

Document Type: EA-Administrative Record
Index Field: Final Environmental
Assessment
Project Name: WR Graceland Solar
Project Number: 2021-17

**WR GRACELAND SOLAR PROJECT
FINAL ENVIRONMENTAL ASSESSMENT**
Shelby County, Tennessee

Prepared by:
TENNESSEE VALLEY AUTHORITY
Knoxville, Tennessee

Submitted by:
WR GRACELAND SOLAR, LLC

Prepared by:
STANTEC CONSULTING SERVICES, INC.

August 2022

To request further information, contact:
Elizabeth Smith
NEPA Compliance
Tennessee Valley Authority
400 West Summit Hill Drive, WT 11B
Knoxville, Tennessee 37902-1499
Phone: 865-632-3053
E-mail: esmith14@tva.gov

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Symbols, Acronyms, and Abbreviations

Abbreviations	Definitions
°F	Degrees Fahrenheit
µg/m ³	Microgram per Meter Cubed
AADT	Average Annual Daily Traffic
AC	Alternating Current
AMSL	Above Mean Sea Level
APE	Area of Potential Effect
ARAP	Aquatic Resource Alteration Permit
AQS	Air Quality Statistics
BCC	Birds of Conservation Concern
BGEPA	Bald and Golden Eagle Protection Act
BMPs	Best Management Practices
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CGP	Construction General Permit
CH ₄	Methane
CIA	Critical Issues Assessment
CN	Canadian National Railway Company
CO	Carbon Monoxide
CO ₂	Carbon Dioxide
CPESC	Certified Professional in Erosion and Sediment Control
CT	Census Tract
CWA	Clean Water Act
dB	Decibel
dBA	A-Weighted Decibel
dbh	Diameter at Breast Height
DC	Direct current
DSWM	Division of Solid Waste Management (TDEC)
EA	Environmental Assessment
ECD	Erosion Control Device
EDR	Environmental Data Resources, Inc.
EIS	Environmental Impact Statement
EJ	Environmental Justice
EO	Executive Order
EPH	Ephemeral Stream
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FIRM	Flood Insurance Rate Map
FIS	Flood Insurance Study
FPPA	Farmland Protection Policy Act
FR	Federal Regulation
GHG	Green House Gas
GIS	Geographic Information System
HUC	Hydrologic Unit Code
INT	Intermittent Stream
IPaC	Information for Planning and Consultation
IRP	Integrated Resource Plan
JD	Jurisdictional Determination
kV	Kilovolt
MIDB	Millington Industrial Development Board

MLGW	Memphis Light, Gas and Water Division
MPT	Main Power Transformer
MRLC	Multi-Resolution Land Characteristics Consortium
MVT	Mid-Voltage Transformer
MW	Megawatt
NAAQS	National Ambient Air Quality Standards
NAVD	North American Vertical Datum
NEPA	National Environmental Policy Act
NHD	National Hydrography Dataset
NHPA	National Historic Preservation Act
N ₂ O	Nitrous Oxide
NO ₂	Nitrogen Dioxide
NO _y	Oxides of Nitrogen
NPDES	National Pollution Discharge Elimination System
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NSA	Naval Support Activity
NWI	National Wetlands Inventory
NWP	Nationwide Permit
O ₃	Ozone
OHWM	Ordinary High-Water Mark
OSHA	Occupational Safety and Health Administration
Pb	Lead
PEM	Palustrine Emergent Wetlands
PER	Perennial Stream
PFO	Palustrine Forested wetlands
PGA	Peak Ground Acceleration
PM	Particulate Matter
PM ₁₀	Particulate Matter Whose Particles Are Less Than or Equal to 10 Micrometers
PM _{2.5}	Particulate Matter Whose Particles Are Less Than or Equal to 2.5 Micrometers
POI	Point of Interconnection
PPA	Power Purchase Agreement
PPB	Parts Per Billion
PPM	Parts Per Million
PSS	Palustrine Scrub-Shrub
PUB	Palustrine Unconsolidated Bottom
PV	Photovoltaic
QHP	Qualified Hydrologic Professional
RCRA	Resource Conservation and Recovery Act
SO ₂	Sulfur Dioxide
SPCC	Spill Prevention, Control and Countermeasure
Sp	Species
Spp	Species (plural)
SR	State Route
SSURGO	Soil Survey Geographic
SWPPP	Stormwater Pollution Prevention Plan
TDEC	Tennessee Department of Environment and Conservation
TDOA	Tennessee Division of Archaeology
TDOT	Tennessee Department of Transportation
THC	Tennessee Historical Commission
TN-IPC	Tennessee Invasive Plant Council
TN-SHPO	Tennessee State Historical Preservation Officer
TVA	Tennessee Valley Authority
TWRA	Tennessee Wildlife Resource Agency
UDC	Unified Development Code
U.S.C.	United States Code

U.S.	United States
USACE	United States Army Corps of Engineers
USDA	United States Department of Agriculture
USDOI	United States Department of Interior
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
UST	Underground Storage Tank
VOCs	Volatile Organic Compounds
WQC	Water Quality Certification
WWC	Wet Weather Conveyance

CHAPTER 1 – INTRODUCTION

The Tennessee Valley Authority (TVA) has entered into a conditional power purchase agreement (PPA) with WR Graceland Solar, LLC (WR Graceland Solar) to purchase the power and environmental attributes generated by the proposed WR Graceland Solar facility (solar facility) in Shelby County, southeast of the City of Millington, Tennessee (TN). Under the terms of the PPA between TVA and WR Graceland Solar, dated March 2, 2021, TVA would purchase the energy and environmental attributes generated by the proposed 150 megawatt (MW) alternating current (AC) solar facility for an initial term of 20 years, subject to the satisfactory completion of all applicable environmental reviews. The property owners within the solar facility's project boundary would enter into long-term lease agreements with WR Graceland Solar.

The proposed solar facility would occupy approximately 849.67 acres of a 1,482-acre Project boundary and would generate up to 150-MW of AC generating capacity output for transmission to the electrical network. The proposed facility would consist of multiple parallel rows of photovoltaic (PV) panels on single-axis tracking structures, along with direct current (DC) and AC inverters and transformers. The panels are bi-facial modules that produce solar power from both sides of the panel. Whereas traditional opaque-back sheeted panels are mono-facial, bi-facial modules expose both the front and backside of the solar cells. Bi-facial solar modules offer many advantages over traditional solar panels such as being more durable due to the UV resistant panels on both sides, and they produce more energy from the power generated from both sides of the bi-facial module. These modules would require the same surface preparations as mono-facial modules, which includes basic mowing during the lifetime of the project.

In addition, the proposed solar facility would include a substation on the north side and an adjacent 161-kilovolt (kV) switching station on the south side. The proposed interconnection would connect to the Memphis Light, Gas and Water (MLGW) 161-kV transmission line to the north via a 250-foot-long generation tie-in line (gen-tie) [Point of Interconnection (POI)]. Together, the construction and operation of the proposed solar facility's solar array layout, substation, switching station, electrical interconnection's 250-foot gen-tie line, proposed project roadways, and construction access points are herein referred to as the "Project" and the "Proposed Action."

The Project is bound by Paul W. Barrett Parkway/State Route 385 (SR-385) to the north, Austin Peay Highway (SR-14) to the east, Raleigh Millington Road to the west, and the Loosahatchie River Drainage Canal to the south (**Figure 1-1**). An existing MLGW transmission line runs along the south side of Paul W. Barrett Parkway (SR-385) through the Project.

According to the National Environmental Policy Act (NEPA) of 1969, federal agencies are required to evaluate the potential environmental impacts of their Proposed Actions. Therefore, this Final EA assesses the impact of TVA's action of entering into the PPA with WR Graceland Solar, including any associated impacts of the construction and operation of the proposed solar facility.

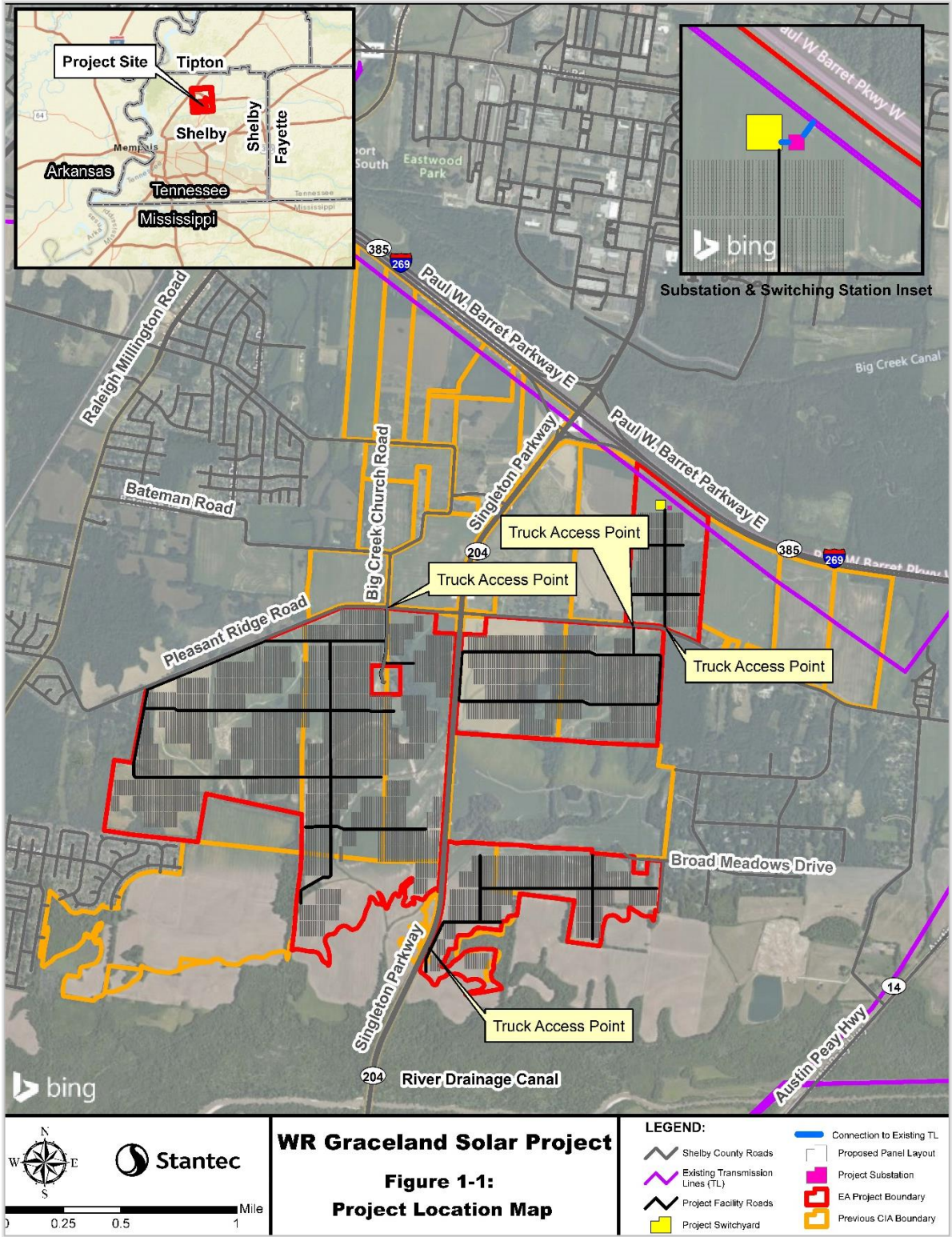


Figure 1-1. WR Graceland Solar Project Location Map

1.1 Purpose and Need for Action

TVA is a corporate agency of the United States and the largest public power provider in the country. Through their partnership with 153 local power companies, TVA supplies energy across 80,000 square miles for 10 million people, 750,000 businesses, and 56 large industrial customers, including military installations and the U.S. Department of Energy facilities at Oak Ridge, TN. Their service area includes parts of seven southeastern states called the Tennessee Valley. Since 1933, TVA's mission has been to serve the people of the region to make life better. 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 while reducing environmental impacts. The 2019 IRP anticipates growth of solar in all scenarios analyzed, with most scenarios anticipating 5,000-8,000 MW and one anticipating up to 14,000 MW (TVA 2019a).

Customer demand for cleaner energy prompted TVA to release a Request for Proposal (RFP) for renewable energy resources (2020 TVA Renewable RFP) to solar developers. The PPAs 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 the Environmental Assessment

This Environmental Assessment (EA) was prepared consistent with 2020 Council on Environmental Quality's (CEQ) regulations for implementing NEPA at 40 CFR 1500-1508 (85 Federal Register [FR] 43304-43376, July 16, 2020). TVA's 2020 NEPA regulations at 18 CFR 1318 were also applied (85 FR 17434, Mar. 27, 2020). Further, the EA is consistent with CEQ's recently finalized rule (87 FR 23453, April 20, 2022) amending certain provisions of its 2020 regulations.

The scope of this Final EA focuses on the Proposed Action Alternative's direct and indirect impacts related to the construction and operation of the solar facility and electrical interconnection (actions taken by MLGW to connect the solar facility and switching station to the MLGW transmission system). In addition, this Final EA describes the existing environment at the Project (**Figure 1-1**). The Final EA also identifies anticipated cumulative impacts that could occur in combination with other ongoing and reasonably foreseeable future proposed activities within the surrounding area of the Project.

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 Action and/or associated facilities, and

2. The Proposed Action 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 Final EA:

- Land Use (includes Natural Areas and Recreation);
- Water Resources;
- Biological Resources;
- Air Quality and Greenhouse Gas Emissions;
- Public and Occupational Health and Safety;
- Noise;
- Geology, Soils, and Prime Farmland;
- Visual Resources;
- Cultural Resources;
- Solid and Hazardous Waste Management;
- Socioeconomics and Environmental Justice; and
- Transportation.

This Final EA consists of 6 main sections, which discuss Project alternatives, resource areas potentially impacted by the Proposed Action, and the analyses of these impacts. Additionally, this Final EA includes 7 appendices, which contain additional studies and details on specific technical analyses and supporting information. The structure of the Final EA is as follows:

- Section 1.0: Introduces the Project and describes the purpose and need for the Proposed Action and the decision to be made, associated environmental reviews and regulatory agency consultations, required environmental permits or licenses, and the Final EA overview.
- Section 2.0: Describes the Proposed Action and No Action alternatives, compares alternatives and discusses the Preferred Alternative.
- Section 3.0: Discusses the affected environment and the potential direct and indirect impacts on these resource areas. Includes applicable proposed mitigation measures where appropriate.
- Section 4.0: Discusses the potential cumulative impacts the Proposed Action could contribute when combined with other ongoing and reasonably foreseeable proposed activities within the surrounding or overlapping area of the Project.
- Section 5.0: Contains a List of Preparers of this Final EA.
- Section 6.0: Contains a List of Literature Cited in the development of this Final EA.

1.3 Background

A WR Graceland Solar Project Desktop Critical Issues Analysis (CIA) Report was completed on July 2, 2020 (Stantec 2020b). At the time of the CIA, the project boundary was larger than the current boundary for this EA, and included 31 parcels, approximately 3,223 acres in size, known as the CIA Project Area in this section (**Figure 1-1** consists of the CIA Project Area boundary). The following potential constraints were identified for the CIA Project Area through the CIA desktop survey.

Based on the preliminary desktop reviews, there were approximately 70.1 acres of National Wetlands Inventory (NWI) wetlands and other surface waters and 55,125.9 linear feet of National Hydrology Dataset (NHD) stream channels and 5.9 acres of NHD waterbodies identified on the CIA Project Area (Stantec 2020b). In addition, there were approximately 210.8 acres (6.5 percent) of hydric soils and 719.6 (22.3 percent) acres of partially hydric soils, which indicated the presence of wetlands.

Based upon the review of databases and land cover assessments, it was determined there would be little to no habitat present for 7 of the 11 threatened and endangered species whose ranges were included in the CIA Project Area as listed in the U.S. Fish and Wildlife Service (USFWS) Information for Planning and Consultation (IPaC) system and the Tennessee Department of Environment and Conservation (TDEC) Rare Species by County List (Stantec 2020b). The areas with the highest potential for protected species to occur were localized to areas where water is present, either intermittently or perennially, or where forested areas occur. Few natural habitats, determined through a review of land cover and aerial imagery, occurred in the CIA Project Area; however, it is possible that the small, forested patches present within the CIA Project Area would have provided habitat for two federally protected mammal species: the Indiana bat (*Myotis sodalis*) and the northern long-eared bat (*Myotis septentrionalis*); and two state-protected flowering plants: ovate catchfly (*Silene ovata*) and copper iris (*Iris fulva*).

Portions of the CIA Project Area are located within the U.S. Federal Emergency Management Agency (FEMA) Zone AE 100-year floodplain of the Big Creek Drainage Canal in the northern portion of the CIA Project Area and the Loosahatchie Drainage Canal in the southern part of the CIA Project Area (Stantec 2020b).

The potential for archaeological deposits was anticipated to be low to moderate within the CIA Project Area (Stantec 2020b). However, the CIA Project Area was identified to be within proximity to significant water sources such as the Loosahatchie River to the south, which indicated a high potential for cultural resources in the area.

Based on the Federal Aviation Administration (FAA) Notice of Criteria Tool results, the CIA Project Area exceeded Notice Criteria due to its proximity to a navigation facility, which may have impacted the assurance of navigation signal reception (Stantec 2020b).

1.4 Necessary Permits or Licenses

Permits, licenses, and consultations that may be required for the Proposed Action are summarized in **Table 1-1** below.

Table 1-1. Potentially Required Approvals/Coordination

Permit/Approval	Lead Agency	Associated Documentation
Federal		
Section 404 of the Clean Water Act (CWA)	U.S. Army Corps of Engineers (USACE)	Nationwide Permit (NWP) 14 is anticipated due to proposed stream crossings to accommodate the proposed interior project site proposed roadways. Pre-construction notification is required if greater than 1/10-acre of stream and/or wetland will be impacted. NWPs 51 and 57 are not anticipated to be required. WR Graceland Solar is currently exploring the location of the construction and permanent project site roadways; however, all potential areas have been included in the environmental review.
Section 7 Endangered Species Act Bald and Golden Eagle Protection Act Migratory Bird Treaty Act (MBTA)	USFWS	Informal consultation report presenting results of the biological survey and protected species habitat results, and bat survey results.
Farmland Protection Policy Act (FPPA)	U.S. Department of Agriculture (USDA) Natural Resource Conservation Service (NRCS)	FPPA does not apply to this Project since no federal funds are being spent on the construction of this Project. WR Graceland Solar is providing the funding for this solar facility.
State		
Aquatic Resource Alteration Permit (ARAP) / 401 Water Quality Certification (WQC)	TDEC	General permit anticipated due to proposed stream crossings to accommodate the proposed interior project site roadways.
National Pollutant Discharge and Elimination System (NPDES) – Construction General Permit (CGP)	TDEC	Requires development of a Stormwater Pollution Prevention Plan (SWPPP) and implementation of best management practices
Section 106 – Cultural/Historic	Tennessee Historical Preservation Office (TN-SHPO) and Tennessee Division of Archaeology (TDOA)	Consultation with the TN-SHPO and TDOA presenting results of archeological and architectural surveys

Permit/Approval	Lead Agency	Associated Documentation
Burn Permit	TDOA, Division of Forestry, and TDEC	WR Graceland Solar will coordinate with the Shelby County Health Department prior to any burning measures. In addition, a burn permit would be obtained through the TDOA, Division of Forestry, and TDEC would be notified. Any woody debris and other vegetation would likely be piled and burned, chipped, or taken off-site.
County/Municipal		
Land Development Plan Review	Shelby County Office of Planning and Development	Adhere to Shelby County Unified Development Code and interconnection standards established by MLGW.
Zoning Changes/Easements	Shelby County Planning and Development	Solar farms are a permitted use for current zoning

1.5 Public and Agency Involvement

TVA issued a copy of this Draft EA for a 30-day public and agency review and comment period. TVA notified the public of the availability of the Draft EA via an advertisement through the following media outlets:

- Tri-State Defender
- The Commercial Appeal (two separate people were emailed)
- The South Reporter
- The Gazette
- The Daily Memphian
- Inside Memphis Business
- WMC-TV
- WHBQ-TV
- High Grounds News
- La Prensa Latina
- Memphis Business Journal
- The News Leader
- Daily Corinthian
- WREG-TV

The Draft EA public comment period began on April 15, 2022 and ended on May 10, 2022. TVA also notified appropriate local, state, and federal agencies and federally recognized tribes of the availability of the Draft EA. A total of two comments were received from the general public and interested agencies: specifically, a local organization, Protect our Aquifer, and a state agency, TDEC. TVA reviewed comments received on the Draft EA and addressed substantive comments, as appropriate, as part of this Final EA. TVA also consulted on the effects of the Project with appropriate regulatory agencies and tribes. Copies of all public involvement materials, including notices, advertisements, comments received and a comment response table, is provided in **Appendix B**.

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CHAPTER 2 - ALTERNATIVES

This section explains the rationale for identifying the alternatives to be evaluated, describes each alternative, compares alternatives concerning their potential environmental impacts, and identifies the Preferred Alternative. This Final EA evaluates two alternatives: The No Action Alternative and the Proposed Action Alternative.

2.1 No Action Alternative

Under the No Action Alternative, TVA would not purchase the power generated by the Proposed Action under the 20-year PPA with WR Graceland Solar, and TVA would not be involved with the Project. Existing conditions would remain unchanged (i.e., the property would remain as agricultural land), and agricultural activities would likely continue. There would be no Project-related changes to land use and natural resources in the immediate future; however, the Project Site could be affected by other future developments. TVA would continue to rely on other sources of generation described in the 2019 IRP (TVA 2019a) to ensure an adequate energy supply and meet its goals for increased renewable and low greenhouse gas (GHG)-emitting generation. Therefore, a No Action Alternative would not meet the Project purpose and need and would impede TVA's progress towards meeting its long-range program goals. The No Action Alternative provides a baseline of conditions against which the impacts of the Proposed Action Alternative can be measured.

2.2 Proposed Action Alternative

Under the Proposed Action Alternative, WR Graceland Solar would construct and operate a 150-MW AC single-axis tracking PV solar facility in Shelby County, Tennessee, and TVA would purchase 100 percent of the renewable energy from the facility under the terms of the 20-year PPA with WR Graceland Solar. The solar facility would generate up to 150MW AC output for transmission to the electrical network and would occupy approximately 849.67 acres (including nine parcels) of land in Shelby County, Tennessee. 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 MLGW electrical transmission line via the proposed Project's 250-foot gen-tie line to the proposed switching station adjacent to the proposed substation. See Error! Reference source not found. for a diagram of the PV solar system and connection to energy flow.

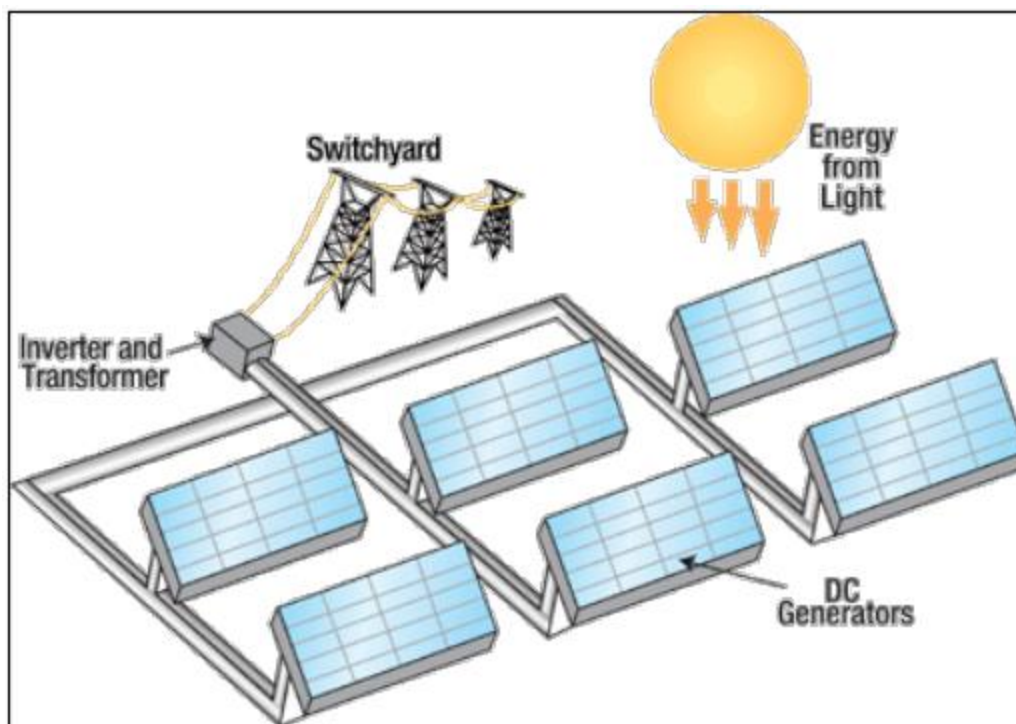


Figure 2-1: Solar System Energy Flow Diagram

Solar Facility

The proposed solar facility would convert sunlight into DC electrical energy within the PV panels (modules). 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, which causes them to absorb energy as photons of light and then release electrons. An electric current is produced and used as electricity when the free electrons are captured.

The Project, or solar facility, would be composed of anti-reflective coated smooth glass PV bi-facial modules mounted together on a racking system in arrays. Groups of panels would be connected electrically in series to form “strings” of panels. The maximum string size is chosen to ensure that the string voltage does not exceed the maximum inverter input voltage at the Project’s high design temperature. Approximately 6.5 feet by 4 feet wide and to 7.92 feet high, the panels would be in individual blocks consisting of the PV arrays and an inverter station. The bi-facial modules would be attached to single-axis trackers that allow the panels to pivot along a typical 180-degree axis to follow the sun’s path from east to west across the sky. These are bi-facial modules that produce solar power from both sides of the panel by exposing both the front and backside of the solar cells. 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 to be transmitted to the electrical grid. Each inverter would have a colocated mid-voltage transformer (MVT) which boosts the AC voltage to account for the standard electrical loss between the central inverters and the onsite substation.

From the MVTs, a network of underground AC power cables would connect to a single main power transformer (MPT) located within the 161-kV Project substation. Cable lines would be installed in trenches approximately 3 to 4 feet deep and 12 inches wide.

The Project substation, approximately one to two acres in size, would have switching, protection, control equipment, and the main power transformer. In addition, the substation would have circuit breakers that would be used to interrupt any short circuits or overload currents that may occur on the network. Other devices such as capacitors, voltage regulators, and reactors would also be located at the substation. Other Project components would include security equipment, facility roads, communications equipment, meteorological stations, an operations and maintenance building, and supporting Project water well. At this time, the solar facility layout is conceptual. See **Figure 1-1** for the conceptual design of the solar array layout, substation, switching station, gen-tie, permanent facility roads, and construction/trucking access points.

Gravel-based project roads would be located throughout the Project and provide access to each module and inverter block for maintenance and repairs. These permanent facility roads would be approximately 20 feet wide and would include either culverts or low water crossings for stream crossings. In addition, WR Graceland would only utilize the identified construction access points from arterial roadways for major truck traffic during construction. During construction, heavy truck traffic will avoid minor arterial or residential roadways to enter the Project.

Electrical Interconnection

Under the Proposed Action, WR Graceland Solar would construct a permanent Project interconnection switchyard (switching station), approximately three to four acres in size. The switching station would have three 161-kV breakers and would be installed in a ring bus configuration along with associated metering, communication, and protective equipment. The Project gen-tie line would connect at one of the 161-kV breakers in the ring bus to the existing transmission line owned by MLGW. This switching station would be adjacent to the Project substation, resulting in a 250-foot-long gen-tie line. The proposed location of these facilities would be on the northeast side of the overall solar facility's Project area (see **Figure 1-1**).

WR Graceland Solar would clear vegetation on the substation and switching station-site, remove the topsoil, and grade the property per applicable standards and requirements. The area surrounding the substation and switching station would be filled with gravel. Tree limb trimming may be needed; however, the site is predominantly cropland, therefore, has been disturbed at one time. If necessary, any woody debris and other vegetation would likely be piled and burned, chipped, or taken off-site. Before any burning, WR Graceland Solar will coordinate with the Shelby County Health Department prior to any burning measures. In addition, a burn permit would be obtained through the TDOA, Division of Forestry, and TDEC would be notified. However, burning would be avoided during air quality alerts as part of best management practices. No upgrades are anticipated for the existing transmission line, and if they do occur the MLGW would be responsible for this work.

Construction

Construction activities would take approximately 12 months to complete using a crew that ranges from 250 to 300 workers. Work would generally occur six days a week and average ten-hour workdays, generally during daylight hours. Additional hours after dark could be necessary to make up for schedule deficiencies or to complete critical construction activities. Night-time construction, if determined necessary, would require temporary lighting in some areas within the Project. 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 the airport and nearby households.

Site preparation is generally required before construction of the solar facility and assembly of the solar arrays. Site preparation typically includes surveying and staking, removing tall vegetation/trimming tree branches, clearing, and grubbing, grading, installing security fencing around components near one another and not separated by public roads, erosion prevention and sediment control best management practices (BMPs), and preparation of construction laydown areas. Solar array assembly and construction include driving steel piles into the ground for the tracker support structures, installing solar panels, and installing electrical connections and testing/verification.

Construction materials would be transported by truck to the Project, where materials would be staged, assembled, and moved into place. There would be multiple locations around the solar facility designated 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 areas would be staged within the locations proposed for the PV arrays. The laydown areas would be located outside of designated floodplain areas and remain onsite for the duration of construction. Temporary construction laydown areas for materials, equipment, and parking would be required within the Project. Temporary construction trailers for material storage and office space would be parked onsite at the designated location. Following completion of construction activities, trailers, unused materials, and construction debris would be removed from the Project. WR Graceland Solar would utilize one mobile double-wide trailer onsite as the operations and maintenance building or may construct a small freestanding building in accordance with applicable county regulations/requirements. Please note this mobile trailer/structure would be located within the Project boundary and avoid environmentally sensitive resources described in this Final EA. At this time, the conceptual layout does not include the locations of these elements; however, it would remain in the Project boundary and avoid environmentally sensitive areas identified in this Final EA.

WR Graceland Solar would use the existing landscape, such as slope, drainages, and roadways where feasible, minimizing grading work where possible. Grading activities that could not be avoided would be performed using mobile earthmoving equipment, resulting in a consistent slope on land. Native topsoil would be preserved to the greatest possible extent during grading, stockpiled on-site and preserved for redistribution over the disturbed area after grading is complete. After construction, disturbed areas within the fenced solar facility area would be reseeded with a mix of native grasses and/or noninvasive vegetation that may include pollinator attracting plant species. Erosion control BMPs would be regularly inspected and maintained until the disturbed areas' vegetation has been established and meets permit restoration requirements. Water would be used for dust control and/or soil compaction during construction on an as-needed basis.

To manage stormwater during construction, onsite temporary sedimentation basins, sediment traps, or diversion berms could be necessary within the solar facility. If needed, a diversion berm would be constructed along portions of the Project perimeter to contain stormwater onsite. Any necessary sedimentation basins and/or traps would be compliant with TDEC and local floodplain administration requirements. If necessary, sedimentation basins and traps would be constructed by the impoundment of natural depressions or excavating the existing soil. The floor and embankments of the basins would be allowed to naturally reestablish 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 placing a silt fence around each ground disturbance area within the Project. These stormwater BMPs would minimize the potential for sediment to enter

jurisdictional streams and wetlands and minimize sediment migration offsite during construction. BMPs would remain in place for the duration of the Project and would be removed once the Project is stabilized and revegetation efforts meet permit requirements.

Construction activities would be sequenced to minimize exposure of bare soil in disturbed areas. In addition, silt fencing and other appropriate controls, such as temporary cover, may 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 CGP authorization (see **Section 1.4**), the site-specific SWPPP would be finalized with the final grading and civil design and would address all construction-related activities prior to construction commencement.

The design of the tracker support structures for the solar facility could vary depending on the final PV technology and vendor selected. The trackers would likely 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 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 two to 12 inches wide. The trenches would be backfilled with native soil and appropriately compacted. This utility work has not undergone design; however, it would remain within the Project boundary or existing utility easement and would avoid environmentally sensitive areas.

The MPT would be supported on a concrete foundation and the aboveground transmission cable would be constructed to connect the MPT through a circuit breaker. This would be within the Project and construction of the MPT would avoid environmentally sensitive areas.

After the equipment is electrically connected, electrical service would be tested, motors would be checked, and control logic verified. As the solar arrays are installed, the facility's balance would continue to be constructed and installed, and instrumentation would be installed. Following the testing of all the individual systems, integrated project testing would occur.

Operations

Operation of the solar facility would require up to three on-site, full-time staff to manage the facility and conduct regular inspections. This staff would likely use the mobile construction building. However, if a permanent office building with a septic system is needed, WR Graceland Solar would acquire the appropriate permits and use standard BMPs.

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 would be maintained to control growth and prevent overshadowing or shading of the PV panels. Depending on the growth rate, trimming, and mowing would likely be performed several times per year to maintain an appropriate ground cover height of no more than approximately 12 to 18 inches. During the 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 vegetation. The application of herbicides should be by persons certified and licensed by the TN Department of Agriculture and must meet their general permits and regulations. Such requirements would avoid herbicide application prior to predicted rainfall events or high winds to minimize any possibility of runoff or drift.

The solar facility would be monitored remotely from WR Graceland Solar 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 non-working 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 move from west to east in a similar slow-motion to minimize row-to-row shading. The modules would track to a flat or angled stow position at sunset. Otherwise, the PV modules would simply collect solar energy and transmit it to the TVA power grid. Operations staff would be reporting to the site each workday in their personal vehicles. Except for fence repair, vegetation control, periodic array inspection, repairs, and maintenance, the solar facility would have relatively little human activity during operation except for operations staff arrivals and departures. No significant physical disturbances would occur during the operation. Permanent lighting is anticipated as a potential onsite need during facility operations, independent of the potential operations and maintenance structure. Permanent lighting would be downward-facing and timer- and/or motion-activated to minimize impacts to surrounding areas.

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 comply with appropriate BMPs to minimize soil erosion and/or stream and wetland sedimentation. Module wash water would be trucked in from a municipal source.

Decommissioning and Reclamation

Following the expiration of the 20-year PPA with TVA, WR Graceland Solar would reassess the site operation and determine whether to cease operation or attempt to enter into a new PPA or another arrangement. If TVA or another entity were willing to enter into such an agreement, the facility would continue operating. If no commercial arrangement is possible, the facility would be decommissioned and dismantled, and the site restored. However, the switching station would remain as a permanent structure. In general, the majority of decommissioned equipment and materials would be recycled. However, materials that cannot be recycled would be disposed of at approved facilities in accordance with federal, state, and local laws and regulations. WR Graceland Solar would develop a decommissioning plan to document recycling and disposal of materials per applicable local, state, and federal laws and regulations.

