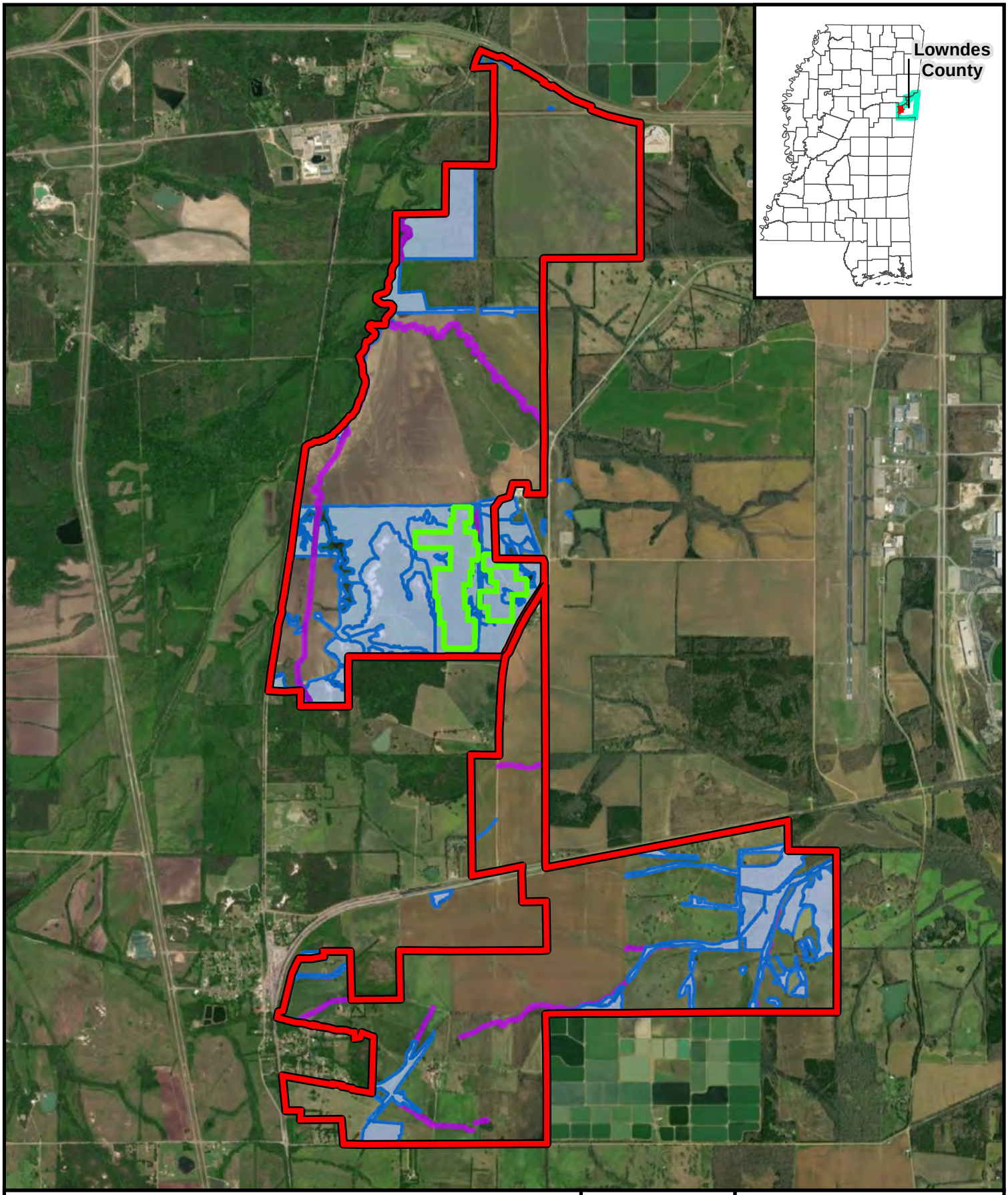
The wood stork is federally protected under the ESA. Suitable roosting habitat for the wood stork does not exist within the Survey Area for the Project. However, suitable foraging habitat may be present near open water and large, inundated wetlands. As the current layout shows, the area of impact has been designed to avoid any impacts on wetlands. There are also large aquaculture/fish farms both north and south of the Project that may attract foraging wood storks. The Project would not affect fish farms or large open waters outside the immediate Project limits. For these reasons, impacts to wood storks or wood stork habitat are not anticipated from implementation of the Proposed Action.

Only thirteen populations of Price's potato-bean are known to exist today because of its specific habitat requirements (USFWS 2019). Targeted botanical surveys were conducted within areas on the Project Site that could potentially support Price's potato bean. During the survey, no individuals were observed. Additionally, most of the chalk prairie complex has been designated as a "no build area" for several reasons, including its potential as habitat for protected species. For these reasons, the Proposed Action would have no effect to Price's potato-bean.

Suitable foraging habitat for the NLEB was identified over ponds, wetlands, and streams located in the Project Site. Suitable summer roost habitat is also present in the forested areas. Up to150 acres of forested area that could provide summer roosting habitat for NLEBs may require clearing (Figure 3-8). Efforts would be made to minimize clearing of these areas as refinement of future design allows. Additionally, MS Solar 5 would avoid tree clearing activities within potential NLEB habitat during pup season (between June 1 and July 31) in order to minimize potential impacts to bat populations that may be present within the Project Site.

Consultation with the USFWS on the potential effects of the Proposed Action on federally listed species under Section 7 of the ESA is underway regarding the potential effects of the Proposed

Action on the federally listed NLEB. Though potentially suitable summer roosting and foraging habitat is present, no known hibernacula or maternity roosts occur within five miles of the Project Site.



Project Site
Proposed Tree Clearing

Protected Species Habitat

Potential Northern Long Eared Bat Forage Habitat
Potential Northern Long Eared Bat Roost Habitat

NORTH

0 1,750 3,500

Scale in Feet

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Figure 3-8

NLEB Habitat Map Golden Triangle Solar Project
Lowndes County, Mississippi

Path: C:\Users\olhaney\Desktop\Projects\GoldenTriangle\EA\MXDs\ProtectedSpecies.mxd olhaney 10/18/2020
Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Source: Esri, Burns & McDonnell

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Bald Eagles and Migratory Birds

Sparse habitat along the forest edges and vegetated stream corridors may provide habitat for migratory birds within the Project Site. Wetlands, streams, and forested areas would be avoided to the greatest extent practicable under the Proposed Action. Up to 150 acres of tree removal could be conducted outside of the NLEB pup season (June 1 – July 31). Implementation of the Proposed Action may reduce negligible amounts of low-quality nesting habitat, reduce minor amounts of foraging habitat, and may displace birds to surrounding areas with similar habitat and land use during construction. Most riparian areas will be avoided, however, minor direct impacts to rusty blackbirds may occur if pond edges and riparian woodlands are disturbed. Mortality to rusty blackbirds from vegetation removal would be unlikely since it would occur outside of breeding season, however, it could cause birds to flush and have to relocate to similar habitat nearby. Implementation of the Proposed Action may also reduce minor foraging habitat for species such as the American kestrel and other birds of prey that use farm fields as foraging habitat. However, it is assumed any birds using the farms fields within the Project Site for foraging would use adjacent lands if there is a significant reduction in prey items. Red headed woodpeckers may be present in forested areas proposed for clearing. Tree clearing would be restricted from June 1 – July 30; however, clearing could occur in May, August, and September which is the bird's breeding season. The most likely impact would be limited to red-headed woodpeckers relocating to nearby areas of similar habitat during active construction. In smaller numbers, inadvertent instances of bird mortality could occur if red headed woodpeckers occur within trees that would be cleared during its breeding season. Impacts would be adverse but temporary in these instances. Long-term, the Project Site would provide nesting and foraging habitat for some species of songbirds once operational.

Due to limited nesting and foraging habitat for other migratory birds currently at the Project Site, in conjunction with seasonal tree clearing, no significant direct or indirect adverse impacts on migratory birds or bald eagles are expected from Project activities.

Additional details regarding the network upgrades, such as the exact locations of pull points or any potential pole replacements, are still being developed. Supplemental NEPA analysis would be conducted if there are changes or upgrades to the scope of this Project.

3.5 Visual Resources

Visual resources are described as physical features or visual characteristics of a place that define the visual and aesthetic character of an area. The following sections describe the aesthetic and visual characteristics of the Project Site and surrounding areas.

3.5.1 Affected Environment

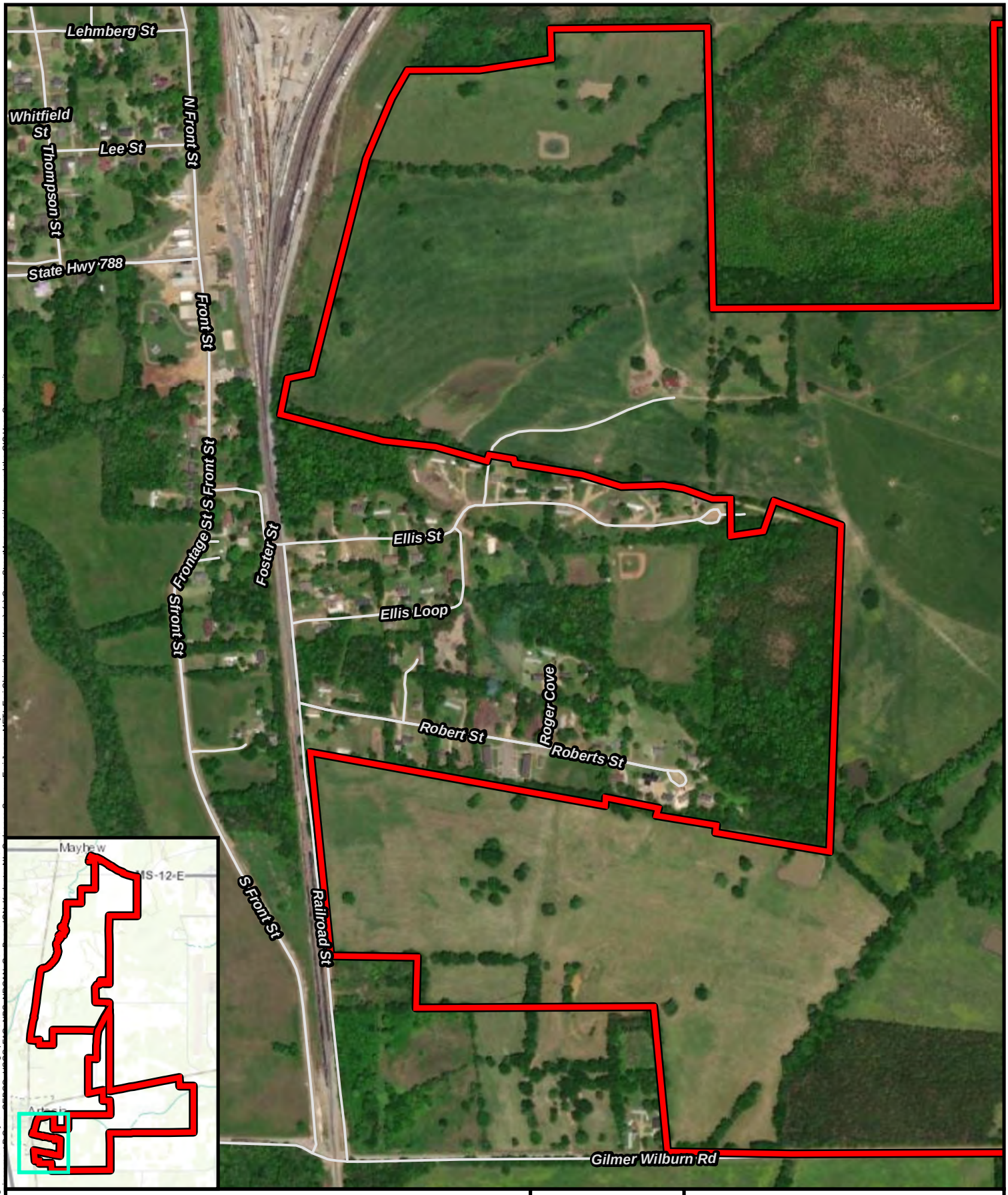
Visual resources are the visible features of an area and can include both natural viewsheds and viewsheds comprised of manmade attributes. Visual resources can influence how an observer experiences a certain location and how they may distinguish the location from other locations. Visual resources are important to the people living in and traveling through an area. Additionally, visual resources can make up a significant component of historically and/or culturally significant

settings. Additional information pertaining to the visual APE and historic or culturally significant resources is provided in section 3.8.1.

During preliminary field surveys, Project historians conducted a viewshed analysis to document the actual visibility of the Project within an established Visual APE that accounts for terrain, vegetation, and other setting intrusions that would impede views of the Project. The Project Site constitutes the established APE for physical impacts while the ½ mile buffer around the Physical APE was developed to account for visual and other non-physical effects from Project implementation. The Visual APE comprised approximately 8,980 acres.

All but the forested areas of the Project Site are comprised of active agricultural land and pastureland for livestock grazing. The active agriculture area is used to produce a rotational mix of corn and soybeans. There are several mature stands of hardwood forests around the Project Site, as visible in Figure 2-1. A highly active railyard is located just west of the Project Site. The railyard is mostly shielded by trees and topography, but there is an active railroad running parallel to Artesia Road that almost always has trains idling throughout the day. The Golden Triangle Regional Airport (GTR) is located just east of the Project Site. GTR is a commercial airport but also is used by private airlines due to its central location. Small jets land and take off from this airport regularly (an average of approximately 1 – 2 airplanes per hour).

There is a residential area on the west side of the Project Site. Ellis Street and Roberts Street in Artesia are located in between two of the Project Site parcels. There are approximately 20 residences along Ellis Street that range from 400 to less than 50 feet from the Project Site. There are also approximately 20 residences as well as two apartment buildings along Roberts Street that range from just over 500 feet to less than 50 feet from the Project Site (Figure 3-9).



Path: C:\Users\olhaney\Desktop\Projects\GoldenTriangle\EA\MXDs\Residential_Map.mxd olhaney 10/18/2020
Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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Figure 3-9

Artesia Residential Map
Golden Triangle Solar Project
Lowndes County, Mississippi

Source: Esri, Burns & McDonnell

Issued: 10/18/2020

The photos below provide representative views of the Project Site. Generally, the Project Site is rural and agricultural with isolated single-family homes adjacent to the Project Site. The topography is characterized by generally flat terrain to gently rolling hills interspersed with intermittent and perennial streams. Scenic attractiveness is separated into three classes: Class A – Distinctive; Class B – Typical, and Class C – Indistinctive. The scenic attractiveness of the Project Site is rated as typical, which means the visual aesthetics are considered common of a rural-agricultural and sparsely residential area. The Scenic integrity is assessed as moderate due to the surrounding railroad operations and commercial airport.

Figure 3-10: View of pasture/field in Project Site looking west, taken from the south side of Artesia Road (11/4/19)

Figure 3-11: View of deer plot and bean field on west side of Project Site, looking northeast (11/4/19)

The Project is located within the Mississippi Hills National Heritage Area (MHNHA), which was designated by Congress and the President in April 2009, through the Omnibus Public Land Management Act of 2009. The MHNHA fully covers 19 counties and portions of 11 counties in the northeastern part of Mississippi. The MHNHA is representative of a distinct cultural landscape that has been shaped predominantly by the intersection of the Appalachian and Delta cultures. National Heritage Areas are places where cultural, historic, and natural resources unite as a significant national landscape. NHAs are a partnership unit of the National Park Service (NPS), but unlike the national parks managed by the NPS, NHAs are large, lived-in landscapes. The primary theme of the MHNHA is African-American heritage, Native American history, Civil War, and music and literature (Mississippi Hills National Heritage Area 2020). The MHNHA includes the Elvis Presley Birthplace and Museum, the Natchez Trace Parkway, the homes of William Faulkner and Tennessee Williams, the Corinth Civil War Interpretive Center, and Brices Cross Roads National Battlefield. No associated MHNHA markers or Civil War battle sites were identified within the Physical APE or Study Area (Shaver, Harris, House, and Kepka 2020).

3.5.2 Environmental Consequences

3.5.2.1 No Action Alternative

Under the No Action Alternative, the proposed Solar Facility and associated structures would not be constructed; therefore, no Project-related impacts to visual resources would result. Existing views would be expected to remain unchanged from the present conditions, which are either natural and undeveloped or open fields under agricultural use.

3.5.2.2 Proposed Action

The Project would convert mostly agricultural land and pastureland into industrial/electrical infrastructure consisting mostly of low-profile PV arrays. Figure 2-2 provides the preliminary layout for PV arrays, the Golden Triangle Substation, and the Artesia Switching Station.

During site visits in May – August 2020, Burns & McDonnell assessed the potential for visual impacts on sensitive areas such as residences, churches, schools, and from roadways. There are three public roadways that abut portions of the Project Site and one US Highway with a small window to view the Project:

- Guerry Road is a public gravel road that would parallel the Project Site for approximately 4,500 feet. There are three single-family residences and two agricultural-related businesses along Guerry Road. The Golden Triangle Substation and Artesia Switching Station would likely not be visible from residences due to existing natural buffers. These residences would be shielded from direct view of the proposed Solar Facility due to rolling hills and mature vegetation that would remain in place.
- Artesia Road is a two-lane paved road that would parallel the Project Site for approximately 7,400 feet. Artesia Road and the Project Site would be separated by an active railroad track. The proposed solar panels would be set back by at least 100 feet from Artesia Road simply because of the space between the road right-of-way and the paralleling railroad and its right-of-way. About half of the Project Site on the south side of Artesia Road would be visually buffered by the existing tall trees along the fence row. PV panels located within the Project Site would likely not be visible on the north side of Artesia Road due to rolling hills and mature trees.
- North Frontage Road/MS State Hwy 182 would pass the Project Site for approximately 4,100 feet on the far north end.
- Drivers riding along US Hwy 82, just north of North Frontage Road, would be able to view the PV panels for about 3,000 feet; however, taking into account the existing mature trees and the speed of vehicles along US Hwy 82, the PV panels would likely only be visible for about 30 seconds.

From the above listed vantage points, the manufactured and structural appearance of the Solar Facility would be most obvious in the morning, when the dark-colored solar panels would be upright, averaging approximately eight feet from the ground, at full tilt, facing east. At midday, the

panels would be less obvious as they are laying nearly flat. At midday, when the panels are flat, they would average about five feet off the ground. In the evening, when the panels would be at full tilt and facing west, they would be most obvious along Artesia Road if there is not an idling train shielding the view.

Figure 3-12: Representative Photo of Single-Axis Tracking PV System in the Morning, Facing East

Figure 3-13: Representative Photo of Single-Axis Tracking PV System at Midday, Laying Flat

Although portions of the Project would be visible across open fields or otherwise clear areas, residential and commercial properties and roadways in the vicinity of the Project Site generally have mature trees along or near property boundaries and fence lines that would partially or almost fully obscure views of the Solar Facility from many vantage points. The relatively stable elevations and the maintenance of existing vegetation along the perimeter of the Project Site would largely shield views from most vantage points to the Solar Facility.

Residences along Ellis Street and Roberts Street in Artesia (on the west side of the Project Site but just east of the railroad tracks) may be able to view the Project Site from their homes. There are vegetated fencerows with mature trees along the Project Site boundaries which would likely provide natural screening from any arrays that could be positioned in this area. Further, if arrays were to be installed within the parcels located north and south of this residential area, MS Solar 5 would observe appropriate setbacks from the residences to reduce any adverse encroachment on this area. By implementing these measures, no long-term adverse direct impacts on residential areas would occur from the Project.

Construction of the proposed Project would temporarily alter the visual character of the Project Site. During construction, heavy machinery would be present, changing the visual characteristics from vantage points surrounding the Project Site. Within the Project Site, many trees and other tall vegetation would be preserved to the extent practicable, which would provide natural buffers from public roadways. In areas where grading would be necessary, minor changes to the contour, color, and texture of the scenery would be visible. The Project Site would appear as a mixture of neutral colors such as dark browns and grays due to earthmoving, road construction, and concrete activities. Water would be used to suppress dust. Visual impacts from construction would be minimal at night since 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.

Over the approximately 17-month-long construction phase, indirect impacts to visual resources in the area may occur due to increased traffic and movement of heavy machinery to the Project Site along local roads. Overall, there would be minor temporary direct and indirect impacts to visual resources during the construction phase of the Proposed Action.

Visual impacts during the operation phase of the Project would be minor in the immediate vicinity, due to substantial tree buffers around property boundaries and rolling hills within the Project Site. Visual impacts would be minimal to negligible on a larger scale, due to variation of the visual attributes of the surrounding area as distance from the Project Site increases.

Additional details regarding the network upgrades, such as the exact locations of pull points or any potential pole replacements, are still being developed. Supplemental NEPA analysis would be conducted if additional environmental resources are affected.

3.6 Noise

The magnitude and frequency of environmental noise may vary considerably over the course of the day, throughout the week, and across seasons, in part due to changing weather conditions and the effects of seasonal vegetation cover. Two measures that relate the time-varying quality of environmental noise to its known effect to people are the 24-hour equivalent sound level (L_{eq}) and day-night sound level (L_{dn}). The L_{eq} is the level of steady sound with the same total (equivalent) energy as the time-varying sound of interest, averaged over a 24-hour period. The L_{dn} is the L_{eq} plus 10 dBA added to account for people's greater sensitivity to nighttime sound levels (typically considered between the hours of 10:00 p.m. and 7:00 a.m.). The A-weighted scale is used to assess noise impacts because human hearing is less sensitive to low and high frequencies than mid-range frequencies. The human ear's threshold of perception for noise change is considered 3 A-weighted decibels (dBA); 6 dBA is clearly noticeable to the human ear, and 10 dBA is perceived as a doubling of noise (or halving, if the noise is decreasing).

In 1974, the EPA published *Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin on Safety*, which evaluated the effects of environmental noise on public health and welfare (USEPA 1974). In this document, the EPA indicated that a L_{dn} of 55 dBA is the noise threshold that would prevent outdoor activity interference or annoyance from continuous noise. We have adopted this criterion and use it to evaluate potential noise impacts from TVA projects at noise sensitive areas (NSAs) such as residences, schools, or hospitals. A L_{dn} of 55 dBA is equivalent to a continuous sound level of 48.6 dBA for facilities that generate constant sound levels. A list of typical sound levels for common sound sources is presented in the table below.

Table 3-7: Typical Sound Pressure Levels Associated with Common Sound Sources

Sound Pressure Level (dBA)	Subjective Evaluation	Environment	
		Outdoor	Indoor
140	Deafening	Jet aircraft at 75 feet	--
130	Threshold of pain	Jet aircraft during takeoff at a distance of 300 feet	--
120	Threshold of feeling	Elevated train	Hard rock band
110	--	Jet flyover at 1,000 feet	Inside propeller plane
100	Very loud	Power mower, motorcycle at 25 feet, auto horn at 10 feet, crowd sound at football game	--
90	--	Propeller plane flyover at 1,000 feet, noisy urban street	Full symphony or band, food blender, noisy factory
80	Moderately loud	Diesel truck (40 miles per hour) at 50 feet	Inside auto at high speed, garbage disposal, dishwasher
70	Loud	B-757 cabin during flight	Close conversation, vacuum cleaner

Sound Pressure Level (dBA)	Subjective Evaluation	Environment	
		Outdoor	Indoor
60	Moderate	Air-conditioner condenser at 15 feet, near highway traffic	General office
50	Quiet	--	Private office
40	--	Farm field with light breeze, birdcalls	Soft stereo music in residence
30	Very quiet	Quiet residential neighborhood	Inside average residence (without TV and stereo)
20	--	Rustling leaves	Quiet theater, whisper
10	Just audible	--	Human breathing
0	Threshold of hearing	--	--
Sources: Egan, 1988; Ramsey and Sleeper, 1994			

3.6.1 Affected Environment

The proposed Solar Facility is located in a rural area adjacent to several local roadways. U.S. Highway 82 is to the north, a large and very active railyard is to the south, and the Golden Triangle Regional Airport is about a mile to the east. The major noise sources in this area are traffic on the roadways, the coupling of trains within the railyard, private and commercial jets, farm equipment, wind, and farm animals. Noise levels in rural areas typically range from 45 to 55 dBA (A-weighted decibels, a measure of noise level). A day-night average sound level of 55 dBA is commonly used as a threshold for noise levels which could result in adverse impacts. Prolonged exposure to levels above 65 dBA is considered unsuitable for residential areas.