2.3 Alternatives Eliminated from Further Consideration

WR Graceland Solar evaluated additional site locations for development within TVA's service area to meet the purpose and need of the Project and support TVA's efforts to expand its renewable energy portfolio. Specifically, they evaluated land parcels that met several criteria, including suitably sized vacant parcels where the current landowner is interested in entering into a long-term lease or sale. In determining the further suitability for the development of a site within TVA's service area, multiple criteria were considered for screening potential locations and ultimately eliminating those sites that did not provide the needed attributes. This process of review and refinement eventually led to the consideration of the current Project. Project screening criteria included:

- Availability of solar resources based upon landscape position and features
- Generally flat landscape with minimal slope, with preference given to disturbed contiguous land with no on-site infrastructure or existing tall infrastructure in the immediate vicinity
- At least 1,500 acres of contiguous parcels with the appropriate zoning regulations and located away from densely populated areas
- Land having sound geology for construction suitability, lacking floodplains or large forested or wetland areas
- Ability to avoid and/or minimize impacts to known sensitive biological, visual, and cultural resources
- Condition of the existing electrical transmission system and the capability of supporting the development of a large-scale solar power facility

WR Graceland Solar assessed additional parcels to the north, east, and southwest for inclusion in the Project during the initial siting review. However, parcels to the north are located within the City Millington A-Agricultural and B-2 General Commercial districts, which do not allow for solar farms under current zoning (Shelby County Zoning Mapper 2022); therefore, they were not further considered. In addition, landowners of the parcels to the east and southwest were not interested in entering into a lease agreement.

Furthermore, three areas within the Project were eliminated from further consideration by the existing landowners. The first area includes two five-acre parcels at the intersection of Pleasant Ridge Road and Singleton Parkway, otherwise known as parcels D0137 00085 and D0126 00084, which were excluded by the landowner(s) for potential alternative use or development in the future. The second ten-acre area including parcels D0137 00112 and D0137 00085 were excluded by the existing landowner because the home on the property maintains sentimental value. The third area resides on the south side of the Project, where portions of parcels under the lease have been excluded to avoid large areas of wetlands and areas within the 100-year floodplain.

2.4 Comparison of Alternatives

This Final EA evaluates the potential environmental effects resulting from implementing the No Action Alternative or the Proposed Action Alternative at the WR Graceland Solar Project in Shelby County, Tennessee. The Final EA impact analysis is based on the Project's current and

potential future conditions and the surrounding region. A comparison of the direct and indirect impacts of the alternatives is provided in **Table 2-1**.

Table 2-1. Summary and Comparison of Alternatives by Resource Area

Resource Area	Impacts From No Action Alternative	Impacts From Proposed Action Alternative
Land Use	No impacts or indirect impacts are anticipated.	<p>Minor direct impacts with land-use changing from agricultural/residential to industrial light land use. Since the Project is consistent with development trends, no indirect impacts are anticipated.</p> <p>Geology and Paleontology: Minor direct and indirect impacts are anticipated due to soil and shallow subsurface disturbances.</p> <p>Geologic Hazards: Minor direct and indirect impacts due to possible seismic activity.</p>
Geology, Soils, and Prime Farmlands	No impacts or indirect impacts are anticipated.	<p>Soils: Minor direct impacts due to soil disturbance during construction. This would be temporary for most of the site, except for the permanent switching station. No indirect impacts. Beneficial impacts could occur from discontinued agricultural use.</p> <p>Prime Farmland: Temporary direct impacts on Prime Farmland throughout the duration of the Project. Beneficial impacts could occur from discontinued agricultural use.</p> <p>Groundwater: Direct and indirect impacts are not anticipated. Beneficial impacts could occur from discontinued agricultural use.</p>
Water Resources	No impacts or indirect impacts are anticipated.	<p>100-Year Floodplains: No direct or indirect impacts are anticipated due to avoidance of construction within 100-year floodplains.</p> <p>Streams and Wet Weather Conveyances (WWCs): No direct impacts are anticipated to jurisdictional wetlands and streams due to the</p>

Resource Area	Impacts From No Action Alternative	Impacts From Proposed Action Alternative
Biological Resources	No impacts or indirect impacts are anticipated.	<p>buffers implemented. However, there would be minor direct impacts to those streams where proposed permanent facility roads would cross. Additionally, there would be direct impacts to non-jurisdictional streams and ponds.</p>
		<p>Wetlands: No direct or indirect impacts are anticipated due to the 50-foot buffer from construction.</p> <p>Vegetation: Minor direct impacts are anticipated due to construction (such as tree clearing) on already disturbed land. No indirect impacts are anticipated because the spread of exotic or invasive species is not anticipated.</p> <p>Wildlife: Temporary direct impacts could occur to immobile wildlife and migratory birds of conservation concern during construction. Temporary minor indirect impacts are anticipated due to some tree removal within the Project. Benefits would occur from revegetation of native grasses and/or noninvasive seed mix and the halt of agricultural practices.</p> <p>Threatened, Endangered, and Rare Species: Direct impacts are anticipated to the sweetbay magnolia and the state-listed tricolored bat. Minor indirect impacts are anticipated for potentially suitable habitats. Consultation with USFWS under Section 7 of the Endangered Species Act (ESA) is underway.</p>
Visual Resources	No impacts or indirect impacts are anticipated.	<p>Visual: Temporary direct impacts are anticipated due to construction, and with the land being relatively flat, views could be altered; however, Shelby County has buffer requirements.</p> <p>Glare Hazard: No impacts or indirect impacts are anticipated.</p>

Resource Area	Impacts From No Action Alternative	Impacts From Proposed Action Alternative
Noise	No impacts or indirect impacts are anticipated.	Due to construction and the proximity of noise-sensitive land uses, the Project would have temporary impacts. Air Quality: Temporary minor direct impacts are anticipated due to localized dust and fumes from construction. No adverse indirect impacts are anticipated.
Air Quality and Greenhouse Gas Emissions	No impacts or indirect impacts are anticipated.	Greenhouse Gas Emissions: Temporary direct impacts during construction. Benefits include reducing the need to generate power that would otherwise be generated by the combustion of fossil fuels and its associated GHG emissions. No adverse indirect impacts are anticipated.
Cultural Resources	No impacts or indirect impacts are anticipated.	Historic/Architectural: No direct or indirect impacts are anticipated. Archaeology: No direct or indirect impacts are anticipated.
Solid and Hazardous Waste Management	No impacts or indirect impacts are anticipated.	No direct or indirect impacts are anticipated.
Public and Occupational Health and Safety	No impacts or indirect impacts are anticipated.	Temporary and minor direct and indirect impacts.
Socioeconomics	No impacts or indirect impacts are anticipated.	No disproportionately high or adverse direct or indirect impacts are anticipated. Benefits to the economy could result from the construction and operation of the Proposed Action.
Environmental Justice	No impacts or indirect impacts are anticipated.	Potential for direct impacts to any on-site minority/Environmental Justice populations. No disproportionately high or adverse impacts are anticipated to minority or low-income populations.
Transportation	No impacts or indirect impacts are anticipated.	Temporary minor direct and indirect impacts to traffic flow.

2.5 Identification Best Practices and Mitigation Measures

WR Graceland Solar would implement the following minimization and mitigation measures concerning resources potentially affected by the proposed Project.

- Comply with the terms of the SWPPP prepared as part of the NPDES CGP process and implement other routine BMPs, such as non-mechanical tree removal within surface waters, placement of silt fences and sediment traps along buffer edges, and proper vehicle maintenance to reduce the potential for adverse impacts to groundwater.
- Comply with the conditions of the CWA Section 401 WQC/TDEC ARAP and CWA Section 404 permit [33 (United States Code) U.S.C. § 1251 et seq.], as applicable.
- WR Graceland Solar has agreed to implement 50-foot buffers to all jurisdictional wetlands and 50-foot buffers to the jurisdictional streams.
- Should traffic flow be a problem for local developments, WR Graceland Solar would consider staggering work shifts to space out traffic flow to and from the Project. The use of such mitigation measures would minimize potential adverse impacts to traffic and transportation to less than significant levels.
- WR Graceland Solar would design and implement the fencing and screening for the Project in adherence with the relevant requirements of The Memphis and Shelby County UDC (Unified Development Code) (Memphis and Shelby County 2021). Panel arrays would meet all setback requirements of the respective district in which they are located. Panel arrays should be set back no less than 110 percent of the height of the array.
- If Project plans change, WR Graceland would re-consult with state and federal resource agencies to determine if further action is required to comply with regulations.
- The individual solar panels and any flood-damageable equipment would be elevated to at least elevation 270.3 feet, which would be 1 foot above the 100-year flood elevation.
- Any additional night-time lighting would be downward-facing and timer and/or motion-activated to minimize impacts to avoid visual and wildlife impacts.
- After construction, disturbed areas within the fenced solar facility area would be reseeded with a mix of native grasses and/or non-invasive vegetation that may include pollinator attracting plant species.
- Upon decommissioning and deconstruction of the Project at the end of its useful life, any demolition debris would be deposited off-site, outside 100-year floodways.

2.6 The Preferred Alternative

The TVA-preferred alternative for fulfilling the purpose and need for this Project is the Proposed Action: construction and operation of a single-axis PV solar power facility of up to 150-MW AC, on an approximately 1,482-acre site in Shelby County, TN, with the energy generated being sold to TVA under a 20-year PPA. The preferred alternative (Proposed Action) would produce renewable energy for TVA and its customers with only minor direct and indirect environmental impacts, help meet TVA's renewable energy goals, and help TVA meet future energy demands on the TVA system.

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CHAPTER 3 – AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

Chapter 3 discusses the existing conditions and the Proposed Action's environmental, social, and economic consequences. In addition to the existing conditions, potential environmental effects associated with the No-Action Alternative and the Proposed Action Alternative are identified and discussed throughout the chapter.

3.1 Land Use

This section provides an overview of existing land use at and surrounding the Project and potential impacts to land use associated with the No Action and Proposed Action alternatives.

Affected Environment

Land use is defined as the way people use and develop land, including undeveloped, agricultural, residential, and institutional uses. Many municipalities and counties develop zoning ordinances and planning documents to control development direction and keep similar land uses together. According to the Shelby County Zoning Mapper (2022), the Project consists of all or portions of nine parcels (ID: D012600086, D013700112, D013700085, D012600084, D012700028, D012700264, D013700111, D013700120, and D013700014) located within the jurisdiction of Shelby County Division of Planning and Development. The parcels within the Project are zoned CA - Conservation Agriculture but show existing land use of both residential and vacant or agriculture (see **Figure 3-1**).

The Project is currently and has been historically used for agricultural purposes (i.e., cultivation of row crops and pasture/hay) since at least the 1930s (Stantec 2020a). Based on observations during on-site surveys, row crops include soybeans, corn, and cotton (Stantec 2021b and 2022a). Based on the Multi-Resolution Land Characteristics Consortium (MRLC) National Land Cover Database, the Project consists primarily of cultivated crops and pasture/hay with small proportions of woodland forests (MLRC 2019). According to the Tennessee Wildlife Resource Agency (TWRA) Wildlife Management Agency Maps and the National Conservation Easement Database, there are no managed conservation lands or easements within the Project (TWRA 2020; MLRC 2019). The topography of the Project is generally flat with a gradual slope to the south towards the Loosahatchie River (Stantec 2020a). Topography ranges from approximately 310 feet above mean sea level (AMSL) to 230 feet AMSL (USGS 2014). Abrupt contour breaks and high-gradient slopes are restricted to narrow, eroded drainage ways and streams (Stantec 2020a).

As for infrastructure on the Proposed Action, one abandoned single-family residence on the northern side of the Project (southwest of the intersection of Pleasant Ridge Road and Singleton Parkway) is excluded from the Project boundary. However, the entire parcel is identified as residential existing land use. Two small storage buildings associated with farming operations are in the same vicinity as the single-family residence. Additional Project features include water and sediment control basins. These basins are typically constructed by building a berm across site contours with a culvert extending through the berm with an inlet at the bottom of the basin. These basins are designed to intercept and store sediment-laden runoff in upland areas and slowly release water via the culvert. MLGW overhead

distribution and transmission lines run along Paul W. Barrett Parkway (SR-385) and across a northern portion of the Project.

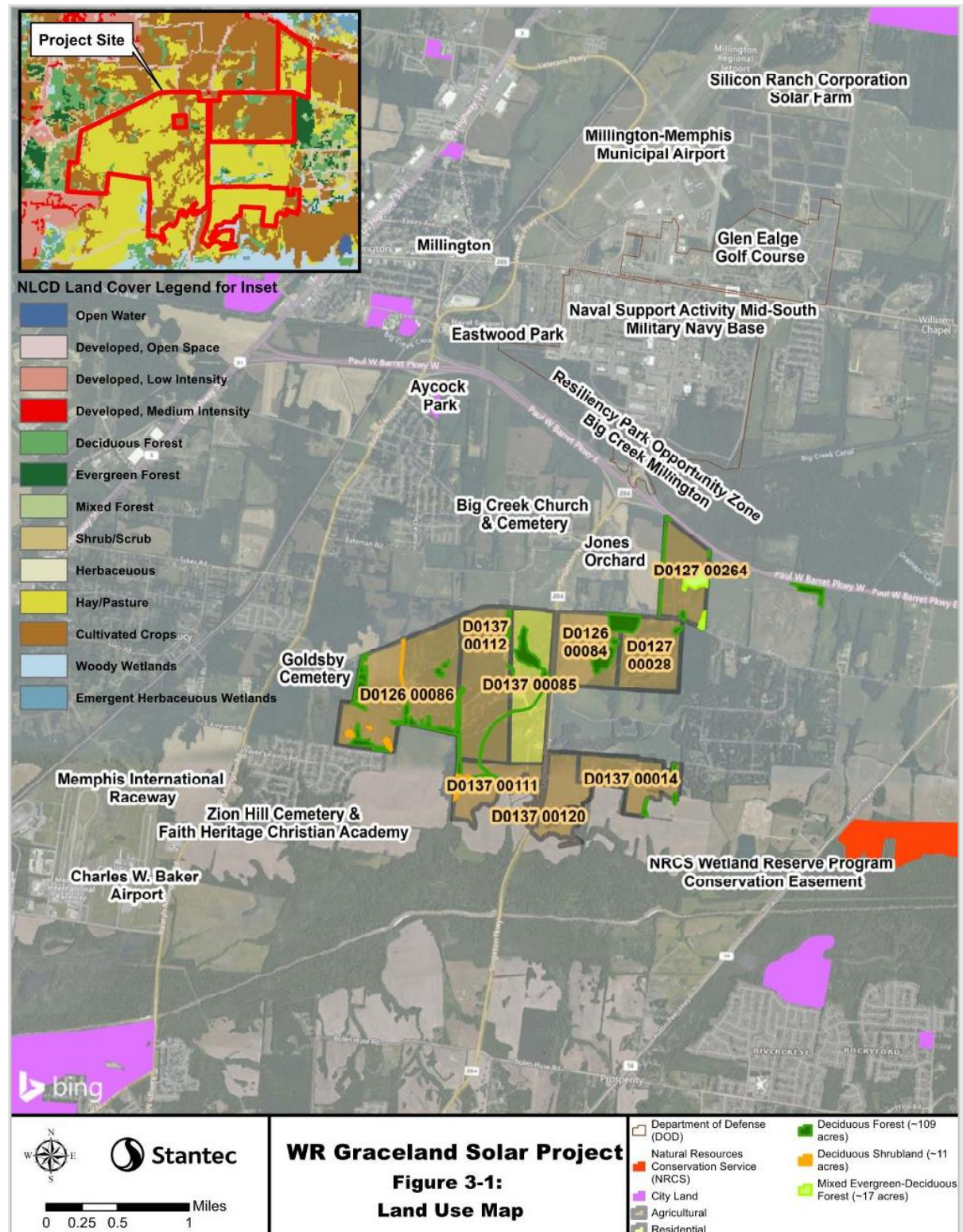


Figure 3-1. WR Graceland Solar Project Land Use

The Project is bounded by Paul W. Barrett Parkway (SR-385), Pleasant Ridge Road, single-family residential properties, and agricultural lands (primarily cultivated crops such as corn, cotton, and soybeans and the Jones Orchard) to the north; agricultural row crop, forested and single-family residential properties to the east; agricultural row crop and a large, forested flood zone area along the Loosahatchie River to the south; and agricultural row crop and single-family residential properties to the west. Singleton Parkway transects the Project north to south. In addition, a 1,200-acre Resiliency Park is planned within the Millington and Memphis Area Opportunity Zone in the forested flood zone of Big Creek to the north of Paul Baxter Parkway (MIDB 2022). The purpose of the opportunity zone is to provide a tax incentive for community developments to drive long-term capital to rural and low-to-moderate income urban communities. The Resiliency Park was planned and designed to protect the U.S. Naval Command Center and low-to-moderate income communities from chronic flooding.

The Project lies approximately 2.5 miles southeast of the City of Millington core; however, sections of the Project are adjacent to the city limits (Shelby County Zoning Mapper 2022). Furthermore, several institutional, agricultural/conservation, recreational, and industrial light land uses are located within a three-mile radius of the Proposed Action (GoogleEarth Imagery, 2022) (See **Figure 3-1**):

- Millington-Memphis Municipal Airport - approximately 2.4 miles north and just west of Veterans Parkway
- Naval Support Activity Mid-South Military Navy Base - approximately 0.4 miles north and directly north of SR-385
- Big Creek Baptist Church and Cemetery – just south of Big Creek Church Road
- Goldsby Cemetery – just west, off Pleasant Ridge Road
- Mt. Zion Church and Faith Heritage Christian Academy - approximately 1.5 miles southwest
- Memphis International Raceway - approximately 1.5 miles southwest
- Charles W. Baker Airport - approximately 1.5 miles southwest
- The Glen Eagle Golf Course - on the naval property, approximately three miles north
- Silicon Ranch Corporation Solar Farm - between the Millington Airport and U.S. of America property, approximately three miles to the north
- NRCS 150-acre Wetland Reserve Program conservation easement – approximately 2.9 miles to the southeast
- Eastwood and Aycock Park are approximately 1.5 miles to the northwest
- Rivercrest Natural Area Land Trust is approximately 1.1 miles to the southwest

Environmental Consequence

3.1.1 No Action Alternative

Under the No Action Alternative, the Proposed Action would not be constructed; therefore, no Project-related impacts to current land use would result. Because there would not be an approved solar facility, the site would remain in its existing condition. Ongoing agricultural land-use practices could persist, and residential development could occur in the foreseeable future.

3.1.2 Proposed Action Alternative

Under the Proposed Action Alternative, the construction and operation of the Proposed Action would change the existing land use from agriculture (approximately 87 percent) and residential (approximately 13 percent) to light industrial. However, the Project is zoned CA, compatible with a utility-scale solar facility land use. According to the City of Millington Master Plan, for the next 20 years, the Project parcels are proposed to stay zoned for agricultural use (City of Millington 2018).

Construction of the Proposed Action would have temporary direct impacts and minor indirect impacts, including some that may be beneficial, such as pausing agricultural practices, which may improve soil stability. In addition, portions of the Project outside the 849.67-acre Proposed Action's built environment would remain undeveloped (approximately 42.67 percent) with no farming activities or activities other than general maintenance as required for operation. This unbuilt area in the Project would likely involve some forested habitat and open agricultural fields observed during Project surveys (Stantec 2021 a, 2022a).

Following the expiration of the 20-year PPA, if the facility were to be decommissioned, the majority of the land could be returned to agriculture, or residential land uses as allowed by the local zoning regulations. Therefore, there would be a minor direct impact on the Project's land use since the land would return to its original use.

The surrounding area is mixed with agricultural, residential, recreational, industrial, and institutional uses, likely to continue over the next 20 years based on the City of Millington Master Plan (City of Millington 2018). The proposed Project's development is consistent with the development trends and land use of the surrounding areas to the west, north, and east causing little change or growth. Therefore, the Project would result in adverse indirect impacts to adjacent lands. In addition, the Proposed Action may result in more economic development and environmentally friendly development in the surrounding areas.

3.2 Geology, Soils, and Prime Farmland

This section describes the existing geological resources within the Project and the potential impacts to geological resources that would be anticipated under the No Action and Proposed Action alternatives. Components of geological resources that are analyzed include geology, paleontology, geological hazards, soils, and prime farmland.

Affected Environment

3.2.1 Geology

The Project is located in the Gulf Coastal Plain physiographic province and specifically in the Upper East Gulf Coastal Plain section (Griffith et al. 1998). The province's topography ranges from gently rolling hills near the Appalachian Mountains to flat sandy coastal regions near the Gulf of Mexico. West Tennessee is primarily flat. The Proposed Action is located in

the Mississippi Valley Loess Plains Ecoregion (USGS 2022). The Mississippi Valley Loess Plains include Cenozoic sand, silt, clay, gravel, and loess and the Mississippi alluvial plains have the same makeup, but loess is not present.

3.2.2 Paleontology

Quaternary and Tertiary sedimentary rocks cover a large portion of western Tennessee and the region surrounding Memphis. A band along the western edge of Tennessee exposes Quaternary sediments, and several mastodon skeletons have been found within these formations in other parts of Tennessee. A warm tropical sea periodically flooded Western Tennessee during the Tertiary Period, and fossils of marine organisms can be found in these sediments. Shallow marine environments covered much of the state during this time. Thick layers of limy sediment built up on the seafloor. Stromatolites, trilobites, and other marine organisms thrived in warm waters (Paleontology Portal 2022). It is unlikely that significant fossil remains are present within the Project as the area is not typically associated with paleontological finds.

3.2.3 Geological Hazards

Geological hazard conditions may potentially include landslides, volcanoes, earthquakes/seismic activity, and subsidence/sinkholes. However, the conditions necessary for the majority of these types of hazards do not exist on the Proposed Action. The predominant geologic unit in Shelby County is Quaternary-aged loess, but with the relatively flat and stable ground, landslides are not a potential risk (USGS 2020). However, soil erosion is common throughout Shelby County due to the soil composition. No volcanoes are present within several hundred miles of the Project. According to a USGS desktop survey, the Project appears to lack the carbonate bedrock geology and karst landforms associated with sinkholes (USGS 2020). The historic Reelfoot scarp and New Madrid seismic fault zone is west of Tennessee, approximately 17 miles west (USGS 2020).

Seismic activity at the Project could cause surface faulting, ground motion, ground deformation, and conditions including liquefaction and subsidence. The Modified Mercalli Scale is used within the United States to measure the intensity of an earthquake (USGS 2018). The scale arbitrarily quantifies the effects of an earthquake based on the observed effects on people and the natural and built environment. Mercalli intensities are measured on a scale of I through XII, with I denoting the weakest intensity and XII denoting the most vigorous intensity. The lower degrees of the scale generally deal with how people feel the earthquake. The higher numbers of the scale are based on observed structural damage. This value is translated into a peak ground acceleration (PGA) value to measure the maximum force experienced. The PGA is the maximum acceleration experienced by a building or object at ground level during an earthquake on a uniform, firm-rock site conditions. The PGA is measured in terms of percent of “g,” the acceleration due to gravity. The USGS Earthquake Hazards Program publishes seismic hazard map data layers that display the PGA with a ten percent (1 in 500-year event) probability of exceedance in 50 years (USGS 2018). For example, the potential ground motion for the Proposed Action is 0.65 g for a PGA with a two percent probability of exceedance within 50 years. See **Figure 3-2** below.

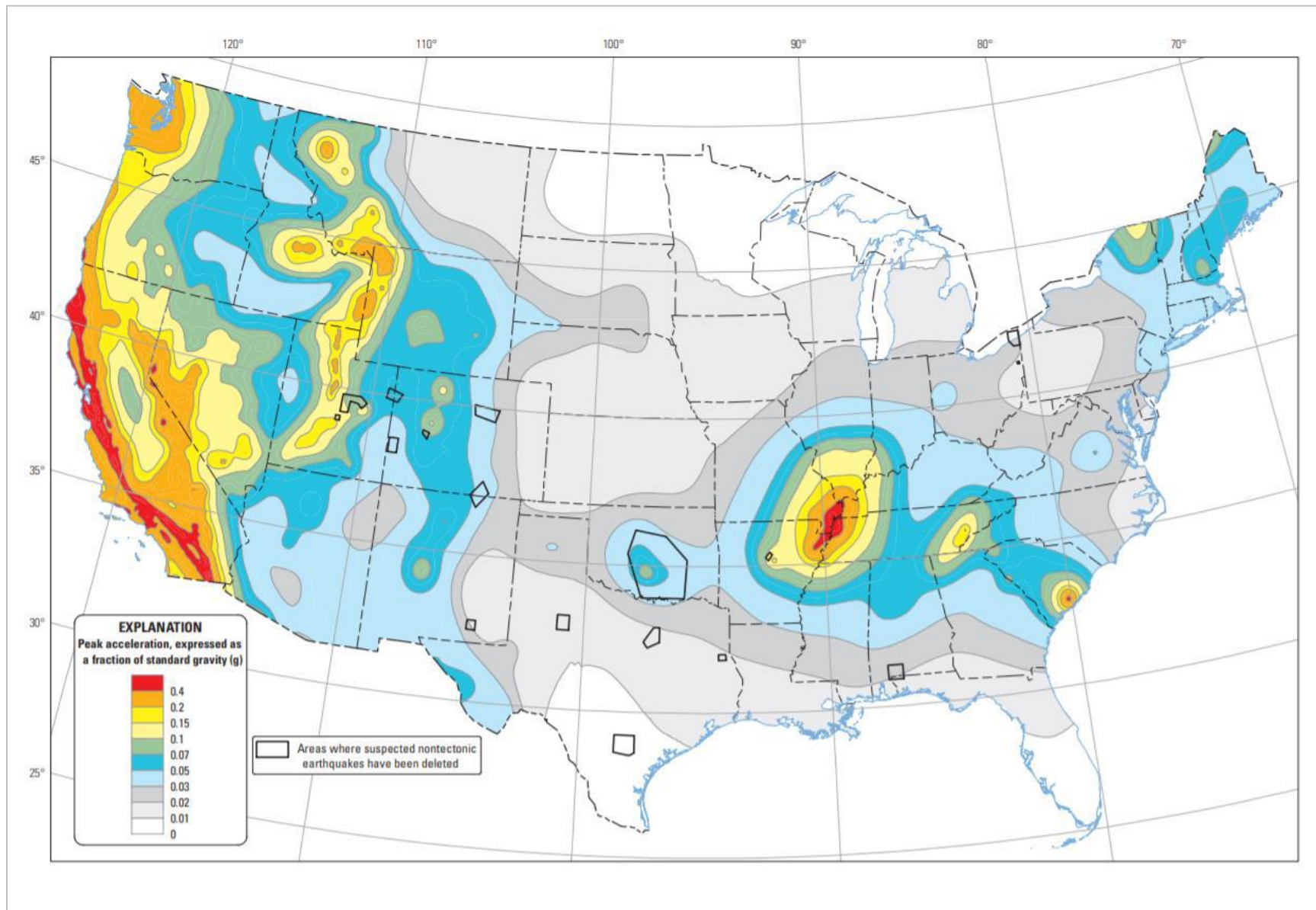


Figure 3-2. Ten Percent Probability of Exceedance in 50 Years Map of Peak Ground Acceleration

3.2.4 Soils

The Project contains 14 known soil types; however, most of the Proposed Action is dominated by 5 soil types: Memphis silt loam (MeB and MeC2), Falaya silt loam (Fm), Adler silt loam (Ad), and Grenada silt loam (GaB) (USDA NRCS 2022c). These soil map units total 1,178.5 acres, or 80 percent, of the Project (**Table 3-1, Figure 3-3**). Individually, the other soil map units are less than 5 percent each of the total Project, and include Henry silt loam (He), Calloway silt loam (Ca), two types of Memphis silt loams (MeB2 and MeD2), and 3 types of Loring silt loams (LoC2, LoB, and LoD3).

In general, the Project is a combination of well to poorly drained soils (USDA NRCS 2022c). Memphis series are steep, well-drained, silty soils on uplands. Memphis silt loam (MeB) is deep, well-drained, and 2 to 5 percent slope. This unit is very friable, strongly acidic, and phosphorus and potassium are considered medium. Map units MeB2, MeC2, and MeD2 are in the Memphis series, have thinner soils, steeper slopes, and are more erodible than MeB. The Falaya series is less well-drained than the Memphis series. Falaya silt loam (Fm) is an acidic and friable soil with zero to two percent slopes. The Adler series are generally deep, flat, and drains water moderately well. Unlike Memphis and Falaya series, Adler silt loam (Ad) is more alkaline. Soils in the Grenada series are silty with a fragipan about 17 to 25 inches in depth, strongly acidic, and moderately well drained. Grenada silt loam (GaB) has a 2 to 5 percent slope. The Henry series soils are dark, poorly drained, and acid soils. Henry series soils typically have a fragipan about 12 to 16 inches in depth like Grenada series soils. The shallow fragipan allows for surface water under certain conditions. Henry series has an increased concretion of manganese compared to Memphis, Falaya, and Grenada series. Soils in the Calloway series are acidic and poorly drained due to the shallow fragipan (16 to 20 inches in depth). Calloway series soils have manganese concretions similar to Henry series soils but in low concentrations. This series also has low iron concretions. Waverly series soils are frequently flooded and poorly drained. In areas with shallow water tables, these soils hold excessive water in the bottomlands. The Loring series soils are on uplands with a permeable, deep fragipan (26 to 40 inches). These soils can be moderate to well-drained and medium to strongly acidic. Additionally, these soils can be highly erodible.

Two of the 14 soil map units are included on the national hydric soil list, Henry silt loam (He) and Waverly silt loam (Wv) (USDA NRCS 2022c). These soils make up approximately 5 percent and 1 percent of the Project. Fm, a floodplain soil, has potential for hydric inclusions and can contain Wv inclusions that would be considered hydric. This soil type makes up approximately 24.3 percent of the Project. The final soil map unit, Water (W), is less than an acre. **Figure 3-3** displays the distribution of the 14 soil map units, and **Table 3-1** provides descriptions and acreages of the soil map units.



Table 3-1. Soil Types and Descriptions for WR Graceland Solar Project in Shelby County, Tennessee

Map Unit Symbol	Description	Hydric	Prime Farmland	Acres	Percent of the Project
Ad	Alder silt loam, 0-2 percent slopes, occasionally flooded		x	189.8	12.8%
Ca	Calloway silt loam, 0-2 percent slopes		x	58.7	4.0%
Fm	Falaya silt loam, partially hydric soils	x	x	276.4	18.6%
GaB	Grenada silt loam, 2-5 percent slopes		x	165.6	11.2%
He	Henry silt loam	x		67.2	4.5%
LoB	Loring silt loam, 2 to 5 percent slopes		x	26.9	1.8%
LoC2	Loring silt loam, 5 to 8 percent slopes, eroded			42.6	2.9%
LoD3	Loring silt loam, 5 to 12 percent slopes, severely eroded			2.5	0.2%
MeB	Memphis silt loam, 2 to 5 percent slopes, northern phase		x	287.6	19.4%
MeB2	Memphis silt loam, 2 to 5 percent slopes, moderately eroded, northern phase		x	53.6	3.6%
MeC2	Memphis silt loam, 5 to 8 percent slopes, moderately eroded, northern phase			259.1	17.5%

Map Unit Symbol	Description	Hydric	Prime Farmland	Acres	Percent of the Project
MeD2	Memphis silt loam, 8 to 12 percent slopes, moderately eroded, northern phase			32.9	2.2%
W	Water			0.9	0.1%
Wv	Waverly silt loam, 0 to 2 percent slopes, occasionally flooded, long duration	x		18.4	1.2%
Total				1,482.3	100

Source: NRCS Soil Survey 2022

3.2.5 Prime Farmland

Prime farmland, as defined by the USDA, “is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops, and is also available for these uses (the land could be cropland, pastureland, rangeland, forest land, or other land, but not urban built-up land or water) (USDA NRCS 2022b). The soils are of the highest quality and can economically produce sustained high yields of crops when treated and managed according to acceptable farming methods.” Therefore, prime farmland is the most suitable land for economically producing sustained high yields of food, feed, fiber, forage, and oilseed crops.

The Farmland Protection Policy Act ([FPPA]; 7 U.S.C. 4201 et seq.) requires federal agencies to take into account the adverse effects of their actions on prime or unique farmlands (USDA NRCS 2022a). The purpose of the FPPA is to “minimize the extent to which federal programs contribute to unnecessary and irreversible conversion of farmland to nonagricultural uses.”

Of the 14 soil types identified, 7 are indicated as prime farmland, making up approximately 1,059 acres of the Project (about 71.4 percent of the on-site soils). These soil types include Adler silt loam (Ad), Calloway silt loam (Ca), Falaya silt loam (Fm), Grenada silt loam (GaB), Loring silt loam (LoB), and Memphis silt loam (MeB and MeB2) (USDA NRCS 2022c). **Table 3-2** and **Figure 3-3** also exhibit the Prime Farmland soils within the Project boundary.

Environmental Consequences

3.2.6 No Action Alternative

Under the No Action Alternative, the Proposed Action would not be constructed; therefore, no direct or indirect Project-related impacts on geology, paleontological, geological hazards, soils, or prime farmlands would result. However, existing land use would be expected to remain a mix of agricultural, residential, and forested areas. If the existing land use remains

the same, continued farming could deplete nutrients, causing minor impacts to soils within the Project boundary. In addition, this may affect the depletion of farmlands in West Tennessee and adversely impact the local economy.

3.2.7 Proposed Action Alternative

Under the Proposed Action Alternative, the following sections describe the possible impacts to geology, paleontology, geologic hazards, soils, and prime farmland anticipated due to the construction and operation of the Proposed Action.

3.2.7.1 Geology and Paleontology

The solar arrays would be supported by steel piles which would either be driven or screwed into the ground to a depth of 6 to 10 feet, not requiring deep excavation activities or removal of bedrock for construction. Likewise, on-site sedimentation ponds would be generally shallow and, to the extent feasible, utilize the existing terrain without requiring extensive excavation. The PV panel arrays would be connected via underground wiring placed in trenches approximately 3 to 4 feet deep and 2 to 12 feet wide.

Since excavation would be limited, only minor direct impacts to geological and paleontological resources would be anticipated. Should paleontological resources be exposed during site construction (i.e., during grading, trenching, or foundation placement) or operation activities, a paleontological expert would need to be consulted. A paleontological expert would determine the nature of the paleontological resources, recover the resources, analyze the potential for additional impacts, and develop a recovery plan/mitigation strategy.

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. Screw piles create a similar soil disturbance footprint as driven piles. Due to limited areas of disturbance and the shallow nature of the proposed subsurface disturbances, only minor indirect impacts to geological resources are anticipated. However, a geotechnical evaluation of the Project has not been completed.

3.2.7.2 Geological Hazards

Hazards resulting from geological conditions are expected to have minor direct and indirect impacts because the Project is located within a relatively stable geologic setting. There is a minor to moderate probability of seismic activity due to the location of the Project near the New Madrid seismic zone that typically causes strong shaking (USGS 2018). Such disturbance would likely only cause minor impacts to the Project and equipment. However, the Project could be subject to potential adverse effects from ground failure associated with liquefaction during a strong seismic event. Structural damage to PV panels, PV panel support structures, and other associated equipment could occur. Since the site would not be heavily staffed during operation, potential damage to on-site structures would pose a minimal risk to humans. Geologic hazard impacts on the Proposed Action would likely not cause impacts to off-site resources.

There is a possibility of an earthquake or landslide event in this region every 50 years (USGS 2020). Therefore, the possibility of severe damage to solar facilities at the Project from such occurrences exists. A site-specific geotechnical investigation would be conducted, further assessing the geological risk associated with the Project before the

commencement of any construction activities. Geological hazard impacts on the site would be unlikely to impact off-site resources.

3.2.7.3 Soils

As part of the site preparation and development process, portions of the site would be temporarily affected during mowing/vegetative maintenance and construction activities. The only permanent impact would be the 3- to 4-acre switching station as part of the construction activities. Soils in areas where only vegetation clearing is proposed would remain unless it is a circuit trench or the areas where gravel would replace the foundation (e.g., roadways, substation, and switching station foundations). Therefore, off-site soil resources would be necessary for the construction phase, such as borrow and fill materials (e.g., sand, gravel, riprap, etc.) that would be obtained nearby from permitted off-site sources.