There is a residential area on the west side of the Project Site. Ellis Street and Roberts Street in Artesia are located in between two of the Project Site parcels. There are approximately 20 residences along Ellis Street that range from 400 to less than 50 feet from the Project Site. There are also approximately 20 residences as well as two apartment buildings along Roberts Street that range from just over 500 feet to less than 50 feet from the Project Site.

3.6.2 Environmental Consequences - Noise

3.6.2.1 No Action Alternative

Under the No Action Alternative, the proposed Solar Facility and associated structures would not be constructed; therefore, no Project-related noise impacts would result. Current noise impacts related to air traffic, train operations, and agricultural land use, which is likely minimal, would persist.

3.6.2.2 Proposed Action

Under the Proposed Action Alternative, noise levels would be temporarily elevated in the areas immediately surrounding the Project Site when construction is occurring. Construction activities

such as tree removal, site grading, and installation of the PV panel support posts would generate noise on a temporary basis. Maximum noise levels produced by the construction equipment are in the range of 80 to 85 dBA at a distance of 50 feet. The nearest occupied residences are about 50 feet from the Project Site. Nearby residents would likely experience elevated noise levels caused by the operation of construction equipment during daytime hours (typically 8am – 7pm) as well as an increase in traffic during peak morning and evening commutes. However, the elevated noise levels would be short in duration and would not occur at night. Furthermore, the elevated noise levels at the closest residence would not exceed the 65 dBA for prolonged periods of time.

As the Project design evolves, MS Solar 5 would attempt to locate inverters at least 500 feet away from residences. If a 500-foot setback could not be accomplished for all residences, once the Solar Facility is operational, mufflers or sound reducing devices may be installed on inverters that are located within 500 feet of residential areas if an increase in noise from the Solar Facility occurs. The occupants of residences along Ellis Street and Roberts Street would not experience elevated noise levels from operation of the Project with the exception of periodic maintenance activities during commercial hours. Periodic maintenance activities, such as mowing, would temporarily increase noise levels; however, these levels would be consistent with the existing agricultural operations that have historically occurred in the area. Overall, the noise impacts resulting from both construction and operation of the Project would be negligible.

Additional details regarding the network upgrades, such as the exact locations of pull points or any potential pole replacements, are still being developed. Supplemental NEPA analysis would be conducted if additional environmental resources are affected.

3.7 Air Quality and Greenhouse Gas Emissions

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

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. With the issuance of the Clean Air Act of 1970 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 public health and welfare: sulfur dioxide (SO_2), ozone, 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.

Primary NAAQS were developed to protect public health and safety, and secondary NAAQS were developed to protect public welfare (e.g., visibility, crops, forests, soils, and materials) from known

or potential adverse effects of air pollutants. Areas in compliance with the NAAQS are designated "attainment" areas. Areas not in compliance with the NAAQS are designated as "nonattainment" areas. New sources proposed in or near nonattainment areas may be subject to more stringent air permitting requirements. Nonattainment areas are usually defined by county. National standards may not be exceeded more than once per year (except where noted). Areas that cannot be classified based on available information for a specific pollutant are designated as "unclassifiable" and are treated as attainment areas unless proven otherwise. If an area that was formerly designated as nonattainment for a particular pollutant later qualifies as attainment, that area is then categorized as "maintenance" for that pollutant for the next 20 years as long as the area continues to meet the NAAQS for that pollutant. If an area remains in attainment for the 20-year maintenance period, the status will qualify it to be formally designated back to normal attainment.

3.7.1.1 Regional Air Quality

The area where the Project is located is in rural Lowndes County, which has little development in the vicinity apart from that related to rural-residential and agricultural uses. Denser development is approximately 10 miles or more to the west in Starkville and about 12 miles to the east in Columbus. Lowndes County is considered in attainment for all pollutants (USEPA 2020b).

Table 3-8 presents the most recent USEPA emission inventory data (USEPA 2020d) for the most prevalent NAAQS pollutants for Lowndes County. These data represent anthropogenic emissions from all stationary source and mobile source activities. Included in Lowndes County is the City of Columbus, the Columbus Airforce Base, and the Golden Triangle Regional Airport, which offers private and commercial flights. All values fall beneath the USEPA thresholds for NAAQS pollutants.

Table 3-8: Average Emissions of NAAQS Pollutants in Lowndes County

Pollutant	Emissions for Lowndes County (tons per year)
Carbon Monoxide	5,168
Nitrogen Oxides (NO_x)	2,992
PM_{10}	7,393
$PM_{2.5}$	1,300
Sulfur Dioxide (SO_2)	452
Volatile Organic Compounds (VOCs)	11,491

Source: EPA 2020d

3.7.1.2 Regional Climate

The Project Site is located almost halfway between Starkville and Columbus, MS. This region of the country is known as the humid subtropical climate region and is characterized by temperate winters; long, hot summers; and rainfall that is evenly distributed throughout the year. Normal annual precipitation at the Project Site is 55 inches per year.

Prior to initiating pedestrian surveys at the beginning of March 2020, the Golden Triangle region underwent numerous intense rain events with the region experiencing serious flooding in some areas. 2019 was the wettest year on record in Starkville, and the additional heavy rains in early 2020 increased the height of the water table and the high saturation levels in the region, causing severe runoff and flooding events throughout the area (Vrbin, 2020).

Table 3-9: Historic Rainfall Data (Starkville, MS)

Recorded Period	Total Rainfall	Normal Rainfall
2015 - total	59.4	55.22
2016 - total	49.83	55.22
2017 - total	58.05	55.22
2018 - total	68.19	55.22
2019 - total	88.88	55.22
January 2020	10.52	5.40
February 2020	14.96	5.70
March 2020	6.80	4.85
April 2020	11.6	4.94
May 2020	1.62	4.58

Sources: MSU, 2020 and U.S. Climate Data, 2020

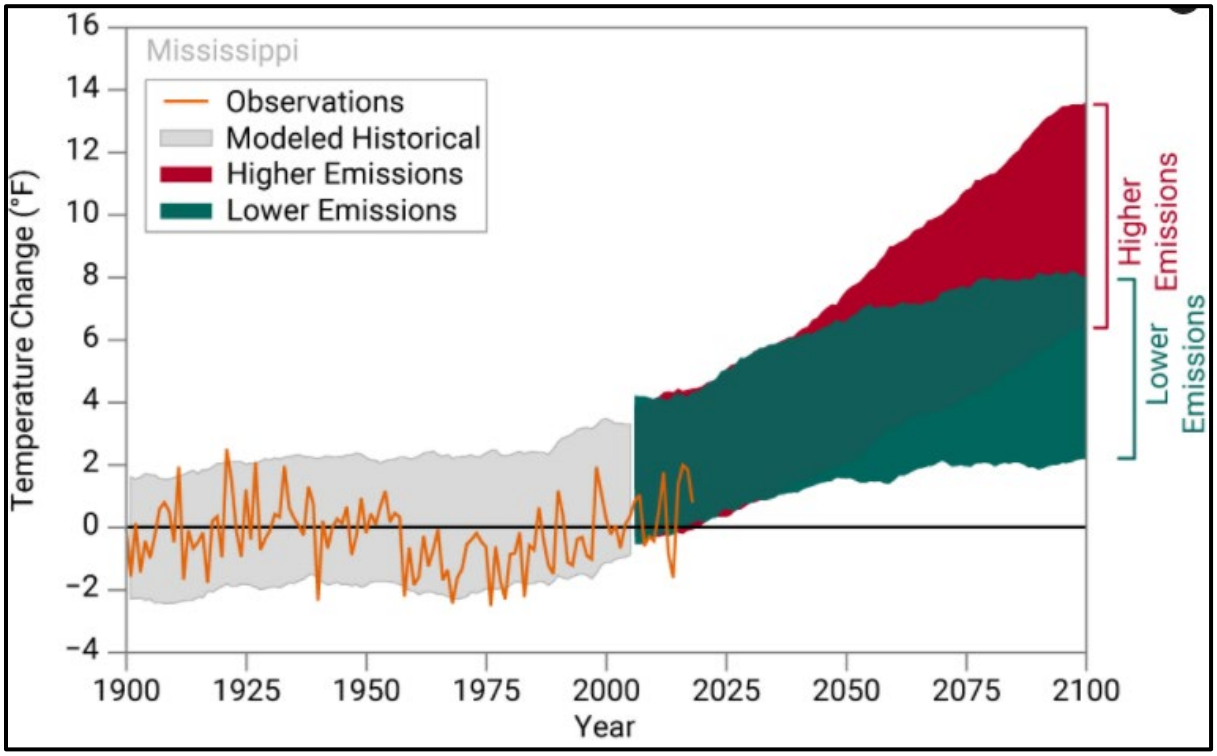
Throughout the delineation efforts, measurable rain events continued to occur either during field delineations or within 48-hours prior to when field surveys were conducted. Twenty-three rain events were recorded at the nearest certified weather station (MSU North Farm Starkville) during the course of the wetland delineations. Rainfall data reported from MSU's North Farm Starkville Agriculture Weather Station is available as an Appendix to the Wetland and Waterbody Delineation Report (Appendix B).

Weather conditions during the field surveys varied from clear to overcast and temperatures ranged from a low of 31° Fahrenheit (F) to a high of 86° F.

3.7.1.3 Greenhouse Gas Emissions

Greenhouse Gases typically consist of natural and man-made compounds that are released into the earth's atmosphere. GHGs also absorb a portion of Earth's infrared radiation and can re-emit some of the radiation back to the earth's surface. When radiation is emitted back to the earth's surface, temperatures are typically warmer than they would naturally be. With that process, GHGs act as insulation and contribute to the maintenance of global temperatures. Increasing levels of GHGs in the atmosphere result in an increase in temperature on earth, commonly known as global warming. Changes in climate associated with global warming produce adverse economic and social consequences globally through changes in weather (e.g., more intense natural disasters, greater risk for forest fires, flooding) (USGCRP 2020). However, as shown in Figure 3-12, for the State of Mississippi, there is currently no noticeable long-term upward trend in temperature.

Figure 3-14: Observed and Projected Temperature Change in Mississippi



Source: NOAA 2019

The primary GHG emitted by human activities in the U.S. is carbon dioxide (other than water vapor), representing approximately 82 percent of total GHG emissions in the US (USEPA 2020e). Dominant sources of carbon dioxide and of overall GHG emissions is fossil fuel combustion. Emissions of the GHG methane, which have declined in the U.S. from levels in 1990, are primarily a result of digestion of domestic livestock, decomposition materials in landfills, coal mining, and natural gas leaks. Agricultural soil management is the major source of the GHG nitrous oxide emissions in the United States, representing approximately 74 percent of its emissions from human activities (USEPA 2020e).

3.7.2 Environmental Consequences

3.7.2.1 No Action Alternative

Under the No Action Alternative, the proposed Solar Facility would not be constructed. Therefore, no air emissions or GHGs would be generated by equipment or vehicles from construction or operation of the Solar Facility. Existing land use would be expected to remain as a mix of farmland and undeveloped land, and the only ongoing emissions would be due to vehicles or equipment used to operate the farms or maintain the agricultural clearings, and from domestic livestock operations.

3.7.2.2 Proposed Action Alternative

Under the Proposed Action, minor direct impacts on 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.

Regional Air Quality

The majority of potential air quality impacts associated with the Proposed Action would occur during construction. Construction activities would result in emissions from the operation of construction equipment, contracted employees' personal vehicles, and fugitive dust suspension from clearing, grading, and other activities across exposed dry soil. 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 local ordinances or burn permits and is not expected to have any health consequences for this rural area.

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

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 routes taken to reach the Project Site. As necessary, fugitive dust emissions from construction areas and paved and unpaved roads would be mitigated using wet suppression. Wet suppression would reduce fugitive dust emissions from roadways and unpaved areas by as much as 95 percent. Direct impacts to air quality associated with construction activities would be temporary and minor.

Regional Climate

No noticeable direct or indirect impacts to the regional climate would occur as a result 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 which happens with urban development. Therefore, average temperatures of the developed area are not expected to change significantly due to the proposed development.

Greenhouse Gases

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 occur due to transporting materials and workers to the Project Site, 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 resulting from construction would be entirely offset by Project operation over the long term as the electricity generated by the Project would offset some fossil-fuel-based electricity generation and the GHG emissions associated with the combustion of fossil fuels.

Tree and other tall vegetation removal during construction of the Project would represent a minor loss of sequestered carbon, as well as potential future carbon sequestration. 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 future changes on the Project Site would not result in 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 Project Site.

The operation of the Project is not anticipated to have any long-term adverse impacts to air quality or GHG emissions. Operation of the Solar Facility or electrical lines would not produce emissions. 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 operation 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 at regional or larger scales. It would, however, be a component of the larger planned system-wide reduction in GHG emissions by the TVA power system. The adverse impacts of GHG emissions and the beneficial impacts of TVA's efforts to reduce GHG emissions are described in more detail in the TVA IRP (2019).

Additional details regarding the network upgrades, such as the exact locations of pull points or any potential pole replacements, are still being developed. Supplemental NEPA analysis would be conducted if additional environmental resources are affected.

3.8 Cultural Resources

Cultural resources include, but are not limited to, prehistoric and historic archaeological sites, historic structures, and historic sites at which important events occurred. Cultural resources are finite, non-renewable, and often fragile. They are frequently threatened by industrial, commercial, and residential development, as well as construction of roads and other infrastructure.

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 and if found to possess one or more of four different 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.

Under Section 106 of the NHPA, each federal agency must consider public views and concerns about historic preservation issues when making final project decisions (GSA, 2020). The NHPA addresses the preservation of "historic properties," which are defined under the Act as any prehistoric or historic district, site, building, structure, or object included in or eligible for inclusion in the NRHP. Under Section 106 of NHPA, the Project is required to consider ways to avoid or minimize effects from its undertakings on significant cultural resources.

3.8.1 Affected Environment

Phase I archaeological and historic architecture surveys were performed within the Project Site between April 27 and July 2, 2020 and October 9 – 10, 2020. The cultural survey area, also referred to as the "APE" included more than 3,600 acres. Additionally, a ½ mile buffer around the Physical APE was developed to account for visual and other non-physical effects from Project implementation (Visual APE). The Visual APE comprised approximately 8,980 acres. The Phase I archaeological resources survey of the Physical APE and the architectural resources survey of the Visual APE and the refined visual effects buffer were conducted between April 27 and July 2, 2020.

The purpose of the Phase I Survey was to identify and document both previously recorded and newly documented archaeological and historic-age non-archaeological resources, to assess their

eligibility for listing in the NRHP, and to assess potential Project impacts to historic (NRHP-listed or eligible) properties as required under Section 106 of the NRHP. The surveys were conducted to professional standards and guidelines and in accordance with the *Mississippi Department of Archives and History* (MDAH)*, Mississippi State Historic Preservation Office's* (SHPO) *Guidelines for Archaeological Investigation and Reports in Mississippi* (Sims 2001)*, the Secretary of the Interior's Standards and Guidelines for Archaeology and Historic Preservation* (48 FR 44716-44742), and in accordance with the *Secretary's Standards for Identification* (48 FR 44720-44723).

Prior to the cultural resource survey field effort, a desktop review was conducted of the Study Area comprising the Physical APE and a 0.5-mile buffer to determine if any previously recorded archaeological sites, architectural resources, and NRHP-listed properties are located in the Study Area. The review involved the evaluation of previously recorded archaeological sites and cultural resources survey data maintained at the MDAH – Archaeological Search Room, located within the Charlotte Capers Archives and History Building in Jackson, Mississippi, and online through the MDAH Historic Resources Inventory Map.

The background research identified eight previously recorded archaeological sites within the Study Area. Six of the previously recorded archaeological sites (22LO0603, 22LO0728, 22LO0731, 22LO0834, 22LO0835, and 22LO0836) are located within the Physical APE. One of these sites, 22LO0731, was previously determined eligible for listing in the NRHP. Previously recorded site 22LO1063, located outside of the Physical APE, but within the Study Area, was determined ineligible for the NRHP, while the remaining six previous recorded archaeological sites within the Study Area have not been evaluated for listing in the NRHP.

Additionally, TVA initiated consultations on a government-to-government basis with the tribes listed below regarding the Proposed Action's potential to affect historic properties that are of religious and cultural significance to federally-recognized Indian tribes. A summary of TVA's consultations with federally-recognized Tribes is included in Appendix E. None of the consulted tribes identified such properties or objected to the Proposed Action.

- Absentee Shawnee Tribe of Indians of Oklahoma,
- Alabama-Coushatta Tribe of Texas,
- The Chickasaw Nation,
- The Choctaw Nation of Oklahoma,
- Coushatta Tribe of Louisiana,
- Eastern Shawnee Tribe of Oklahoma,
- Jena Band of Choctaw Indians,
- Kialegee Tribal Town,
- Mississippi Band of Choctaw Indians,
- The Muscogee (Creek) Nation,
- Shawnee Tribe, and
- Thlopthlocco Tribal Town

The background review revealed that three sites are associated with historical grants to individual Choctaw Nation citizens. The Physical APE crosses three land scrip certificates that were issued to individual Choctaw Nation citizens under Articles 14 and 19 of the 1830 Treaty of Dancing Rabbit Creek, which allowed for individual land grants to Tribal citizens that did not relocate to Oklahoma and chose to remain in Mississippi and submit to state jurisdiction. These sites are related to sites of cultural and historical importance for the Choctaw Nation and historical ownership of individual Choctaw Nation citizens but are not accompanied by any contemporary legal right to title or jurisdiction by the Choctaw Nation. Because of the historical significance, the Choctaw Nation of Oklahoma and related Choctaw tribes were consulted during the NHPA process (see list of tribes above).

Previously recorded site 22LO0731 is associated with the Yokatubbee Choctaw Indian Reservation. As noted above, this site has previously been determined as eligible for listing in the NRHP. Additionally, previously recorded site 22LO0603 is partially located within the Ho-Ta-Na Choctaw Land Grant. It is considered eligible for inclusion in the NRHP.

The background review identified portions of the Billups-Mims plantation that are located within the Physical APE. The Billups-Mims plantation is located roughly 0.33-mile northeast of the intersection of Guerry Road and Mims Road.

Two unnamed cemeteries were identified in the Physical APE. Interviews with informants identified one of the cemeteries as having been associated with the people enslaved by the Billups and their descendants. The Billups-Mims/Swoaps cemetery of enslaved African Americans (DS1) is located northeast of the Billups-Mims plantation, and is recommended as eligible for inclusion in the NRHP under Criterion A and D, NRHP Criteria Consideration D.

The second cemetery, depicted on USGS topographic maps from 1960, 1972, 1976, and 1987, is located 0.30-mile south of Artesia Road within the Project Site. No additional information was found regarding this cemetery during preliminary archival research, a landowner interview, or archaeological survey. Both cemeteries will ultimately be avoided by Project implementations.

3.8.1.1 Architectural Resources

Review of the MDAH Historic Resources Inventory Map identified four previously recorded architectural resources within the Study Area, one of which (087-ART-0008) is no longer extant. All of the resources are located in the community of Artesia and outside of the Visual APE.

The historic-age, non-archaeological, resources survey resulted in the documentation of 62 resources comprising 44 properties. Two resources, the Mayhew Tomato Farm (Resource 01) and the Beulah Grove Cemetery (Resource 12), are recommended for NRHP inclusion. The resources would not be directly impacted by the Project, and no adverse effects are anticipated. Specifically, the resources are either removed from direct view of the Proposed Project or are screened by vegetation or other setting intrusions. The remaining resources include primarily twentieth century residential resources, many of which are mobile homes moved to their current location during the late-twentieth century. Other resource types are limited but include agricultural,

religious, funerary, and transportation-related properties. Other than the properties recommended for NRHP inclusion, none of the remaining resources recorded during the survey, either individually or collectively, appear to meet the criteria for NRHP inclusion due to a lack of significance and/or architectural integrity.

3.8.1.2 Archaeological Resources

During fieldwork for the Phase I archaeological resources survey of the Physical APE, 39 newly identified archaeological sites, of which four are isolated finds consisting of a single artifact, were recorded. Of the four isolated find sites, two are prehistoric and two are historic. The other newly identified archaeological sites include 33 historic-period sites and two multicomponent sites with both prehistoric and historic-period components. Of the new sites, DS2, DS7, DS8, and DS22 are proposed for avoidance by Project implementation. Newly identified site DS2 is recommended eligible for inclusion in the NRHP, under Criterion A and D for its association with the Ho-Ta-Na Choctaw land grant, under Article XIV of the 1830 Treaty of Dancing Rabbit Creek, the historic Choctaw removal period from Mississippi, and the potential for additional research of historic Choctaw homesteads. Sites DS7 and DS8 have been identified as mid-nineteenth to early twentieth century tenant farms. Both sites are recommended undetermined for inclusion in the NRHP, and additional archival research is recommended for these sites. Both archival and archaeological evidence suggests that DS22 was likely associated with the Stover Apiary Operation during the early- to mid-twentieth century. Site DS22 is located near the railroad east of Artesia and could have represented worker housing, storage, and other unknown components of the business. Additional research would be required to determine the site's function, but its association with an early and important agricultural operation in the area suggests it may maintain significance under NRHP Criterion A.

The remaining 32 archaeological sites and four isolated find sites have a NRHP recommendation of not eligible. Sites recommended as not eligible for inclusion in the NRHP have limited integrity and/or limited research potential, and therefore are not recommended for avoidance by the Project. If changes to the construction footprint occur, it is recommended that any newly added areas be surveyed for cultural resources prior to any earthmoving activities.

MDAH is currently reviewing newly submitted archaeological site cards, for archaeological sites identified during the 2020 investigations, as well as updated sites cards for previously recorded sites revisited during the 2020 investigations. Based on informal discussions with MDAH, there is potential that previously recorded sites 22LO0603 and 22LO0824, along with a newly identified artifact scatter (field number DS2) will be merged into a single site. The single merged site will be recommended eligible for inclusion in the NRHP, under Criterion A and D for its association with the Ho-Ta-Na Choctaw land grant.

3.8.2 Environmental Consequences - Cultural

3.8.2.1 No Action Alternative

Under the No Action Alternative, existing land use would be expected to remain unchanged. Ground-disturbing agricultural practices currently carried out at the site would continue to have the potential to impact intact cultural resources at the surface or within the first 8 to 10 inches of soil. If the site were instead redeveloped for residential, commercial, or industrial land uses, then more significant impacts to existing or potential cultural resources would be expected.

3.8.2.2 Proposed Action

A total of 62 historic-age, nonarchaeological resources on 44 properties were recorded within the Project's visual APE. Of the accessible resources, two properties (the Mayhew Tomato Farm and the Beulah Grove Cemetery) are recommended for NRHP inclusion and two properties (the Kansas City Southern Railroad and the Kansas City Southern Railyard) have marginal NRHP significance. The resources recommended for NRHP inclusion would not be adversely affected by the Project. Specifically, the resources are removed in distance and shielded by vegetation and other setting intrusions. As a result, construction of the Project would not affect any of the characteristics that qualify the resources for NRHP inclusion.

None of the remaining resources recorded during the survey, either individually or collectively, appear to meet the criteria for NRHP inclusion due to a lack of significance and/or architectural integrity. As no historic (NRHP-eligible or listed) resources would be physically or otherwise adversely affected by the proposed Project, no further consideration of effects to historic properties under Section 106 of the NHPA is recommended in connection with the Project as currently proposed.

The locations of six previously recorded archaeological sites within the Physical APE were visited and resurveyed during the current field investigations. As a result of these efforts the boundaries of three previously recorded archaeological sites (22LO0603, 22LO0731, and 22LO0834) have been expanded. Two of the sites (22LO0603 and 22LO0731) are considered eligible for inclusion in the NRHP and the other four sites remain unevaluated. All six previously recorded archaeological sites would be avoided, along with a 100-foot-wide buffer during Project implementation and operation. No adverse direct or indirect impacts would occur to these sites.

Thirty-five newly identified archaeological sites and four isolated find locations were encountered within the Physical APE during the Phase 1 surveys. Three of these sites (DS1, DS2, and DS22) are considered eligible for listing in the NRHP and two (DS7 and DS8) remain unevaluated.