Minor disturbance to soils would occur during the operation of the Proposed Action Alternative. Creating a new impervious surface in the form of panel footings and the foundations for the inverter stations and a substation would result in a minor increase in stormwater runoff and potentially increase soil erosion. In addition, vegetation clearing associated with the overall Proposed Action would result in a minor increase in stormwater runoff and increased soil erosion potential. The use of BMPs such as soil erosion and sediment control measures would minimize the potential for increased soil erosion and runoff. Due to the project disturbance area being greater than one acre, an NPDES CGP for discharges of stormwater associated with construction activities would be required (TDEC 2021). Application for the permit would require submitting an SWPPP describing the management practices utilized during construction to prevent erosion and runoff and reduce pollutants in stormwater discharges from the site. Following construction, soil stabilization and vegetation management measures would reduce the potential for erosion impacts during site operations.

Routine maintenance could affect soils and would include a periodic motor replacement, inverter air filter replacement, fence repair, vegetation control, and periodic array inspection, repairs, and other maintenance activities. The Proposed Action Alternative would include management of vegetation utilizing mechanical and chemical controls, as needed. The mechanized landscaping may include the use of lawnmowers, weed eaters, etc. However, traditional trimming and mowing would be performed periodically to maintain the vegetation at a height ranging from six inches to two feet. Selective use of herbicides may also be employed around structures to control weeds. A professional contractor would apply products to control noxious weeds per local, state, and federal regulations. Weather events, e.g., predicted rainfall or high winds, would be taken into account before the application of herbicides in efforts to reduce potential runoff or drift. These maintenance activities would not result in any adverse or indirect impacts to soils on the Project Site during operations.

3.2.7.4 Prime Farmland

The USDA NRCS uses a land evaluation and site assessment system to establish a farmland conversion impact rating score (7 CFR § 658.4(c)(4)(ii)). When considering the impact rating score, project stakeholders must consider alternative sites if the potential adverse impacts on the farmland exceed the recommended allowable level (USDA 2022a).

Should the Proposed Action be implemented, approximately 1,059 acres (71 percent) of soils occurring on the Project are classified as Prime Farmland (USDA NRCS 2022c). The

remaining 423 acres (29 percent) of soils on the Project are classified as Not Prime Farmland.

The construction and operation of the Proposed Action Alternative would result in temporary adverse effects to prime farmland (i.e., removed from production) during the operation of the solar facility. There are approximately 270,074 acres of prime farmland in Shelby County, accounting for roughly 54 percent of the total land area in the county. The majority of the solar array, covering approximately 849.67 acres within the Project boundary, would be installed in areas identified as prime farmland. Therefore, the development of the 1,482-acre Project impacts a minimal portion of the total available farmland in the county.

Any area within the Project not developed for the solar facility would remain undeveloped with no agricultural or other activities, aside from general vegetation maintenance. Adhering to BMPs during construction and operation of the solar facility, including installing erosion control devices (ECDs) during stockpiling events, would preserve topsoil and limit erosion, resulting in negligible impacts to prime farmland.

Solar projects do not result in the permanent or irreversible conversion of farmland; however, the switching station would be a permanent structure. While agricultural production would cease on the Project, long-term impacts on prime farmlands and soil productivity would be insignificant. Except for up to four acres of farmland which would be permanently impacted by construction of the switching station, the Project could be readily returned to agricultural production once the solar farm is decommissioned. Based on the limited site disturbance, temporary direct impacts to prime farmland would occur throughout the duration of the Proposed Action Alternative.

3.3 Water Resources

This section provides descriptions of and potential impacts to the water resources within the Project, including ground and surface waters, floodplains, and wetlands. Additionally, this section reviews the potential impacts associated with the No Action Alternative and Proposed Action Alternative. Water resource features were delineated and included 28 wetlands, 63 channel segments (including wet-weather conveyances/ephemeral, perennial, and intermittent streams), and 3 ponds within the Project (Stantec 2021b).

Affected Environment

3.3.1 Groundwater

The aquifer underlying the Project in Shelby County is the Upper Claiborne aquifer and the Middle Claiborne aquifer, part of the Mississippi embayment aquifer system in the Coastal Plain Physiographic province. There are no sole-source aquifers designated by the USEPA in Shelby County (USEPA 2022c).

3.3.2 Floodplains

A floodplain is a relatively level land area along a stream or river subject to periodic flooding. The area subject to a 1-percent chance of flooding in any given year is typically called the 100-year floodplain. The area subject to a 0.2-percent chance of flooding in any given year is typically called the 500-year floodplain. It is necessary to evaluate development in the 100-year floodplain to ensure that the project is consistent with the requirements of Executive Order (EO) 11988, Floodplain Management (EO 11988 1977). A map of the Project and the FEMA flood zones are shown in **Figure 3-4**.

Based on a review of Panel 180 of 635, Map No. 47157C0180G of Shelby County, Tennessee, FIRM, effective 02/06/2013; Panel 170 of 635, Map No. 47157C0170F of the Shelby County, FIRM, effective 9/26/2007; and Panel 190 of 635, Map No. 47157C0190G of the Shelby County, Tennessee, FIRM, effective 02/06/2013, the Proposed Action would avoid the 100-year floodplain of the Loosahatchie River Drainage Canal [Hydrologic Unit Code (HUC) 8-08010209] to the south, as well as the 100-year floodplain of Big Creek (HUC 8-05130202) to the north (FEMA 2007, 2013a, 2013b, 2013c, and 2013d).

The southern portion of the Project would be located between Loosahatchie Drainage Canal miles 14.9 and 17, right descending bank. The northern portion of the Project would be located at Big Creek Drainage Canal mile 11.8, left descending bank, both in Shelby County, Tennessee. Based on Table 4 in the 2013 Shelby County Flood Insurance Study (FIS), the 100-year flood elevations on Loosahatchie Drainage Canal would vary from 238.6 to 242.2 feet, North American Vertical Datum (NAVD) 1988; and on Big Creek Drainage Canal would be 269.3 feet, NAVD 1988 (FEMA 2013). Based on Profile 68P in the 2013 Shelby County FIS, the 500-year flood elevations on Loosahatchie Drainage Canal would vary from 240.6 to 244.0 feet, NAVD 1988 (FEMA 2013). Based on Profile 07P in the same FIS, the 500-year flood elevation of the Big Creek Drainage Canal would be 271 feet, NAVD 1988, (FEMA 2013).

Additionally, field surveys revealed two perennial streams within the Project, both being tributaries of the Loosahatchie Drainage Canal (Stantec 2021b). As discussed in **Section 3.3.4**, the streams have a maximum width of 10 feet.

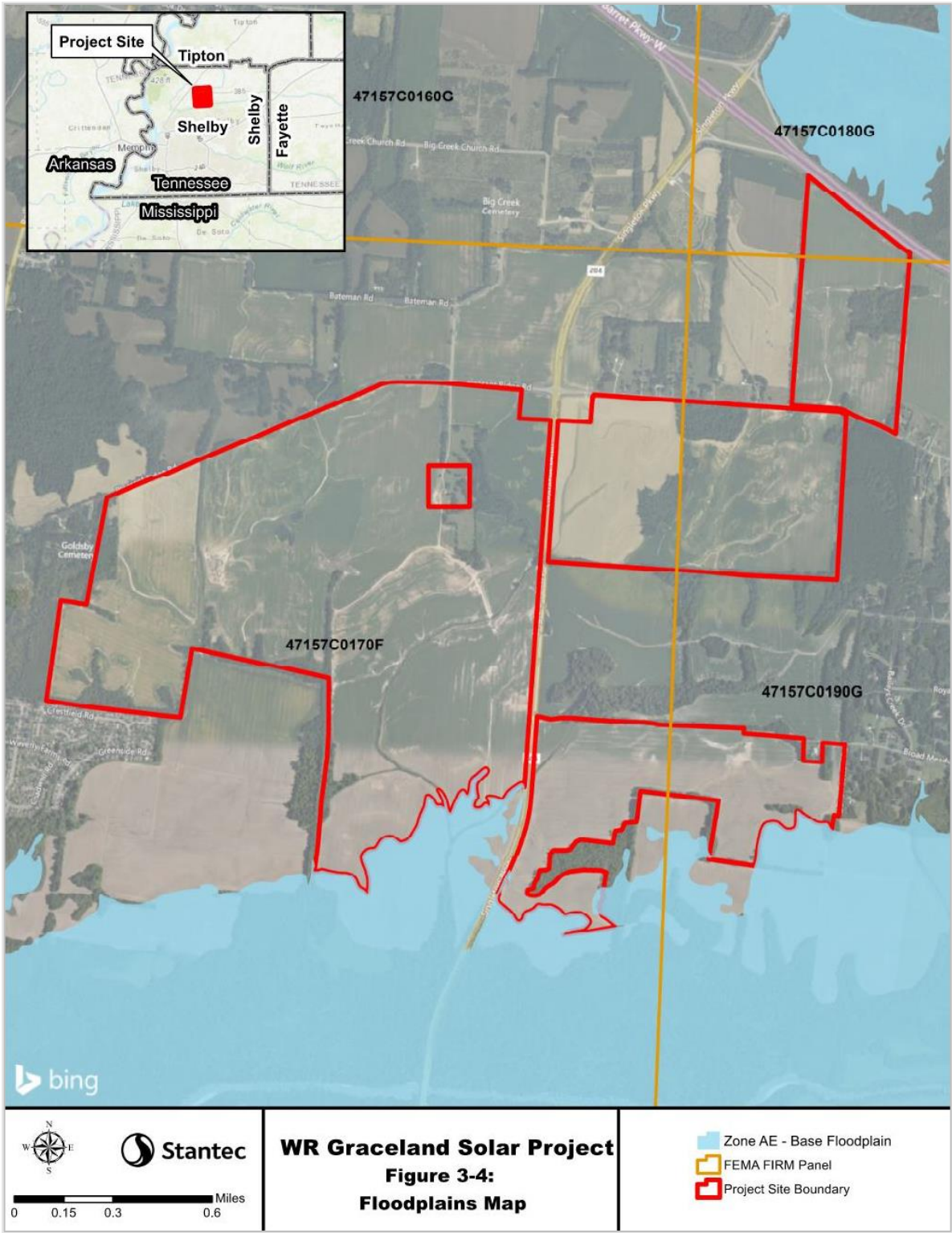


Figure 3-4. WR Graceland Solar Project FEMA FIRM Map

3.3.3 Surface Waters and Wetlands

Surface waters are any body of water on the Earth's surface and include wetlands, streams, ponds, and lakes. Streams can further be classified as perennial, ephemeral, or intermittent. Under the CWA Section 404, wetlands are defined as areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas (33 U.S.C 1972). Based on rules set forth by TDEC (2019, T.C.A. 2020), a wet weather conveyance (WWC) is defined as “made-made or natural watercourses, including natural watercourses that have been modified by channelization: that flow only in direct response to precipitation runoff in their immediate locality; whose channels are at all times above the groundwater table; that are not suitable for drinking water supplies; and in which hydrological and biological analysis indicate that, under normal weather conditions, due to naturally occurring ephemeral or low flow there is not sufficient water to support fish, or multiple populations of obligate lotic aquatic organisms whose life cycle includes an aquatic phase of at least two months.” Features that do not meet the criteria for WWC are determined to be a stream and waters of the state.

The Proposed Action is located within the Loosahatchie River drainage (HUC8-08010209). The watershed encompasses approximately 738 square miles and contains 1,443 stream miles and 81 acres of lakes (TDEC 2022). Surface waters on the Project eventually flow into either unnamed tributary of the Loosahatchie River or directly into the Loosahatchie River, located south of the Project. The portion of the Loosahatchie River receiving drainage from Project streams is currently on the EPA's 303(d) List for Impaired Waters for siltation and habitat impairment.

Wetland and stream delineations were completed in November 2020, September 2021, and November 2021 (Stantec 2021b). The delineation was conducted per the 1987 Corps of Engineers Wetlands Delineation 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 (USACE 1987, 2010). Linear features were evaluated to determine if they were a wetland, stream, WWC, or upland (i.e., upland conveyance feature) drainage. Surface water features were identified by TN Qualified Hydrologic Professionals (TN-QHP). Before conducting delineations, Stantec personnel reviewed available background information for the Proposed Action. This available background information included: USGS 7.5-minute topographic maps, USGS NHD; USFWS NWI maps; Esri World Imagery; FEMA National Flood Hazard Layer; USDA NRCS Soil Survey Geographic (SSURGO) digital data; and TDEC Division of Water Resources Water Quality Assessment and Permits map. Lastly, data from the nearest Community Collaborative Rain, Hail, and Snow (CoCoRaHS) station was reviewed to evaluate precipitation conditions.

3.3.4 Streams and Wet Weather Conveyances

According to the Wetland and Stream Delineation Report dated November 30, 2021, 6 stream segments, consisting of 2 stream types (perennial and intermittent), and 56 WWCs, for a total of approximately 39,850 linear feet of delineated surface waters, were identified within the Project (**Table 3-2, Figure 3-5**; Stantec 2021b).

The 56 WWCs total approximately 23,972 linear feet and were delineated within the Project (Stantec 2021b). Ephemeral streams are characterized by a defined bed and bank and two other ordinary high-water mark (OHWM) indicators but had no flow during the site visit, indicating that these streams largely carry water only during and after precipitation events.

Ephemeral streams range from approximately 1.5 to 6 feet in width at the OHWM, with bank heights ranging from 0.5 to 3 feet. At the time of the delineation, most ephemeral channels contained no water; the few channels that did hold water were present in isolated pools. The substrates of the ephemeral streams were comprised of silt and sand with little gravel. These streams are in wooded areas and agricultural fields.

Four intermittent stream channels totaling 12,302 linear feet were delineated within the Project (Stantec 2021b). Intermittent streams are characterized by the presence of a limited volume of flow at the time of the site visit and limited aquatic fauna. Intermittent streams are 2 to 5 feet in width at the OHWM, with bank heights ranging from 1 to 4 feet. At the time of the delineation, water depth ranged from 1 inch to 1 foot, and substrates were comprised of silt with sand and gravel. These streams flow through agricultural fields and wooded riparian areas.

Two perennial streams totaling 3,576 linear feet were delineated within the Project (Stantec 2021b). Perennial streams are characterized by the presence of a high volume of flow at the time of the site visit and observations of fish and other aquatic fauna. Perennial streams are approximately 5 to ten feet in width at the OHWM, with bank heights ranging from 4 to 8 feet. At the time of the delineation, the water depth was 2 to 4 feet, and the substrate consisted of silt, sand, and gravel.

It should be noted that stream STR-01 transitions from intermittent to perennial within the Project (see **Table 3-2**); however, it is a single, continuous feature.

Table 3-2. Type and Length of Delineated linear Features within the Project

Feature Number	Flow Regime	Length of Surface Water (feet) in Project
Streams		
STR-01a	PER	2,346.9
STR-01b	INT	1,741.6
STR-02	INT	1,413.9
STR-03	INT	1,632.4
STR-04	INT	7,514.6
STR-05	PER	1,229.4
Wet Weather Conveyances		
WWC-01	EPH	2,184.9
WWC-02	EPH	230
WWC-03	EPH	756
WWC-04	EPH	955.4
WWC-05	EPH	65.3
WWC-06	EPH	217.2

Feature Number	Flow Regime	Length of Surface Water (feet) in Project
WWC-07	EPH	302.6
WWC-08	EPH	36.5
WWC-09	EPH	153.6
WWC-10	EPH	2,326.2
WWC-11	EPH	93.1
WWC-12	EPH	347.8
WWC-13	EPH	173.1
WWC-14	EPH	107.7
WWC-15	EPH	870.3
WWC-16	EPH	137.3
WWC-17	EPH	115.7
WWC-18	EPH	126.5
WWC-19	EPH	84.9
WWC-20	EPH	1,188.1
WWC-21	EPH	79.5
WWC-22	EPH	81.1
WWC-23	EPH	53.6
WWC-24	EPH	948.3
WWC-25	EPH	267.3
WWC-26	EPH	100.9
WWC-27	EPH	190.5
WWC-34	EPH	346.9
WWC-35	EPH	851.3
WWC-36	EPH	403
WWC-37	EPH	275.9
WWC-38	EPH	860
WWC-39	EPH	302.3
WWC-40	EPH	281.1
WWC-41	EPH	35.5

Feature Number	Flow Regime	Length of Surface Water (feet) in Project
WWC-44	EPH	39.2
WWC-45	EPH	1,396.7
WWC-46	EPH	72.5
WWC-47	EPH	47.2
WWC-48	EPH	184.5
WWC-49	EPH	2477
WWC-50	EPH	84.1
WWC-51	EPH	29.1
WWC-52	EPH	68.3
WWC-53	EPH	53.4
WWC-54	EPH	140.9
WWC-55	EPH	29
WWC-56	EPH	868.4
WWC-57	EPH	153.3
WWC-58	EPH	108.3
WWC-59	EPH	179.8
WWC-60	EPH	203
WWC-61	EPH	346.2
WWC-62	EPH	102.7
WWC-63	EPH	538
WWC-64	EPH	301.5

Source: Stantec 2021b

Legend: EPH = ephemeral; INT = intermittent; PER = perennial

3.3.5 Wetlands

According to the Wetland and Stream Delineation Report, there are a total of 28 wetlands, comprised of three wetland types (palustrine emergent wetlands [PEM], palustrine forested [PFO], and palustrine scrub-shrub [PSS]) and totaling approximately 8.76 acres (**Table 3-3, Figure 3-5**; Stantec 2021b). Sixteen PEM wetlands, totaling approximately 4.67 acres, 11 PFO wetlands, totaling approximately 3.41 acres, and one PSS wetland, totaling approximately 0.68 acres, were delineated. In addition, three ponds (palustrine unconsolidated bottom [PUB]) were identified, totaling approximately 0.91 acres.

Condition, functional capacity, and quality of wetlands are assessed using the Tennessee Valley Authority Rapid Assessment Method (TVA-RAM), a TVA wetland assessment methodology. The TVA-RAM uses six metrics to assess wetland condition, function, and quality, assigning an individual score to the following parameters: 1) wetland size, 2) upland buffers/surrounding land use, 3) hydrology, 4) habitat alteration/development, 5) special wetlands, and 6) plant communities/interspersion. Scores for all parameters are tallied, with the highest possible score being 100. A wetland is considered low quality and low functioning if it scores 0-29, good/moderate quality if it scores 30-59, and superior/high quality with a high functional capacity if it scores 60-100. Twenty-four of the 28 wetlands within the Project scored as low quality/low functioning wetlands due to several limiting factors, including small size, lack of upland buffers, habitat alteration, and altered hydrology; four wetlands scored as moderate quality. There are no wetlands in the Project that are considered high quality/high functioning based on the TVA-RAM assessment (Stantec 2021b).

Table 3-3. Type and Size of Delineated Wetlands within the Project

Wetland Number*	Wetland Type	Area of Wetland (acre) in Project
Wetlands		
WTL-01	PEM	0.059
WTL-02	PSS	0.678
WTL-03	PFO	0.373
WTL-04	PEM	0.226
WTL-05	PEM	0.006
WTL-06	PFO	0.114
WTL-07	PEM	1.542
WTL-08	PEM	0.481
WTL-09	PFO	0.11
WTL-10	PEM	0.022
WTL-11	PEM	0.031
WTL-12	PEM	0.027
WTL-13	PEM	0.074
WTL-15	PEM	0.897
WTL-16	PFO	0.706
WTL-17	PFO	0.028

Wetland Number*	Wetland Type	Area of Wetland (acre) in Project
WTL-18	PEM	0.096
WTL-20	PFO	0.032
WTL-21	PEM	0.099
WTL-22	PEM	0.864
WTL-23	PFO	0.005
WTL-24	PEM	0.014
WTL-26	PFO	1.566
WTL-27	PEM	0.191
WTL-28	PFO	0.058
WTL-29	PEM	0.036
WTL-30	PFO	0.242
WTL-31	PFO	0.174
Ponds		
POND-01	PUB	0.062
POND-02	PUB	0.696
POND-03	PUB	0.148

Source: Stantec 2021b

*Due to changes in the Project limits, enumeration of wetlands may not be consecutive, as several parcels that were included in the initial Project boundary were eliminated from the final Project boundary.

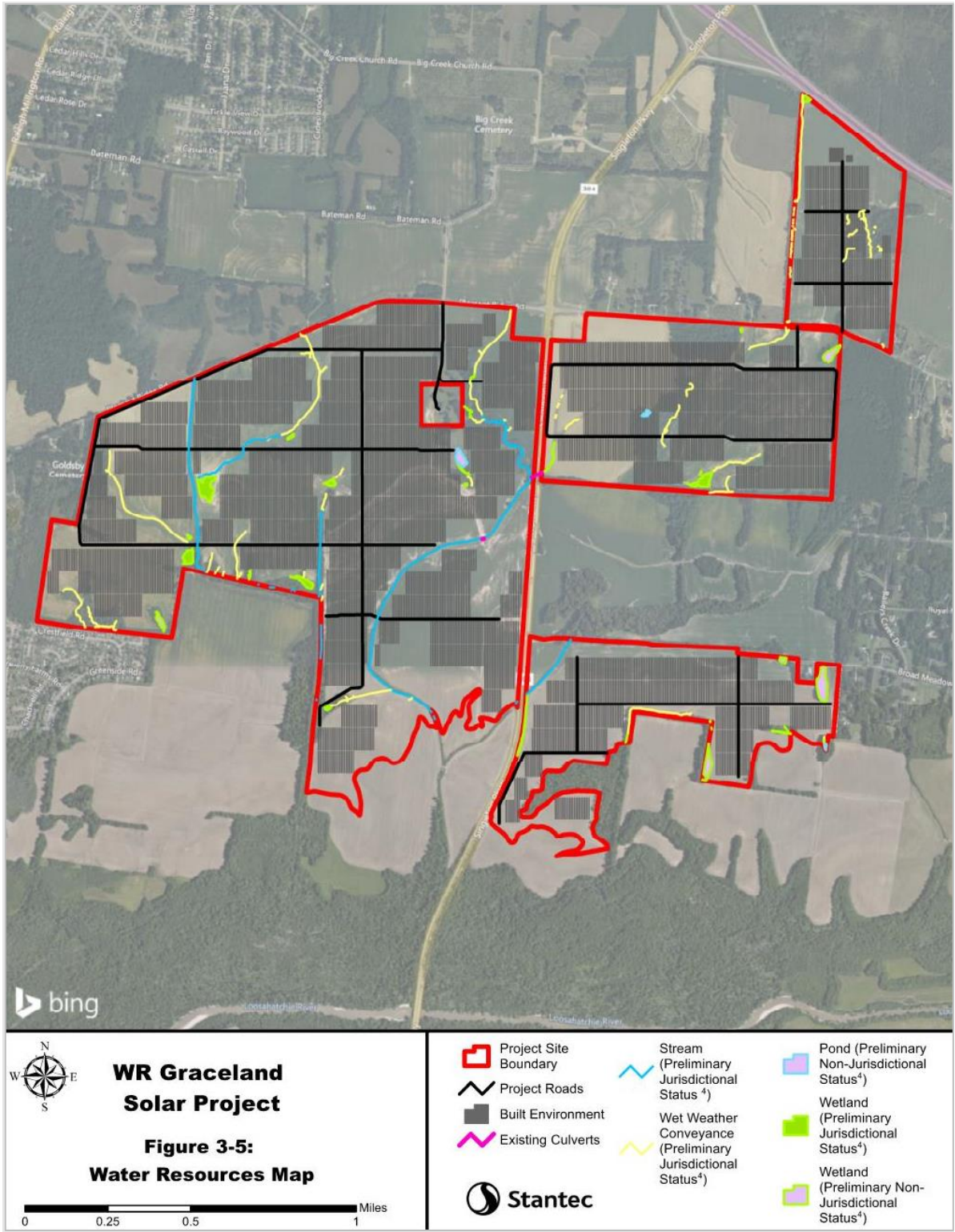


Figure 3-5. WR Graceland Solar Project Water Resources Map

Environmental Consequences

3.3.6 No Action Alternative

Under the No Action Alternative, there would be no changes to the Proposed Action, and no Project-related impacts would occur. The Project would remain the same at approximately 1,482 acres of primarily agricultural row crops (e.g., corn, cotton, and soybeans) and forested habitats (e.g., fence lines and small tree stands). These water resources have been highly degraded and channelized and would be further impacted (i.e., sedimentation from erosion and runoff, and agricultural chemical fertilizers, pesticides, and herbicides) by continuing agricultural practices within the Project. As a result, a No Action could lead the Project streams to meet a 303(d) list for impaired waters directly connected to the Loosahatchie River.

3.3.7 Action Alternative

Under the Proposed Action Alternative, there would be minor impacts on water resources from the construction and operation of the proposed solar facility. Under the Proposed Action Alternative, some tree removal would alter the landscape but impacts to jurisdictional water features would be avoided. The Proposed Action would be conducted following county, state, and federal mandates and use best management practices to minimize impact to aquatic systems.

3.3.7.1 Groundwater

Direct adverse impacts to the supply and availability of groundwater are not anticipated as a result of the Proposed Action Alternative. During construction, hazardous materials would be located on-site that could potentially contaminate groundwater resources, including petroleum products for fuel and lubrication of construction equipment, hydraulic fluids, and various other chemicals commonly used for general construction permits. A Spill Prevention, Control, and Countermeasure (SPCC) Plan would be developed and implemented according to applicable requirements to minimize the potential for impacts from leaks or spills that may occur. In addition, groundwater pollution from sedimentation getting into channels could occur during construction activities resulting from erosion. Appropriate BMPs would be followed; all proposed project activities would be conducted to ensure waste materials are contained, and the introduction of pollution materials to the receiving waters would be minimized. A CGP would be needed as more than one acre would be disturbed. This permit also requires the development and implementation of a SWPPP.

A 50-foot buffer is proposed around the wetlands and streams on-site to comply with the TVA requirements. The SWPPP would identify specific BMPs to address construction-related activities that would be adopted to minimize stormwater impacts. Additionally, BMPs, as described in the Tennessee Erosion and Sediment Control Handbook (TDEC 2012), would be used to avoid contamination of surface water in the Project Site.

Impervious buildings and infrastructure prevent rain from percolating through the soil and result in additional runoff of water and pollutants into storm drains, ditches, and streams. Clearing vegetation and ground cover, and the addition of impervious surfaces, could alter the current stormwater flows. The Proposed Action Alternative could increase the impervious cover on the Project, thus altering and possibly increasing the concentrated stormwater flow off the Project. This flow would be appropriately treated by implementing proper BMPs or diverting stormwater discharge to ensure adequate drainage.

If the 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 to 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 facility are not anticipated.

Overall, impacts on local aquifers and groundwater are not anticipated due to the limited volume of groundwater required for initial construction, operation, maintenance, or decommissioning and closure. Implementation of BMPs and a Decommissioning and Closure Plan would reduce the potential for hazardous materials to reach groundwater resources throughout the construction and operations of the facility.

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

3.3.7.2 Floodplains

TVA adheres to the requirements of EO 11988, Floodplain Management. The objective of EO 11988 is "...to avoid to the extent possible the long- and short-term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative" (EO 11988 1977). The EO is not intended to prohibit floodplain development in all cases but rather to create a consistent government policy against such development under most circumstances (U.S. Water Resources Council 1978). Therefore, the EO requires that agencies avoid activities in the 100-year floodplain unless there is no practicable alternative.

The Proposed Action would avoid construction within mapped 100-year floodplains, which would be consistent with EO 11988. However, the ground is gently sloped, and although not within a mapped 100-year floodplain, could be inundated during larger floods. To minimize adverse impacts, the individual solar panels and any flood-damageable equipment would be elevated at least one foot above the Loosahatchie River Drainage Canal 100-year flood elevation on the south side, to at least elevation 241.5 feet downstream of Singleton Parkway, and to at least 243.2 feet upstream of Singleton Parkway. On the north side of the Project, where the land drains to the Big Creek Drainage Canal, the individual solar panels and any flood-damageable equipment would be elevated to at least elevation 270.3 feet, which would be one foot above the 100-year flood elevation.

Upon decommissioning and deconstruction of the Project at the end of its useful life, any demolition debris (i.e., soil, wood, etc.) would be deposited in the appropriate disposal or recycling facilities, outside the Project and 100-year floodways. By implementing the above mitigation measures, the proposed Project would have no significant impact on floodplains and their natural and beneficial values.

3.3.7.3 Surface Waters and Wetlands

Based on the preliminary site layout, there are potentially nine locations where permanent facility roads would directly impact stream channels. These direct stream crossings would result in minor impacts. These impacts would be subject to the terms and conditions of a general ARAP from TDEC according to Section 401 of the CWA, and a USACE NWP according to Section 404 of the CWA (33 U.S.C. § 1251 et seq.). A Hydrologic

Determination from TDEC and Jurisdictional Determination from the USACE have been requested and are awaiting final decisions by the agencies; thus, WR Graceland Solar is utilizing preliminary determinations made by Stantec in the Wetland and Surface Water Delineation Report. Based on the Proposed Action Alternative, individual permitting efforts would not be needed. WR Graceland Solar has committed to a 50-foot buffer of jurisdictional streams and wetlands, aside from the areas where project facility roads are crossing streams. With the implementation of appropriate BMPs, impacts to surface waters and aquatic life would be insignificant during construction, and no long-term adverse impacts are anticipated. In addition, there is a potential for long-term beneficial impacts on streams within the Project due to the reduction in annual agriculture activities and applications of pesticides and fertilizer within the Project.

There are numerous preliminary non-jurisdictional WWCs within the Project that would be directly impacted due to grading and fill and/or indirectly impacted by sediment runoff during construction and operation of the facility. These WWCs would be included and accounted for in the SWPPP submittal as part of the NPDES CGP.

TVA is subject to EO 11990, Protection for Wetlands, which mandates federal agencies avoid new construction in wetlands wherever practicable and otherwise minimize wetland destruction or degradation (EO 11990 1977). Therefore, in alignment with the goals of EO 11990, no permanent structures associated with the solar facility are proposed within wetlands on-site under the Proposed Action Alternative. In addition, WR Graceland Solar has committed to implementing a 50-foot buffer around jurisdictional wetlands areas. However, due to filling, all three ponds (presumed to be non-jurisdictional) would be directly impacted.

Therefore, based on the current design, there would be no direct impacts on preliminary jurisdictional wetlands, but there would be direct impacts to streams as a result of up to 9 permanent facility road crossings. Additionally, there would be direct impacts on non-jurisdictional WWCs and ponds. No indirect impacts are anticipated. See **Figure 3-5**.

3.4 Biological Resources

This section provides an overview of existing biological resources within the Project, including vegetation, wildlife, and rare, threatened, or endangered species. Additionally, this section reviews the potential impacts associated with the No Action Alternative and Proposed Action Alternatives.

Affected Environment

Regulations exist at the state and federal levels for biological resources within the Project, including:

- ESA (16 U.S.C. §§ 1531-1544),
- Migratory Bird Treaty Act (MBTA) of 1918 (16 U.S.C. §§ 703-712),
- Executive Order for Migratory Birds (EO 13186 2001),
- Bald and Golden Eagle Protection Act (BGEPA), and
- The Tennessee Wildlife Resources Agency Rules, Chapter 1660-01-32 (also see Tennessee Code Annotated §§ 70-1-206, 70-8-104, 70-8-106 and 70- 8-107).

In accordance with these regulations, the review of Biological Resources included desktop and field surveys (Stantec 2021a, 2022a). The desktop survey, used to determine state and federally protected species whose ranges include the Project, consisted of reviewing 1) USFWS IPaC data, 2) TDEC data, and 3) TVA Regional Natural Heritage database. Four field survey events (i.e., July 10 – 14, 2021, August 8 – 10, 2021, September 13 – 17, 2021, and November 3 – 4, 2021) were conducted in order to accommodate farming activities on the Project, as well as Project boundary changes. The field surveys followed TVA's Guidelines for Conducting Biological and Cultural Survey and Impact Analysis dated November 2020 (TVA 2020).

3.4.1 Vegetation

Natural vegetation typical of the Mississippi Valley Loess Plains region is primarily oak–hickory forest or oak–hickory–pine; however, much of the bottomland forests have been removed for agricultural practices (Stantec 2022a). The vegetative community within the Project is common for this region.

The majority of the Project (1,345 acres; approximately 91 percent) consists of agricultural row crops including corn, cotton, and soybeans (Stantec 2022a). Stantec botanists classified the remainder of the Project as deciduous forest (109 acres), mixed evergreen–deciduous forest (17 acres), and deciduous shrubland (11 acres). All habitat areas were small and patchy and largely surrounded by agriculture fields. Forested habitat within the Project includes fence lines, and fragmented tree stands ranging from successional to secondary growth stands. Tree size ranged from less than 4 inches diameter at breast height (dbh) to greater than 40 inches dbh (one single, isolated tree).

The most common canopy species at the Project include American elm (*Ulmus americana*), persimmon (*Diospyros virginiana*), American sycamore (*Platanus occidentalis*), red maple (*Acer rubrum*), black cherry (*Prunus serotina*), red mulberry (*Morus rubra*), black oak (*Quercus velutina*), black willow (*Salix nigra*), sassafras (*Sassafras albidum*), boxelder (*Acer negundo*), shumard oak (*Quercus shumardii*), eastern cottonwood (*Populus deltoides*), silver maple (*Acer saccharinum*), hackberry (*Celtis occidentalis*), southern red oak (*Quercus falcata*), loblolly pine (*Pinus taeda*), sugarberry (*Celtis laevigata*), Osage orange (*Maclura pomifera*), sweetgum (*Liquidambar styraciflua*), overcup oak (*Quercus lyrata*), water oak (*Quercus nigra*), pecan (*Carya illinoensis*), and willow oak (*Quercus phellos*) (Stantec 2022a).

The shrub layer is dense to moderately open depending on the tree stand within the Project. The most common species of the shrub layer include bristly greenbrier (*Smilax hispida*), roughleaf dogwood (*Cornus drummondii*), Chinese privet (*Ligustrum sinense*), shrub honeysuckle (*Lonicera amur*), elderberry (*Sambucus canadensis*), silky dogwood (*Cornus amomum*), multiflora rose (*Rosa multiflora*), spicebush (*Lindera benzoin*), pawpaw (*Asimina triloba*), winged elm (*Ulmus alata*), raspberry species (*Rubus* sp.), and saplings of the common canopy species.

The herbaceous stratum included the following species: common greenbrier (*Smilax rotundifolia*), rough horsetail (*Equisetum hyemale*), heartleaf peppervine (*Ampelopsis cordata*), summer grape (*Vitis aestivalis*), peppervine (*Ampelopsis arborea*), trumpet creeper (*Campsis radicans*), poison ivy (*Toxicodendron radicans*), Virginia creeper (*Parthenocissus quinquefolia*), and purple passionflower (*Passiflora incarnata*) (Stantec 2022a). Other observed forbs were non-native species, which are discussed below.