Site DS1, the Billups-Mims/Swoaps cemetery, is an enslaved African-American cemetery that, according to informant information, dates to the Billups-Mims plantation. The last burial in the cemetery was reportedly Nelson Swoaps in 1929. The Billups-Mims/Swoaps cemetery is recommended eligible for inclusion in the NRHP under Criteria A and D. Newly identified site DS2 is associated with the Ho-Ta-Na Choctaw Reservation and is recommended eligible for inclusion

in the NRHP under Criteria A and D. Both the Billups-Mims/Swoaps cemetery and site DS2 will be avoided by the Project. A 100-foot avoidance buffer has been placed around the boundaries of the Billups-Mims/Swoaps cemetery and DS2 site. No adverse direct or indirect impacts would occur to these sites.

Both archival and archaeological evidence suggests that DS22 was likely associated with the Stover Apiary Operation during the early- to mid-twentieth century. The main facility/farm is located north of the Physical APE in the community of Mayhew. Site DS22, which is located near the railroad east of Artesia, could have represented worker housing, storage, and other unknown components of the business. Additional research would be required to determine the site's function, but its association with an early and important agricultural operation in the area suggests it may maintain significance under NRHP Criterion A. The site is proposed for avoidance by Project implementation. No adverse direct or indirect impacts would occur to these sites. As a result, no further consideration of Project impacts is recommended at this location under Section 106.

Sites DS7 and DS8 appear to be associated with short-term tenant farms. Few confirmed tenant occupations have been investigated in the southeastern United States, and information gained from either site could provide valuable insights into the lifeways of tenant farmers in rural Mississippi during the Reconstruction period to Post-Depression era. Both sites will be avoided by direct impacts from the Project. A 100-foot avoidance buffer has been placed around sites DS7 and DS8. No adverse direct or indirect impacts would occur to these sites.

The remaining thirty sites encountered during Phase 1 investigations are considered ineligible for inclusion in the NRHP and no further investigations are recommended.

Because TVA is in continued consultation with MDAH regarding the determination of adverse effects to sites, the Project has been designed to avoid all previously listed or recommended eligible sites. If previously recorded sites 22LO0603 and 22LO0834, along with the newly identified artifact concentration (field number DS2) are merged into a single site the Project will be designed to avoid the newly merged site.

All sites within the Project Area that were identified as "undetermined" or "eligible" would be avoided during the construction and operation of the Project. Throughout the Section 106 consultation process, if it is determined that the Project would result in an adverse effect on cultural resources, the Project would be redesigned to avoid affected sites so that MS Solar 5 would not need to mitigate for impacts through an MOA process. Therefore, there would be no direct or indirect impacts to archaeological or historic resources potentially eligible for the NRHP. TVA is consulting with the SHPO and federally recognized Indian tribes with an interest in the area with respect to TVA's findings of both the archaeological and architectural surveys.

Should previously undiscovered cultural resources be identified during Site construction or operations, construction in the affected area will be immediately stopped and the discovery

location secured against further disturbance, pending completion of the consultation. TVA and the SHPO will be consulted before any further action is taken.

Additional details regarding the network upgrades, such as the exact locations of pull points or any potential pole replacements, are still being developed. Supplemental NEPA analysis would be conducted if additional environmental resources are affected.

3.9 Utilities

This section describes an overview of existing utilities within the Project Site and the immediate surrounding 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 on farmland in a rural area of Lowndes County, Mississippi. Available power sources to the county residents are electricity and natural gas. No significant renewable energy sources are currently located in this area.

3.9.1.1 Telecommunications

Telecommunication services in the area are provided primarily by Franklin Telephone Company and Bellsouth Telecommunications, as well as mobile providers.

3.9.1.2 Electricity

The local electricity provider for most of Lowndes County as well as the adjacent counties is 4-County Electric Power Association (4CEPA), a not-for-profit electric cooperative that purchases power generated by TVA. A TVA-owned transmission line traverses the Project Site, cutting east-west across the northern portion of the site (see Figure 2-2). Distribution lines are present throughout the area, including along portions of Old Mayhew Road, Artesia Road, Guerry Road, MS-182, Gilmer-Wilburn Road and other major and minor roads in the vicinity.

3.9.1.3 Natural Gas

A regional distribution pipeline travels north-south along the entire length of the Project Site, operated as part of the Southern Natural Gas (SNG) system by Kinder Morgan. Natural gas service in the vicinity is provided by Atmos Energy, which owns a natural gas pipeline that taps the SNG pipeline at a meter station located on a parcel that abuts the Project Site.

3.9.1.4 Water and Sewer

Because the Project Site is predominantly outside of incorporated municipality limits, water service is provided either by the Prairie Land Water Association or through private wells, and sewer service is provided through private septic systems. No known public service water lines or line markers servicing individual customers were observed on the Project Site. The residents located adjacent to the southern and northern portions of the Project Site may have water service from Prairie Land Water Association or other public utility companies.

3.9.2 Environmental Consequences - Utilities

This section describes the potential impacts to utilities should the No Action or Proposed Action Alternatives 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

Under the Proposed Action, installation of approximately 1,665 feet of new gen-tie line would occur. Electrical station service to the Golden Triangle Solar Facility would be provided by 4CEPA. If electrical outages were necessary, 4CEPA would be responsible for communicating to its consumers. No long-term adverse impacts are anticipated as a result of the Project.

Minimal temporary impacts to local electricity service could be expected when bringing the Solar Facility on-line or during routine maintenance of the facility. Once the Project enters the operation phase, 4-County Electric Power Association (4CEPA) would provide the required back-up power for controls. Based on discussions with 4CEPA and given the low level of retail electric demand needed for the facility, no changes to the 4CEPA distribution system would be expected, and there would be no impacts to the local utility or its customers. Implementation of the Proposed Action would result in additional renewable energy resources in the region, which would augment total electricity supply and constitute an improvement to the environmental impacts associated with regional electricity generation.

Water would be needed for soil compaction and dust control during construction, and to a lesser extent for domestic use during operations (i.e., cleaning solar panels if drought conditions persisted). There would be no habitable buildings on-site and no need for potable water. Portable toilet facilities would be available on-site for the duration of the construction period; there would be no need for a septic system or connection to the closest sanitary sewer. Water in sufficient quantity and quality would be made available through use of on-site groundwater wells, or delivery via water trucks. MS Solar 5's construction contractor would determine daily water requirements based on the preliminary grading plan and size the new on-site wells accordingly. MS Solar 5's construction contractor would perform groundwater drilling and testing work prior to full construction to generate data on aquifer characteristics and develop a plan for the production well design. If existing groundwater wells are available and needed, they would be utilized for the Project, the exact location of which would be identified in the final design. The wells would be spaced around the Project Site to provide easy access for construction water and to reduce the potential for any significant water level drawdown.

Natural gas service would not be required for the Project, and the existing natural gas infrastructure present on the site would not be disturbed or otherwise impacted during the construction or operation of the Project.

No communication resources are anticipated to be acquired through the local providers. MS Solar 5 would have a dedicated communications system to remotely monitor the Project facility and operations.

No long-term adverse impacts to utilities would be anticipated as a result of implementation of the Proposed Action. No indirect impacts to utilities would occur under the Proposed Action. The Proposed Action would result in a new source of renewable energy for the region; thus, the Project would ultimately contribute to a beneficial impact to electrical services across the region.

3.10 Waste Management

This section provides an overview of existing waste management within the surrounding area of the Project Site and the potential impacts to waste management that would be associated with the No Action or 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 which, 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.

Because the current land use of the Project Site is entirely either agricultural or undeveloped, no known hazardous waste exists on the site and none is anticipated aside from potential petroleum, pesticides, herbicides, or fertilizers that can be removed as part of the construction process.

Collection and disposal of solid waste in Lowndes County is conducted by Golden Triangle Waste Services. Nonhazardous wastes, including construction wastes, can be hauled to an operating Class I facility.

3.10.2 Environmental Consequences

This section describes the potential impacts to waste management resources should the No Action or Proposed Action Alternatives 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 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

Construction of the Proposed Action would result in the generation of hazardous and nonhazardous solid waste in the form of construction debris, grading spoils, packaging materials, and general construction waste. Under the Proposed Action, every effort would be made to minimize the amount of waste generated during and after construction of the Project.

Materials suitable for soil compaction are anticipated to be procured from within the Project Site as needed and off-loaded at the designated road or building location for immediate dispersion. Materials unsuitable for compaction, such as mowed debris, would be removed and loaded immediately for subsequent disposal at an acceptable off-site location. Contaminated grading and mowing materials are not anticipated; however, if any such materials are encountered during excavation, they would be disposed of at the nearest appropriate facility in accordance with applicable laws, ordinances, regulations, and standards. It is estimated that not more than 20 cubic yards of construction debris and material waste would be generated each week (during heavier periods of construction), which would be accumulated in a construction debris container and hauled off monthly. A list of acceptable waste facilities is listed in Table 3-10.

Table 3-10: Waste Facilities Near the Project Site

Landfill	Address	Materials
Columbus Landfill	2221 Armstrong Rd, Columbus, MS 39702	Class I rubbish landfill for yard waste, construction debris, and furniture/appliances.
Golden Triangle Regional Solid Waste Management Authority	9778 Old West Point Rd, Starkville, MS 39759	Household garbage, mixed building debris, vegetative debris, commercial wastes, office wastes, packaging wastes and other non-hazardous solid wastes.

Hazardous Waste

Small quantities of hazardous wastes would be generated during construction, operation and maintenance, and decommissioning of the Project. Hazardous wastes generated during the construction phase would include substances such as paint and primer, thinners, and solvents. Hazardous solid and liquid waste streams that would be generated during operation of the Project include substances such as used hydraulic fluids, used oils, greases, filters, etc., as well as fluorescent light bulbs, spent cleaning solutions, and spent batteries. Hazardous wastes generated during decommissioning would include substances such as carbon dioxide, diesel fuel, hydraulic fuel, and lube oil. To the extent practicable, hazardous wastes would be recycled. Waste collection and disposal would be conducted in accordance with applicable regulatory requirements to minimize health and safety effects.

MS Solar 5 (or its contractor) would report any spills to MDEQ. A sampling and cleanup report would be prepared and sent to the agency to document each spill and clean up. Each spill, regardless of amount, would be cleaned up within 48 hours and a spill report completed. Copies of spill and cleanup reports would be kept on-site.

Minimal amounts of petroleum fuel would be kept on-site during construction. BMPs would be implemented in order to minimize the potential of a spill and to instruct on-site workers on how to contain and clean up any potential spills. The Project Site would be surrounded by security fencing during both construction and operational phases 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.

During construction, hazardous materials would be stored on-site in storage tanks, vessels, or other appropriate containers specifically designed for the characteristics of the materials to be stored. The storage facilities would include secondary containment in case of tank or vessel failure. Construction- and decommissioning-related hazardous materials used for development of the Project could include gasoline, diesel fuel, oil, lubricants, and small quantities of solvents and paints. Material Safety Data Sheets for applicable materials present on-site would be made readily available to on-site personnel.

Fueling of some construction vehicles and other mobile equipment would occur primarily in the construction laydown area. Special procedures would be identified to minimize the potential for fuel spills, and spill control kits would be carried on refueling vehicles for activities such as refueling, vehicle or equipment maintenance procedures, waste removal, and tank clean-out. Fuel for construction equipment could be provided by a fuel truck or could be stored in aboveground double-walled storage tanks with built-in containment. The volume of each individual tank would not exceed 1,320 gallons, the threshold above which a Spill Prevention, Countermeasure and Control (SPCC) Plan would be required (40 CFR 112). However, because there would be fuel in reserve for diesel generators, in addition to the volume of oil contained in the main electrical transformers, the total volume of regulated materials may exceed the threshold. In that case, an SPCC Plan would be prepared.

The SPCC Plan would include procedures, methods, and equipment supplied during construction to prevent discharges from reaching navigable waters. The facility would fall under USEPA's SPCC applicability as a Tier I Qualified Facility. Because oil storage would consist of only "oil-filled operational equipment," double-walled protection would not be required [40 CFR 112.7(k)(2)] and the SPCC Plan would not have to be certified by a Professional Engineer [40 CFR 112.3(g)]. The SPCC plan would be prepared and implemented prior to and during construction to prevent oil discharges during facility operation. The administering agency is the EPA.

At the end of its useful life, the Project facilities would be decommissioned and dismantled, restoring the site. During decommissioning, above ground equipment and below ground electrical connections would be removed from the Project Site. In addition, concrete pads and foundations would be broken and removed, underground utilities would be abandoned, compacted areas would be scarified, and soils would be stabilized. The majority of decommissioned materials and

equipment would be recycled. MS Solar 5 would seek a processor to recycle the solar panels to the highest degree practicable. Materials that cannot be recycled would be disposed at approved facilities. Alternatively, the Project facilities may be repurposed for new solar technologies available at the end of the plant lifecycle, where equipment, cabling, and foundations would be re-used where practicable. Hazardous materials that could be present during construction and decommissioning of the Proposed Action are included in Table 3-11.

Table 3-11: Summary of Special Handling Precautions for Large Quantity Hazardous Materials

Hazardous Material	Use	Relative Toxicity[1] and Hazard Class[2]	Permissible Exposure Limit	Storage Description; Capacity	Storage Practices and Special Handling Precautions
Diesel Fuel	Equipment Generator refueling and emergency diesel fire pump	Low toxicity; Hazard class – combustible liquid	PEL; none established TLV: 100 mg/m^3	Carbon steel tank (3,600 gallons)	Secondary containment, overfill protection, vapor recovery, spill kit.
Hydraulic fluid (if applicable)	Tracker drive units	Low to moderate toxicity; Hazard class – Class IIIB combustible liquid	TWA (oil mist); 5 mg/m^3 STEL: 10 mg/m^3	Hydraulic drive tank, approx. 20 gallon per tracker drive unit (if applicable) throughout solar field. Carbon steel tank, maintenance inventory in 55-gallon steel drums.	Found only in equipment with a small maintenance inventory. Maintenance inventory stored within secondary containment, alternative measures to secondary containment for equipment would be implemented at the Project.
Lube Oil	Lubricate rotating equipment (*e.g.*, tracker drive units)	Low toxicity Hazard class – N/A	None established	Carbon steel tank, maintenance inventory in 55-gallon steel drums.	Secondary containment for tank and for maintenance inventory.

PEL = permissible exposure limit
TLV = threshold limit value
TWA = time weighted average
STEL = short-term exposure limit

[1]Low toxicity is used to describe materials with an NFPA Health rating of 0 or 1. Moderate toxicity is used to describe materials with an NFPA rating of 2. High toxicity is used to describe materials with an NFPA rating of 3. Extreme toxicity is used to describe materials with an NFPA rating of 4.

[2]N/A denotes materials that do not meet the criteria for any hazard class defined in the 1997 Uniform Fire Code.

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), 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.

MS Solar 5 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.

Non-hazardous Waste Management

Construction, operation and maintenance, and decommissioning of the Project would generate non-hazardous solid wastes. Facility-related wastes generated during all phases of the Proposed Action would include soiled rags, worn or broken metal and machine parts, defective or broken electrical materials, other scrap metal and plastic, insulation material, empty containers, cardboard, glass, wood/pallets, and other miscellaneous solid wastes including the typical refuse generated by workers. These materials would be disposed of by means of contracted refuse collection and recycling services. Waste collection and disposal would be in accordance with applicable regulatory requirements to minimize health and safety effects, and no waste would be treated on site during construction or operations. 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 MS Solar 5. Information on universal wastes anticipated to be generated during Project construction is provided in Table 3-12.

Table 3-12: Summary of Construction Waste Streams and Management Methods

Waste Stream	Origin and Composition	Estimated Frequency of Generation	On-site Treatment	Waste Management Method / Offsite Treatment
Construction waste	Empty material containers	Intermittent	None	Return to vendor
Construction Waste	Used oil, hydraulic fluid, oily rags	Intermittent	None	Recycle wherever practicable, remove to off-site disposal location
Construction Waste	Steel, glass, plastic, wood/pallets, cardboard, paper	Intermittent	None	Recycle wherever practicable, otherwise dispose of at a class I landfill
Sanitary waste	Portable chemical toilets – sanitary waste	Periodically pumped to tanker truck by licensed contractors	None	Ship to sanitary wastewater treatment facility.

The anticipated quantities of waste produced during Project operation are summarized in Table 3-13. Universal wastes and unusable materials produced as a result of implementation of the Proposed Action would be handled, stored, and managed in accordance with Mississippi Universal Waste requirements.

Table 3-13: Summary of Operational Waste Streams and Management Methods

Waste Stream	Origin and Composition	Estimated Volume	Estimated Frequency of Generation	Waste Management Method	
				Onsite	Offsite
Used hydraulic fluid, oils, and grease-petroleum-related wastes	Tracker drives, hydraulic equipment	1,000 gallons/year	Intermittent	Accumulate for <90 days	Recycle
Oily rags, oil absorbent, and oil filters – petroleum-related wastes	Various	One 55-gallon drum/month	Intermittent	Accumulate for <90 days	Send offsite 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 practicable, waste would be recycled. Materials that could not 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, MS Solar 5 or its contractor would obtain a hazardous waste generator identification number from the State of Mississippi prior to generating any hazardous waste. Any spills related to the Project would be reported to MDEQ's Emergency Response Division. A sampling and cleanup report would be prepared for the Project Site and sent to MDEQ 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 Solar Facility environmental specialist.

3.11 Public and Occupational Health and Safety

This section describes an overview of existing public health and safety at the Project Site 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 the Occupational Safety and Health Administration (OSHA) standards.

3.11.1 Affected Environment

The Project Site is currently private property, with a predominant land use activity of agricultural and livestock. Public emergency services in the area include fire protection services, law enforcement services, urgent care clinics, and hospitals. Fire protection services are provided by the Columbus Fire Department and the Starkville Fire Department, located approximately 13 miles (18 minutes) and 13 miles (20 minutes), respectively, from the Project Site. Law enforcement services in the City of Starkville are provided by the Starkville Police Department. Lowndes County law enforcement services are provided by the Lowndes County Sheriff's Department in Columbus, approximately 15 miles (20 minutes) east of the Project Site. The State Urgent Care Center, located on South Montgomery Street, approximately 13 miles (18 minutes) west of the Project Site, is the closest urgent care center to the Project Site. The North Mississippi Medical Center is the closest hospital, located in West Point approximately 16 miles (19 minutes) north of the Project Site. The Mississippi Emergency Management Agency has the responsibility and authority to coordinate with state and local agencies in the event of a release of hazardous materials.

Glint and Glare

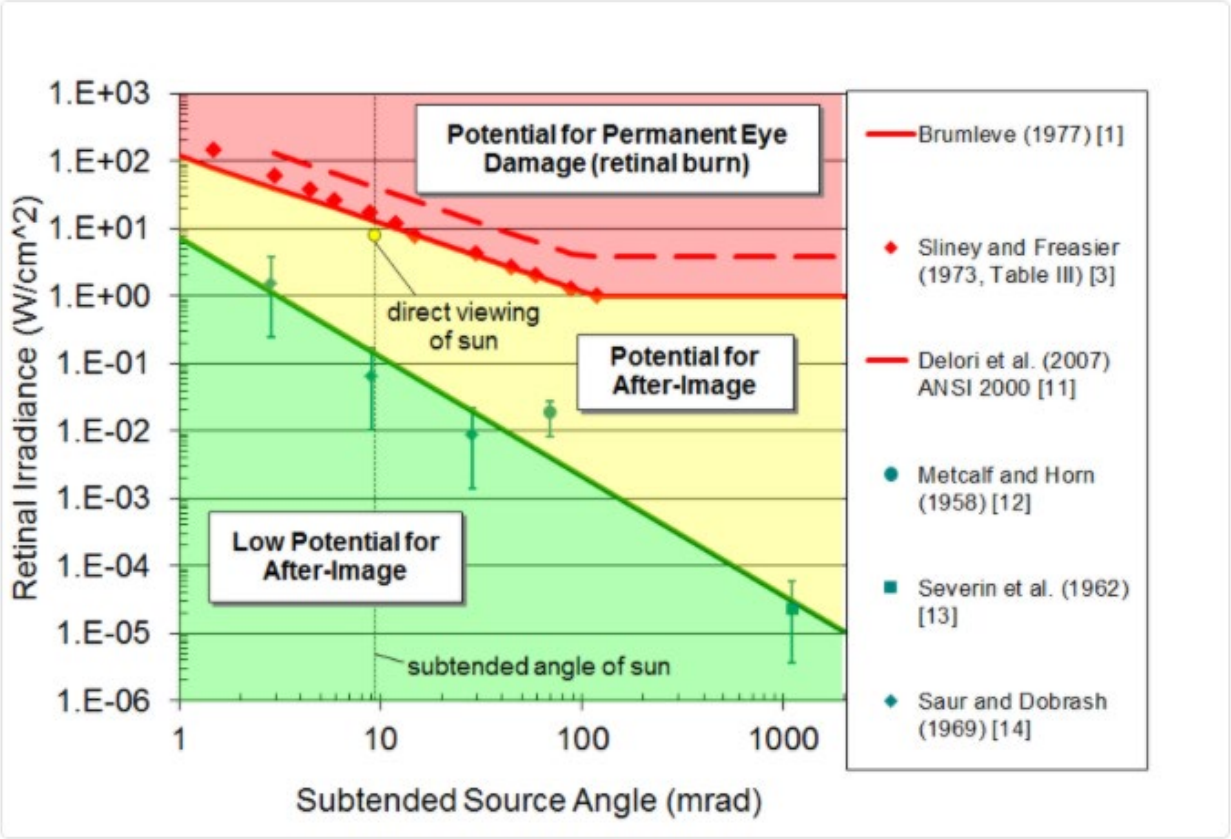
Glint is typically defined as a momentary flash of bright light, often caused by a reflection off a moving source. A typical example of glint is a momentary solar reflection from a moving car. Glare is defined as a continuous source of bright light. Glare is generally associated with stationary objects, which, due to the slow relative movement of the sun, reflect sunlight for a longer duration. The difference between glint and glare is duration. Industry-standard glare analysis tools evaluate the occurrence of glare on a minute-by-minute basis; accordingly, they generally refer to solar hazards as 'glare' (ForgeSolar, 2020).

Due to the proposed Project's proximity to the GTR Airport, a glare analysis was performed in accordance with Federal Aviation Administration (FAA) standards. In order to understand and model glare in accordance with FAA's standards, Sandia National Laboratories developed the Solar Glare Hazard Analysis Tool (SGHAT). To perform the glare analysis for this study, the SGHAT, as licensed to ForgeSolar, was utilized (ForgeSolar, 2020). The SGHAT allows the user to specify a site location, draw an outline of the proposed photovoltaic array, and specify observer locations. Once these points are given the properties of the arrays such as the tracking type, tilt, module surface type, and orientation can be specified as well for each array. Latitude, longitude, and elevation for each observation point and array vertex are tracked and used for sun position and vector calculations to determine glare for that observation point. Additional information regarding reflectance, environment, and ocular factors can be altered, however typical values were already provided.

The ocular impact of glare is visualized with the Solar Glare Ocular Hazard Plot (SGOHP). This chart displays the ocular impact as a function of glare subtended source angle and retinal irradiance. Each minute of glare is displayed on the chart as a small circle in its respective hazard zone. For convenience, a reference point is provided which illustrates the hazard from viewing

the sun without filtering, i.e. staring at the sun. Each plot includes predicted glare for one PV array and one receptor (ForgeSolar, 2020).

Figure 3-15: Solar Glare Ocular Hazard Plot



Source: ForgeSolar 2020

If glare is found, the SGHAT calculates the retinal irradiance and size/distance of the glare source, defines how many minutes of "green glare," "yellow glare," and "red glare" exist at each observation point, and produces the SGOHP. Other results from the SFHAT are a plot that specifies when glare would occur throughout the year and at what times with color codes indicating the potential ocular hazard.

The FAA established an interim policy in 2013 relating to glare from solar projects. The FAA determined that for pilots, no yellow or red glare is allowable on approach, green glare is acceptable on approach, and there are no restrictions for when regularly flying the plane. See below for exact wording on page 2 of Federal Register / Vol. 78, No. 205 / Wednesday, October 23, 2013 / Notices:

> "No potential for glare or "low potential for afterimage" along the final approach path for any existing landing threshold or future landing thresholds (including any planned interim phases of the landing thresholds) as shown on the current FAA-approved Airport Layout Plan (ALP). The final approach path is defined as two (2)

miles from fifty (50) feet above the landing threshold using a standard three (3) degree glidepath" (FAA, 2013).