EO 13112 (Invasive Species) defines an invasive species as any non-native species and its parts (e.g., seeds, eggs, spores, or other biological material capable of propagating the species) that does or is likely to cause harm (i.e., economic, environmental, and human health) (EO 13112 1999). The Project contained 17 non-native plant species (Stantec 2022a). These species were not isolated but distributed throughout much of the Project. According to the USDA's Federal Noxious Weed List (USDA 2010), none of the non-native species within the Project were considered noxious and invasive at the federal level. The most abundant invasive species observed on the Project were Japanese stiltgrass (*Microstegium vimineum*), Johnson grass (*Sorghum halepense*), kudzu (*Pueraria montana*), wintercreeper (*Euonymus fortunei*), and lesser periwinkle (*Vinca minor*). Other species of low abundance included bush honeysuckle (*Lonicera maackii*), callery pear (*Pyrus calleryana*), Chinaberry (*Melia azedarach*), Chinese privet (*Ligustrum sinense*), heavenly bamboo (*Nandina domestica*), mimosa (*Albizia julibrissin*), multiflora rose (*Rosa multiflora*), Oriental chaff flower (*Achyranthes japonica*), river cane (*Arundinaria gigantea*), silver poplar (*Populus alba*), and tree of heaven (*Ailanthus altissima*) (Stantec 2022a). All of these species except 13 are invasive species, according to the Tennessee Invasive Plant Council (TN-IPC 2017).

3.4.2 Wildlife

During the site visits, biologists observed both visually and aurally wildlife species or captured bat species (via Mist Net Survey) (Stantec 2021a and 2022a). These observations and captures occurred in forested, aquatic, and agricultural areas within the Project. No caves, karst, or abandoned mine features were encountered during the field surveys. A total of 52 species were observed, with the majority of observations being birds (28 species), amphibians (10 species), and mammals (10 species). Biologists also reported two species of insects, one mollusk species, and one reptile species.

The BGEPA and MBTA protect various bird species; however, no eagles (*Haliaeetus leucocephalus* or *Aquila chrysaetos*) or nests were observed during field surveys (Stantec 2022a). The Project lacks quality nesting and foraging habitat for both species. There are no large bodies of water within the Project for bald eagle foraging; however, the Loosahatchie River is 1.0 kilometer to the south, and the Mississippi River is 17.5 kilometers to the west. Due to the proximity of water and location within the Mississippi flyway, individual bald eagles might occasionally fly near, fly over, or stop within the Project during migration through the region. Golden eagles are rare and are usually migrant visitors in Tennessee. The species rarely reproduces in Tennessee and there are no quality nesting or foraging habitat within the Project.

Additionally, the USFWS IPaC Report identified two Birds of Conservation Concern (BCC), American kestrel (*Falco sparverius paulus*) and prothonotary warbler (*Protonotaria citrea*) as potentially occurring in the Project (Stantec 2022a). BCCs are migratory and non-migratory bird species that represent USFWS's highest priority. The USFWS IPaC Report indicates American kestrels and prothonotary warblers breed from April 1st to August 31st in the region. American kestrels have the probability of presence in late February, whereas prothonotary warblers only in the breeding season. There are preferred habitats for both species at the Project; however, very little for the prothonotary warbler. American kestrel inhabits open areas, including croplands (TWRA 2022a). The prothonotary warbler inhabits forested swamps, wetlands, and flooded bottomlands along meandering rivers (TWRA 2022d). These species were not observed during the field surveys; however, a formal BCC survey was not conducted.

Table 3-4. Wildlife Observations Documented within the Project

Category	Wildlife Species	
Birds	American Crow (<i>Corvus brachyrhynchos</i>)	Mourning Dove (<i>Zenaidura macroura</i>)
	American Goldfinch (<i>Spinus tristis</i>)	Northern Cardinal (<i>Cardinalis cardinalis</i>)
	American Robin (<i>Turdus migratorius</i>)	Northern Mockingbird (<i>Mimus polyglottos</i>)
	Barn Swallow (<i>Hirundo rustica</i>)	Osprey (<i>Pandion haliaetus</i>)
	Carolina Chickadee (<i>Poecile carolinensis</i>)	Purple Martin (<i>Progne subis</i>)
	Carolina Wren (<i>Thryothorus ludovicianus</i>)	Red-Tailed Hawk (<i>Buteo jamaicensis</i>)
	Eastern Kingbird (<i>Tyrannus tyrannus</i>)	Red-Winged Blackbird (<i>Agelaius phoeniceus</i>)
	Eastern Towhee (<i>Pipilo erythrophthalmus</i>)	Ruby-Throated Hummingbird (<i>Archilochus colubris</i>)
	Eastern Wood Pewee (<i>Contopus virens</i>)	White-Breasted Nuthatch (<i>Sitta carolinensis</i>)
	Field Sparrow (<i>Spizella pusilla</i>)	White-Eyed Vireo (<i>Vireo griseus</i>)
	Fish Crow (<i>Corvus ossifragus</i>)	White-Throated Sparrow (<i>Zonotrichia albicollis</i>)
	Great Blue Heron (<i>Ardea herodias</i>)	Wood Thrush (<i>Hylocichla mustelina</i>)
	Indigo Bunting (<i>Passerina cyanea</i>)	Yellow-Billed Cuckoo (<i>Coccyzus americanus</i>)
	Mississippi Kite (<i>Ictinia mississippiensis</i>)	Yellow-Breasted Chat (<i>Icteria virens</i>)
Insects	Hackberry Emperor (<i>Asterocampa celtis</i>)	Monarch Butterfly (<i>Danaus plexippus</i>)
Mammals	Coyote (<i>Canis latrans</i>)	White-Footed Mouse (<i>Peromyscus leucopus</i>)
	Eastern Mole (<i>Scalopus aquaticus</i>)	Eastern Red Bat (<i>Lasiurus borealis</i>)
	Hispid Cotton Rat (<i>Sigmodon hispidus</i>)	Evening bat (<i>Nycticeius humeralis</i>)
	Raccoon (<i>Procyon lotor</i>)	Tricolored Bat (<i>Perimyotis subflavus</i>)
	Virginia Opossum (<i>Didelphis virginiana</i>)	White-Tailed Deer (<i>Odocoileus virginianus</i>)
Mollusk	Flamed Disc (<i>Anguispira alternata</i>)	
Amphibians	American Bullfrog (<i>Rana catesbeiana</i>)	Fowler's Toad (<i>Bufo fowleri</i>)
	American Toad (<i>Bufo americanus</i>)	Green Frog (<i>Rana clamitans</i>)
	Broadhead Skink (<i>Plestiodon laticeps</i>)	Northern Cricket Frog (<i>Acris crepitans</i>)
	Cope's Gray Treefrog (<i>Hyla chrysoscelis</i>)	Southern Leopard Frog (<i>Lithobates sphenoccephalus</i>)
	Eastern Narrow-Mouthed Toad (<i>Gastrophryne carolinensis</i>)	Spring Peeper (<i>Pseudacris crucifer</i>)
Reptiles	Eastern Cottonmouth (<i>Agkistrodon piscivorus</i>)	

Source: Stantec 2022c

3.4.3 Rare, Threatened, and Endangered Species

Stantec biologists and botanists reviewed the USFWS IPaC Report and the TDEC and the TVA Regional Natural Heritage databases to assess the rare, threatened, and endangered species. The following parameters were used during review of the database: aquatic species within 10 miles, federally listed aquatic species county-wide, aquatic species by hydrologic unit code, plant species within five miles, federally listed plant species county-wide, terrestrial species within three miles, and federally listed terrestrial species county-wide. TDEC's state species lists are provided by county. **Table 3-5** summarizes federal- and state-listed species identified in the databases whose ranges include the Project (Stantec 2021a, 2022a).

Table 3-5. State Listed and Federally Protected Species Potentially Occurring in the Project

Common Name (Scientific Name)	Federal Status	State Statues	Habitat Present (Y/N)
Mammals			
Indiana Bat (<i>Myotis sodalis</i>)	Endangered	E	Y
Northern Long-eared Bat (<i>Myotis septentrionalis</i>)	Threatened	E	Y
Tricolored Bat (<i>Perimyotis subflavus</i>)	-	T	Y
Eastern Woodrat (<i>Neotoma floridana illinoensis</i>)	-	D	N
Insects			
Monarch Butterfly (<i>Danaus plexippus</i>)	Candidate	-	Y
Plants			
American Ginseng (<i>Panax quinquefolius</i>)	-	S-CE	N
Cedar Elm (<i>Ulmus crassifolia</i>)	-	S	N
Copper Iris (<i>Iris fulva</i>)	-	T	N
Featherfoil (<i>Hottonia inflata</i>)	-	S	N
Harvey's Beakrush (<i>Rhynchospora harveyi</i>)	-	T	N
Multiflowered Mud-plantain (<i>Heteranthera multiflora</i>)	-	S	N
Ovate Catchfly (<i>Silene ovata</i>)	-	E	Y
Red Starvine (<i>Schisandra glabra</i>)	-	T	N
Sweetbay Magnolia (<i>Magnolia virginiana</i>)	-	T	Y
Willow Aster (<i>Symphyotrichum praealtum</i>)	-	E	N

Common Name (Scientific Name)	Federal Status	State Statues	Habitat Present (Y/N)
Birds			
Bewick's Wren (<i>Thryomanes bewickii</i>)		D	N
Interior Least Tern (<i>Sternula antillarum athalassos</i>)		E	N
Cerulean Warbler (<i>Setophaga cerulea</i>)		D	N
Swainson's Warbler (<i>Limnothlypis swainsonii</i>)		D	N
Fish			
Blue Sucker (<i>Cycleptus elongatus</i>)		T	N
Naked Sand Darter (<i>Ammocrypta beanii</i>)		D	N
Piebald Madtom (<i>Noturus gladiator</i>)		D	N
Reptiles			
Northern Pinesnake (<i>Pituophis melanoleucus melanoleucus</i>)		T	N

Source: Stantec 2022a

State Status Key: D – Deemed in Need of Management, E – Endangered, S – Special Concern, S-CE – Special Concern, Commercially Exploited, T – Threatened

3.4.3.1 Federally Protected Species

The Project is within the range of two federally protected species: the northern long-eared bat and the Indiana bat, and one candidate species, the monarch butterfly (USFWS, 2021a and 2021b). Both the northern long-eared bat and the Indiana bat have known occurrences in Shelby County, Tennessee (TWRA 2022b, TWRA 2022c). Traditional winter habitat for both species consists of caves and abandoned mines. Still, the northern long-eared bats occasionally inhabit basements, crawl spaces, natural rock outcrops, talus slopes, and other rocky structures (e.g., road cuts and mine high walls). During summer, the Indiana bat migrates from their hibernacula to their summer habitat, where they typically roost under loose bark on living or dead trees (USFWS 2006). The Indiana bat is known to roost in over 30 tree species but would normally select ash (*Fraxinus* spp.), elm (*Ulmus* spp.), hickory (*Carya* spp.), maple (*Acer* spp.), oak (*Quercus* spp.), and poplar (*Populus* spp.) trees. The species may change roost sites frequently (i.e., every two to three days) and traverse several miles between roost sites (Kurta 2004). The foraging habitat for the Indiana bat includes upland and bottomland forested areas such as stream corridors, forested wetlands, and along edges of pasture and agricultural fields (USFWS 2006). See **Figure 3-6** for potential bat habitat locations identified in field reviews.

Like the Indiana bat, the northern long-eared bat roosts in forested habitats where they can be found in various sized trees in the summer months. This species' summer roost sites typically include cavities or crevices of live or dead trees and occasionally man-made structures, such as abandoned houses or barns. Preferred roost sites usually have greater

solar exposure (USFWS 2015). The northern long-eared bat typically forages in mature forests on hillsides, ridges, and road corridors (Harvey et al. 1999).

During the field surveys, federally permitted bat biologists identified wooded areas with potential to serve as roosting and foraging habitat for the Indiana bats or northern long-eared bats (Stantec 2022a). No hibernacula, including cave, karst, or abandoned mine features, were encountered during the field surveys. A total of 191 potential roost trees were identified within the Project and included the following species: American elm, American Hophornbeam (*Ostrya virginiana*), bitternut hickory (*Carya cordiformis*), black cherry, black gum (*Nyssa sylvatica*), black locust (*Robinia pseudoacacia*), black oak, black walnut (*Juglans nigra*), black willow, boxelder, cherrybark oak (*Quercus pagoda*), eastern cottonwood, green ash (*Fraxinus pennsylvanica*), hackberry, hickory (*Carya* spp.), honey locust (*Gleditsia triacanthos*), loblolly pine, northern catalpa (*Catalpa speciosa*), northern red oak (*Quercus rubra*), oak (*Quercus* spp.), osage orange (*Maclura pomifera*), overcup oak, pecan (*Carya illinoensis*), pin oak (*Quercus palustris*), post oak (*Quercus stellata*), sassafras (*Sassafras albidum*), shagbark hickory (*Carya ovata*), shellbark hickory (*Carya laciniosa*), Shumard oak (*Quercus shumardii*), silver maple (*Acer saccharinum*), sugarberry, sweetgum, tulip poplar (*Liriodendron tulipifera*), water oak, water tupelo (*Nyssa aquatica*), white oak (*Quercus alba*), willow oak, and winged elm.

The Proposed Action was surveyed via mist-netting from August 8 – 10, 2021 (Stantec 2021a). Mist netting surveys followed USFWS guidelines (USFWS 2020) and occurred in suitable roosting habitats (see **Figure 3-6**). A federally permitted bat biologist assessed suitable net locations within the Project, targeting areas where bat activity would be relatively high (Stantec 2021a). Net site selection was also influenced by property access. The net placement was based on various characteristics, including canopy cover, potential flight corridors, proximity to water, and forest conditions found within these work limits. A total of four mist netting sites were identified as containing suitable habitat for Indiana and northern long-eared bats; however, neither species was captured within the Project during mist net surveys for the Project. A total of 22 bats were captured including 17 eastern red bats (*Lasiurus borealis*), four (4) evening bats (*Nycticeius humeralis*), and one (1) tricolored bat (*Perimyotis subflavus*).

The monarch butterfly is distributed across the entire continental United States and is considered a Candidate species under the ESA. The monarch butterfly is a migratory species that overwinter in Mexico from August to November but migrates north to the United States and Canada during warmer months (USFWS 2021). This species has an obligate relationship with milkweed (primarily *Asclepias* spp.), which serves as a host plant for laying eggs and feeding larvae. Through feeding on milkweed, Larvae sequester toxic chemicals from the plant, which act as a defense against predators. Unfortunately, monarch butterfly numbers have largely declined due to habitat loss and fragmentation in recent decades. Pesticides commonly used in agricultural practices typically destroy the milkweed habitat (USFWS 2021). However, several monarch butterflies were observed within the Project during the wildlife and vegetation surveys in July 2021 (see **Figure 3-6**). These individuals were observed adjacent to a soybean field in an herbaceous area containing milkweed plants (Stantec 2022a).

3.4.3.2 State Protected Species

Vegetation data from TDEC and the Regional Natural Heritage Database identified 10 plant species deemed in need of management, state endangered, species of special concern, or state threatened that have the potential to occur within the Project (Stantec 2022a). Of these 10 species, botanists identified suitable habitat for the sweetbay magnolia (*Magnolia virginiana*) species and the ovate catchfly (*Silene ovata*) within the Project. The sweetbay magnolia species are widespread and frequently encountered throughout the Atlantic and Gulf Coastal Plains Regions of the United States. Because west Tennessee is at the edge of the central portion of the range, few populations occur in the state (Priester n.d.). Two isolated sweetbay Magnolia specimens were observed during field surveys; therefore, suitable habitat for the species occurs in the southwestern section of the Project (see **Figure 3-6**).

The ovate catchfly is widespread but rare throughout its distribution (NatureServe 2021). The species occurs in most southeastern states and two northern states (i.e., Illinois and Indiana). The preferred habitat varies by state, but forested uplands on moderate to steep slopes in shallow loess, acidic soils are common characteristics across the range (Basinger, 2002). In Tennessee, the species occurs in open or forested sandy/pebbly habitats, such as open oak woods and floodplains. During the field survey, biologists did not observe the ovate catchfly even after intense searches; however, they encountered potentially suitable habitat along the southern portion of the Project (Stantec 2022a; **Figure 3-6**).

The TDEC and the TVA Regional Natural Heritage Database identified 12 animal species (i.e., Indiana bat, northern long-eared bat, tricolored bat, eastern woodrat, Bewick's wren, interior least tern, cerulean warbler, Swainson's warbler, blue sucker, naked sand darter, piebald madtom, and northern pine snake) deemed in need of management, state endangered, species of special concern, or state threatened that have the potential to occur within the Project (Stantec 2022a). Biologists observed two of these protected species and one protected species' suitable habitat within the Project during the wildlife and environmental surveys.

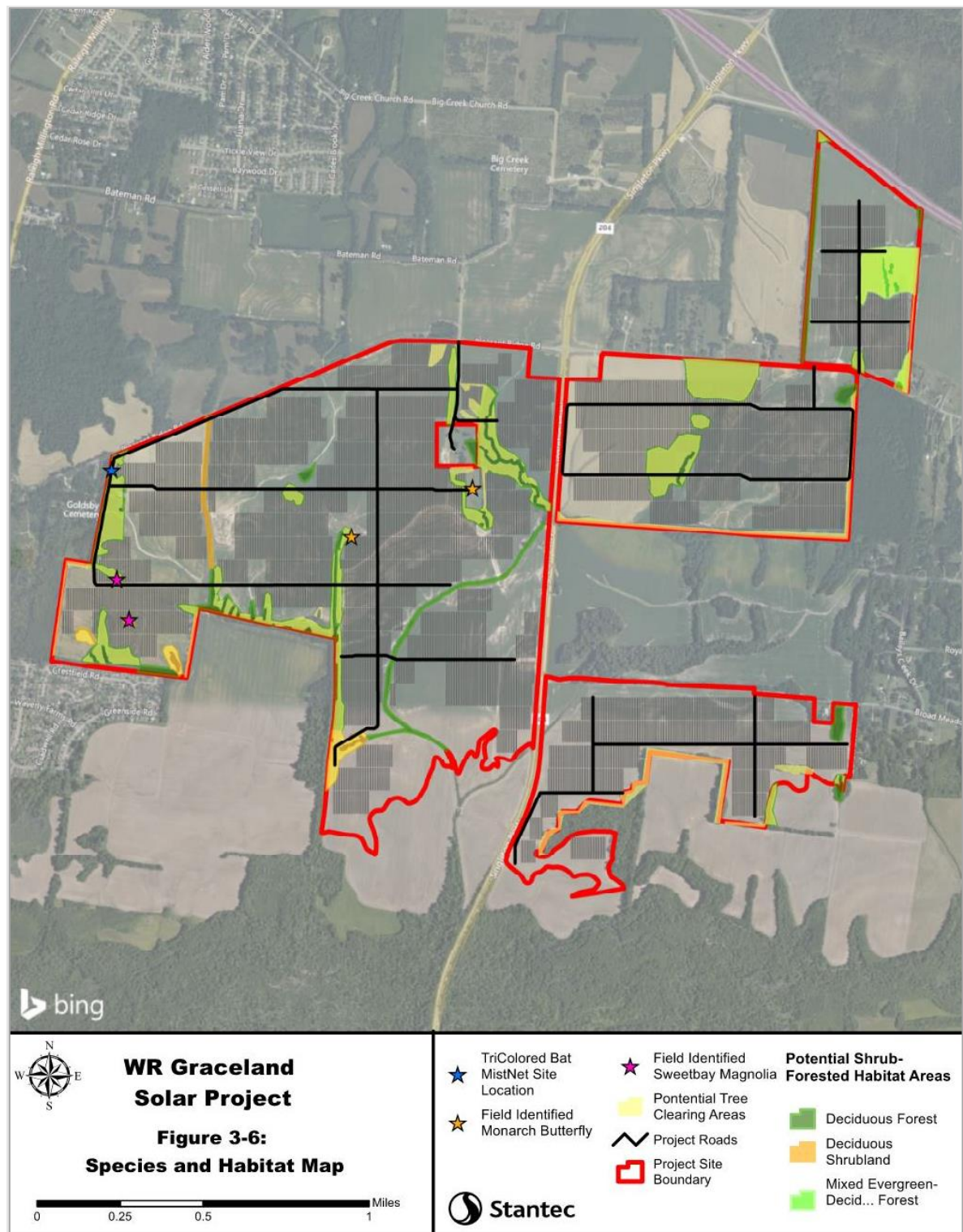


Figure 3-6. WR Graceland Solar Project Species and Habitat Map

Environmental Consequences

3.4.4 No Action Alternative

Under the No Action Alternative, the Proposed Action would not be constructed; therefore, no direct or indirect Project-related impacts on biological resources including vegetation, wildlife, and threatened and endangered species. The Project would remain the same at approximately 1,482 acres of agricultural row crops (e.g., corn, cotton, and soybeans) and forested habitats (e.g., deciduous, and mixed evergreen forests). Sedimentation from erosion and runoff, and chemicals (i.e., fertilizers, pesticides, and herbicides) would likely continue due to agricultural practices within the Project.

3.4.5 Proposed Action Alternative

Under the Proposed Action Alternative, a solar facility would be developed and constructed within the Project and Project-related activities would have direct impacts on biological resources. Tree removal under the Proposed Action Alternative would alter the landscape; however, jurisdictional water features via buffers would protect some trees and plants and thus wildlife habitat. This action would be conducted following county, state, and federal regulations and use best management practices to minimize impact to plant and wildlife species. The Proposed Action Alternative could indirectly benefit the Project's biological resources as the reduction of agricultural practices (i.e., spraying pesticides and tilling land) potentially would reduce runoff, erosion, sedimentation, and accumulation of agricultural chemicals in soils.

3.4.5.1 Vegetation

Based on the current conceptual design, approximately 137 acres of mostly forest fringe areas would be cleared, and 809 acres of cropland would be converted for the Proposed Action (see **Figure 3-6** for potential tree clearing areas). The tree clearing areas are mainly necessary to avoid shading the solar panels. But, overall, this impact represents a reduction from the original Project boundaries resulting from avoidance of environmentally sensitive areas, including jurisdictional stream 50-foot riparian buffers and jurisdictional wetland 50-foot riparian buffers. In addition, these forested areas have been disturbed at one time or another from farming and/or timbering activities.

Land use surrounding the Proposed Action to the east, north, and west is essentially an agricultural matrix intermixed with small urban areas (GoogleEarth Imagery 2022). To the south, there is a floodplain habitat of the Loosahatchie River (i.e., north side), which roughly totals 1,300 acres of forested and undeveloped habitat, although selective harvesting appears to have occurred in the area. This large tract of land is connected to the Project by a narrow-forested corridor in the southcentral portion of the Project. Another tract of habitat (i.e., a roughly 430 acres) largely consisting of forest and undeveloped lands occurs to the west and northwest near Pleasant Ridge Road and Raleigh Millington Road. This tract is connected to the Project along a narrow-vegetated corridor on the north boundary of a residential area west of the Project. These 2 tracts neighboring the Project's 1,700 acres are undeveloped habitat. However, this habitat is bordered by agricultural lands to the north and south, and further south, land use shifts to heavy urbanization. Considering the land use surrounding the proposed solar facility, removing, and altering existing vegetation and cropland would be regarded as minor direct impacts. Furthermore, the direct impact of forested fringe areas (i.e., timber harvest) due to the construction of the proposed solar facility and infrastructure would be minimal by comparison. No rare plant communities or unique habitats were identified within the Project, and most tree species are commonly found locally and regionally. Overall, vegetation's direct impacts (i.e., removal) would be

minor since by comparison to the region, the vegetation removal is minimal and not significant due to the past agricultural activity that has disturbed the Project at one time or another.

BMPs and appropriate erosion controls would be used as needed to minimize exposure of soil and erosion of soil from the Proposed Action. Silt fences, sedimentation basins, and other appropriate controls would be used as needed to minimize exposure to soil and to prevent eroded soil from leaving the work area. Disturbed areas would be seeded post-construction utilizing a mixture of certified weed-free, low-growing native non-invasive grass with potential of herbaceous plant, and flowering plant seed following recommendations from USDA (2018). This mixture could attract pollinator species. However, the final seed mix will be determined based on commercial availability. Erosion control measures would be inspected and maintained until vegetation in the disturbed areas has become well-established and stabilized.

One benefit of the Proposed Action Alternative would be the planting of native, low-growing grasses and wildflowers that may include pollinator attracting plant species. After construction and during the operation of the solar facility, WR Graceland Solar plans to manage vegetation to limit vegetative height near panels. To avoid the spread of exotic or invasive species within the Project, weed-free seed mixes and mulch will be used, equipment will be cleaned before entering the site, and selective use of USEPA-approved spot herbicides maybe used. Under the Proposed Action Alternative, the Proposed Action would have minor impacts to vegetation and would not significantly contribute to the spread of exotic or invasive species.

3.4.5.2 Wildlife

Under the Proposed Action Alternative, the construction phase of the Proposed Action would impact local wildlife via noise, vegetation removal, soil compaction and grading, and potential mortalities (Lovich and Ennen 2011). Therefore, wildlife present at the time of construction may be directly impacted, particularly during heavy machinery for vegetation clearing and driving piles. In addition, noise and vegetation removal may result in the displacement of migratory species into the surrounding landscape for the necessities of survival (e.g., food, water, breeding, and shelter). Large tracts of undeveloped habitat (1,700 acres) are adjacent to the Project and would provide these necessities during the project's construction phase. However, direct impacts on individuals may occur if those individuals are immobile during the time of habitat removal. Direct impacts would more likely happen if activities occurred during breeding/nesting seasons or winter hibernation periods when animals are stationary in shallow burrows.

The Project would be bounded by chain-linked fences (6-foot height). No special design features are being considered to facilitate non-volant wildlife movement. The fence likely will not impede non-volant wildlife due to burrowing under, climbing over and through, and leaping over. Additionally, more mobile species (i.e., larger mammals, such as deer and coyotes) could disperse round the Project. Therefore, no fragmentation impacts due to the fence is anticipated.

According to the Threatened and Endangered Species Report, two migratory birds of conservation concern may occur within the Project, the American kestrel and prothonotary warbler. Neither of these species were identified during field surveys, and very little suitable habitat is available for the prothonotary warbler. However, both species could be on-site outside of their breeding seasons when second broods may be reared. If present, direct

impacts could occur to these nestlings potentially located in areas where tree removal is proposed during the breeding season. In any case, mobile individuals are expected to flush out if disturbed (including adults and fledglings hatched from the first brood of the year).

WR Graceland Solar intends to conduct tree clearing outside of the nesting season (i.e., winter), to the extent practicable. However, it should be noted that permitting timeframes and construction scheduling may require clearing outside of the winter season in order to avoid significant project delays. If tree clearing is necessary during the nesting season, WR Graceland Solar would agree to have the migratory bird habitat areas surveyed for the presence of the American kestrel and prothonotary warbler. Thus, it is not expected that populations of these migratory bird species would be impacted since they were not identified during field surveys.

Bald and golden eagles are protected under the BGEPA; however, no eagles or nests were observed during field surveys and quality nesting and foraging habitat for both species is lacking within the Project. Due to the proximity of water and location within the Mississippi flyway, bald eagles might occasionally but temporarily disperse through the vicinity of the Project Site. Because there is no suitable roosting or nesting habitat for eagles exists within the Project or immediate vicinity (~17 miles to the Mississippi River), it is unlikely that eagles would occupy the Project.

Overall, temporary direct impacts caused by the construction phase could occur to common wildlife and migratory birds. Additionally, temporary minor indirect impacts (i.e., small, isolated and fringe habitat loss) are anticipated since tree removal is planned; however, there is roughly 1,700 acres of neighboring undeveloped and forested areas for wildlife to disperse. In addition, during the post-construction phase, the revegetation and conversion of croplands to native species (following recommendations from USDA [2018]) would provide habitat for displaced individuals and encourage new species to inhabit the Project.

3.4.5.3 Threatened and Endangered and Other Rare Species

Under the Proposed Action Alternative, two federally listed wildlife species (two mammals), one federally listed candidate species (butterfly), two state-listed plant species, and one state-listed mammal species occur or have the potential to occur in the Project. No federally listed plants or aquatic species, no state-listed wildlife or aquatic species, and no protected or unique habitats were observed within the Project; therefore, the Proposed Action would not directly impact these species' groups.

Monarch butterflies were recently listed as a federally listed candidate species under the ESA. While there are no Section 7 requirements for this species as a candidate species, two monarch butterflies were observed within the Project. The monarchs were observed adjacent to a soybean field in an herbaceous area containing milkweed plants (See **Figure 3-6**). Due to the limited habitat, or areas of herbaceous habitat, within the Project, effects to the monarch butterfly are expected to be minor. In addition, the conversion of row crop fields via planting native species [following recommendations from USDA (2018)] within and adjacent to the panel arrays would likely benefit this species in the long term. Proposed actions would not significantly impact monarch butterfly.

No federally listed bat species were captured within the Project during bat surveys; however, one state-listed species was captured – an adult male tri-colored bat (Stantec 2021a). Biologists identified 150 acres of suitable summer roosting and foraging habitat and no winter hibernacula features for bats were observed. Based on survey results Indiana and

northern long-eared bats are likely absent from the Project. Section 7 consultation under the ESA is underway regarding potential impacts to federally listed bat species. In the summer, adult male tricolored bats solitarily roost; whereas females roost in small colonies. Therefore, the capture of the lone male individual and not females suggest the abundance of this species is very low and the habitat within the Project might not represent high-quality foraging. Therefore, for this species, the Proposed Action would result in a potential direct impact due to the possibility of tree clearing during roosting months.

Botanists identified the state-threatened sweetbay magnolia and suitable habitat within the south and southwestern portions of the Project (Stantec 2022a; see **Figure 3-6**). All suitable habitat was surveyed. Two small individuals were observed along agricultural fields, which are not located in a wetland. These individuals appeared in poor health and are likely influenced by agricultural chemicals (e.g., herbicides and exfoliants). According to Southeast Regional Network of Expertise and Collections and iNaturalist databases, there are numerous individual occurrences of this species in West Tennessee, including Shelby County. Therefore, the Project does not represent a critical habitat or an isolated population in Tennessee. In addition, with only two small, immature plants present within the Project, it is unlikely the species' long-term survival would be affected by potential tree clearing in those areas. Under the Proposed Action Alternative's current conceptual design, there would be direct impacts to sweetbay magnolia (i.e., removal of both individuals). The other state-endangered plant species, ovate catchfly, was not present within the Project.

TVA consulted with USFWS over the protected species identified above, and on July 6, 2022, USFWS concurred with the effect determination(s) for the resources protected by the ESA. Therefore, the Proposed Action would have no impacts and has completed Section 7 clearance.

3.5 Visual Resources

This section provides an overview of existing visual resources within and surrounding the Project and potential impacts to visual resources associated with the Proposed Action Alternative and No Action Alternative.

Visual resources are the visual characteristics of a place and include both natural and man-made attributes. Visual resources are important as they can determine how an observer experiences a particular location. For example, an agricultural setting would elicit different feelings in an observer than in a manufacturing plant or an industrial area. Visual resources are important to people living in the area, people going through an area, and in the context of historical and culturally significant settings. The experience of a historically significant building can be severely altered if the surrounding visual character is changed. A viewshed is defined as the environment that can be seen from a certain vantage point, while a viewpoint is the vantage point from where the visual character is seen.

Affected Environment

The Project is located in Shelby County, Tennessee, and consists of 1,482 acres of rural land dominated by agriculture. Based on review of aerial imagery and land cover data, the Project Site and surrounding areas are primarily used for agriculture and low-density rural residential development (GoogleEarth Imagery 2022). There are several farm complexes, Goldsby Cemetery, Big Creek Baptist Church and cemetery, Jones Orchard, Zion Hill Cemetery, Faith Heritage Christian Academy, residential housing, NRCS wetland reserve program conservation easement, and the planned opportunity zone resiliency park are

located in close proximity to the Project. Depending on the final Project design, these sites could be within the viewshed of the Project (see **Figure 3-1**).

Six airports and one hospital helipad are located within 10 miles of the Project: Charles W. Baker Airport, Needham's Airport, Ray Airport, Millington-Memphis Airport, Shoemaker-Shelby Forest Airstrip, General DeWitt Spain Airport, and the Methodist North Hospital helipad; therefore, a glare hazard analysis was completed for the Proposed Action Alternative (Stantec 2022b). This glare hazard analysis was completed in 2022 based on the Project Design layout. This analysis utilized the web-based ForgeSolar glare hazard analysis program to determine the potential for glint/glare from the PV solar panels to affect pilots and airport operations, residents in the area, and drivers passing through (Stantec 2022b).

Environmental Consequences

3.5.1 No Action Alternative

Under the No Action Alternative, the proposed solar facility would not be constructed, and no Project-related impacts to visual resources would result. Existing views would be expected to change as the nearby residential areas develop to the east and west of the Project. Additionally, visual changes may occur over time as vegetation on the Project changes or if the site is, again, subjected to agricultural practices.

3.5.2 Proposed Action Alternative

The Proposed Action Alternative would alter the existing rural and open viewsheds. No national wild and scenic rivers are located near the Project Site (National Wild and Scenic Rivers System 2019). Based on a review of Tennessee State Parks and the National Park Service Sites, no State Parks or National Parks are located near the Project (Tennessee State Parks 2019 and USDOJ NPS 2020). In addition, there are no recreational trails located within or near the Project Site [Federal Highway Administration (FHWA) 2018]. Depending on the final design of the Project, motorists traveling along major arterials such as Paul W. Barret Parkway (SR-385), Walter K. Singleton Parkway (SR-204), Pleasant Ridge Road, Bateman Road, and Big Creek Orchard Road would see the Project, such as the proposed facility roads, fencing, substations, and the top of the solar arrays. Any residential roadway, or minor arterial, within the parameters of the major arterials above would also be inclined to see the elements of the solar facility, described above.

Construction of the Proposed Action Alternative would create temporary changes in views of and from the Project. Construction activities would temporarily introduce construction equipment and associated vehicles into the viewshed of surrounding property owners. In areas where grading would be necessary, minor changes to the ground surface's contour, color, and texture would be visible. ECDs such as silt fences would likely be visible from many vantage points during construction. Erosion control silt fences and sediment traps would be removed once construction is complete.

Visual changes resulting from construction are considered short-term and temporary. Construction occurring past daylight hours, which varies by season, could require lighting to illuminate construction activities that occur in the dark, in which case WR Graceland Solar would use downward facing lighting. However, visual impacts from construction would be minimal at night since most construction is anticipated to occur during the day. In addition, dust control would be implemented during construction to reduce the potential for slowly moving dust clouds that would attract attention from visual receptors and reduce the availability of short-range views.

Aerial photography indicates several residences, religious organizations, and a school within proximity of the Project. Occupied private residences surrounding the project area may have constrained siting options, require buffer or setback zones for nearby development, and/or drive stakeholder opposition to development. WR Graceland would address applicable visual impacts with a screening installation that follows Memphis and Shelby County UDC screening requirements.

The Project is open and relatively flat, but the Project would fit in with surrounding land uses. However, per Memphis and Shelby County UDC, there are required screening buffers that may be applicable to the project (Memphis and Shelby County 2021). WR Graceland Solar would coordinate with Shelby County to determine the appropriate screening measures necessary to further minimize any potential visual impacts from the Project.

This Glare Hazard Analysis was completed in February 2022 based on the Project Design layout (Stantec 2022b). The analysis utilized the web-based ForgeSolar glare hazard analysis program to determine the potential for glint/glare from the PV solar panels to affect pilots and airport operations, residents in the area, and drivers passing through (Stantec 2022b). The arrays used in the analysis program were drawn to encompass most of the outer extent of the proposed array fence lines to be conservative in the glare analysis by analyzing more area than the area panels would occupy.