3.11.2 Environmental Consequences

This section describes the potential impacts to public and occupational health and safety if the No Action or Proposed Action Alternatives is 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 and pastureland, and existing public health and safety issues would be expected to remain as they are at present.

3.11.2.2 Proposed Action

Based on typical hazards associated with construction, workers on the Project Site would have an increased safety risk during construction. Due to increased safety risks associated with construction, standards such as those developed by OSHA would be implemented to maintain health and safety on all construction sites. Health and safety plans in compliance with OSHA standards outline and implement BMPs for site safety management in efforts to minimize potential health and safety risks to workers. BMPs include initial site safety orientations for all personnel on-site; development of work procedures and programs for site specific activities; use of equipment safety measures, emergency stop-work procedures, lockout and tag out procedures, general site housekeeping, and personal protective equipment; safety inspections; and plans and procedures to identify and resolve potential safety hazards.

Fuel for construction vehicles may be stored on-site during construction. An SPCC plan would be developed and implemented to minimize the potential of a spill and would include detailed instructions for on-site personnel on how to contain and clean up any potential spills. Any hazardous materials stored within the Project Site during construction would be secure and not accessible to the general public. General public health and safety would not be at risk in the event of an accidental spill on site. Emergency response for any potential incidents at the Project Site would be provided by the local, regional, and state law enforcement, fire, and emergency responders, as described in the prior section.

A minor increase in potential public health and safety hazards could result from increased traffic on local roadways during construction of the Project. The few residential sites along roadways used by construction traffic to access the Project Site would experience increased commercial and industrial traffic during construction. Established traffic procedures and awareness of these residences would be implemented in the health and safety plans to minimize potential safety concerns associated with the temporary increase in traffic.

No public health or safety hazards would be anticipated from operation of the Solar Facility. Impacts to public health and safety associated with implementation of the Proposed Action would be temporary and minor.

Results of the Glare Analysis

Burns & McDonnell performed a Solar Glare Ocular Impact Analysis for the proposed Project to demonstrate that any glare created from the Project would not adversely impact surrounding properties, vehicles traveling on roadways near the Project Site, or pilots approaching the GTR airport. As part of the analysis, observation points were identified, SGHAT Analysis was performed, Line-of-Sight Analysis was performed, View Angle Analysis was performed, and a landscape review was performed.

The intent of the analysis was not to illustrate that all potential glare has been removed, but to identify the glare that could exist and determine if the glare would adversely impact surrounding properties, vehicles traveling along nearby roadways, or pilots approaching the GTR airport. It was found that the Project would not produce any glare that could cause permanent eye damage due to retinal burn. Potential glare at all observation points was categorized as having low potential for afterimage (designated as green glare) or having potential for afterimage (designated as yellow glare). Based on the SGHAT results, onsite visual observations, a view angle analysis, and reviews of the landscaping, it was found that no observation points have or would have potential glare to adversely impact surrounding properties near the Project Site.

3.12 Socioeconomics

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

3.12.1 Affected Environment

The proposed Solar Facility would be located within an unincorporated portion of Lowndes County, Mississippi. The Project Site is entirely in U.S. Census Tract (CT) 2808733.07. The total population for Lowndes County, as reported by the U.S. Census Bureau (USCB), was 59,779 in 2010 and an estimated 58,930 in 2018 (USCB, 2020a). Top employment industries for Lowndes County are education, healthcare and social services, manufacturing, and retail trade (USCB, 2020b). Lowndes County offers residents and visitors access to activities and attractions such as museums, campgrounds, biking trails, and a historic welcome center (Lowndes, 2020a).

Columbus is the county seat to Lowndes County and is the only major city in the county. Lowndes County is comprised of three towns, including Artesia, and several communities including Mayhew (Lowndes, 2020b). In 2018, Lowndes County had a labor force of approximately 26,472 with 24,037 employed and 2,435 unemployed civilians. The unemployment rate was an estimated 9.2 percent. By comparison, the unemployment rate for the state of Mississippi was an estimated 8.2%. The median household income in Lowndes County was $45,355. Sixteen percent of

households in Lowndes County made between $50,000 to $74,999 in income and benefits. By comparison, the median household income in Mississippi was $43,567 and 16.9 percent of households made between $50,000 to $74,999 in income and benefits (USCB, 2020b).

3.12.2 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.

3.12.2.1 No Action Alternative

Under the No Action Alternative, the proposed Solar Facility would not be constructed. Therefore, there would be no Project-related socioeconomic impacts within Lowndes County, including the beneficial impacts to local population, employment, and land value associated with the proposed Project.

3.12.2.2 Proposed Action

Under the Proposed Action, a new solar facility would be built at the Project Site. Minor adverse indirect impacts could occur on the agricultural economy of the region due to the loss of up to 2,328 acres of annual soybean and corn production. MS Solar 5 would be leasing the parcels for the Solar Facility which results in a higher lease payment to the landowner than agricultural production does. However, the loss of agricultural land would adversely impact the farmers working the land as well as other services that support agricultural production. These impacts would be minimal, and the economic benefit of the Project would outweigh the adverse impacts substantially.

Construction activities at the Project Site would take approximately 17 months to complete with a crew of approximately 300 to 450 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 Lowndes 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, most of the construction workforce would be sought locally or within the region, while a small portion of the construction workforce might come from out of the region. The direct impact on 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 impacts to employment and income levels in Lowndes County.

During operation of the Solar Facility, a full-time workforce of up to six people would be on site five days a week from 7 A.M. to 5 P.M. This workforce would manage and maintain the Solar Facility and conduct regular inspections. Grounds maintenance and some other operation and maintenance activities may be conducted by local contractors. Therefore, operation of the Solar Facility would have a small positive impact on employment and population in Lowndes County.

Overall, socioeconomic impacts for the operation of the proposed Solar Facility would be positive and long-term, but 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 Lowndes 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.

Additional details regarding the network upgrades, such as the exact locations of pull points or any potential pole replacements, are still being developed. Supplemental NEPA analysis would be conducted if additional socioeconomic resources are affected.

3.13 Environmental Justice

This section provides 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 disproportionate effects on these populations.

3.13.1 Affected Environment

Executive Order (E.O.) 12898 – Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations was issued in 1994 with the purpose of focusing federal attention on the environmental and human health effects of federal actions on minority and low-income populations. The E.O.'s goal is to achieve environmental protection for all communities. Per the E.O., federal agencies are directed to identify and address minority and low-income populations that are disproportionately affected by adverse human health and environmental effects to the greatest extent practicable and permitted by law (USEPA, 2020c). While not subject to this E.O., TVA routinely considers environmental justice in its NEPA review process.

Minority individuals are those who are members of the following demographics: American Indian or Alaskan Native, Asian or Pacific Islander, Black (not of Hispanic origin), or Hispanic. CEQ defines a "minority population" as a readily identifiable group of people residing in geographic proximity with a population comprised of 50 percent minority or greater or an identifiable group that has a meaningfully greater minority population than the adjacent geographic areas, or may also be a geographically dispersed set of individuals such as Native Americans or migrant workers

(Spies, Stine, Gravenmier, Long, & Reilly, 2018). In 2018, the minority population in Lowndes County was approximately 48.2%. By comparison, the minority population in the state of Mississippi was approximately 43.0% (USCB, 2020a). Based on the USEPA's Environmental Justice Screening and Mapping Tool (EJSCREEN), 36 percent of the population block (ID# 280870010001) that the Project is located in is considered minority population (USEPA, 2020a).

A low-income population is considered a community or group of individuals that live in geographic proximity to one another, or a set of individuals such as American Indians or migrant workers who meet the standards for low income and experience common conditions of environmental exposure or effect. Low-income populations located in an affected area should be identified using the annual statistical poverty thresholds provided by the USCB's annual current population reports (Series P-60) on poverty and income. Poverty is defined as the number of individuals or families with income below a defined threshold level (typically 50 percent) (Spies et al., 2018). Lowndes County's estimated poverty rate for 2018 was 23.1%. By comparison, the state of Mississippi had a poverty rate of approximately 19.7%. (USCB, 2020a). Based on the USEPA's EJSCREEN tool, 25 percent of the population block (ID# 280870010001) that the Project is located in is considered low income population (USEPA, 2020).

3.13.2 Environmental Consequences

This section describes the potential impacts on environmental justice populations should the Proposed Action or No Action Alternative be implemented. According to the 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).

3.13.2.1 No Action Alternative

Under the No Action Alternative, there would be no changes attributable to the proposed solar Project within Lowndes County that would create disproportionately high and adverse direct or indirect impacts on minority or low-income populations.

3.13.2.2 Proposed Action

Based on the USEPA's online screening tool, EJSCREEN, no minority or low-income populations have been identified in the potentially affected area. Additionally, based on the analysis of impacts for all resource areas presented in this EA, it was determined that there would be no significant adverse health impacts on members of the public or significant adverse environmental impacts on the physical environment (water, air, aquatic, and terrestrial resources) and socioeconomic conditions. As there are no identified environmental justice communities in the block group within which the proposed Project is located, there would be no disproportionately high or any adverse

direct or indirect impacts on minority or low-income populations due to human health or environmental effects resulting from the Proposed Action.

3.14 Transportation

This section describes roadways and other transportation infrastructure serving the Project Site and surrounding area, 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.

3.14.1 Affected Environment

The area considered for transportation is located within the Northwest portion of Lowndes County, Mississippi, with the cities of Artesia to the south and Mayhew to the north. Artesia West Point Road runs north-south along the west portion of the north site from Artesia to Mayhew. It appears to be a paved road that turns into a gravel road before it reaches the western boundary of the site. State Highway 182 is a paved road that runs east-west along the northern boundary of the Project Site. This road runs parallel with Highway 82 when it reaches the northeast portion of the Project Site. Artesia Road is a paved road that runs east-west through the center of the Project parcels.

Existing traffic volumes on roads in the Project Site were determined using the most recent 2018 Average Annual Daily Traffic (AADT) counts measured at existing Mississippi Department of Transportation (MDOT) stations (MDOT 2018). The 2018 AADT count for Site ID 44110, located on Artesia Road near the center of the Project Site, consisted of 950 vehicles. The 2018 AADT count for Site ID 44003, located on Highway 82, near the northern boundary of the Project Site consisted of 20,000 vehicles. The 2018 AADT count for Site ID 440340, located along Highway 182 approximately 2.1 miles west from the northwest boundary of the Project Site, consisted of 2,200 vehicles.

The closest rail line is operated by Kansas City Southern and runs parallel to Artesia Road. The closest regional airport is the GTR Airport, located approximately 1.5 miles east of the Project Site. The airport consists of one runway that is approximately 7,860 feet long.

3.14.2 Environmental Consequences

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

3.14.2.1 No Action Alternative

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

3.14.2.2 Proposed Action

The construction and operation of the Project would have no effect on operation of the airports in the region. The operation of the Project would not affect commercial air passenger traffic 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 300 to 450 workers would be present at the Project Site between sunrise and sunset, seven days a week. A majority of these workers would likely come from the local area or region. Other workers would come from outside the region, and many would likely stay at hotels in Starkville or Columbus. It is anticipated that workers would drive personal vehicles to the Project Site. 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 five vehicles per day during construction, as discussed in more detail below.

Traffic flow around the Project Site would be heaviest at the beginning of the workday, at lunch, and at the end of the workday. Deliveries and most workers would likely access the Project Site from the east and west along Artesia Road. Should substantial traffic congestion occur, MS Solar 5 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 20 flatbed semi-trailer trucks or other large vehicles visiting the Project Site each day during the 17-month 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 area surrounding the Project would be anticipated as a result of construction vehicle activity.

Several on-site access roads would be maintained within the Project Site. Access points during construction include Carleigh D. Ford Jr. Drive, Guerry Road at Artesia Road, an existing farm road on the south side of Artesia Road, approximately one mile east of Guerry Road, and Old Mayhew Road where it becomes a private drive. Permanent access to the Golden Triangle Substation and Artesia Switching Station would be off of Guerry Road and Carleigh D. Ford Jr. Drive.

The Solar Facility would be staffed by up to six 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.

The overall direct impacts on transportation resources associated with implementation of the Proposed Action would be moderate during construction due to the influx of workers traveling to the job site. These impacts would be temporary and minimized through appropriate mitigation. The Proposed Action would not result in any indirect impacts on transportation.