Based on the solar array parameters provided and the current site design, glare is not predicted from the Project for pilots landing at 6 airports and 1 helipad located within a 10-mile radius of the Project, including Charles W. Baker Airport, Needham's Airport, Ray Airport, Millington-Memphis Airport, Shoemaker-Shelby Forest Airstrip, General DeWitt Spain Airport, and the Methodist North Hospital helipad (Stantec 2021b). In addition, the results of the ForgeSolar analysis determined that glare from the Proposed Action is not predicted to occur for drivers of vehicles on 15 roadways adjacent to the Project. The analysis was completed at 2 roadway viewing heights: 5-foot (cars and small trucks) and 9-foot (semi-trucks). Glare is also not predicted for the total of approximately 115 structures, primarily residences, that were analyzed within proximity to the Project Site. All routes and structures were analyzed using 5-foot and 7.92-foot panel heights.

3.6 Noise

This section provides an overview of existing noise within and surrounding the Project and potential impacts to noise associated with the Proposed Action Alternative and No Action Alternative.

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 vegetative cover.

Noise is generally described as unwanted sound, based on objective effects (hearing loss, damage to structures, etc.) or subjective judgments (such as community annoyance). Sound is typically measured by the decibel (dB), which is used to express the ratio of one value of a physical property to another on a logarithmic scale. A day-night average sound level of 55 A-weighted decibel (dBA) is commonly used as a threshold level for noise, resulting in adverse impacts, and prolonged exposure to levels above 65 dBA is considered unsuitable for residential areas (USEPA 1974). Noise regulations were reviewed for Shelby County, and no numerical limits are defined in the ordinance (Chapter 16 Article III § 16.61-69).

Noise is typically analyzed in the context of sensitive receptors, which include land uses associated with occupied dwellings for human activity, particularly sensitive to noise. Examples include hospitals, libraries, schools, and residential uses.

Affected Environment

The proposed project would be developed on a 1,482-acre tract located south of Paul W. Barret Parkway (SR-385) and intersected by Walter K. Singleton Parkway (SR-204). Surrounding the Project, primary ambient noise sources come from the surrounding roadways, agricultural uses, airports (north and southwest), military base to the north, and the raceway to the southwest.

The Project's sensitive noise receptors include single-family residences, cemeteries, institutional venues (e.g., religious institutions or schools), and parks. There are over 100 residences within 500 feet of the Project; however, denser concentrations of residences are located both east (south of Pleasant Ridge Road) and west (west of Raleigh Millington Road) of the Project. Residences along the north of Pleasant Ridge Road include rural residences, primarily associated with agricultural production. Three cemeteries are located to the northwest, directly to the west, and to the southwest of the Project. Parks are located to the northwest, and a proposed opportunity zone park will be located north. Two churches are located to the northwest and southwest of the Project. A school is located to the southwest of the Project (See **Figure 3-1**). Participants and residents in these areas would experience temporary increases in noise during construction.

Environmental Consequences

3.6.1 No Action Alternative

Under the No Action Alternative, no noise impacts would occur from the construction or operation of the proposed solar facility, and current noise levels related to vehicle traffic and agricultural land use would remain unchanged.

3.6.2 Proposed Action Alternative

The Proposed Action Alternative would result in short-term noise production related to construction activities. Construction equipment typically results in a maximum noise level within the range of 80-90 dBA, dropping to 71 to 81 dBA at 300 feet and 50 to 60 dBA at 1,000 feet. As a result, nearby residents could experience elevated noise levels caused by construction equipment. Still, construction noise would be of short duration and likely not exceed the 71 to 81 dBA noise level at nearby houses for prolonged periods. The construction work associated with pile driving would be the loudest and occur during daylight hours. Other construction-related noise would remain under 65 dBA for nearby residences. Work would generally occur six days per week (Monday through Saturday) from 7:00 am to 7:00 pm.

Noise impacts from constructing a temporary substation and permanent switching station (including new transformers and fans) would occur during construction only. The noise increases from vegetation removal and construction activities associated with the proposed substation and switching station would be most noticeable from Paul W Barret Parkway (SR-385). Elevated noise levels would be temporary and would only occur during daytime hours.

During operations, maintenance activities, primarily mowing, would result in noise periodically; however, this noise would be similar to existing noises near the Project. The PV arrays would be electric-powered and produce little noise. However, the arrays would

connect to a total of 39 skids of five TMEIC 840-kw power inverters to convert the DC electricity generated by the solar panels into AC electricity. Tracking equipment allowing PV modules to face the sun over the course of the day can cause a low level of noise. The noise generated by the inverters, panel motors, and transformers would not be audible above the ambient noise outside of the facility fence.

The nearest occupied houses are approximately 100 to 200 feet from the solar facility's southwestern and northern boundary. Therefore, throughout the rezoning and planning process with Shelby County, neighboring residences would be notified of project public hearings and provided an opportunity to comment on related actions to the Proposed Alternative.

Overall, the Proposed Action Alternative would have temporary direct noise impacts. However, WR Graceland Solar would include the appropriate setbacks, vegetation buffers, and fencing to help alleviate these potential noise impacts.

3.7 Air Quality and Greenhouse Gas Emissions

This section describes the existing air quality and GHG emissions at the Project and region, and the potential impacts on air quality and GHG emissions associated with the No Action and Proposed Action alternatives.

Affected Environment

The Clean Air Act (42 U.S.C. §7401 *et seq.*) mandates protecting and enhancing our nation's air quality resources. National Ambient Air Quality Standards (NAAQS) for the following criteria pollutants have been set to protect the public health and welfare:

- Sulfur dioxide (SO₂),
- Ozone (O₃),
- Nitrogen dioxide (NO₂),
- Particulate matter whose particles are less than or equal to 10 micrometers (PM₁₀),
- Particulate matter whose particles are less than or equal to 2.5 micrometers (PM_{2.5}),
- Carbon monoxide (CO), and
- Lead (Pb).

The primary NAAQS were promulgated to protect public health, and the secondary NAAQS were promulgated to protect the public welfare from any known or anticipated adverse effects associated with the presence of pollutants in the ambient air. Areas in violation of the NAAQS are designated as nonattainment areas. New sources in or near these areas may be subject to more stringent air permitting requirements. A listing of the NAAQS is presented in **Table 3-6** (USEPA 2022a). National standards other than annual standards are not to be exceeded more than once per year (except where noted). Ambient air monitoring is conducted through the Shelby County Air Monitoring Program at five locations in Shelby County. Shelby County monitors and reports data for the following EPA-required pollutants: CO, NO₂, O₃, PM₁₀, PM_{2.5}, PM_{10-2.5}, SO₂, and total reactive nitrogen oxides

(NO_y), speciated volatile organic compounds (VOCs), and carbonyls (Shelby County Health Department 2022). The Shelby County Air Monitoring Branch does not measure for lead due to the limited sources of lead-emitting facilities operating in the county.

The system-wide emissions from TVA's electrical generating facilities are described in TVA's 2019 IRP EIS (TVA 2019b). In addition, TVA has reduced its criteria pollutants and GHGs by installing emission controls at fossil-fueled plants, idling, and retiring coal-fired generating units, increasing the use of low-emission generating facilities, and increasing energy efficiency and demand reduction efforts.

Table 3-6. NAAQS Table

Pollutant		Primary/Secondary	Average Time	Level	Form
Carbon Monoxide (CO)		Primary	8 hours	9 ppm	Not to be exceeded more than once per year
			1 hour	35 ppm	
Lead (Pb)		Primary and Secondary	Rolling 3-month average	0.15 µg/m ³ ⁽¹⁾	Not to be exceeded
Nitrogen Dioxide (NO ₂)		Primary	1 hour	100 ppb	98 th percentile of 1-hour daily maximum concentrations, averaged over 3 years
		Primary and Secondary	1 year	53 ppb ⁽²⁾	Annual mean
Ozone (O ₃)		Primary and Secondary	8 hours	0.070 ppm ⁽³⁾	Annual 4th-highest daily maximum 8-hour concentration, averaged over 3 years
Particle Pollution (PM)	PM _{2.5}	Primary	1 year	12.0 µg/m ³	Annual mean, averaged for 3 years
		Secondary	1 year	15.0 µg/m ³	Annual mean, averaged for 3 years
		Primary and Secondary	24 hours	35 µg/m ³	98 th percentile, averaged over 3 years

Pollutant		Primary/Secondary	Average Time	Level	Form
	PM ₁₀	Primary and Secondary	24 hours	150 µg/m ³	Not to be exceeded more than once per year on average over 3 years
Sulfur Dioxide (SO ₂)		Primary	1 hour	75 ppb ⁴	99 th percentile of 1-hour daily maximum concentrations, averaged over 3 years
		Secondary	3 hours	0.5 ppm	Not to be exceeded more than once per year

Source: USEPA 2022a

Abbreviations: ppb = parts per billion, ppm = parts per million, µ/m³ = micrograms per cubic meter

(1) In areas designated nonattainment for the Pb standards prior to the promulgation of the current (2008) standards, and for which implementation plans to attain or maintain the current (2008) standards have not been submitted and approved, the previous standards (1.5 µg/m³ as a calendar quarter average) also remain in effect.

(2) The level of the annual NO₂ standard is 0.053 ppm. It is shown here in terms of ppb for the purposes of clearer comparison to the one-hour standard level.

(3) Final rule signed October 1, 2015, and effective December 28, 2015. The previous (2008) O₃ standards are not revoked and remain in effect for designated areas. Additionally, some areas may have certain continuing implementation obligations under the prior revoked one-hour (1979) and eight-hour (1997) O₃ standards.

(4) The previous SO₂ standards (0.14 ppm 24-hour and 0.03 ppm annual) will additionally remain in effect in certain areas: (1) any area for which it is not yet one year since the effective date of designation under the current (2010) standards, and (2) any area for which an implementation plan providing for the attainment of the current (2010) standard has not been submitted and approved and which is designated nonattainment under the previous SO₂ standards or is not meeting the requirements of a SIP call under the previous SO₂ standards (40 CFR 50.4(3)). A SIP call is an EPA action requiring a state to resubmit all or part of its State Implementation Plan to demonstrate attainment of the required NAAQS.

3.7.1 Regional Air Quality

Areas in compliance with the NAAQS are designated “attainment areas,” while those not in compliance with the NAAQS are designated as “nonattainment areas” (USEPA 2021). The county usually defines nonattainment areas. 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. For example, suppose an area formerly designated as nonattainment for a particular pollutant later qualifies as attainment. In that case, the pollutant is categorized as “maintenance” for the next 20 years (if it continues to meet NAAQS) before qualifying for designated attainment. Based on available ambient air quality data, Shelby County is currently in attainment for all criteria pollutants (USEPA 2022b). Air quality statistics (AQS) for Shelby County, Tennessee (reported as of May 5, 2021) are presented in **Table 3-7** (USEPA 2021b).

Table 3-7. AQS Data for Shelby County, TN (Published on May 5, 2021)

Criteria Pollutant	Shelby County AQS Data	NAAQS
CO 8-hour (ppm)	1	9
Pb 3-month ($\mu\text{g}/\text{m}^3$)	No Data	0.15
NO ₂ AM (ppb)	10	53
NO ₂ 1-hour (ppb)	33	100
O ₃ 8-hour (ppm)	0.062	0.070
PM ₁₀ 24-hour ($\mu\text{g}/\text{m}^3$)	64	150
PM _{2.5} Weighted AM ($\mu\text{g}/\text{m}^3$)	9.1	12
PM _{2.5} 24-hour ($\mu\text{g}/\text{m}^3$)	20	35
SO ₂ (ppb)		75

3.7.2 Regional Climate

Weather conditions determine the potential for the atmosphere to disperse emissions of air pollutants. West Tennessee's climate is characterized by warm, humid summers with average high temperatures up to 89 degrees Fahrenheit (°F) and cool winters with average low temperatures around 45 °F (Weatherspark 2022).

More specifically, in Memphis, TN, the summers are long, hot, and muggy. The winters are short, very cold, wet, and windy. Over the course of the year, the temperature typically varies from 34 °F to 91 °F (Weatherspark 2022).

3.7.3 Greenhouse Gas Emissions

GHGs are chemical compounds in the Earth's atmosphere that trap and convert sunlight into infrared heat. Gases exhibiting greenhouse properties come from both natural and man-made sources. Carbon dioxide, methane, and nitrous oxide are among the most common GHGs emitted from natural processes and human activities.

The largest sources of GHGs in the U.S. are from fossil fuel combustion for electricity, heat, and transportation (USEPA 2019). For the electricity sector, CO₂ makes up the vast majority of GHGs from the sector, but the electricity sector also emits smaller amounts of CH₄ and N₂O; however, these vary by fuel source (USEPA 2019).

Environmental Consequences

3.7.4 No Action Alternative

Under the No Action Alternative, the proposed solar facility would not be constructed. Therefore, no project-related impacts to climate or air quality would occur as the proposed solar facility would not be built. Existing land use would remain a mix of residential, agricultural, and forested, with little effect on climate and air quality.

3.7.5 Proposed Action Alternative

Under the Proposed Action Alternative, minor impacts on air quality would occur during the facility's construction. Only minimal air impacts would be expected, as construction might result in localized dust and fumes from equipment. Construction would likely involve diesel-powered machinery and thereby create small amounts of airborne dust and debris. Internal combustion engines' emissions associated with diesel fuels would generate local emissions, including carbon dioxide, nitric oxide, and sulfur dioxide during construction (a temporary increase of GHG emissions during construction). The impacts on air quality are expected to be minimal and short-lived. Any emissions would be temporary and would not adversely impact the environment.

Approximately 849.67 acres of the Project would be subject to ground-disturbing activities, including vegetative clearing. However, adequately implemented control and suppression measures and BMPs and standard erosion control measures, such as reseeding, would minimize the potential for wind erosion. In addition, trees and other tall vegetation removed during construction to accommodate the panel layout and gen-tie would represent a minor loss of sequestered carbon, as well as potential future carbon sequestration. Therefore, no adverse impact to air quality and GHGs is anticipated from the Proposed Action.

The operation of the solar facility is not anticipated to have any adverse impacts on air quality or GHG emissions, as only minor maintenance would be expected to occur, which would not constitute a major source of air pollutants. Conversely, overall emissions of air pollutants from the TVA power system would decrease during operation as the nearly emission-free power generated by the Proposed Action would reduce the need to generate new power from the combustion of fossil fuels. The reduction in GHG emissions resulting from the operation of this individual facility would have little noticeable effect at regional or larger scales. However, it would be a component of the larger planned system-wide reduction in GHG emissions by the TVA power system through reducing the need for some fossil-fuel based electricity generation. 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 (2019a).

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, nonrenewable, and often fragile. They are frequently threatened by industrial, commercial, residential development, roads, and other infrastructure construction.

Cultural resources are prehistoric and historic archaeological sites, districts, buildings, structures, objects, and locations of historical events of importance. Cultural resources listed or determined to be eligible for listing on the National Register of Historic Places (NRHP) maintained by the National Park Service are considered historic properties. Section 106 of the National Historic Preservation Act (NHPA) is a federal requirement to evaluate the potential effects of its actions on historic properties (36 CFR Part 800). When a Proposed Action would adversely affect a historic property, the agency responsible must consider ways to avoid or minimize the adverse effect in consultation with state historic preservation officers, federally recognized Indian tribes, and other stakeholders. If avoidance or minimization is not feasible, measures to mitigate the adverse effect must be taken.

The NHPA provides a national program to support 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 (other than in exceptional cases) if found to possess one or more of four different criteria, per 36 CFR § 60.4:

1. 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.
2. 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.
3. 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 generally include architectural resources such as buildings, objects, districts, and designed landscapes.
4. 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 vital information not contained elsewhere.

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. In addition, under Section 106 of NHPA, the Project is required to consider ways to avoid or minimize effects from its undertakings on significant cultural resources.

Affected Environment

Under Section 106 of the NHPA, Phase I cultural resource surveys were conducted to document and assess resources within the Project associated with the Proposed Action. The Area of Potential Effect (APE) for the cultural studies consisted of the Project; however, desktop reviews included areas visually connected to it via viewshed to and from the Project within a 0.5-mile radius. Therefore, areas within the APE radius that were determined not to be within view of the proposed undertaking due to terrain, vegetation, and/or modern built environments were not considered part of the APE (CRA 2021, 2022a).

The surveys were conducted to provide an inventory of resources within the Project, descriptions of the condition of any resources identified, and recommendations regarding their NRHP eligibility. All work was consistent with the Secretary of the Interior's Standards and Guidelines for Identification (USDOI NPS 1983) and met the minimum requirements established by TDOA (2022).

Please note that the Project boundary was revised after the cultural team conducted surveys; therefore, both the historic/architectural and archeological reports have two surveys accompanied by one report (each) and an addendum to include the additional parcels in the current Project (CRA 2021, 2022a, 2022b, 2022c). In addition, the Project boundary defines the APE, and therefore, was updated in the addendum reports to include the additional parcels. Regardless of the change in APE, the current Project was included in these cultural reports.

3.8.1 Historic/Architectural

The Historic Architectural Resource Survey report was completed in October 2021 (CRA 2021). A desktop review of records maintained by the THC revealed 24 previously recorded resources within a 0.5-mile buffer of the APE. The field survey was performed in August 2021. Sixteen of the 24 resources are within the viewshed of the Project, but six were determined to no longer be extant, and two were obstructed from view based on field observations. None of the remaining sites were determined eligible for inclusion in the NRHP under Criterion A, B, or C (CRA 2021).

An additional survey was performed in November 2021 to examine an additional parcel for the proposed interconnection and project substation (CRA 2022a). This survey identified eight previously recorded resources located within the APE for the additional parcel. Five sites were previously recorded sites, of which three have been demolished, and two (SY-32040A and SY-32038A) were previously inaccessible during the August 2021 field survey. Three newly recorded sites (documented in the August 2021 survey) were not recommended for eligibility for inclusion in the NRHP. Sites SY-32040A and SY-32038A were assessed in November 2021 and not recommended for eligibility for inclusion in the NRHP. Sites SY-32809A and SY-32808A were further evaluated and discovered more early agricultural buildings and intact landscape features were present than previously documented from the public right-of-way, and additional research is recommended to evaluate the property thoroughly. However, a majority of the property is outside of the 0.5-mile buffer and outside the viewshed of the Project; therefore, no adverse effects are anticipated even if the site were determined eligible for listing under the NRHP (CRA 2022a).

3.8.2 Archaeology

A Phase I Archeological Survey was completed in January 2022 (CRA 2022b). Prior to the cultural resource's fieldwork, a desktop review was conducted to review previous records from within the APE and a 1-mile buffer radius around the APE. The review involved evaluating previously recorded archaeological sites and cultural resources survey data maintained by TDOA. Seven previously recorded archaeological sites occur within the APE and an additional 26 previously recorded sites within a 1-mile radius of the APE. However, limited information was available for these previously recorded sites, and it was unlikely they were previously assessed for NRHP eligibility.

Field surveys were conducted in the APE for the project between June 2 and August 20, 2021 (CRA 2022b). The survey covered approximately 1,360 acres. The Phase I Archeological Survey report aimed to identify and document previously recorded and newly documented archaeological and historic-age non-archaeological resources. In addition, the report assessed the eligibility for listing properties in the NRHP and the potential project impacts to NRHP-listed or eligible properties as required under Section 106. An additional survey was performed between November 3 and 18, 2021, to examine an additional parcel for the proposed interconnection and project substation (CRA 2022c).

The APE was surveyed via pedestrian survey, surface collection, and screened shovel testing (CRA 2022c). The archaeological survey included 1,066 timed surface collections units, 15 general surface collections, 518 piece plotted artifact locations, and the excavation of 828 shovel tests. The survey also included the re-visit and re-assessment of seven previously recorded sites and the documentation of 50 new archaeological sites (15 pre-contact sites, 23 historic sites, and 12 multicomponent sites). Further work was recommended at five of those sites (40SY877, 40SY879, 40SY344, 40SY856, and 40SY878) to evaluate them for NRHP eligibility. However, the remaining sites were not recommended for eligibility.

The survey for the additional parcel identified one previously recorded archaeological site (40SY33) that no longer contains archaeological material (CRA 2022c). In addition, six new archaeological sites were documented (40SY900, 40SY901, 40SY902, 40SY903, 40SY904, and 40SY905) and two non-site localities and five isolated finds. Based on the lack of stratigraphic integrity, a general dearth of precontact material and the relatively late age of historic materials, the addendum sites were not recommended for eligibility or inclusion on the NRHP.

Environmental Consequences

3.8.3 No Action Alternative

Under the No Action Alternative, the existing land use would be expected to remain unchanged. Therefore, no impacts to cultural resources would occur as the site would not be developed as a solar facility.

3.8.4 Proposed Action Alternative

3.8.4.1 Historic/Architectural

The Proposed Action Alternative would not impact any listed or NRHP-eligible architectural sites. On January 5, 2022, the TN-SHPO concurred with the findings of the architectural survey reports and concluded that no architectural resources eligible for listing in the NRHP would be affected by the Proposed Action (see **Appendix G**). After re-coordination to include an additional parcel, TN-SHPO responded in a letter dated February 18, 2022, that the documents submitted were insufficient to complete their review based on the lack of information for Jones Orchard. TN-SHPO stated that Jones Orchard should be evaluated for eligibility and if the site is recommended eligible the TVA should provide a map of the site and more information on the substation height. Then, if the site is determined eligible, the effects to the resource would need to be assessed. On March 29, 2022, TVA responded that the proposed project would result in no adverse effects to Jones Orchard and provided more detailed information on the negligibility of the orchard. TN-SHPO responded on April 1, 2022, stating that they concur that even if the Jones Orchard were to be eligible for listing in the NRHP, it would not be adversely affected by this undertaking.

3.8.4.2 Archaeology

Further archaeological investigations were recommended for five sites within the APE of the Project (40SY877, 40SY879, 40SY344, 40SY856, and 40SY878). Upon the conclusion of the cultural resource investigations, the Project's conceptual design was altered to avoid impacting these cultural resource sites with a 20-meter buffer during the construction and operation of the Project. Therefore, no impacts to any listed, eligible, or potentially eligible NRHP archaeological sites would occur due to the Proposed Action Alternative. The TN-SHPO concurred with these findings on February 17, 2022, (see **Appendix G**).

3.8.4.3 Native American Consultation

TVA initiated consultation on April 16, 2021, with federally recognized tribes with an interest in this county including Absentee Shawnee Tribe of Indians of Oklahoma, Cherokee Nation, The Chickasaw Nation, The Choctaw Nation of Oklahoma, Eastern Shawnee Tribe of Oklahoma, Jena Band of Choctaw Indians, Kialegee Tribal Town, The Muscogee (Creek) Nation, The Quapaw Nation, Shawnee Tribe, Thlopthlocco Tribal Town, and United Keetoowah Band of Cherokee Indians in Oklahoma. In a letter dated May 19, 2021, the Chickasaw Nation noted their interest in acting as a consulting party to this Proposed Action. In addition, the Cherokee Nation stated that based on their review of the cultural reports, “the Nation does not foresee this project imparting impacts to Cherokee cultural resources at this time. However, the Nation requests TVA halt all project activities immediately and recontact our Offices for further consultation if items of cultural significance are discovered during the course of this project.” See **Appendix G** for a copy of the tribal consultation letters.

TVA and WR Graceland Solar will sign an agreement document that ensures that sites 40SY877, 40SY879, 40SY344, 40SY856, and 40SY878 would be avoided during the life of the PPA. Should previously undiscovered cultural resources be identified during construction or operations, a Secretary of the Interior-qualified archaeologist, TVA, and the TN-SHPO would be consulted before any further action is taken.

3.9 Solid and Hazardous Waste Management

This section provides an overview of existing waste management within the Project and the potential impacts to waste management that would be associated with the Proposed Action and No Action alternatives. Components of waste management that are analyzed include solid and hazardous waste and materials.

“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, the 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 Title 40, CFR, Part 261. In addition, 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.

Affected Environment

A Phase I Environmental Site Assessment (Phase I ESA) report was completed in January 2020 for all or portions of the City of Millington and Shelby County, Tennessee Parcel Record Number's M0126 00192, M0126 00031, M0126 00080, M0126 00193, D0126 00084, D0127 00028, D0127 00264, D0127 00356, D0127 00273, D0127 00271, D0137 00014, D0137 00120, D0137 00111, D0126 00086, D0137 00112, and D0137 00085 (the “Project”; Stantec 2020a). The Phase I ESA was conducted in conformance with the requirements of ASTM International (ASTM) Designation E 2247-16, and All Appropriate Inquiry (AAI) as defined by the USEPA in Title 40 of the Code of Federal Regulations, Part 312. The property covered by the Phase I ESA consisted of an approximately 2,691-acre

(the larger CIA Project Boundary) collection of parcels associated with the Proposed Action at the time of the report. The Phase I ESA resulted in the following findings:

- Based on the Environmental Data Resources, Inc. (EDR) Well Map, multiple residential, irrigation, and USGS Science Center groundwater monitoring wells (USGS wells) are located within a one-mile radius of the Property (Stantec 2020a). The USGS wells are associated with nationwide aquifer monitoring performed. Three wells, one USGS well, one residential and one irrigation, appear to be located within the current Project boundary; however, they were not observed during the field surveys. Based on the reported use of the wells for potable water, irrigation, and aquifer monitoring, they are not an environmental concern for the Proposed Action.
- Based on the historical documents, the Project was developed and utilized for agricultural use since 1937 (Stantec 2020a). Therefore, a wide variety of pesticides were commonly applied on agricultural land, especially arsenic-based pesticides, until the late 1960s. Other pesticides of concern are lead-based compounds, dichlorodiphenyltrichloroethane, and aldrin/dieldrin. Lead and arsenic are highly persistent in the environment and would remain indefinitely. However, evidence of chemical mixing areas, crop-dusting airstrips, or maintenance areas was not found. Notwithstanding, the shallow soils may still contain pesticide residue and metal impacts.
- Jones Orchard was listed in the EDR Area Corridor Report on the Underground Storage Tank (UST) and Historical UST databases (Stantec 2020a). The Jones Orchard site is an active fruit tree orchard located over 2,300 feet to the north of the Project. This site does include one UST/historical UST record for a 550-gallon, steel, diesel UST. The UST was installed on 6/1/1988 and has a tank status designation of “Permanently Out of Use.” Stantec obtained records for the UST listing from the TDEC. Records received included UST registration and fee payment records. According to the records, the UST was installed in approximately 1984, contained diesel fuel for farm operations, and was constructed of steel with steel piping and no cathodic protection. There were no records documenting proper closure and sampling of the UST. Based on the distance from the current Project boundary, the Jones Orchard site is not considered an environmental concern.

In summary, there are no environmental concerns associated with CERCLA-listed hazardous materials or petroleum products were identified during the Phase I ESA.

Environmental Consequences

3.9.1 No Action Alternative

Under the No Action Alternative, the proposed solar facility would not be constructed, and no Project-related impacts related to waste management resources would occur. Existing land use would be expected to continue as agriculture and residential, and waste management conditions would be expected to adjust as needed (no defined waste management practices currently exist).

3.9.2 Proposed Action Alternative

Under the Proposed Action Alternative, construction activities and facility operations would generate solid waste. Oily rags, worn or broken metal and machine parts, defective or broken electrical materials, other scrap metal and plastic, broken down module boxes,

empty containers, paper, glass, and other miscellaneous solid wastes would be generated throughout all phases of the proposed Project. Waste would be disposed of by means of contracted refuse collection and recycling services. All applicable regulatory requirements would be followed in collecting and disposing of waste to minimize health and safety effects. Any potential asbestos containing materials in structures proposed for demolition would be tested and handled and disposed of according to the applicable federal, state, and local regulations.

According to the Phase I ESA findings, the Proposed Action Alternative would not directly impact hazardous materials because they are not likely to be encountered during construction. During construction of the proposed solar facility, materials would be stored on site in storage tanks, vessels, or other appropriate containers specifically designed for the characteristics of these materials. Fuel for construction vehicles may be stored on-site during construction. A Tennessee Spill Prevention Control and Countermeasure plan would be developed and implemented to minimize the potential of a spill and detailed instructions for on-site personnel on how to contain and clean up any potential spills. Fueling of construction vehicles would occur within the construction area. All applicable local, state, and federal regulatory requirements would be followed, and waste would be properly disposed of should the solar facility be completed. During construction and operation of the Proposed Action, any materials determined to be wastes would be evaluated (e.g., waste determinations) and managed (e.g., inspections, container requirements, permitted transport, and disposal) in accordance with the Solid and Hazardous Wastes Rules and Regulations of the State of Tennessee (TDEC Division of Solid Waste Management Rule 0400 Chapters 11 and 12, respectively).

Procedures to limit fuel spills would be implemented during the construction and operation of the facility. Details regarding the handling of fluid spills and general trash would be included in the SWPPP. Spills would be managed in accordance with standard procedures for spill prevention and cleanup and waste management protocols in accordance with applicable federal, state, and local requirements. Waste generated during operation would be minimal and would mainly result from the replacement of equipment. Nonhazardous wastes would be disposed of in an approved, operating landfill. Bulk chemicals would be stored in storage tanks or returnable delivery containers. The transport, storage, handling, and use of all chemicals would be conducted in accordance with applicable local, state, and federal laws, ordinances, regulations, and standards.

Upon expiration of the 20-year PPA or an amended or alternative PPA for the sale of power after the 20 years, WR Graceland Solar would develop a decommissioning plan to document the recycling and/or disposal of solar facility components in accordance with applicable federal, state, and local laws and regulations. To the extent possible, waste would be recycled. More specifically, portions of the panels that could be recycled, including steel, glass, and aluminum, would be recycled. Materials that could not be recycled would be disposed of at a landfill or approved facility to be determined by the contractor(s).

3.10 Public and Occupational Health and Safety

This section provides an overview of existing public health and safety at the Project and the potential impacts of the No Action Alternative and Proposed Action alternatives.

Affected Environment

The Project is currently private property and includes agricultural and rural-residential land uses. Public emergency services in the area include urgent care clinics, hospitals, law

enforcement services, and fire protection services. A brief description of the public emergency services relative to the project location is provided below:

The Naval Support Activity (NSA) Mid-South Branch Health Clinic is the closest hospital to the Project, located south of Navy Road on Singleton Avenue, approximately two miles (four minutes) from the Project (GoogleEarth Imagery 2022). The Methodist North Hospital is the next closest hospital, located approximately 11 miles and 15 to 20 minutes from the Project. The Millington Police Department provides law enforcement services in the City of Millington. Shelby County law enforcement services are provided by the Shelby County Sheriff's Department. The Millington Police Department is located in Millington, approximately three miles (five minutes) from the Project. Fire protection services are provided by the Millington City Fire Department and the Shelby County Fire Department (Station 64), located approximately four miles (ten minutes) and 0.50 miles (two minutes), respectively, from the Project. The Tennessee Emergency Management Agency has the responsibility and authority to coordinate with state and local agencies in the event of a release of hazardous materials associated with project activities.

Electric and Magnetic Fields

Power frequency (60 Hz) electric and magnetic fields (EMF) are present wherever electricity is generated, transmitted, or used, including utility installations such as substations and transmission lines, and typical household electrical appliances such as hairdryers and microwave ovens. The health effects of 60 Hz EMF have been the subject of extensive research since the late 1950s and no studies report adverse health cause and effect related to power frequency EMF. Further information on Electric and Magnetic fields associated with electrical power is available on TVA's website at tva.com/emf.

Environmental Consequences

3.10.1 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. In addition, existing land use would remain a mix of agricultural, residential, and some forested land. Since the Project's land is not currently used by, or accessible to the general public, there are no current public health and safety issues.

3.10.2 Proposed Action Alternative

Workers at the Proposed Action Alternative and associated electrical lines would have an increased safety risk associated with the construction activities. However, because construction work has known hazards, standard practice is for contractors to establish and maintain health and safety plans in compliance with Occupational Safety and Health Administration (OSHA) regulations. Such health and safety plans emphasize BMPs for site safety management to minimize potential risks to workers. Examples of BMPs include employee safety orientations; establishment of work procedures and programs for site activities; use of equipment guards, emergency shutdown procedures, lockout procedures, site housekeeping, personal protective equipment; regular safety inspections; and plans and procedures to identify and resolve hazards.

Potential public health and safety hazards could result in association with the flow of construction traffic along the public roadways. For example, Pleasant Ridge Road would be used by construction/major truck traffic to access the Project, and as a result the residences along Pleasant Ridge Road may experience a temporary increase in GHG emissions and car accidents. The construction team would follow the appropriate traffic procedures to

minimize potential safety concerns (i.e., GHG emissions or car accidents) that would be included in established health and safety plans.

Minimal amounts of fuel for construction vehicles would be kept on-site during construction. BMPs would be implemented to minimize the potential of a spill and instruct on-site workers on how to contain and clean up any spills. In addition, spill response kits would be maintained on-site during construction. The Project would be surrounded by security fencing during construction and operational phases, and access gates would normally remain locked. As a result, general public health and safety would not be at risk in the event of an accidental spill on-site.

Emergency response for the Project would be provided by the local, regional, and state law enforcement, fire, and emergency responders. No public health or safety hazards would be anticipated due to operations. Overall, impacts to public health and safety in association with the implementation of the Proposed Action would be considered temporary and minor.

Electric and Magnetic Fields

The WR Graceland Solar site would be designed and constructed to meet or exceed applicable industry safety codes and standards. The equipment being used consists of components already in widespread use throughout power utilities. EMF emissions would be no different from a typical power delivery substation. Highest levels of EMF would be present inside the fence perimeter which is not accessible to the general public or those without training for working in areas of elevated EMF. This information will be included in the Final EA.

3.11 Socioeconomics and Environmental Justice

This section describes an overview of existing socioeconomic conditions and environmental justice (EJ) considerations associated with the No Action Alternative and Proposed Action Alternative. EO 12898 directs Federal agencies to consider the impacts of their actions on minority and low-income populations and to avoid disproportionate impacts to those populations (EO 12898 1994). While not subject to this EO, TVA routinely addresses EJ in its NEPA analysis and review processes. In identifying minority and low-income populations, the following definitions from the CEQ were used (CEQ 1997b):

- *Minority individuals.* Individuals who identify themselves as members of the following population groups: American Indian or Alaskan Native, Asian, Native Hawaiian or Other Pacific Islander, Black, Hispanic, or two or more races.
- *Minority populations.* Minority populations are identified where (1) the minority population of an affected area exceeds 50 percent or (2) the minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis.
- *Below Poverty populations.* Below Poverty populations in an affected area are identified with the annual statistical poverty thresholds from the Census Bureau's Current Population Reports, Series P-60, on Income and Poverty.

Affected Environment

The proposed project is in a rural area of Shelby County near the City of Millington. The Project is located in Census Tracts (CT) 202.22, Block Group (BG) 2 and CT 203.01, BG 1.

Table 3-8 and **Table 3-9** below provide a breakdown of the relevant population, income, and poverty data. The remaining data was found through the U.S. Census 2015 – 2019 Five-Year American Community Survey (ACS) Estimates (Census 2019).

3.11.1 *Population and Minority*

The total population in Tennessee is 6,709,356, in Shelby County the total population is 936,374, and within the Project the total population is 2,305, equaling to approximately 0.2 percent of the total county population. The Project Site's CT 203.01, BG 1 is below the EJ requirements being 13.83 percent of minority populations, and CT 202.22, BG 2 is 54.83 percent of minority populations, which is over 50 percent of the total population, and higher than the City of Millington and the state of Tennessee's percent of minority populations (Census 2019).

Table 3-8. Project Population and Minority

WR Graceland Solar Project Population Data			
Geography	Population	Minority Population	
	Total	Minority Population	Percent Minority
Tennessee	6,709,356	1,757,798	26.20%
Shelby County	936,374	601,535	64.24%
City of Millington	10,645	4,099	31.51%
CT 202.22, BG 2 of the Project	1,056	579	54.83%
CT 203.01, BG 1 of the Project	1,249	174	13.83%

Sources: Census 2019

3.11.2 Employment Site Income and Poverty

The state of Tennessee median household income is \$53,320 and per capita income is \$29,859, Shelby County has a similar median household income of \$51,657 and a similar per capita income of \$30,104. Within a 1-mile radius of the Project, there is a lower per capita income of \$24,672. While median household income is not reported at a 1-mile radius level through EJSCREEN, likely, the median household income within one mile of the Project would be slightly below the median Shelby County household income of \$54,657 (USEPA 2022d). The Project's populations below the poverty line are relatively low with CT 202.22 being 2.27 percent and CT 203.01, BG 1 being 18.73 percent, which is less than Shelby County's percent below poverty (Census 2019).

Table 3-9. Project Income and Poverty

WR Graceland Solar Project Income and Poverty Data						
Geography	Median and Per Capita Income			Poverty Level		
	Total Households	Median Household Income	Per Capita Income in Past 12 Months	Population for Whom Poverty Status is Determined	Population Below Poverty Level	Percent Below Poverty Level
Tennessee	2,597,292	\$53,320	\$29,859	6,709,356	996,930	15.24%
Shelby County	351,194	\$51,657	\$30,104	936,376	177,675	19.35%
City of Millington	4,136	\$52,500	\$28,837	10,645	1,927	18.63%
Project (1-mile Radius)	1,723	N/A	\$24,672	N/A	N/A	N/A
CT 202.22, BG 2 of the Project	N/A	N/A	N/A	1,056	24	2.27%
CT 203.01, BG 1 of the Project	N/A	N/A	N/A	1,249	216	18.73%

Sources: Census 2019 and USEPA 2022d

Environmental Consequences

3.11.3 No Action Alternative

Under the No Action Alternative, the proposed solar facility would not be constructed. Therefore, no project-related socioeconomic impacts within Shelby County would occur. Further, no disproportionate impacts on low-income or minority populations in the Proposed Action would occur. The benefits of lease payments to landowners would not take place during the this No Action Alternative.

3.11.4 Proposed Action Alternative

Under the Proposed Action Alternative, the proposed solar facility would take approximately 12 months with as many as 250-300 workers employed for the peak of construction. Workers would include a mix of general laborers, electrical technicians, and journeyman-level electricians. Work would generally occur six days a week from 7:00 am to 7:00 pm, though occasionally work may occur seven days a week. There would be short-term beneficial economic impacts from construction activities associated with the project, including purchasing 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. Some construction materials and services would likely be purchased locally in Shelby County and the region. Also, most of the construction workforce may be from local or regional sources, though a small portion of the workforce may come from out-of-state. Therefore, the direct impact on the economy associated with construction would be short-term and beneficial.

The majority of the indirect employment and income impacts would be from the expenditure of the wages earned by the workforce involved in construction activities and the local workforce used to provide materials and services. Therefore, the construction of the solar facility could have minor beneficial indirect impacts on population and short-term employment and income levels in Shelby County and the City of Millington.

During the operation of the solar facility, grounds maintenance and other specific contracts for project operations would most likely be local and ongoing on a regular basis. Three people would also be on-site during biannual inspections of the solar facility, which would have a small positive impact on employment in Shelby County.

Overall, socioeconomic impacts for the operation of the Proposed Action would be positive and long-term, although small relative to the region's total economy. The local tax base would not change from the construction of the solar facility. The property value assessment rate would remain the same as industrial land (Shelby County Assessor of Project 2022). Additionally, the local governments (Shelby County and the City of Millington) would not have to provide traditional government services typically associated with large capital investment, such as water, sewer, and schools.

The Proposed Action would not result in residential dislocations or impact land uses currently associated with residential activities. Based on the analysis presented above, residents within CT 202.22, BG 2 are considered to include minority populations due to there being over 50 percent of minority persons, which qualifies this BG as an EJ population. Therefore, the overall EJ impacts of the solar facility, most of which would occur during the estimated construction period, would be minor to on-site residences and the impacts to residences off-site would be negligible. Based on the impact analysis, there would be no significant adverse health impacts on members of the public or significant adverse environmental impacts on the physical environment (water, air, and terrestrial resources) and socioeconomic conditions. Therefore, there would be no disproportionately high or adverse impacts on minority populations due to the Proposed Action's human health or environmental effects.

3.12 Transportation

This section describes roadways and other transportation infrastructure serving the Project and surrounding area and potential impacts on transportation associated with the No Action Alternative and Proposed Action alternatives.

Affected Environment

The Proposed Action could be directly served by the local and state roadway network, railway line to the west, or the nearest regional airport (non-private) located approximately 2.4 miles to the north. The nearest inland waterway port facility is the International Port of Memphis on the Mississippi River, approximately 10.5 miles southwest of the Proposed Action, the second-largest inland port on the Mississippi (International Port of Memphis) (GoogleEarth Imagery 2022).

3.12.1 Roads

Walter S. Singleton Parkway/SR-204 is considered a National Highway System (NHS), functional class of six, and directly serves the Project. Singleton Parkway is a four-lane divided, paved road that bisects the middle of the Project, running north to Paul W. Barret Parkway East/SR-385 and south to Austin Peay Highway and Covington Pike, and then connecting to Interstate 40 (I-40), east of Memphis. Singleton Parkway connects north to

SR-385, connecting westward to US-51/SR-3 (near the City of Millington), and US-70/SR-1 connects eastward (near the City of Arlington). Paul W. Barret Parkway/SR-385 is a primary urban state route functional class system. Pleasant Ridge Road is a functional rural minor collector route class that intersects Singleton Parkway, running east to west through the Project.

Existing traffic volumes were acquired using Average Annual Daily Traffic (AADT) counts measured at existing Tennessee Department of Transportation (TDOT) stations, with the latest available data being 2020 (TDOT 2022). The 2020 AADT on Singleton Parkway/SR-204, just south of the SR-385 overpass, was 13,592 vehicles, while the AADT on Barrett Parkway (SR-385), west of Singleton Parkway, was 8,034 vehicles. Pleasant Ridge Road, running through crossing Singleton Parkway, had a lower AADT of 6,339 vehicles. Meaning more vehicles are running through the Project on Singleton Parkway.

Table 3-10. Average Daily Traffic on Nearby Roadways

Roadway	Average Annual Daily Traffic (2020)	Number of Lanes
Walter S. Singleton Parkway/SR-204 - South of Paul W. Barrett Parkway (Log Mile (LM) 4.7 to 9.8)	13,592	Four, Divided
Paul W. Barrett Parkway/SR-385 - West side of Singleton Parkway (LM 10.8 to LM 13.9)	8,034	Four, Divided
Pleasant Ridge Road - section crossing Singleton Parkway	6,339	Two

Source: TDOT 2022

3.12.2 Other Modes

Canadian National Railway Company (CN) operates a railroad track that runs approximately one mile to the west of the Project. CN runs from Chicago, Illinois to the south, through Millington, Memphis, Jackson, Mississippi, and New Orleans, Louisiana. CN has two to three intermodal terminals in Memphis, TN (CN 2022).

The nearest regional (non-private) airport is the Charles W Baker Airport, approximately 2.4 miles to the southwest of the Project, and the Millington-Memphis Airport is 2.4 miles to the north. The Memphis International Airport is 11 miles to the southwest and is a Fed Ex World Hub and handles commercial airline, air cargo, military aviation, and general aviation air traffic (Memphis-Shelby County Airport Authority 2022).

Environmental Consequences

3.12.3 No Action Alternative

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

3.12.4 Proposed Action Alternative

The construction and operation of the Proposed Action would have no effect on rail traffic, operation of the airports in the region, or commercial air passenger or air or rail freight traffic. They would not adversely affect any general aviation activities in the vicinity of the site. However, construction traffic would have minor impacts to the minor rural roadway, Pleasant Ridge Road, if heavily utilized during peak travel hours.

The construction of the Proposed Action would have minor, short-term effects on the local roadway network due to additional labor, construction, and delivery vehicles. These effects would be primarily due to worker commutes and delivery of equipment and materials to and from the construction-site. As many as 300 workers would be on-site from approximately 7:00 am to 7:00 pm, six days a week, for approximately four to 12 months. In addition, construction equipment and material delivery would require two to five semi-tractor trailer trucks visiting the Project per day for approximately three months of the construction activities.

Much of the existing roadway network would be traveled by construction-related vehicles, including interstate, state route roadways, and one functional, minor connector. At the peak of construction activities, there would be an estimated 300 additional vehicle trips per day on SR-385 and SR-204, which would be between a two to five percent increase in the 2020 AADT. The interstate and state route roadways would support construction traffic related to the proposed project; however, trucks should avoid rural minor collector roads during peak hours.

The operation of the solar facility would not overburden the local or regional roadway network, as operating activities would require three on-site staff and vehicular traffic, consisting of periodic visits to conduct facility inspections and maintenance. Therefore, the proposed project would result in minor, temporary, direct, and indirect impacts to traffic during construction activities; however, there would be no long-term impacts on the existing roadway conditions.

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CHAPTER 4 – ANTICIPATED ENVIRONMENTAL AND CUMULATIVE IMPACTS

This chapter summarizes the anticipated adverse environmental impacts of the Proposed Action. It considers the relationship between short-term uses and long-term productivity and whether the Proposed Action makes irreversible and irretrievable commitments of resources. This chapter also considers the cumulative impacts concerning other ongoing or reasonably foreseeable proposed activities within the Project and the surrounding area.

4.1 Unavoidable Adverse Environmental Impacts

The Proposed Action Alternative could result in some unavoidable adverse environmental effects. **Table 4-1** below summarizes potential unavoidable indirect impacts and the proposed mitigation measures designed to address each impact.

Table 4-1. Unavoidable Indirect Impacts and Proposed Mitigation Measures

Resource	Impact Type and Description	Mitigation Measure
Geology and Paleontology	Minor indirect impacts are anticipated due to soil and shallow subsurface disturbances.	Placement of construction BMPs, such as early soil stabilization management measures for geologic resources. If paleontology resources are found, work will halt until a specialist develops a recovery plan for extraction.
Geologic Hazards	Minor indirect impacts due to possible seismic activity.	A geologic assessment would be necessary to assess geological risk and potential mitigation measures.
Prime Farmland	Minor indirect impacts since Prime Farmland will not be permanently impacted.	Some areas would remain undeveloped in the Project. BMPs would be utilized, including installing ECDs to preserve topsoil and limit erosion during stockpiling events.
Floodplains	Indirect impacts are anticipated due to sections of the 500-year floodplain present in the Project.	Mitigation measures include the avoidance of the 100-year floodplain; however, WR Graceland Solar would use standard BMPs for encroaching on a 500-year floodplain.
Wildlife	Indirect impacts are anticipated due to a temporary displacement of wildlife during construction.	Large tracts of forested land are located outside of the project area. Jurisdictional streams and wetland riparian buffer areas are also available for wildlife.
Transportation	Temporary indirect impacts.	The interstate and state route roadways would support construction traffic related to the proposed project; however, trucks should avoid

Resource	Impact Type and Description	Mitigation Measure
		rural minor collector roads during peak hours as a mitigation measure.

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

Short-term uses generally occur on a year-to-year basis, such as wildlife foraging, agricultural activities, recreation, and uses of water resources. Long-term productivity is the capability of the land to provide resources, both to market and nonmarket, for future generations. For this Final 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 by converting it from agricultural 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 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 were consumed, committed, or lost due to 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 an irreversible commitment of fuel and resource labor required for the construction, maintenance, and operation of the solar energy system. Because removal of the solar arrays and associated on-site infrastructure could be accomplished relatively quickly, and the facility would not irreversibly alter the site, the Project would be returned to its original condition or used for other productive purposes once the solar facility is decommissioned. Some solar facility components could also be recycled after the facility is decommissioned.

4.4 Cumulative Impacts

Cumulative impacts are defined as the effects of the Proposed Action when considered together with other past, present, and reasonably foreseeable future actions 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 the most applicable and representative of those associated with the Proposed Action. Cumulative impacts related to the Proposed Action are described below in the following resource sections (CEQ 1997a).

Chapter 3, Affected Environment and Environmental Consequences, presents information about past and present environmental conditions and future trends, where appropriate. This section addresses the cumulative impacts of the Proposed Action and any reasonably foreseeable actions in the vicinity. Desktop research was conducted on potential past, present, and future actions in Shelby County, Tennessee. Resources examined included:

- Local and regional news sources.
- City of Millington website records, including planning commission meetings, city meeting minutes, and public notices; and
- Tennessee DOT website.

Federal Projects

TDOT is currently sponsoring several federally funded roadway improvement projects in Shelby County. Most of the projects are associated with roadway improvements in the Memphis metropolitan area.

Studies for a proposed extension of the I-69 corridor are underway in western Tennessee, including Shelby County. I-69 exists presently from the Michigan/Canada border to the northeast side of Indianapolis, Indiana. Congress passed legislation to extend the corridor from Indianapolis to the Lower Rio Grande Valley. The proposed project to extend the I-69 corridor, also known as Corridor 18, includes a new interstate route from Dyersburg to Millington in Shelby, Tipton, Lauderdale, and Dyer Counties. The proposed route is one of the multiple segments for the proposed extension and one of three segments that impact the state of Tennessee. Segment 8 begins at SR 385 (Paul Barrett Parkway in Shelby County and extends north to the I-55/US-412/US-51 interchange in Dyer County. The extension of the corridor will serve Memphis and Shelby County, Tennessee. Segment 9 begins near the I-55/SR 304 Interchange in Hernando, Mississippi, and extends north to Segment 8 in Millington, Tennessee. Both segments have been approved for independent utility, and alternative routes within the corridor are being studied (TDOT 2022a).

This proposed Project has the potential to contribute to cumulative impacts on land use, water resources, geological resources and farmlands, visual resources, noise, and air quality in the area. While many segments of the proposed I-69 would follow existing highway alignments, roads would need to be widened and new segments are proposed that would affect agricultural or undeveloped land. The proposed highway would likely affect wetlands and surface waters; however, compensatory mitigation would be required to offset unavoidable impacts to these resources. The I-69 project's effects on these resources, as well as noise, visual resources, and air quality, have been or are being evaluated under their NEPA analysis. The Proposed Action is expected to result in minor direct impacts and would not contribute to a cumulative adverse effect on these resources.

State and Local Projects

Shelby County's Resiliency Grant project is a flood mitigation between Big Creek and SR-385 from US-51 to Sledge Road. This densely wooded area would be cleared and leveled to 2-4 feet to keep floodwaters from Big Creek from flooding neighboring development. This area is located just north of SR-385 and the Project.

TDOT has projects along SR-14 (PIN 101608.00), a two-lane roadway that has been let for right-of-way and reconstruction. In addition, US-51, north of Paul W. Barret Parkway, has an active project (PIN 128604.00) to implement a bicycle and pedestrian facility. US-70, east of the SR-385 connection, also has an active resurfacing project (PIN 133518.00). Lastly, I-40 has several active and let projects for resurfacing, safety, and bridge repairs. There are no other publicly known state or local projects that the proposed project would prompt cumulative adverse impacts (TDOT 2022). These transportation projects can cause temporary and minor delays during their construction, but it's unlikely they would result in significant adverse cumulative impacts.

CHAPTER 5 – LIST OF PREPARERS

The following persons contributed to the preparation of this Final EA by the Project Team.

Name/Education	Experience	Project Role
TVA		
Elizabeth Smith		Project Manager
Christopher Logan Barber		Ecology Review and Coordination
Michaelyn Harle		Cultural Review and Coordination
Stantec Consulting Services Inc.		
Emery Hartz, QHP	15 years of NEPA documentation, ecology surveys, GIS analysis and mapping, and public engagement.	NEPA Specialist
Amy M. Willoughby, QHP-IT	15 years of ecological surveys, environmental permitting, and environmental due diligence	Project Manager and Reviewer
Josh Ennen, PhD	20 years of threatened and endangered species surveys, wildlife conservation, and permitting	Technical Writer
Erica Christiansen	Six years' experience of NEPA documentation, wildlife ecology, and environmental permitting	Technical Writer
Kelly Daniels, QHP-IT	Three years of experience in ecology surveys and environmental due diligence and permitting	Technical Writer and Ecology Surveys
James Kiser	31 years of experience in wetland and water surveys, threatened and endangered species surveys, bat surveys, and environmental permitting	Ecological Surveys
Wesley Cunningham, QHP	16 years of wetland and water surveys, threatened and endangered species surveys, and permitting	Ecological Surveys

Name/Education	Experience	Project Role
Jennifer Brunty	22 years of wetland mitigation, water resources management, regulatory permitting, and compliance.	Glare Hazard Analysis
Michael Williams, QHP	23 years of wetland and water surveys, threatened and endangered species surveys, and environmental permitting and due diligence	Ecological Surveys and Phase 1 ESA
Ellen Brady	25 years of cultural surveys and cultural management	Cultural Surveys
Rhett Baggett	21 years of ecological surveys, NEPA compliance, and environmental permitting	Reviewer
Tommy Martin, PLA, LEED-AP-ND, CPESC, CESSWI	37 years of land-use planning and design, site planning, engineering, and landscape architecture	Land Use Permitting
Cultural Resource Analysts, Inc.		
Travis Hurdle	16 years of cultural survey and cultural management	Cultural Surveys
Elizabeth Heavrin	17 years of architectural surveys	Architectural Surveys
WR Graceland Solar, LLC		
Joshua McNeely	16 years of solar development	Director, Solar Development East
Patrick McCarthy	20 years of environmental consulting and renewable/fossil fuel energy project permitting	Director of Environmental Affairs and Permitting

CHAPTER 6 – LITERATURE CITED

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Appendix A – Previous Documentation



**Graceland 2 Solar Project
Desktop Critical Issues Analysis
Report**

July 2, 2020

Prepared for:

RWE Solar Development, LLC
701 Brazos Street, Suite 1400
Austin, Texas 78701

Prepared by:

Stantec Consulting Services Inc.
601 Grassmere Park Road, Suite 22
Nashville, Tennessee 37211



Appendix B – Public Involvement



TVA MEDIA ADVISORY

TVA Seeks Public Input on WR Graceland Solar Project

MILLINGTON, Tenn. – The Tennessee Valley Authority values public input and is launching a process to hear from the community on a draft Environmental Assessment for a proposed solar project in Shelby County. This project would add 150 megawatts of solar energy to TVA's growing renewables portfolio and further advances the agency's efforts to create a clean, carbon-free energy future.

The WR Graceland Solar Project Environmental Assessment is available for a 30-day public review and comment period at www.tva.com/nepa.

To promote job creation across the region and achieve its plan to add 10,000 megawatts solar by 2035, TVA has entered into a power purchase agreement with WR Graceland Solar, LLC to buy the energy generated by the proposed project. WR Graceland Solar, LLC would construct, own and operate the proposed solar facility.

The draft EA includes two alternatives: a no-action alternative and an action alternative. Under the No Action Alternative, TVA would not purchase the power generated by the project under the 20-year PPA with WR Graceland Solar, LLC, and TVA would not be involved with the project. Under the Proposed Action Alternative, WR Graceland Solar, LLC would construct and operate a 150-megawatt on 850 acres of a 1,482-acre project site. Additionally, WR Graceland Solar, LLC would build a new substation to connect the solar farm to TVA's power grid.

The public comment period begins today and ends on May 25, 2022. Comments can be submitted online at www.tva.com/nepa, by email to nepa@tva.gov, and by mail in writing to Tennessee Valley Authority, ATTN: Elizabeth Smith, NEPA Specialist, 400 W Summit Hill Dr., WT 11-B, Knoxville, TN 37902.

Please note that all comments received, including names and addresses, will become part of the administrative record and available for public inspection.

For more information about TVA and its 88-year mission of service to the Tennessee Valley, click [here](#).

#

Media Contact: Scott Fiedler, Chattanooga, 901-414-6964
TVA Public Relations, Knoxville, 865-632-6000
<http://www.tva.com/newsroom>
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INVITATION FOR PUBLIC COMMENT

WR Graceland Solar Project

The Tennessee Valley Authority (TVA) is asking the public to provide input on a Draft Environmental Assessment (EA) for the WR Graceland Solar Project in Shelby County, Tennessee. Details of the review are available in a draft Environmental Assessment at www.tva.com/nepa.

TVA has entered into a power purchase agreement (PPA) with WR Graceland Solar, LLC to purchase the power generated by the proposed WR Graceland Solar Project in Shelby County, Tennessee. The Project is anticipated to generate up to 150 megawatts (MW) alternating current (AC) in capacity. The proposed solar facility would be constructed and operated by WR Graceland Solar, LLC.

The draft EA includes two alternatives: a no action alternative and an action alternative. Under the No Action Alternative, TVA would not purchase the power generated by the Project under the 20-year PPA with WR Graceland Solar, LLC, and TVA would not be involved with the project. Under the Proposed Action Alternative, WR Graceland Solar, LLC would construct and operate a 150 MW AC single-axis tracking photovoltaic (PV) solar power facility in Shelby County, TN. The facility would occupy approximately 850 acres of a 1,482-acre Project Site. WR Graceland, LLC would enter long-term leases with the landowners. The proposed project would connect to the existing TVA electrical network Memphis Light, Gas and Water 161-kV transmission line to the north via a 250-foot-long generation tie-in line. The entire 150-MW output from the Solar Facility would be sold to TVA under the terms of the PPA.

The complete draft Environmental Assessment is available at www.tva.com/nepa.

Submitting Comments

TVA invites you to comment on the draft EA. Comments must be received or postmarked no later than **May 25, 2022**. Electronic comment submittals are preferred. Any comments received, including names and addresses, will become part of the administrative record and will be available for public inspection.

Written comments should be sent to:
Tennessee Valley Authority
ATTN: Elizabeth Smith, NEPA Specialist
400 West Summit Hill Drive, WT 11B, Knoxville, TN 37902

Email Comments Here: nepa@tva.gov



Tennessee Valley Authority, 400 West Summit Hill Drive, Knoxville, Tennessee 37902-1499

April 26, 2022

To Whom It May Concern:

TENNESSEE VALLEY AUTHORITY (TVA) - NOTICE OF AVAILABILITY OF A DRAFT ENVIRONMENTAL ASSESSMENT (EA) – WR GRACELAND SOLAR PROJECT

TVA has entered into a Power Purchase Agreement (PPA) with WR Graceland Solar, LLC (referred herein as “Graceland Solar”), to purchase the power generated by the proposed Graceland Solar Project (Project) in Shelby County, Tennessee. This draft EA has been prepared to assess the potential impacts of TVA’s Proposed Action. TVA’s Proposed Action would result in the construction and operation of the proposed solar facility by Graceland Solar and actions taken by TVA to connect the solar facility to the TVA transmission system. The scope of this EA therefore focuses on impacts related to the construction and operation of the proposed solar facility and associated modifications to the TVA transmission system associated with the proposed solar facility.

The purpose of this project is to support the implementation of TVA’s 2019 Integrated Resources Plan (IRP). The project would partially fulfill the renewable energy goals established in the 2019 IRP, which would help meet the energy needs of the TVA region over a 20-year planning period, while achieving TVA’s objectives to deliver reliable, low-cost, and cleaner energy with fewer environmental impacts.

TVA has assessed a No Action Alternative and a Proposed Action Alternative. Under the Proposed Action, Graceland Solar would acquire approximately 1,482 acres of land in Shelby County, Tennessee, and construct, operate, and maintain a single-axis tracking photovoltaic solar power facility. The energy generated by the initial 150-MW proposed solar facility on the Project Site would be sold to TVA in accordance with the terms of the PPA.

The draft EA is posted on TVA’s website at www.tva.com/nepa. Comments on the draft EA must be received on or before May 25, 2022. [Comments can be submitted online](#), or by [email](#). Written comments should be sent to Elizabeth Smith, NEPA Compliance Specialist, 400 West Summit Hill Drive, WT11B-K, Knoxville, Tennessee 37902. Comments may also be submitted by email to esmith14@tva.gov.

If you have any questions, please contact Elizabeth Smith by email, esmith14@tva.gov.

Sincerely,

A handwritten signature in black ink, appearing to read "Elizabeth Smith", is located below the "Sincerely," text.

Elizabeth Smith
NEPA Specialist
Tennessee Valley Authority



May 25, 2022

Elizabeth Smith
TVA NEPA Specialist
400 West Summit Hill Drive, WT 11B
Knoxville, TN 37902
Via email to nepa@tva.gov at 4:30pm on 5/25/22.

Re: TVA's WR Graceland Solar Project Draft Environmental Assessment

Dear Ms. Smith:

Protect Our Aquifer offers the following comments on Tennessee Valley Authority's draft Environmental Assessment (EA) for the proposed WR Graceland Solar Project. Protect Our Aquifer (POA) cares about protecting the land within Shelby County that connects to the region's drinking water source. Our mission is to protect the Memphis Sand Aquifer for the benefit of the resource, our community, and future generations, including the areas listed in the draft EA that overlie the water supply.

We support TVA's decision to expand their renewable energy portfolio to reduce demands on fossil fuels that rely on the Memphis Sand Aquifer. The water source is currently used for cooling a gas-fired power plant and the previous operation of a coal-fired power plant left a legacy of pollution. Expanding renewable energy generation aligns with TVA's Integrated Resource Plan and can reduce quality and quantity degradation on the Aquifer.

We write today to bring up concerns regarding the location, scope, alternative options, groundwater and surface water impacts, and long-term impacts of the changed land use. Specifically, we respectfully insist that TVA:

1. Consider other alternative locations closer to the end user in Gallatin, TN or allow solar-generated energy to supply Shelby County's needs,
2. Commit to studying brownfields for the location of the solar farm,

3. Include the potential of lead and cadmium leaching from the solar panels and impacting the groundwater supply, and
4. Utilize a multi-use restorative agriculture approach to maintain the property.

I . TVA must accurately assess alternative locations closer to the end power user in Gallatin, TN or utilize the solar generation for Shelby County, TN.

Proximity

The proposed solar facility is intended to power 150 MW. Of this, 110 MW will travel over 200 miles to Facebook's Gallatin, TN data center. This will enable Facebook to "continue [their] commitment of 100% renewable energy for [their] global operations."¹ While it is honorable that Facebook wants to limit their use of fossil fuels and the necessary freshwater to operate those facilities, TVA must consider solar projects closer to the end user.

It is a best practice to develop renewable energy projects as close as possible to the end-user because long distance transmission creates power losses. The US Energy Information Administration estimates that electricity transmission and distribution (T&D) losses equaled about 5% of the electricity transmitted and distributed in the United States in 2016 through 2020².

Transmission and distribution lead to some losses in electricity as it moves from the point of generation to the end-user. These losses are collectively referred to as "line loss." In general, the longer the distance the electricity must travel from generation to consumer, the larger the line loss³. If 110 MW of the Project's energy is slated for transmission to Gallatin, land use impacts should be reduced in Shelby County and minimize energy loss.

Local Generation

The proposed Project would connect to the existing Memphis, Light, Gas and Water (MLGW) electrical network via a 250-foot gen-tie line to the proposed switching station adjacent to the proposed substation.

¹<https://americas.rwe.com/press/2021-05-19-rwe-partners-with-facebook-and-tva-on-150-megawatt-solar-project-in-the-us>

² <https://www.eia.gov/tools/faqs/faq.php?id=105&t=3>

³ <https://www.epa.gov/energy/electricity-delivery-and-its-environmental-impacts>

If the solar-generated 150 MW were distributed across Shelby County, they could power almost 103,000 homes with clean energy⁴. Current energy generation is sourced from TVA's Allen Combined Cycle Plant in southwest Memphis that relies on fracked methane gas and uses over 653 million gallons of water annually from the Memphis Sand Aquifer for its operation⁵.

By sending 110 MW of power outside of MLGW's footprint, Shelby County's carbon emission status quo remains and the Allen Plant will continue to deplete the Memphis Sand Aquifer.

This transition to solar should serve the needs of Shelby County if the Project is located within the boundaries of the County. Taking land out of production for use in one County to service another has an impact on the environmental and economic resources of Shelby County and should be considered in this draft EA.

Additionally, TVA's proposed Project will tie into the MLGW transmission system but transfer the energy elsewhere. This enables TVA to send that renewable energy far outside of MLGW's service area and further entangles MLGW infrastructure with the federal agency it is considering leaving.

TVA has yet to reinstate its Distributed Power Production program, which reimbursed customers for at-home renewable energy generation, that was dismantled December 31, 2019. TVA's blanket ban on residential net-metering renders home solar panel implementation economically unfeasible for the majority of Memphians. The expansion of that program could expand solar energy meeting TVA's IRP goals, offset water extraction and impacts from the Memphis Sand Aquifer and lower the cost of electricity for residents throughout the County. None of this was analyzed as an alternative option.

If MLGW decides not to renew their contract with TVA, it appears that TVA is utilizing over 1,400 acres that would essentially "block" MLGW from access to that power. Would TVA expect to continue using MLGW transmission lines for a fee? That is not something TVA has offered MLGW if the split were to occur. This scenario must be considered in the EA analysis due to the environmental and economic impacts that will occur on Shelby County.

⁴ <https://seia.org/initiatives/whats-megawatt>

⁵ <https://www.commercialappeal.com/story/news/2022/01/18/mlgws-top-water-customers-memphis-use-billions-gallons-every-year/9169674002/>

Alternative Placement

The 2022 Draft Environmental Assessment describes the proposed solar facility as occupying 850 acres with the total land use of 1,482 acres. The current landscape is predominately used for agriculture which allows for rainwater to directly infiltrate the soils and recharge the shallow aquifer. The placement of 150 MW of solar will increase the impervious surfaces and lead to more runoff, potentially aiding in downstream flooding.

Have any brownfields or other degraded lands in Shelby County been considered at the location for this solar field? Decommissioned and contaminated industrial sites are generally situated in areas adjacent to existing transmission infrastructure. The Environmental Protection Agency has established a program⁶ to encourage the development of renewable energy projects on potentially contaminated lands. The agency's RE-Powering America's Land Initiative encourages renewable energy projects on current and formerly contaminated lands, landfills, etc.

Alternative site selection analysis should consider this program from EPA and the use of brownfields over forested or agricultural lands. Some sites to consider are the former Firestone Plant, Shelby County Landfill, Dunn Field at the Memphis Defense Depot, and Jackson Pit Landfill.

II. The Draft EA lacks particular risks to freshwater aquifers and lists impacts as "low" without additional specificity.

In a report from the U.S. Geologic Survey, the confining clay layer existing between but locally the Cockfield Formation may be absent as a result of structural relief from faulting and subsequent erosion⁷. The site's geology, groundwater flow, and contaminant plume should be investigated before proposing and selecting a final EA.

Studies have shown the heavy metals in solar panels can leach out of the cells and infiltrate into groundwater⁸, as well as affect plants. While this scenario could seem unlikely, considering the groundwater and drinking water impacts from lead and

⁶<https://www.epa.gov/land-revitalization/renewable-energy-contaminated-lands-mine-sites-landfills-brownfields-superfund>

⁷ <https://pubs.usgs.gov/sir/2004/5040/PDF/SIR20045040part2.pdf>

⁸ <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5607867/>

cadmium contained within the panels should be investigated. Additionally, TVA must outline a plan for mitigating this risk and include it in the EA.

According to the EA, the panels will be built at an elevation of 270 feet, keeping them one foot above the 100-year flood elevation. Portions of the Project area are located within FEMA Zone AE 100-year floodplain of the Big Creek Drainage Canal in the northern portion and the Loosahatchie Drainage Canal in the southern part (Stantec 2020b). Will the expansion of impervious cover impact surface runoff?

To what depth must the rebar or other stabilization methods penetrate the ground? Will these create avenues for contamination to infiltrate into the shallow aquifer system? Will this increase the amount of shallow aquifer recharge flowing into the system? This analysis is critical to understanding water quality and quantity impacts to our drinking water supply and surface water bodies.

We applaud TVA's plan to ensure there are 50 foot buffers to all jurisdictional wetlands and a 50 foot buffer to the jurisdictional streams. This type of riparian zone can reduce contamination in the runoff and decrease stormwater flow.

III. The Project must utilize a multi-use restorative agriculture approach to maintain the property.

There are no details explaining the methods utilized to upkeep of grasses beyond restoring the landscape after construction. How will the vegetation be maintained?

Conventional, gas-power lawn mowers and leaf blows have high greenhouse gas emissions that will degrade air quality and be hypocritical to use renewables at the Project site. This type of vegetation control also creates noise pollution at decibels above 78 for the homes surrounding the site and over 95 dB for the operators⁹.

We recommend restorative agricultural multi-use of the land with native plantings and the use of grazing livestock for vegetation control.

⁹ <http://dangerousdecibels.org/>



For decades TVA has utilized massive amounts of drinking water for their energy generation and left a legacy of polluted groundwater in southwest Memphis. TVA must consider all alternative locations and end-users listed in this letter as part of the EA for the Graceland Solar Project. While we support TVA's expansion of renewable energy, we do not support the extensive land use for power supply outside of Shelby County. TVA must consider the broad impacts of their operation in and around Shelby County, including the Memphis Sand Aquifer.

Thank you for your consideration of these comments.

Sincerely,

A handwritten signature in black ink that reads "Sarah H." with a stylized flourish at the end.

Sarah Houston
Executive Director
Protect Our Aquifer



STATE OF TENNESSEE
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
NASHVILLE, TENNESSEE 37243-0435

DAVID W. SALYERS, P.E.
COMMISSIONER

BILL LEE
GOVERNOR

May 25, 2022

Via Electronic Mail to nepa@tva.gov

Elizabeth Smith
Tennessee Valley Authority
400 W. Summit Hill Drive, WT11B-K
Knoxville, TN 37902.

Dear Ms. Smith:

The Tennessee Department of Environment and Conservation (TDEC) appreciates the opportunity to provide comments on the Tennessee Valley Authority's (TVA) *WR Graceland Solar Project Draft Environmental Assessment* (Draft EA), which evaluates the potential environmental effects associated with the construction and operation of a solar PV facility on a 1,482-acre property located southeast of the city of Millington in Shelby County, Tennessee. The proposed solar facility would occupy approximately 849.67 acres of the 1,482-acre project boundary and would generate up to 150 megawatts (MW) of alternating current (AC) generating capacity output for transmission to the electrical network. The proposed facility would consist of multiple parallel rows of bi-facial photovoltaic (PV) panels on single-axis tracking structures, along with direct current (DC) and AC inverters and transformers. TVA has entered into a Power Purchase Agreement (PPA) with WR Graceland Solar, LLC (Graceland Solar) subject to the successful completion of applicable environmental reviews. Under the long-term PPA, TVA would purchase the electric output and electrical interconnection generated by the proposed 150MW AC solar facility for an initial term of 20 years, and the property owners within the solar facility's project boundary would enter into long-term lease agreements with Graceland Solar.