4.0 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 Site and the surrounding area.

4.1 Unavoidable Adverse Environmental Impacts

As described in Section 2 (Table 2-1), the Proposed Action could result in some unavoidable adverse environmental effects. 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 staggering work shifts and/or posting a flag person during the heavy commute periods. Temporary increases in health and safety risks would be minimized by implementation of the Project health and safety plan. Construction and operations of the Project would have minor, localized effects on soil erosion and sedimentation that would be minimized by placement of construction BMPs, early soil stabilization, and vegetation management measures. Selective maintenance of tree buffers and/or fence screening (existing vegetated fence rows) along the perimeter of the Solar Facility would minimize effects to visual resources, during both construction and operation. The Project would change land uses on the Project Site from primarily agricultural to solar uses, where these practices are not presently occurring.

Table 4-1 provides a list of impacts and proposed mitigation on environmental and human resources associated with the Project.

Table 4-1: Unavoidable Impacts and Proposed Mitigation for the Golden Triangle Solar and BESS Project

Impact Type	Location	Description	Mitigation Measure
Floodplain	Solar Facility	Temporary construction activities within floodplain. Permanent placement of solar arrays and buried collection lines within floodplain.	When rain events greater than ½ inch are predicted, remove large construction equipment from the floodplain during overnight parking, temporary stabilization measures where exposed soils are located, and maintaining any soil stockpiles outside the boundaries of the floodplain. Once in operation, the support structures would not impede floodplains or floodwaters. At its lowest angle, all panels within the floodplain would be greater than 1 foot above BFE.
Regulated Floodway	Solar Facility (northwest corner)	Avoidance Area	No permanent structures within the Catalpa Creek regulated floodway.

Impact Type	Location	Description	Mitigation Measure
			No spoil storage within the regulated floodway. No overnight parking within the regulated floodway.
			The area would be returned to its pre-construction condition
Streams	Throughout Project Site	Access roads will be used to cross streams.	Utilize existing bridges and culverts first. Where additional stream crossings are needed, keep crossings as narrow as possible and maintain BMPs to keep sediment out of streams.
Wetlands	Throughout Project Site	PFO and PSS wetlands occur within the Project Site	Avoid jurisdictional wetland and install silt fencing along the outside of the construction work area where wetlands are present.
Soils	Solar Facility areas occurring on agricultural land.	Permanent loss of prime farmland soils.	If fill or soil removal were needed, the topsoil would first be stripped and segregated. Once fill or other intense earthwork was complete, the topsoil would be reapplied to the surface.
Vegetation	Solar Facility	Removal of agricultural vegetation resulting in a large area of exposed soil.	Seeding Solar Facility with native and non-invasive low-growing grasses and flowers that would attract pollinators.
Vegetation	Solar Facility	Prevent unintentional encroachment in avoidance areas.	Install signage and/or temporary construction fencing around avoidance areas. Identify avoidance areas on site plans and constraints maps.
Wildlife	Solar Facility	Temporary displacement of wildlife during construction.	Enhance the existing Project Site by revegetating with native and/or naturalized non-invasive herbaceous plants maintained without the extensive use of harmful herbicides and pesticides.
Protected Species	Predominantly in wooded areas	Approximate 150 acres of potentially suitable NLEB habitat could be impacted.	Avoid clearing trees between June 1 – July 31 (NLEB pup season).
Visual	Solar Facility in vicinity of Artesia Town Limits	Residences on Ellis Street and Roberts Street	Avoid clearing mature trees that serve as natural buffers along the backyards of residences on Ellis Street and Roberts Street, where practicable.

Impact Type	Location	Description	Mitigation Measure
Noise	Solar Facility in vicinity of Artesia Town Limits.	Potential for increased noise levels to residents within 500 feet of inverters.	For residences that are within 500 feet of an inverter, a pre-construction sound study including an ambient survey would be conducted to quantify the existing ambient environment. After the project reaches commercial operation, MS Solar 5 would measure the sound levels at residential property lines and identify any equipment that generates a Ldn sound level that exceeds 55 dBA at the property line. If there are locations where noise levels exceed that threshold, MS Solar 5 would install sound buffers (walls, fences with screening, or vegetation) in order to minimize the noise levels from operating equipment
Transportation	Solar Facility	Delivery trucks and most workers would likely access the Project Site from Artesia Road at Guerry Road. Potential for congestion, especially if trains are progressing easterly down the parallel railroad track.	Should substantial traffic congestion occur, MS Solar 5, or its contractor, would implement staggered work shifts 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.

With the installation and routine maintenance of appropriate BMPs, no unavoidable adverse effects to groundwater are expected. Long-term habitat loss would occur due to alteration of land use on 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 federal or state-listed species. Tree clearing in areas identified as potential summer roosting habitat for federally-protected northern long-eared bats would be avoided between June 1 through July 31, during pup season. Consultation with the USFWS under Section 7 of the ESA is under way.

4.2 Relationship of Short-Term Uses and Long-Term Productivity

Short-term uses are generally those that occur on a year-to-year basis, such as wildlife foraging, 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. For this EA, long-term impacts to site productivity would be those that last beyond the life of the Project. The Proposed Action would affect short-term uses of the Project Site by converting it from agricultural and undeveloped land to solar power generation. However, the effects on long-term productivity would be minimal because the 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 if resources would be consumed, committed, or lost as a result of the Project. The commitment of a resource would be considered irretrievable if 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 would involve irreversible commitment of fuel and resource labor required for the construction, maintenance, and operation of the Solar Facility. 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 the Solar Facility is decommissioned. Most of the Solar Facility components could also be recycled after the facility is decommissioned.

4.4 Cumulative Impacts

A cumulative impact, as defined by the Council on Environmental Quality (CEQ), is described as an impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such other actions. Cumulative impacts can result from individually minor but aggregately significant actions taking place over a period of time (40 CFR 1508.7). A cumulative impacts analysis acknowledges the effects of the proposed alternatives on the various environmental resources. The analysis also recognizes the effects of other past, present, and reasonably foreseeable future actions, and describes the cumulative or additive effects that may result. While some cumulative effects, however minimal, can be established for virtually any resource or condition, the effects described in this EA are considered to be the most applicable and representative of those associated with the Proposed Action. Cumulative impacts associated with the Proposed Action are described below in the following resource sections. This section addresses the cumulative impacts of the Project when combined with any reasonably foreseeable future action in the vicinity.

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

- Local and regional news sources.
- City of Starkville and City of Columbus website records, including planning commission meetings, city meeting minutes, and public notices; and
- Mississippi DOT 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 potential effects to land use, geological resources and farmlands, water resources, biological resources, visual resources, noise, air quality, public health and safety, and transportation.

Based on a review of the above listed resources, and through discussions with local officials, seven projects were identified in Lowndes County that have or will have at least partial federal funding. These seven projects are part of the MSDOT's 5-Year Plan and will receive federal funding and additional funding from either the State or County (MDOT 2020). The projects include sign replacements, 3 rumble strip installation projects along existing highways, and three resurfacing projects along existing highways. The closest of these, a resurfacing project, is directly north of the Project Site on US Hwy 82. It is scheduled to be complete in 2020. The resurfacing along Hwy 82 will occur along the existing roadway about one year before the Golden Triangle Project would begin construction. Given the nature of the impacts of the proposed Golden Triangle Project, the Proposed Action is unlikely to contribute towards adverse cumulative effects to the same resources affected by these MSDOT projects.

The Infinity Megasite is a pending 1,144-acre industrial development that is adjacent to the proposed Golden Triangle Solar Project to the east, on the north side of Artesia Road. The proposed Megasite is a TVA and Golden Triangle Development LINK (LINK) project. A megasite is a land development that is intended to promote business clusters. The organizations (in this case TVA and LINK) develop the land through permitting and infrastructure, so that it is "shovel ready" for big business. The development would result in the permanent conversion of approximately 250 acres of forested land and 894 acres of predominantly agricultural land to commercial/industrial land use. There would be minor impacts on smaller streams and riparian wetlands which would be mitigated through the purchase of wetland and stream mitigation credits or some other approved mitigation development process. The Golden Triangle Solar Project combined with the Infinity Megasite Project would result in an adverse cumulative impact on agricultural land. However, as previously discussed in section 3 of this EA, once the Project is decommissioned, the Project Site could be returned to its pre-construction/pre-operation use without significant effort. Therefore, the Project's contribution towards a long-term cumulative impact on agricultural land, when combined with impacts from the Infinity Megasite, would be minor. If the Golden Triangle Project and the Megasite were constructed at the same time, a minor adverse cumulative impact on air (from construction equipment emissions and fugitive dusts) and noise (from construction equipment operation) would be expected. This would be a short-term cumulative impact that would be most obvious during normal daytime working hours, and it would subside once construction was complete.

4.4.2 State and Local Projects

The Project Site is within both the Town of Artesia and unincorporated Lowndes County, but is largely rural and agricultural. Aside from the previously discussed County and State projects with associated federal funding, there are no known past, present, or reasonably foreseeable future projects near the proposed Project Site that, when combined with impacts from the Proposed Action, would result in adverse cumulative impact on the same resources.

5.0 LIST OF PREPARERS

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: Golden Triangle Solar Project Environmental Assessment Team

Name/Education	Experience	Project Role
TVA		
Ashley Pilakowski B.S. Environmental Management	9 years in environmental planning and policy and NEPA compliance.	NEPA Compliance and Project Management
Adam Dattilo M.S. Forestry B.S. Natural Resource Conservation	16 years in ecological restoration and plant ecology, 9 years in botany	Vegetation
Elizabeth B. Hamrick M.S. Wildlife and Fisheries Science, B.A. Biology	18 years conducting field biology, 13 years technical writing, 9 years NEPA and ESA compliance	Terrestrial Ecology, Threatened and Endangered Species
A. Chevales Williams B.S., Environmental Engineering	14 years of experience in water quality monitoring and compliance; 13 years of NEPA planning and environmental services	Surface Water
Craig Phillips B.S. and M.S. Wildland and Fisheries Science	12 years sampling and hydrologic determination for streams and wet weather conveyances, 11 years in environmental reviews	Aquatics
Carrie Williamson, P.E., CFM M.S., Civil Engineering; B.S., Civil Engineering	6 years Floodplains, 3 years River Forecasting, 2 years NEPA Specialist, 7 years compliance monitoring.	Floodplains
Michaelyn Harle Ph.D., Anthropology; M.A. Anthropology; B.A. Anthropology	19 years in cultural resource management	Cultural and Historic Resources, Section 106 Compliance
Burns & McDonnell		
Jesse Brown B.A. Biology M.S. Biology	10 years in NEPA documentation, environmental permitting, protected species evaluations, and wetland delineations.	Document Preparation, Field Survey Coordination, Field Survey Biologist, Habitat Assessment, Deputy PM
John Fulmer B.A. Anthropology M.A. Anthropology	More than 20 years of experience surveying, documenting, and report writing for cultural and archeological resources	Senior Technical Reviewer

Name/Education	Experience	Project Role
Olivia Haney B.S. Chemistry Certificate: Natural Resources and Environmental Studies	2 years of environmental permitting, wetland and waterbody surveys, and GIS support	Mapping and impact calculations
Ellen Pennington B.S. Ecological Restoration B.S. Renewable Natural Res.	3 years of environmental permitting and NEPA documentation.	Document Preparation
Claire Randall M.S. Biology	3 years of environmental permitting and NEPA documentation.	Document Preparation
Doug Shaver M.S. Environmental & Urban Geosciences Registered Professional Archeologist	12 years' experience in cultural, archeological, and Native American Studies. Graduate Certification in Native American Studies. Graduate Certification in Historic Preservation	Principal Investigator and lead author for cultural resources.
Robyn Susemihl B.S. Zoology, Chemistry minor	16 years in NEPA documentation, project management, protected species analysis, and stream and wetland delineations	Project Manager, Document Preparation, Sr. Technical Review
David Thomas B.S. Biology M.S. Zoology	25+ years preparing NEPA documents, protected species evaluations and surveys, and field assessments	Senior Technical Review
Rebecca Torres B.S. Animal Biology M.S. Wildlife & Fisheries Science	3 years of environmental permitting and NEPA documentation with focus on aquatic ecology	Document Preparation

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