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

- Alternative A – No Action Alternative: Under this alternative, TVA would not purchase the power generated by the Proposed Action under the 20-year PPA with WR Graceland Solar, and TVA would not be involved with the Project. Existing conditions would remain unchanged (i.e., the property would remain as agricultural land), and agricultural activities would likely continue. There would be no Project-related changes to land use and natural resources in the immediate future; however, the Project Site could be affected by other future developments. TVA would continue to rely on other sources of generation to ensure an adequate energy supply and meet its goals for increased renewable and low greenhouse gas (GHG)-emitting generation.
- Alternative B – Proposed Action Alternative: Under the Proposed Action Alternative, WR Graceland Solar would construct and operate a 150-MW AC single-axis tracking PV solar facility in Shelby County, Tennessee, and TVA would purchase 100 percent of the renewable energy from the facility under the terms of the 20-year PPA with WR Graceland Solar. The solar facility would generate up to 150MW AC output for transmission to the electrical network and would occupy approximately 1,482 acres (including nine parcels) of land in Shelby County, Tennessee. 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 MLGW electrical network via the proposed Project's 250-foot gen-tie line to the proposed switching station adjacent to the proposed substation.

TDEC is the environmental and natural resource regulatory agency in Tennessee with delegated responsibility from the U.S. Environmental Protection Agency (EPA) to regulate sources of air pollution; solid and hazardous waste; radiological health issues; underground storage tanks; and water resources. TDEC's comments are made in the context of proposed Alternative B. TDEC has reviewed the Draft EA and has the following comments regarding the proposed action:

Air Pollution Control

Table 1-1 (Necessary Permits or Licenses) includes TDEC as a lead agency for obtaining a burn permit, however, the Tennessee Air Pollution Control Board has delegated regulation of most air pollution control responsibilities, including open burning, to the Shelby County Health Department. The Draft EA has been forwarded to the Shelby County Health Department's Air Pollution Control Program for review and comment and should be contacted prior to any open burning. In addition, TDEC recommends avoiding open burning on days that air quality alerts have been issued. TDEC also recommends that all construction equipment employed on site be well maintained and equipped with the latest emissions control equipment, and to minimize idling of heavy-duty non-road mobile sources.

Energy

TDEC supports efforts to increase energy resiliency, including a more decentralized power supply in the state. In the event of an energy emergency the additional source from the solar PV site may provide emergency access to energy and serve as a temporary "energy" bridge to the surrounding region. TDEC would support additional power supply measures that utilize connections with the solar farm to provide an alternate supply of energy during or after a natural or made-made energy disruption.

TDEC recommends that TVA consider using electric-powered lawn equipment, which can be as much as fifty percent quieter than traditional gas-operated models. Electric-powered lawn equipment also has zero air emissions onsite, reduces petroleum-fuel purchases, and eliminates used oil waste. Similarly, if there is an opportunity to use all-electric portable earthmoving equipment, that use would result in reduced noise, air emissions, petroleum-fuel purchases, and used oil waste. TDEC recommends TVA consider these additional details in the Final EA.

TDEC recommends that TVA consider addressing any potential Electro Magnetic Field impacts that may result from the proposed action in the final EA.

Water Resources

The proposed project will require a stormwater construction permit, including a Storm Water Pollution Prevention Plan.¹ The size of the project, which calls for solar panel installation on 1,482 total acres, may necessitate an individual permit rather than a general stormwater construction permit. The proposed project will also require an Aquatic Resource Alteration Permit.² Due to the considerable vegetation management around the panels involving herbicide application, care should be taken to follow manufacturer's directions and avoid herbicide application prior to predicted rainfall events or high winds to minimize any possibility of runoff or drift.

TDEC appreciates the opportunity to comment on this Draft EA. Please note that these comments are not indicative of approval or disapproval of the proposed action or its alternative, nor should they be interpreted as an indication regarding future permitting decisions by TDEC. Please contact me should you have any questions regarding these comments.

¹ <https://www.tn.gov/environment/permit-permits/water-permits1/npdes-permits1/npdes-stormwater-permitting-program/npdes-stormwater-construction-permit.html>

² <https://www.tn.gov/environment/permit-permits/water-permits1/aquatic-resource-alteration-permit--arap-.html>

Sincerely,

A handwritten signature in black ink, appearing to read "Bryan Davidson". The signature is fluid and cursive, with the first name "Bryan" and last name "Davidson" clearly distinguishable.

Bryan Davidson | Policy Analyst
Office of Policy and Sustainable Practices, TDEC
William R. Snodgrass Tennessee Tower
312 Rosa L Parks Ave, 2nd Floor
Nashville, TN 37243
Email: Bryan.Davidson@tn.gov
Phone: 615-393-0359

Draft Environmental Assessment for Graceland Solar Farm Project - Public and Agency Comments and Graceland Solar Responses

Comment Period: 4/26/2022 - 5/25/2022

Commentor	Comment	Comment Type	Comment Type	Date	Responses
Sarah Houston, Executive Director of Protect our Aquifer	"We write today to bring up concerns regarding the location, scope, alternative options, groundwater and surface water impacts, and long-term impacts of the changed land use. Specifically, we respectfully insist that TVA: 1. Consider other alternative locations closer to the end user in Gallatin, TN or allow solar-generated energy to supply Shelby County's needs, 2. Commit to studying brownfields for the location of the solar farm, 3. Include the potential of lead and cadmium leaching from the solar panels and impacting the groundwater supply, and 4. Utilize a multi-use restorative agriculture approach to maintain the property."	Introduction	Letter	5/25/2022	Comment noted. The energy produced from the facility would be delivered to the TVA bulk electric system. Certain environmental attributes produced from the facility have been contracted to TVA customers participating in the Green Invest Program, contingent upon the satisfactory completion of environmental reviews. See the Land Use Section 3.1 starting on page 3-1 for more details on potential land use impacts. Additionally, numerous criteria are considered for identifying a suitable site within TVA's service area that would meet the purpose and need for a solar project as well as expand TVA's renewable energy portfolio. Some of these criteria are: -Site must accommodate enough PV panels to generate 150-MW AC output for transmission to the electrical system; -Contiguous parcels with at least 1,500 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; -Flat landscape with minimal slope; preferably previously disturbed contiguous land with minimal existing infrastructure obstacles; -Minimal presence of forested areas and wetlands; -Parcels within appropriate local zoning regulations and located away from densely populated areas; -Land that would allow developer to avoid and/or minimize impacts on known sensitive biological, visual, and cultural resources.
Sarah Houston, Executive Director of Protect our Aquifer	I . TVA must accurately assess alternative locations closer to the end power user in Gallatin, TN or utilize the solar generation for Shelby County, TN. <i>Proximity:</i> In general, the longer the distance the electricity must travel from generation to consumer, the larger the line loss. If 110 MW of the Project's energy is slated for transmission to Gallatin, land use impacts should be reduced in Shelby County and minimize energy loss.	Power in proximity to consumer	Letter	5/25/2022	

Sarah Houston, Executive Director of Protect our Aquifer	<p><i>Local Generation:</i> The proposed Project would connect to the existing Memphis, Light, Gas and Water (MLGW) electrical network via a 250-foot gen-tie line to the proposed switching station adjacent to the proposed substation. If the solar-generated 150 MW were distributed across Shelby County, they could power almost 103,000 homes with clean energy. Current energy generation is sourced from TVA’s Allen Combined Cycle Plant in southwest Memphis that relies on fracked methane gas and uses over 653 million gallons of water annually from the Memphis Sand Aquifer for its operation. By sending 110 MW of power outside of MLGW’s footprint, Shelby County’s carbon emission status quo remains and the Allen Plant will continue to deplete the Memphis Sand Aquifer. This transition to solar should serve the needs of Shelby County if the Project is located within the boundaries of the County. Taking land out of production for use in one County to service another has an impact on the environmental and economic resources of Shelby County and should be considered in this draft EA. Additionally, TVA’s proposed Project will tie into the MLGW transmission system but transfer the energy elsewhere. This enables TVA to send that renewable energy far outside of MLGW’s service area and further entangles MLGW infrastructure with the federal agency it is considering leaving. TVA has yet to reinstate its Distributed Power Production program, which reimbursed customers for at-home renewable energy generation, that was dismantled December 31, 2019. TVA’s blanket ban on residential net-metering renders home solar panel implementation economically unfeasible for the majority of Memphians. The expansion of that program could expand solar energy meeting TVA’s IRP goals, offset water extraction and impacts from the Memphis Sand Aquifer and lower the cost of electricity for residents throughout the County. None of this was analyzed as an alternative option.</p> <p>Local Generation: If MLGW decides not to renew their contract with TVA, it appears that TVA is utilizing over 1,400 acres that would essentially "block" MLGW from access to that power. Would TVA expect to continue using MLGW transmission lines for a fee? That is not something TVA has offered MLGW if the split were to occur. This scenario must be considered in the EA analysis due to the environmental and economic impacts that will occur on Shelby County.</p>	Energy transmission	Letter	5/25/2022	See response to Comment No. 2. The PPA would allow TVA to purchase new renewable energy to meet new customer demands rather than needing to generate the energy through the combustion of fossil fuels. As described in Chapter 1 of this EA, TVA is committed to increasing its use of clean, non-carbon emitting generation, while maintaining a reliable, low-cost, power system. To achieve this, and in response to customer demand, TVA has established goals for additional renewable generating capacity, including solar energy. Customer demand for cleaner energy prompted TVA to release a Request for Proposal (RFP) for renewable energy resources (2020 TVA Renewable RFP to solar developers). The Solar PPA that resulted from this RFP will help TVA meet immediate needs for additional renewable generating capacity. In general, the cost for distributed generation, such as rooftop solar, is higher than utility-scale generation for the same type of resource.
		Energy transmission	Letter	5/25/2022	NEPA does not require the study of uncertain or contingent future events that may not occur as anticipated or may not occur at all. To the extent that changes occur in the future between MGLW and TVA that would change the proposed project, any appropriate and necessary supplemental environmental reviews would be conducted at that time.
Sarah Houston, Executive Director of Protect our Aquifer	<p><i>Alternative Placement:</i> The 2022 Draft Environmental Assessment describes the proposed solar facility as occupying 850 acres with the total land use of 1,482 acres. The current landscape is predominately used for agriculture which allows for rainwater to directly infiltrate the soils and recharge the shallow aquifer. The placement of 150 MW of solar will increase the impervious surfaces and lead to more runoff, potentially aiding in downstream flooding.</p>	Flooding	Letter	5/25/2022	As discussed in Soils Section 3.2.4 starting on page 3-12, WR Graceland would control increased stormwater runoff or soil erosion that could result from new impervious surfaces created by the solar panels through control measures, such as soil stabilization and vegetation management measures required by stormwater permits. See Section 3.3.2 starting on page 3-14 which describes how the project would be located outside the 100-year floodplain and other placement requirements to avoid potential adverse flooding impacts.

Sarah Houston, Executive Director of Protect our Aquifer	Have any brownfields or other degraded lands in Shelby County been considered at the location for this solar field? Decommissioned and contaminated industrial sites are generally situated in areas adjacent to existing transmission infrastructure. The Environmental Protection Agency has established a program to encourage the development of renewable energy projects on potentially contaminated lands. The agency’s RE-Powering America’s Land Initiative encourages renewable energy projects on current and formerly contaminated lands, landfills, etc. Alternative site selection analysis should consider this program from EPA and the use of brownfields over forested or agricultural lands. Some sites to consider are the former Firestone Plant, Shelby County Landfill, Dunn Field at the Memphis Defense Depot, and Jackson Pit Landfill.	Facility Alternatives	Letter	5/25/2022	According to Alternatives Eliminated from Further Consideration Section 2.3, land parcels were evaluated based on screening criteria: <ul style="list-style-type: none"> • Availability of solar resources based upon landscape position and features • Generally flat landscape with minimal slope, with preference given to disturbed contiguous land with no on-site infrastructure or existing tall infrastructure in the immediate vicinity • Land having sound geology for construction suitability, lacking floodplains or large forested or wetland areas • Ability to avoid and/or minimize impacts to known sensitive biological, visual, and cultural resources • Condition of the existing electrical transmission system and the capability of supporting the development of a large-scale solar power facility
	II. The Draft EA lacks particular risks to freshwater aquifers and lists impacts as “low” without additional specificity. In a report from the U.S. Geologic Survey, the confining clay layer existing between but locally the Cockfield Formation may be absent as a result of structural relief from faulting and subsequent erosion. The site’s geology, groundwater flow, and contaminant plume should be investigated before proposing and selecting a final EA. Studies have shown the heavy metals in solar panels can leach out of the cells and infiltrate into groundwater ⁸ , as well as affect plants. While this scenario could seem unlikely, considering the groundwater and drinking water impacts from lead and cadmium contained within the panels should be investigated. Additionally, TVA must outline a plan for mitigating this risk and include it in the EA. According to the EA, the panels will be built at an elevation of 270 feet, keeping them one foot above the 100-year flood elevation. Portions of the Project area are located within FEMA Zone AE 100-year floodplain of the Big Creek Drainage Canal in the northern portion and the Loosahatchie Drainage Canal in the southern part (Stantec 2020b). Will the expansion of impervious cover impact surface runoff? To what depth must the rebar or other stabilization methods penetrate the ground? Will these create avenues for contamination to infiltrate into the shallow aquifer system? Will this increase the amount of shallow aquifer recharge flowing into the system? This analysis is critical to understanding water quality and quantity impacts to our drinking water supply and surface water bodies. We applaud TVA’s plan to ensure there are 50 foot buffers to all jurisdictional wetlands and a 50 foot buffer to the jurisdictional streams. This type of riparian zone can reduce contamination in the runoff and decrease stormwater flow.				In addition to this criteria, zoning restrictions and landowner exclusions were also taken into consideration.
	III. The Project must utilize a multi-use restorative agriculture approach to maintain the property.				See the Geology, Soils, and Prime farmland Section 3.2 starting on Page 3-5 where geologic hazards (Section 3.2.3) are considered. See the Water Resources Section 3.3 starting on Page 3-23 of the Final EA for potential groundwater and floodplain impacts. See Section 2.2 the Proposed Action Alternative for a detailed description of the solar facility. The panels will be polysilicon and do not contain cadmium; however, all panels contain very small amounts of lead. These panels are well sealed and propose little risk of leakage into the environment. In addition, WR Graceland Solar would perform regular operational maintenance of this facility, and inspect the panels for any damage, potential fire hazards, and other potential environmental concerns. WR Graceland Solar would operate in compliance with federal, state, and local guidelines to minimize the potential for environmental contamination onsite or offsite; specifically, in accordance with the Solid and Hazardous Waste Rules and Regulations of the State (Rule 0400, Chapters 11 and 12, respectively). WR Graceland Solar would immediately take measures to correct any identified issues.
Sarah Houston, Executive Director of Protect our Aquifer	There are no details explaining the methods utilized to upkeep of grasses beyond restoring the landscape after construction. How will the vegetation be maintained? Conventional, gas-power lawn mowers and leaf blows have high greenhouse gas emissions that will degrade air quality and be hypocritical to use renewables at the Project site. This type of vegetation control also creates noise pollution at decibels above 78 for the homes surrounding the site and over 95 dB for the operators. We	Vegetation Control/Maintenance/Air Quality	Letter	5/25/2022	Comment noted. As discussed in Section 3.2.7.3 on page 3-12 of the Final EA, vegetation is stated to be maintained by mowing, similar to mechanisms used in residential neighborhoods. This method of vegetation control would also be similar to existing noise in the area. Noise going above 65 decibels is only expected to be temporary due to construction equipment, and would not likely exceed 71-81 decibels. See Noise Section 3.6.2 starting on page 3-40.

recommend restorative agricultural multi-use of the land with native plantings and the use of grazing livestock for vegetation control.

Sarah Houston, Executive Director of Protect our Aquifer Sarah Houston, Executive Director of Protect our Aquifer Bryan Davidson, Policy Analyst with Tennessee Department of Environment and Conservation (TDEC) Bryan Davidson, Policy Analyst with Tennessee Department of Environment and Conservation (TDEC)	For decades TVA has utilized massive amounts of drinking water for their energy generation and left a legacy of polluted groundwater in southwest Memphis. TVA must consider all alternative locations and end-users listed in this letter as part of the EA for the Graceland Solar Project.	Groundwater	Letter	5/25/2022	See Groundwater Section 3.2.7 starting on page 3-23, discussing there are not anticipated impacts to local aquifers and groundwater.
	While we support TVA’s expansion of renewable energy, we do not support the extensive land use for power supply outside of Shelby County. TVA must consider the broad impacts of their operation in and around Shelby County, including the Memphis Sand Aquifer.	Power	Letter	5/25/2022	Comment noted. See response to Comment No. 2. All potential impacts have been considered as part of the Final EA.
	Air Pollution Control: Table 1-1 (Necessary Permits or Licenses) includes TDEC as a lead agency for obtaining a burn permit, however, the Tennessee Air Pollution Control Board has delegated regulation of most air pollution control responsibilities, including open burning, to the Shelby County Health Department. The Draft EA has been forwarded to the Shelby County Health Department’s Air Pollution Control Program for review and comment and should be contacted prior to any open burning. In addition, TDEC recommends avoiding open burning on days that air quality alerts have been issued.	Air Pollution Control	Letter	5/25/2022	As stated in Chapter 2 on page 2-3, WR Graceland Solar will coordinate with the Shelby County Health Department prior to any burning measures. However, burning would be avoided during air quality alerts as part of best management practices.
	TDEC also recommends that all construction equipment employed on site be well maintained and equipped with the latest emissions control equipment, and to minimize idling of heavy-duty non-road mobile sources.	Equipment	Letter	5/25/2022	Comment noted. WR Graceland Solar would utilize best management practices of construction equipment maintenance and minimizing idling where possible.
Bryan Davidson, Policy Analyst with Tennessee Department of Environment and Conservation (TDEC)	Energy: TDEC supports efforts to increase energy resiliency, including a more decentralized power supply in the state. In the event of an energy emergency the additional source from the solar PV site may provide emergency access to energy and serve as a temporary “energy” bridge to the surrounding region. TDEC would support additional power supply measures that utilize connections with the solar farm to provide an alternate supply of energy during or after a natural or made-made energy disruption. TDEC recommends that TVA consider using electric-powered lawn equipment, which can be as much as fifty percent quieter than	Maintenance	Letter	5/25/2022	Comment noted. The solar system will be connected to the bulk electric system and not the distribution system, which would provide electricity to homes. Power outages tend to be distribution based, so electric-powered machinery would not be helpful in that scenario.

and Conservation (TDEC)	traditional gas-operated models. Electric-powered lawn equipment also has zero air emissions onsite, reduces petroleum-fuel purchases, and eliminates used oil waste. Similarly, if there is an opportunity to use all-electric portable earthmoving equipment, that use would result in reduced noise, air emissions, petroleum-fuel purchases, and used oil waste. TDEC recommends TVA consider these additional details in the Final EA.					
Bryan Davidson, Policy Analyst with Tennessee Department of Environment and Conservation (TDEC)	TDEC recommends that TVA consider addressing any potential Electro Magnetic Field impacts that may result from the proposed action in the final EA.	Electro Magnetic Field Impacts	Letter	5/25/2022	Comment noted. According to Section 3.10, page 3-52, power frequency (60 Hz) electric and magnetic fields (EMF) are present wherever electricity is generated, transmitted, or used, including utility installations such as substations and transmission lines, and typical household electrical appliances such as hairdryers and microwave ovens. The health effects of 60 Hz EMF have been the subject of extensive research since the late 1950s and no studies report adverse health cause and effect related to power frequency EMF. Further information on Electric and Magnetic fields associated with electrical power is available on TVA’s website at tva.com/emf.	
Bryan Davidson, Policy Analyst with Tennessee Department of Environment and Conservation (TDEC)	Water Resources: The proposed project will require a stormwater construction permit, including a Storm Water Pollution Prevention Plan.1 The size of the project, which calls for solar panel installation on 1,482 total acres, may necessitate an individual permit rather than a general stormwater construction permit. The proposed project will also require an Aquatic Resource Alteration Permit.2 Due to the considerable vegetation management around the panels involving herbicide application, care should be taken to follow manufacturer’s directions and avoid herbicide application prior to predicted rainfall events or high winds to minimize any possibility of runoff or drift. TDEC appreciates the opportunity to comment on this Draft EA. Please note that these comments are not indicative of approval or disapproval of the proposed action or its alternative, nor should they be interpreted as an indication regarding future permitting decisions by TDEC.	Stormwater and Aquatic Resource Alteration Permitting	Letter	5/25/2022	According to Section 3.10.2, page 3-53, the WR Graceland Solar site would be designed and constructed to meet or exceed applicable industry safety codes and standards. The equipment being used consists of components already in widespread use throughout power utilities. EMF emissions would be no different from a typical power delivery substation. Highest levels of EMF would be present inside the fence perimeter which is not accessible to the general public or those without training for working in areas of elevated EMF. This information will be included in the Final EA. According to Section 1.4, Table 1-1, on page 1-6 to 1-7, WR Graceland would require the following: <ul style="list-style-type: none">- Development of a Stormwater Pollution Prevention Plan (SWPPP) and implementation of best management practices.- A general permit is anticipated due to proposed stream crossings to accommodate the proposed interior project site roadways.- Nationwide Permit (NWP) 14 is anticipated due to proposed stream crossings to accommodate the proposed interior project site proposed roadways. Pre-construction notification is required if greater than 1/10-acre of stream and/or wetland will be impacted. NWPs 51 and 57 are not anticipated to be required. WR Graceland Solar is currently exploring the location of the construction and permanent project site roadways; however, all potential areas have been included in the environmental review.- WR Graceland Solar will coordinate with the Shelby County Health Department prior to any burning measures. In addition, a burn permit would be obtained through the TDOA, Division of Forestry, and TDEC would be notified. Any woody debris and other vegetation would likely be piled and burned, chipped, or taken off-site. According to Section 2.2, page 2.6, During the 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 vegetation. The application of herbicides should be by persons certified and licensed by the TN Department of	

Agriculture and must meet their general permits and regulations. Such requirements would avoid herbicide application prior to predicted rainfall events or high winds to minimize any possibility of runoff or drift.

Appendix C – Ecology Survey Reports



**Wetland and Stream Delineation
Report, WR Graceland Solar LLC,
Shelby County, Tennessee**

November 30, 2022

Prepared for:

WR Graceland LLC, Solar
353 N. Clark Street, 30th Floor
Chicago, IL 60654

Prepared by:

Stantec Consulting Services Inc.
601 Grassmere Park Road, Suite 22
Nashville, TN 37211



Threatened and Endangered Species Report

WR Graceland Solar LLC, Shelby
County, Tennessee

January 6, 2022

Prepared for:

WR Graceland Solar LLC
353 N. Clark Street, 30th Floor
Chicago, IL 60654

Prepared by:

Stantec Consulting Services Inc.
601 Grassmere Park Road, Suite 22
Nashville, TN 37211





**Bat Mist Net Survey for Graceland
2 Solar Project, Shelby County,
Tennessee**

August 30, 2021



Prepared for:

WR Graceland Solar, LLC
353 North Clark Street, 30th Floor
Chicago, IL 60654



Appendix D – Glare Hazard Analysis



Glare Hazard Analysis
WR Graceland Solar, LLC
Shelby County, Tennessee

February 11, 2022

Prepared for:

WR Graceland Solar, LLC
353 N. Clark Street, 30th Floor
Chicago, IL 60654

Prepared by:

Stantec Consulting Services Inc.
601 Grassmere Park Suite 22
Nashville, TN 37211

Appendix E – Cultural Survey Reports and Addendums

PHASE I ARCHAEOLOGICAL SURVEY FOR THE PROPOSED WR GRACELAND SOLAR LLC PROJECT IN SHELBY COUNTY, TENNESSEE

by:

Jason Ross
Andrew P. Bradbury, MA
Desiree Marcel
Dustin Lawson
Tracy Jenkins, PhD
Victoria Swenson, MA
William Joseph, MA

Submitted to:

Amy Tolley
Stantec Consulting Services, Inc.
601 Grassmere Park Road
Suite 22
Nashville, Tennessee 37211

Submitted by:

Cultural Resource Analysts, Inc.
119 West Summit Hill Drive
Knoxville, Tennessee 37902
CRA Project No.: T210176



Andrew P. Bradbury, RPA
Principal Investigator

Draft Report

November 5, 2021

Revised
December 17, 2021

Lead Federal Agency: Tennessee Valley Authority

ADDENDUM PHASE I ARCHAEOLOGICAL SURVEY FOR THE PROPOSED WR GRACELAND SOLAR LLC PROJECT IN SHELBY COUNTY, TENNESSEE

by:

Jason Ross and Desiree Marcel

Submitted to:

Amy M. Willoughby
Principal/Business Center Practice Lead, Environmental Services
Stantec Consulting Services Inc.
601 Grassmere Park Road Suite 22
Nashville, Tennessee 37211-3681 US
Direct: 615 829-5461
Amy.Willoughby@stantec.com

Submitted by:

Cultural Resource Analysts, Inc.
119 West Summit Hill Drive
Knoxville, Tennessee 37902
CRA Project No.: T210176

Andrew P. Bradbury, RPA
Principal Investigator

Draft Report

December 22, 2021

Lead Federal Agency: Tennessee Valley Authority

HISTORIC ARCHITECTURAL RESOURCE SURVEY FOR THE PROPOSED WR GRACELAND SOLAR LLC PROJECT IN SHELBY COUNTY, TENNESSEE

By
John P. Dickerson, MA

Submitted to:

Amy M. Tolley
Principal/Business Center Practice Lead, Environmental Services
Stantec Consulting Services, Inc.
601 Grassmere Park Road Suite 22
Nashville, Tennessee 37211-3681 US
Direct: 615 829-5461
Amy.Tolley@stantec.com

Submitted by:

Cultural Resource Analysts, Inc.
119 West Summit Hill Drive
Knoxville, Tennessee 37902
Phone: (865) 249-6035
Email: twhurdle@crai-ky.com
CRA Project No.: T210178



Elizabeth Heavrin, M.H.P.
Principal Investigator

October 19, 2021

ADDENDUM TO THE HISTORIC ARCHITECTURAL RESOURCE SURVEY FOR THE PROPOSED WR GRACELAND SOLAR LLC PROJECT IN SHELBY COUNTY, TENNESSEE

By


Chelsey Johnson, MA; Jenny Andrews, MA; and Elizabeth Heavrin, MHP

Submitted to:

Amy M. Willoughby
Principal/Business Center Practice Lead, Environmental Services
Stantec Consulting Services Inc.
601 Grassmere Park Road Suite 22
Nashville, Tennessee 37211-3681 US
Direct: 615 829-5461
Amy.Willoughby@stantec.com

Submitted by:

Cultural Resource Analysts, Inc.
119 West Summit Hill Drive
Knoxville, Tennessee 37902
Phone: (865) 249-6035
Email: twhurdle@crai-ky.com
CRA Project No.: T210178



Elizabeth Heavrin, MHP
Principal Investigator

December 22, 2021

Appendix F – Phase I Environmental Site Assessment (ESA)



**GRACELAND 2 SOLAR SITE
Phase I Environmental Site
Assessment**

January 12, 2020

Prepared for:

RWE Renewables Americas, LLC
353 N. Clark Street, 30th Floor
Chicago, IL 60654

Prepared by:

Stantec Consulting Services Inc.
601 Grassmere Park Suite 22
Nashville, TN 37211

Project No.: 172677409

Appendix G – Agency Coordination



400 West Summit Hill Drive, Knoxville, Tennessee 37902

April 16, 2021

Mr. E. Patrick McIntyre, Jr.
Executive Director
and State Historic Preservation Officer
Tennessee Historical Commission
2941 Lebanon Road
Nashville, Tennessee 37243-0442

Dear Mr. McIntyre:

TENNESSEE VALLEY AUTHORITY (TVA), POWER PURCHASE AGREEMENT (PPA)
GRACELAND SOLAR, SHELBY COUNTY, TENNESSEE (35.299106, -89.898419) TVA
TRACKING NUMBER – CID 80006)

TVA proposes to enter into a PPA with Graceland Solar, LLC for a 150-megawatt solar photovoltaic (PV) generating facility in Shelby County, Tennessee. The facility would be located on an assemblage of parcels making up approximately 1740-acres (Figure 1 in the enclosed proposal). TVA proposes that the area of potential effects (APE) should be considered to be the footprint where ground disturbance could occur as a result of the undertaking including the proposed solar arrays and any supporting infrastructure as well as the 0.5 mile radius of the project area and within the visual line of site that may have a visual effect to historic properties.

For your review, please find the research design for the Phase I Cultural Resources survey by Cultural Resources Analysts, Inc. enclosed. Pursuant to 36 CFR § 800.4(b)(1), TVA finds that the survey design presented here is a reasonable and good faith effort to carry out identification efforts. By this letter, TVA is initiating consultation regarding the proposed undertaking.

Pursuant to 36 CFR Part 800.3(f)(2), TVA is consulting with federally recognized Indian tribes regarding historic properties within the proposed project's APE that may be of religious and cultural significance and are eligible for the National Register of Historic Places.

If you have any questions or comments, please contact Michaelyn Harle by email at mharle@tva.gov.

Sincerely,

A handwritten signature in dark ink, appearing to read "Clinton E. Jones", is written over a light blue horizontal line.

Clinton E. Jones
Manager
Cultural Compliance

Mr. E. Patrick McIntyre, Jr.

Page 2

April 16, 2021

MSH:ABM

Enclosures

cc (Enclosures):

Ms. Jennifer Barnett

Tennessee Division of Archaeology

1216 Foster Avenue, Cole Bldg. #3

Nashville, Tennessee 37210

INTERNAL COPIES NOT TO BE INCLUDED WITH OUTGOING LETTER:

S. Dawn Booker, BR 2C-C
Michael C. Easley, BR 2C-C
Michaelyn S. Harle, WT 11C-K
Brandon J. Hartline, BR 2C-C
Susan R. Jacks, WT 11C-K
Dana M. Nelson, WT 11C-K
Elizabeth Smith, WT 11C-K
Rebecca C. Tolene, WT 7B-K
William B. Wells, BR 2C-C
W. Douglas White, WT 11C-K
ECM, ENVRecords



TENNESSEE HISTORICAL COMMISSION
STATE HISTORIC PRESERVATION OFFICE
2941 LEBANON PIKE
NASHVILLE, TENNESSEE 37243-0442
OFFICE: (615) 532-1550
www.tnhistoricalcommission.org

April 19, 2021

Mr. Clinton E. Jones
Tennessee Valley Authority
400 West Summit Hill Drive
Knoxville, TN 37902

RE: TVA / Tennessee Valley Authority, Power Purchase Agreement, Graceland Solar/
CID 80006, Shelby County, TN

Dear Mr. Jones:

At your request, our office has reviewed the above-referenced Archaeological Survey Work Plan. This review is a requirement of Section 106 of the National Historic Preservation Act for compliance by the participating federal agency or applicant for federal assistance. Procedures for implementing Section 106 of the Act are codified at 36 CFR 800 (Federal Register, December 12, 2000, 77698-77739).

Based on the information provided, we find that the Archaeological Survey Work Plan is sufficient to identify and survey potential archaeological resources. However, you did not include an Architectural Survey Work Plan. We do agree with your letter that a half-mile Area of Potential Effects is sufficient to assess visual effects, but since there is no Architectural Survey Work Plan, we cannot comment on the proposed survey's methodology.

Your continued cooperation is appreciated.

Sincerely,

for: E. Patrick McIntyre, Jr.
State Historic Preservation Officer

Casey Lee
Historic Preservation Specialist/Coordinator
Section 106 Review and Compliance Program
Tennessee State Historic Preservation Office

May 4, 2021

Ms. Marianne Shuler, Senior Specialist,
Archaeologist & Tribal Liaison
Cultural Compliance
Tennessee Valley Authority
400 W. Summit Hill Drive
460 WT 7D-K
Knoxville, TN 37902

Dear Ms. Shuler:

Thank you for the research design and letter initiating consultation on a proposed power purchase agreement with Graceland Solar, LLC for a solar photovoltaic generating facility in Shelby County, Tennessee (CID 80006). We accept the invitation to consult under Section 106 of the National Historic Preservation Act.

The Chickasaw Nation concurs that the procedures outlined in the research design should adequately test the area to locate any potential cultural resources in the project area of potential effects. We wish to review the cultural resource report once it is available. In the event the agency becomes aware of the need to enforce other statutes we request to be notified under ARPA, AIRFA, NEPA, NAGPRA, NHPA and Professional Standards.

Your efforts to preserve and protect significant historic properties are appreciated. If you have any questions, please contact Ms. Karen Brunso, tribal historic preservation officer, at (580) 272-1106, or by email at karen.brunso@chickasaw.net.

Sincerely,

A handwritten signature in black ink, appearing to read 'Lisa John', with a stylized flourish extending to the right.

Lisa John, Secretary
Department of Culture and Humanities

Cc: mmshuler@tva.gov



GWJ, DBF
CHEROKEE NATION®
P.O. Box 948 • Tahlequah, OK 74465-0948
918-453-5000 • www.cherokee.org

Office of the Chief

Chuck Hoskin Jr.
Principal Chief

Bryan Warner
Deputy Principal Chief

May 19, 2021

Marianne Shuler
Tennessee Valley Authority
400 West Summit Hill Drive
Knoxville, TN 37902

Re: CID 80006, Proposed Power Purchase Agreement for Graceland Solar

Ms. Marianne Shuler:

The Cherokee Nation (Nation) is in receipt of your correspondence about **CID 80006**, and appreciates the opportunity to provide comment upon this project. Please allow this letter to serve as the Nation's interest in acting as a consulting party to this proposed project.

The Nation maintains databases and records of cultural, historic, and pre-historic resources in this area. Our Historic Preservation Office reviewed this project, cross referenced the project's legal description against our information, and found no instances where this project intersects or adjoins such resources. Thus, the Nation does not foresee this project imparting impacts to Cherokee cultural resources at this time.

However, the Nation requests that the Tennessee Valley Authority (TVA) halt all project activities immediately and re-contact our Offices for further consultation if items of cultural significance are discovered during the course of this project.

Additionally, the Nation requests that TVA conduct appropriate inquiries with other pertinent Tribal and Historic Preservation Offices regarding historic and prehistoric resources not included in the Nation's databases or records.

If you require additional information or have any questions, please contact me at your convenience. Thank you for your time and attention to this matter.

Wado,

Elizabeth Toombs, Tribal Historic Preservation Officer
Cherokee Nation Tribal Historic Preservation Office

From: [Pelren, David](#)
To: [Williams, Michael \(Nashville\)](#)
Cc: [Kiser, James](#); [Willoughby, Amy](#); [Adams, Joshua](#)
Subject: RE: [EXTERNAL] Bat Survey Plan - Shelby County, TN
Date: Friday, July 23, 2021 9:51:25 AM

Mike (and crew) -

Thank you for providing a description of your study plan for netting at the proposed Graceland 2 solar project site in Shelby County, Tennessee. We concur with your proposed methodology and level of effort for the sampling effort, and we authorize its implementation in accordance with section 10 of the Endangered Species Act. Good luck with your survey.

David Pelren
Fish and Wildlife Biologist
Ecological Services
U.S. Fish and Wildlife Service
446 Neal St.
Cookeville, TN 38501
office phone: 931-525-4974
mobile phone: 931-261-5844

NOTE: This email correspondence and any attachments to and from this sender are subject to the Freedom of Information Act (FOIA) and may be disclosed to third parties.

From: Williams, Michael (Nashville) <Michael.Williams@stantec.com>
Sent: Thursday, July 22, 2021 4:34 PM
To: Pelren, David <david_pelren@fws.gov>
Cc: Kiser, James <James.Kiser@stantec.com>; Tolley, Amy <Amy.Tolley@stantec.com>; Adams, Joshua <Joshua.Adams@stantec.com>
Subject: [EXTERNAL] Bat Survey Plan - Shelby County, TN

This email has been received from outside of DOI - Use caution before clicking on links, opening attachments, or responding.

Dave,

For your review, please find attached a bat survey plan for a proposed solar site near Millington, Shelby County, Tennessee.

Please let me know if you have any questions or need any additional information.

Thank you,

Mike

Michael Williams

Natural Resource Team Lead, Associate

Stantec

601 Grassmere Park, Suite 22, Nashville, TN 37211

Office: (615) 829-5451 Cell: (615) 585-4125 Main: (615) 885-1144

Michael.Williams@stantec.com

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Please consider the environment before printing this email.

From: [Pelren, David](#)
To: [Willoughby, Amy](#)
Cc: [Tennessee ES, FWS](#); [Sikula, Nicole R](#)
Subject: FWS #2021-CPA-0746 / TA-1258 Graceland 2 solar bat netting survey Shelby Co
Date: Friday, October 1, 2021 3:03:47 PM

Ms. Amy Tolley
Stantec
601 Grassmere Park Road, Suite 22
Nashville, Tennessee 37211-3681

Ms. Tolley –

The Fish and Wildlife Service (Service) has reviewed your report of a bat mist net survey that was conducted during summer 2021 in an effort to document the presence/likely absence of Indiana bat and northern long-eared bat in conjunction with the Graceland 2 solar project proposed for construction on 1,797 acres of property near Millington, Shelby County, Tennessee (FWS #2021-CPA-0746 / TA-1258). Stantec staff conducted 19 net-nights of survey effort to sample 150 acres of forested habitat. The project did not result in capture of any federally listed species. Therefore, you concluded that both the Indiana bat and northern long-eared bat are presumed to be absent from the proposed project site, as depicted on a map provided with the survey report.

Based on the survey results, we concur with your conclusion that both the Indiana bat and northern long-eared bat are considered absent from the entirety of the proposed project site. We consider the survey results to be valid for a period of five years after completion of the survey. We understand that WR Graceland Solar, LLC may consult with the Service regarding the proposed solar project and potential impacts to federally listed species, including the two addressed here. We would welcome such coordination. We ask that future consultation efforts regarding this proposal be directed to the email address, TennesseeES@fws.gov, and that the FWS consultation # indicated in the subject line of this message be referenced.

Please contact me at david_pelren@fws.gov or 931-261-5844 if you have questions about these comments.

David Pelren
Fish and Wildlife Biologist
Ecological Services
U.S. Fish and Wildlife Service
446 Neal St.
Cookeville, TN 38501
office phone: 931-525-4974
mobile phone: 931-261-5844

NOTE: This email correspondence and any attachments to and from this sender are subject to the Freedom of Information Act (FOIA) and may be disclosed to third parties

From: Tolley, Amy <Amy.Tolley@stantec.com>
Sent: Monday, September 20, 2021 4:58 PM
To: Pelren, David <david_pelren@fws.gov>
Cc: Kiser, James <James.Kiser@stantec.com>; Adams, Joshua <Joshua.Adams@stantec.com>; Williams, Michael (Nashville) <Michael.Williams@stantec.com>; Fitzpatrick, Caitlin <Caitlin.Fitzpatrick@stantec.com>
Subject: RE: [EXTERNAL] Bat Survey Plan - Shelby County, TN

David, please see attached Bat Mist Net Survey report for the proposed Graceland 2 solar site in Shelby County, Tennessee. Please let us know if you concur with the findings.
Thank you,

Amy M. Tolley

Principal/Business Center Practice Lead, Environmental Services

Direct: 615 829-5461
Mobile: 615 582-9240
Fax: 615 885-1102
Amy.Tolley@stantec.com

Stantec
601 Grassmere Park Road Suite 22
Nashville TN 37211-3681 US

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From: Pelren, David <david_pelren@fws.gov>
Sent: Friday, July 23, 2021 8:51 AM
To: Williams, Michael (Nashville) <Michael.Williams@stantec.com>
Cc: Kiser, James <James.Kiser@stantec.com>; Tolley, Amy <Amy.Tolley@stantec.com>; Adams, Joshua <Joshua.Adams@stantec.com>
Subject: RE: [EXTERNAL] Bat Survey Plan - Shelby County, TN

Mike (and crew) -

Thank you for providing a description of your study plan for netting at the proposed Graceland 2 solar project site in Shelby County, Tennessee. We concur with your proposed methodology and level of effort for the sampling effort, and we authorize its implementation in accordance with section 10 of the Endangered Species Act. Good luck with your survey.

David Pelren
Fish and Wildlife Biologist
Ecological Services
U.S. Fish and Wildlife Service
446 Neal St.
Cookeville, TN 38501
office phone: 931-525-4974

mobile phone: 931-261-5844

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From: Williams, Michael (Nashville) <Michael.Williams@stantec.com>

Sent: Thursday, July 22, 2021 4:34 PM

To: Pelren, David <david_pelren@fws.gov>

Cc: Kiser, James <James.Kiser@stantec.com>; Tolley, Amy <Amy.Tolley@stantec.com>; Adams, Joshua <Joshua.Adams@stantec.com>

Subject: [EXTERNAL] Bat Survey Plan - Shelby County, TN

This email has been received from outside of DOI - Use caution before clicking on links, opening attachments, or responding.

Dave,

For your review, please find attached a bat survey plan for a proposed solar site near Millington, Shelby County, Tennessee.

Please let me know if you have any questions or need any additional information.

Thank you,

Mike

Michael Williams

Natural Resource Team Lead, Associate
Stantec

601 Grassmere Park, Suite 22, Nashville, TN 37211

Office: (615) 829-5451 Cell: (615) 585-4125 Main: (615) 885-1144

Michael.Williams@stantec.com

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TENNESSEE HISTORICAL COMMISSION
STATE HISTORIC PRESERVATION OFFICE
2941 LEBANON PIKE
NASHVILLE, TENNESSEE 37243-0442
OFFICE: (615) 532-1550
www.tnhistoricalcommission.org

January 5, 2022

Mr. James W. Osborne Jr.
Tennessee Valley Authority
400 West Summit Hill Drive
Knoxville, TN 37902

RE: TVA / Tennessee Valley Authority, Architecture Review, Power Purchase Agreement,
Graceland Solar Farm CID 80006, Shelby County, TN

Dear Mr. Osborne:

In response to your request, we have reviewed the architectural survey report and accompanying documentation submitted by you regarding the above-referenced undertaking. Our review of and comment on your proposed undertaking are among the requirements of Section 106 of the National Historic Preservation Act. This Act requires federal agencies or applicants for federal assistance to consult with the appropriate State Historic Preservation Office before they carry out their proposed undertakings. The Advisory Council on Historic Preservation has codified procedures for carrying out Section 106 review in 36 CFR 800 (Federal Register, December 12, 2000, 77698-77739).

Considering the information provided, we concur that no architectural resources eligible for listing in the National Register of Historic Places will be affected by this undertaking. If project plans are changed please contact this office to determine what further action, if any, will be necessary to comply with Section 106 of the National Historic Preservation Act. Questions or comments may be directed to Casey Lee (615 253-3163).

Your cooperation is appreciated.

Sincerely,

for: E. Patrick McIntyre, Jr.
State Historic Preservation Officer

Casey Lee
Historic Preservation Specialist/Coordinator
Section 106 Review and Compliance Program
Tennessee State Historic Preservation Office



400 West Summit Hill Drive, Knoxville, Tennessee 37902

February 16, 2022

Mr. E. Patrick McIntyre, Jr.
Executive Director
and State Historic Preservation Officer
Tennessee Historical Commission
2941 Lebanon Road
Nashville, Tennessee 37243-0442

Dear Mr. McIntyre:

TENNESSEE VALLEY AUTHORITY (TVA), POWER PURCHASE AGREEMENT (PPA),
GRACELAND SOLAR, ARCHAEOLOGICAL SURVEY AND ARCHITECTURAL ADDENDUM,
SHELBY COUNTY, TENNESSEE (TVA TRACKING NUMBER – CID 80006)
(35.299106, -89.898419)

In a letter dated April 16, 2021, TVA initiated consultation with your office regarding TVA's proposal to enter into a PPA with Graceland Solar, LLC for a 150-megawatt solar photovoltaic (PV) generating facility in Shelby County, Tennessee. As originally proposed, the facility would be located on an assemblage of parcels making up approximately 1740 acres.

TVA, in consultation, determined that the area of potential effects (APE) to be the footprint where ground disturbance could occur as a result of the undertaking including the proposed solar arrays and any supporting infrastructure as well as areas within the 0.5-mile radius of the project area within the visual line of site. After completion of the Phase I Archaeological survey, an additional property was included by Graceland Solar, LLC. An additional 165-acre parcel was added to the proposed solar facility that will include a new substation, TVA is revising the APE to include the footprint and viewshed of this additional parcel.

Graceland Solar, LLC contracted with Cultural Resources Analysis, Inc (CRA) to conduct a Phase I Cultural Resources survey. The results of the architectural survey for the original 1740 acres were previously provided to your office. The archeological report for the 1740-acre archaeological survey titled *Phase I Archaeological Survey for the Proposed WR Graceland Solar LLC Project in Shelby County, Tennessee* can be downloaded at [21-188_rev3 Jan 13.pdf - Google Drive](#). The addendum archaeological report can be downloaded at [Addendum Archaeology](#). The architectural addendum report can be downloaded at [Architecture Addendum](#)

During the current survey, CRA revisited seven previously recorded archaeological sites including three precontact sites (40SY304, 40SY305, and 40SY344), two historic sites (40SY347 and 40SY784), and two multicomponent sites (40SY343 and 40SY345). In addition, CRA identified 50 previously unrecorded sites including 14 precontact sites (40SY863, 40SY867, 40SY868, 40SY883, 40SY885, 40SY876, 40SY877, 40SY888, 40SY879, 40SY889, 40SY890, 40SY895, 40SY898, and 40SY899), 24 historic sites (40SY850, 40SY852, 40SY855,

40SY860, 40SY861, 40SY862, 40SY865, 40SY866, 40SY869, 40SY870, 40SY871, 40SY872, 40SY873, 40SY874, 40SY875, 40SY880, 40SY881, 40SY884, 40SY886, 40SY887, 40SY891, 40SY892, 40SY893, and 40SY894), and 12 multicomponent sites (40SY851, 40SY853, 40SY854, 40SY856, 40SY857, 40SY858, 40SY859, 40SY864, 40SY878, 40SY882, 40SY896, and 40SY897). The majority of the archaeological survey area is characterized by highly eroded soils with the majority of the materials recovered from the surface or within the plowzone. CRA recommends that two of the precontact sites (40SY877 and 40SY879), the precontact component at site 40SY856, and the precontact and historic component at sites 40SY344, 40SY854, and 40SY878) should be considered unassessed for the National Register of Historic Places (NRHP) based on the potential for intact deposits. CRA recommends the remaining archeological sites ineligible based on lack of stratigraphic integrity and low density of artifacts.

[REDACTED] Singleton Parkway appears to have destroyed the site as no archaeological material was documented during the addendum survey in its mapped location. As a result of the additional survey, CRA identified six archaeological sites. Sites 40SY900, 40SY901, and 40SY903 represent historic rural domestic sites that date to the twentieth century. Sites 40SY902 and 40SY905 represent indeterminate precontact sites. Site 40SY904 represents a multicomponent rural domestic and indeterminate precontact site. All cultural material was recovered from the surface or from plow zone context. Due to the lack of stratigraphic integrity and low density of artifacts, CRA recommends the sites documented during the addendum survey not eligible for inclusion on the NRHP.

Eight resources located in the revised APE were addressed by the August 2021 survey. In the letter dated January 5, 2022, your office concurred with our findings and recommendations. The APE for the additional parcel overlaps the previously surveyed area addressed in our previous consultation. The APE for the additional parcel intersects a parcel associated with Jones Orchard, containing Sites 13 (SY-32797A; non-extant), 14 (SY-32809A; extant), 15 (SY-32808A, extant), and 16 (SY-32798A, nonextant). Seven properties (Sites 22–28) containing previously unrecorded historic architectural resources were identified within the survey area for the additional parcel. CRA recommends that Jones Orchard should be associated with Site 14 (SY-32809A) and Site 15 (SY-32808), would require additional archival research to better situate the property and landscape within the local agricultural history of the region and therefore, both should be considered unassessed. However, the vast majority of the historic orchard is outside the 0.5 mi buffer and viewshed for both the solar installation and the additional parcel. In addition, a portion of the property has been bisected by Singleton Parkway, and a new interchange was built to its immediate northeast, altering the larger setting of the property. Even if the Jones Orchard were to be determined eligible for the NRHP, TVA finds that proposed undertaking would not result in an adverse effect to the property. In addition, a portion of the parcel also extends onto the property of the Naval Support Activity Mid-South base, no buildings associated with the base are within the APE, and the Naval Support Activity

Mr. E. Patrick McIntyre, Jr.
Page 3
February 16, 2022

Mid-South base is separated from the project area by a modern highway (Paul Barret Parkway) and forested land, and therefore, the proposed undertaking would have no effect to base.

TVA has read the enclosed report and agrees with the recommendations of the authors. To avoid adverse

[REDACTED]

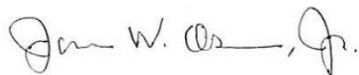
In order to ensure avoidance of these sites during the life of the project, Graceland Solar, LLC and TVA will sign the attached draft legal agreement. TVA finds that, with the proposed avoidance plan, the undertaking will have no adverse effect to historic properties.

Pursuant to 36 CFR Part 800.3(f)(2), TVA is consulting with federally recognized Indian tribes regarding properties within the survey area that may be of religious and cultural significance to them and eligible for the NRHP.

Pursuant to 36 CFR Part 800.5(c) we are notifying you of TVA's finding of no adverse effect, providing the documentation specified in § 800.11(e); and inviting you to review the finding. Also, we are seeking your agreement with TVA's eligibility determinations and finding that the undertaking as currently planned will have no adverse effects on historic properties.

If you have any questions, please contact Michaelyn Harle by email, mharle@tva.gov.

Sincerely,



James W. Osborne, Jr.
Manager
Cultural Compliance

MSH:ABM

Enclosures

cc (Enclosures):

Ms. Jennifer Barnett
Tennessee Division of Archaeology
1216 Foster Avenue, Cole Bldg. #3
Nashville, Tennessee 37210

INTERNAL COPIES NOT TO BE INCLUDED WITH OUTGOING LETTER:

S. Dawn Booker, BR 2C-C
Michael C. Easley, BR 2C-C
Brandon J. Hartline, BR 2C-C
Susan R. Jacks, WT 11C-K
Dana Nelson, WT 11C-K
Rebecca C. Tolene, WT 7B-K
Michaelyn Harle, 11C-K
Elizabeth Smith, 11C-K
William B. Wells, III BR 2C-C
W. Douglas White, WT 11C-K
ECM, ENVRecords



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2941 LEBANON PIKE
NASHVILLE, TENNESSEE 37243-0442
OFFICE: (615) 532-1550
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February 17, 2022

Mr. James W. Osborne Jr.
Tennessee Valley Authority
400 West Summit Hill Drive
Knoxville, TN 37902

RE: TVA / Tennessee Valley Authority, Power Purchase Agreement, Graceland Solar Farm CID 80006, Shelby County, TN

Dear Mr. Osborne:

In response to your request, we have reviewed the archaeological report of investigations, survey report addendum, and accompanying documentation submitted by you regarding the above-referenced undertaking. Our review of and comment on your proposed undertaking are among the requirements of Section 106 of the National Historic Preservation Act. This Act requires federal agencies or applicants for federal assistance to consult with the appropriate State Historic Preservation Office before they carry out their proposed undertakings. The Advisory Council on Historic Preservation has codified procedures for carrying out Section 106 review in 36 CFR 800 (Federal Register, December 12, 2000, 77698-77739).

Our review for the undertaking's potential effects to architectural historic properties will be provided under separate correspondence.

Considering the information provided in the signed agreement to avoid potentially eligible archaeological sites 40SY877, 40SY879, 40SY856, 40SY344, 40SY854, and 40SY878, we concur that no archaeological resources eligible for listing in the National Register of Historic Places will be affected by this undertaking. If project plans are changed or archaeological remains are discovered during project construction, please contact this office to determine what further action, if any, will be necessary to comply with Section 106 of the National Historic Preservation Act. Complete and/or updated Tennessee Site Records should be submitted to the Tennessee Division of Archaeology for all sites recorded and/or revisited during the current investigation. Questions or comments may be directed to Jennifer M. Barnett ((615) 687-4780, Jennifer.Barnett@tn.gov).

Your cooperation is appreciated.

Sincerely,

E. Patrick McIntyre, Jr.
Executive Director and
State Historic Preservation Officer

EPM/jmb



TENNESSEE HISTORICAL COMMISSION
STATE HISTORIC PRESERVATION OFFICE
2941 LEBANON PIKE
NASHVILLE, TENNESSEE 37243-0442
OFFICE: (615) 532-1550
www.tnhistoricalcommission.org

February 18, 2022

Mr. James W. Osborne Jr.
Tennessee Valley Authority
400 West Summit Hill Drive
Knoxville, TN 37902

RE: TVA / Tennessee Valley Authority, Architecture Review, Power Purchase Agreement, Graceland Solar Addendum, CID 80006, Shelby County, TN

Dear Mr. Osborne:

We have reviewed the documents you submitted regarding the architecture review for your proposed undertaking. Our review of and comment on your proposed undertaking are among the requirements of Section 106 of the National Historic Preservation Act. You have submitted documents that are insufficient for us to complete our review. To continue the Tennessee State Historic Preservation Office review of this undertaking, please provide us with the following information:

1. Jones Orchard needs to be evaluated for eligibility. This should include a map that shows the location of the different buildings and structures associated with the Jones Orchard as well as a proposed National Register boundary if the resource is recommended eligible.
2. If Jones Orchard is determined eligible, you should assess effects to the resource in accordance with 36 CFR 800.5 and assess effects to the resource as a whole.
3. You need to provide more information about the substation such as its height. We cannot determine if your APE is appropriate without knowing the details about the height of the components of the substation.

Upon receipt of this additional documentation, we will continue our review of this undertaking as quickly as possible. Please be advised that until this office has provided you a final written comment on this undertaking, you have not met your Section 106 obligation under federal law. Questions and comments may be directed to Casey Lee (615 253-3163). We appreciate your cooperation.

Sincerely,

for: E. Patrick McIntyre, Jr.
State Historic Preservation Officer

Casey Lee
Historic Preservation Specialist/Coordinator
Section 106 Review and Compliance Program
Tennessee State Historic Preservation Office



400 West Summit Hill Drive, Knoxville, Tennessee 37902

March 29, 2022

Mr. E. Patrick McIntyre, Jr.
Executive Director
and State Historic Preservation Officer
Tennessee Historical Commission
2941 Lebanon Road
Nashville, Tennessee 37243-0442

Dear Mr. McIntyre:

REPLY: TENNESSEE VALLEY AUTHORITY (TVA), POWER PURCHASE AGREEMENT (PPA), GRACELAND SOLAR, ARCHITECTURAL ADDENDUM REPORT, SHELBY COUNTY, TENNESSEE (35.299106, -89.898419) (TVA TRACKING NUMBER – CID 80006)

By this letter, TVA is responding to your February 17, 2022 and our subsequent telecom regarding the subject undertaking. Specifically, your office requested that:

- 1. Jones Orchard needs to be evaluated for eligibility. This should include a map that shows the location of the different buildings and structures associated with the Jones Orchard as well as a proposed National Register boundary if the resource is recommended eligible.*
- 2. If Jones Orchard is determined eligible, you should assess effects to the resource in accordance with 36 CFR 800.5 and assess effects to the resource as a whole.*
- 3. You need to provide more information about the substation such as its height. We cannot determine if your APE is appropriate without knowing the details about the height of the components of the substation.*

The area of potential effects (APE) was determined, in consultation with your office in a letter dated April 16, 2021, to be the 0.5-mile radius of the project area within the visual line of sight. As stated previously, only a small portion of the entire property boundary of Jones Orchard falls within the 0.5-mi radius. In order to account for potential effects, CRA completed viewshed analysis for the entire Jones Orchard property, as depicted in Figure 1. The viewshed analysis is based on the most current project layout and reflects an anticipated maximum height of 8-feet for the solar panels and 32-feet for the substation and switching station. Figure 1 depicts the switchyard as 4-acres and the substation as 2-acres, which is the anticipated maximum size. This does not account for any new poles associated with the substation or switching station, but they would be near and no taller than the existing transmission line.

As Figure 1 shows, most of the visibility would be within the northern part of the Jones Orchard property. This portion of the property is already impacted by the existing transmission line, Raleigh Millington Road, and the interchange. There are no historic architectural resources in

Mr. E. Patrick McIntyre, Jr.
Page 2
March 29, 2022

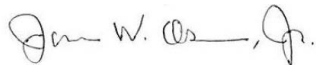
this location. There may be some very minimal spotty visibility within the southern part of the orchard. However, the project would be over a half mile away and would be a distant feature in the viewshed, not an immediate intrusion on the setting.

Additional analysis would be necessary to determine if Jones Orchard is eligible for listing in the National Registry of History Places (NRHP), and if the open land in the northern part of the property contributes to the historic landscape and should be included in the NRHP boundary. However, given that this portion of the property and its viewshed have already been impacted by modern infrastructure projects within the orchard boundary and between the orchard and the project area, TVA maintains that the proposed project would result in no adverse effects to the Jones Orchard, if it were determined eligible for listing in the NRHP.

Pursuant to 36 CFR Part 800.5(c) we are notifying you of TVA's finding of no adverse effect, providing the documentation specified in § 800.11(e); and inviting you to review the finding. Also, we are seeking your agreement with TVA's eligibility determinations and finding that the undertaking as currently planned will have no adverse effects on historic properties.

If you have any questions, please contact Michaelyn Harle by email, mharle@tva.gov.

Sincerely,

A handwritten signature in dark ink, appearing to read "James W. Osborne, Jr.", with a stylized flourish at the end.

James W. Osborne, Jr.
Manager
Cultural Compliance

MSH:ERB
Enclosure

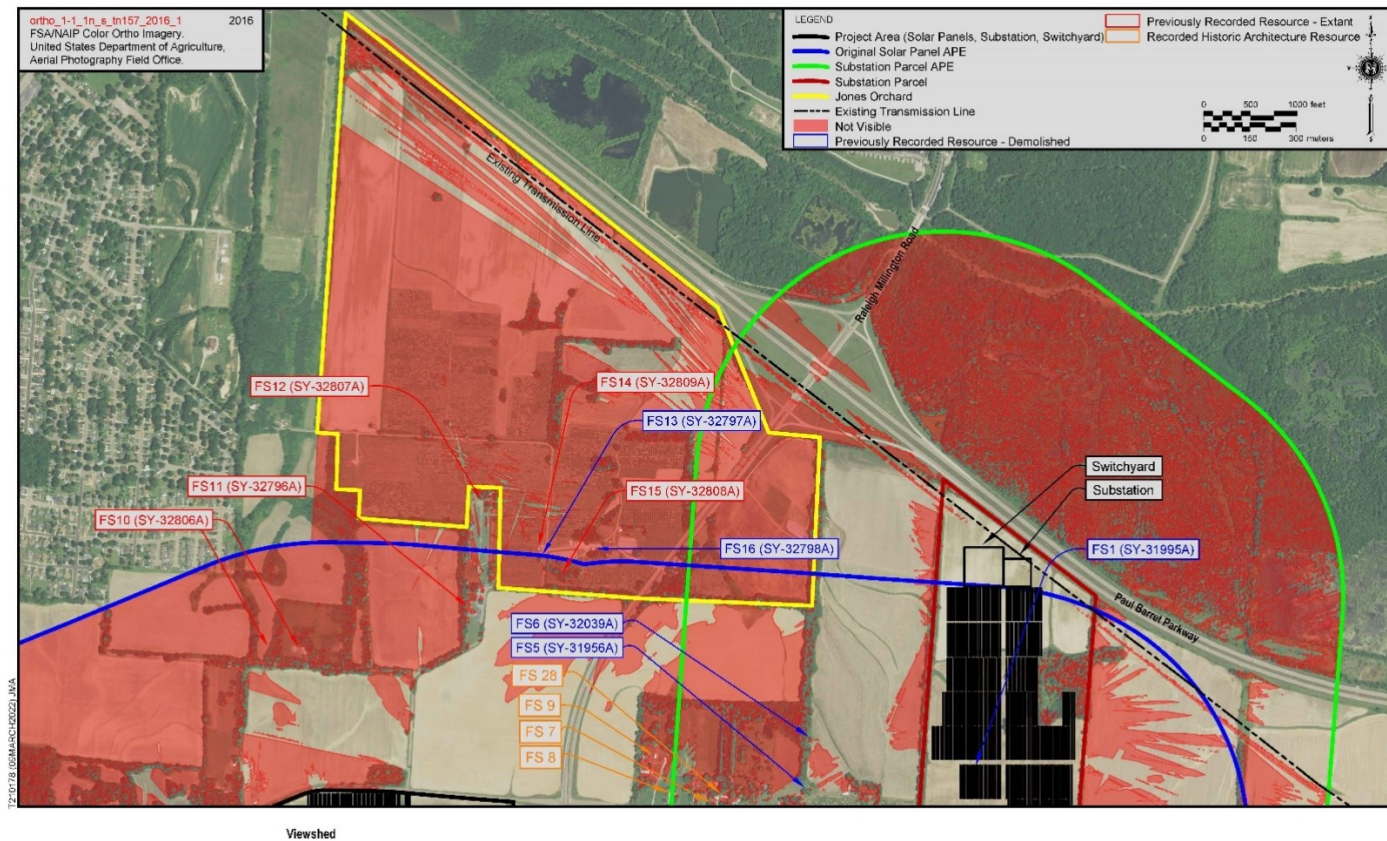


Figure 1: Viewshed model depicting the Jones orchard parcel (outlined in yellow) with the individual properties Sites 13 (SY-32797A; non-extant), 14 (SY-32809A; extant), 15 (SY-32808A, extant), and 16 (SY-32798A, non-extant).

INTERNAL COPIES NOT TO BE INCLUDED WITH OUTGOING LETTER:

S. Dawn Booker, BR 2C-C
Michael C. Easley, BR 2C-C
Michaelyn S. Harle, 11C-K
Brandon J. Hartline, BR 2C-C
Susan R. Jacks, WT 11C-K
Dana M. Nelson, WT 11C-K
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STATE HISTORIC PRESERVATION OFFICE
2941 LEBANON PIKE
NASHVILLE, TENNESSEE 37243-0442
OFFICE: (615) 532-1550
www.tnhistoricalcommission.org

April 1, 2022

Mr. James W. Osborne Jr.
Tennessee Valley Authority
400 West Summit Hill Drive
Knoxville, TN 37902

RE: TVA / Tennessee Valley Authority, Architecture Review, Power Purchase Agreement, Graceland Solar Addendum, CID 80006, Shelby County, TN

Dear Mr. Osborne:

In response to your request, we have reviewed the additional documentation submitted by you regarding the above-referenced undertaking. Our review of and comment on your proposed undertaking are among the requirements of Section 106 of the National Historic Preservation Act. This Act requires federal agencies or applicants for federal assistance to consult with the appropriate State Historic Preservation Office before they carry out their proposed undertakings. The Advisory Council on Historic Preservation has codified procedures for carrying out Section 106 review in 36 CFR 800 (Federal Register, December 12, 2000, 77698-77739).

Based on the additional information provided, we concur that even if the Jones Orchard were to be eligible for listing in the National Register of Historic Places it would not be adversely affected by your undertaking.

This office has no objection to the implementation of this project as currently planned. If project plans are changed, please contact this office to determine what further action, if any, will be necessary to comply with Section 106 of the National Historic Preservation Act. Questions and comments may be directed to Casey Lee (615) 253-3163. We appreciate your cooperation.

Sincerely,

for: E. Patrick McIntyre, Jr.
State Historic Preservation Officer

Casey Lee
Historic Preservation Specialist/Coordinator
Section 106 Review and Compliance Program
Tennessee State Historic Preservation Office



Tennessee Ecological Services Field Office

FWS Log No: 2022-0043572

The Service concurs with your effect determination(s) for resources protected by the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq.). This finding fulfills the requirements of the Act. If project design changes are made or new information becomes available, please submit new plans for review.

Acting Field Supervisor

Date



400 West Summit Hill Drive, Knoxville, Tennessee 37902

May 24, 2022

Mr. Daniel Elbert
U.S. Fish and Wildlife Service
Tennessee Field Office
446 Neal Street
Cookeville, Tennessee 38501

Dear Mr. Elbert:

TENNESSEE VALLEY AUTHORITY (TVA) – GRACELAND SOLAR PROJECT – REQUEST FOR CONCURRENCE – PROJECT CODE: 2022-0043572

TVA has entered into a power purchase agreement (PPA) with WR Graceland Solar, LLC (referred to herein as “WR Graceland Solar”) to purchase the power generated by the proposed WR Graceland Solar facility (solar facility) in Shelby County, Tennessee. To fulfill the PPA, WR Graceland is proposing to develop a 150-megawatt (MW) alternating current (AC) solar photovoltaic (PV) facility. The proposed facility would consist of multiple parallel rows of PV panels on single-axis tracking structures, along with direct current (DC) and AC inverters and transformers. The PV panel surface material would be a smooth glass with an anti-reflective (AR) coating. The proposed solar facility would occupy approximately 849.67 acres of a 1,482-acre project site. In addition, the project would include a substation on the north side and an adjacent 161-kilovolt (kV) switching station on the south side. The proposed interconnection would connect to the existing Memphis Light, Gas and Water (MLGW) 161-kV transmission line via a new 250-foot-long generation tie-in line. The long-term PPA would provide for TVA’s purchase of electric power generated by the solar PV facility for 20 years, subject to the satisfactory completion of all applicable environmental requirements. More details about the scope of this project can be found in the draft Environmental Assessment available online (<https://www.tva.com/environment/environmental-stewardship/environmental-reviews/nepa-detail/graceland-solar-draft-environment-assessment>). See attached rpt_habitat_assessment_wr_graceland_20220125.pdf for more information about field surveys, maps of identified resources, and photos.

A review of the Regional Natural Heritage database and the U.S. Fish and Wildlife Service Information for Planning and Consultation (IPaC) website identified five species listed as federally endangered, threatened, candidate for listing under the Endangered Species Act (ESA), or delisted and monitored under the Act, that have the potential to occur within the Project Area in Shelby County, Tennessee. These species include one insect (monarch butterfly), two birds (bald eagle and interior least tern) and two mammals (Indiana bat, and northern long-eared bat (NLEB) that have the potential to occur within Shelby County based on historic range, proximity to known occurrence records, biological characteristics, and/or physiographic characteristics. Additionally, the alligator snapping turtle, a proposed threatened species, is known from Shelby County. No federally designated critical habitats for these

species are present within or adjacent to the project area, therefore no adverse modification of critical habitats would occur.

Multiple field surveys were conducted by biologists from Stantec between November 2020 and November 2021 to determine whether suitable habitat for federally listed species occurs within the Project Area. Onsite investigations identified 28 wetlands, 56 ephemeral streams, four intermittent stream, two perennial streams, and three man-made ponds. Based on the preliminary site layout, nine permanent stream crossings would occur to accommodate access roads. No direct impacts to jurisdictional wetlands would occur. The impacts to jurisdictional stream features would be authorized under applicable Clean Water Act Permitting. Best Management Practices (BMPs) would be used to reduce indirect impacts from construction activities. With the exception of the nine stream crossing locations, a 50-foot buffer would be used around all streams and wetlands on-site. All BMPs would be documented in the stormwater pollution prevention plan submittal as part of the NPDES permit.

While there are no Section 7 requirements for monarch butterfly as a candidate species, it is identified in IPaC as a species that could occur within the project site. Two monarch butterflies were observed within the project area during the wildlife and vegetation surveys in July 2021. These individuals were observed adjacent to a soybean field in an herbaceous area containing milkweed plants. Small patches of herbaceous flowering vegetation (including milkweed) do exist in several locations on the edges of agricultural fields. Following completion of the project, agricultural crops would be replaced with native species in areas within and adjacent to the panel arrays. Native seed mixes may provide more flowering plants than previously occurred on-site. ***Proposed actions would not jeopardize the continued existence of the monarch butterfly.***

Three bald eagle nests are known from Shelby County, only one of which is extant. It is approximately 21 miles away. No bald eagles or nests were observed during field surveys of the project area. No quality nesting or foraging habitat exists in the project area. ***Bald eagle would not be impacted by the proposed actions.***

Ten interior least tern records are known from Shelby County. All are along the Mississippi River. The closest record is approximately 10.67 miles away. Suitable habitat for interior least tern does not exist in the project area. ***Interior least tern would not be impacted by the proposed actions.***

Phase 1 Bat Habitat Assessments for Indiana bat and NLEB were conducted at the project area using the 2020-2021 Range-Wide Indiana Bat Survey Guidelines. No caves, mines, bridges, derelict buildings, or other potential winter roosting structures were identified during field surveys of the project area. A total of 137 acres of forest was identified within the project area as being suitable for summer roosting by Indiana bat and/or NLEB. Within these identified areas of forest 191 potential roost trees were identified. Stantec botanists classified the forests as deciduous forest (109 acres), mixed evergreen-deciduous forest (17 acres), and deciduous shrubland (11 acres). All habitat areas were small and patchy and largely surrounded by agriculture fields but all contained potential roost trees. Forested habitat within the project area

Mr. Daniel Elbert
Page 3
May 24, 2022

includes fence lines, and fragmented tree stands ranging from successional to secondary growth stands. Tree size ranged from less than four inches diameter at breast height (dbh) to greater than 40 inches dbh (one single, isolated tree). The streams, wetlands, ponds, and woodlands identified on the project area provide adequate foraging opportunities for these bat species. See attached habitat assessment for more details.

Phase 2 Presence/Absence Surveys of the 2020-2021 Range-Wide Indiana Bat Survey Guidelines were conducted using mist nets from August 8-10, 2021. A total of 19 net nights of survey effort occurred. No Indiana bats or NLEBs were captured. A total of 22 bats were captured including 17 eastern red bats (*Lasiurus borealis*), four evening bats (*Nycticeius humeralis*), and one tricolored bat (*Perimyotis subflavus*). See attached rpt_bat_survey_Graceland2_20210830.pdf for survey details.

There are no known records of Indiana bats within Shelby County. The closest known record of Indiana bat is approximately 50 miles away in Benton County, Mississippi. The closest record of NLEB is a Summer 1 record approximately 12 miles away in Shelby County. No caves are known within 3.0 miles of the project area. No Indiana bats or NLEBs were captured during presence/absence surveys. Up to 137 acres of potentially suitable summer roosting habitat for Indiana bat and NLEBs may be removed. WR Graceland Solar intends to conduct tree clearing in winter (October 15-March 31) to the extent practicable. Construction BMPs would be used around jurisdictional bodies of water, including at the nine stream crossing locations, minimizing sedimentation and changes to hydrology. Due to the lack of impacts to potential hibernacula, distance from known records, and probable absence determined via Phase 2 mist net surveys, ***TVA has determined that proposed actions may affect, but are not likely to adversely affect (NLAA) Indiana bat and northern long-eared bat.***

One record of alligator snapping turtle is known from Shelby County. It is approximately 9.26 miles from the Project Area. No suitable habitat exists in the project area for this species. ***Proposed actions would not jeopardize the continued existence of the alligator snapping turtle.***

We respectfully request concurrence with our determinations. Should you have any questions or wish to discuss the project in more detail, please contact Elizabeth Hamrick by email, ecburton@tva.gov.

Sincerely,



W. Douglas White
Manager
Biological Compliance

EBH:ABM
Enclosures