Skeleton Creek Solar and Battery Storage Project Draft Environmental Impact Statement

OCTOBER 2021

PREPARED FOR

U.S. Department of Agriculture
Rural Utilities Service

SKELETON CREEK SOLAR AND BATTERY STORAGE PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT

Prepared for

U.S. Department of Agriculture
Rural Utilities Service
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SKELETON CREEK SOLAR AND BATTERY STORAGE PROJECT DRAFT ENVIRONMENTAL IMPACT STATEMENT

Responsible Federal Agency (Lead): U.S. Department of Agriculture, Rural Utilities Service

Cooperating Agencies: Bureau of Indian Affairs, Bureau of Land Management, and U.S. Army Corps of Engineers

Title: Skeleton Creek Solar and Battery Storage Project Draft Environmental Impact Statement

Location: Garfield County, Oklahoma

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EXECUTIVE SUMMARY

Introduction

Skeleton Creek Energy Center, LLC (the Applicant), a wholly owned subsidiary of NextEra Energy Resources, LLC, intends to construct the Skeleton Creek Solar and Battery Storage Project (Project) on privately owned land in Garfield County, Oklahoma. As proposed, the Project would consist of photovoltaic (PV) solar panels and a lithium ion-based (or similar battery technology) battery storage system. Energy generated from these components would be transferred by a 1-mile-long 345-kilovolt (kV) generation tie (gen-tie) transmission line to the Oklahoma Gas and Electric (OG&E) 345-kV Woodring Substation for use by the energy buyer, Western Farmers Electric Cooperative (WFEC).[1]

The Applicant plans to apply for a Project loan from the U.S. Department of Agriculture (USDA), Rural Utilities Service (RUS). RUS administers the USDA's rural utilities programs. RUS has determined that a loan for the Project would be a federal action and is therefore subject to National Environmental Policy Act (NEPA) review (42 United States Code [USC] 4321 et seq.; 7 Code of Federal Regulations [CFR] 1970.8(c)). RUS has further determined that preparation of an environmental impact statement (EIS) is required to evaluate the Applicant's planned request for funding (7 CFR 1970.9).

Project Purpose and Need

Since the Applicant entered into a power purchase agreement with WFEC for the Project, the Project's purpose and need is focused on meeting the energy buyer's (WFEC) needs. WFEC's objective is to provide safe, adequate, and reliable power to its members at the lowest reasonable cost. The Project would allow the Applicant to provide the additional generation capacity needed by WFEC to achieve these goals within the service territories of their member cooperatives. Specifically, the Project would provide a source of non-dispatchable power via solar panels that increase capacity, whereas battery storage would provide a source of dispatchable power that increases the reliability of generated power to the grid. The pairing of battery storage with solar panels would further allow WFEC to meet peak demand needs without adding additional fossil fuel consumption to the system. In addition, the Project would help WFEC and the Southwest Power Pool to continue to comply with Oklahoma legislative declarations to facilitate the delivery of renewable energy.

Federal Purpose and Need

The following three federal agencies will use this EIS to inform decisions about funding, authorizing, or permitting various components of the Project:

- RUS, the lead federal agency, will evaluate whether or not to provide Project financial assistance.
- The U.S. Army Corps of Engineers will review the Applicant's permit application, as required by Section 404 under the Clean Water Act.
- The U.S. Fish and Wildlife Service will determine the likelihood of Project effects on listed species, as required under Section 7 of the Endangered Species Act.

[1] OG&E and WFEC are both members of the Southwest Power Pool (SPP), the regional transmission organization mandated by the Federal Energy Regulatory Commission to ensure reliable supplies of power, adequate transmission infrastructure, and competitive wholesale electricity prices in the region. The interconnection and market rules established by the SPP allow for the interconnection of the Project into a substation owned by one SPP member and sale of electricity generated by the Project to a different SPP member without the need for additional agreements.

Public Involvement

Throughout the NEPA process, the public and various government agencies have had the opportunity to provide input and comment on the Project. The notice of intent published on March 15, 2021, initiated the 30-day public scoping period. The notice included a brief overview about the Project, potential resource concerns, opportunities to provide input and attend the public meeting, and RUS project contact. Letters, radio and television public service announcements, and newspaper advertisements announcing the Project and the scoping meeting location and time were distributed prior to the public scoping meeting. RUS held one public scoping meeting to present the RUS NEPA process and timelines, and to answer questions and receive comments regarding the Project. RUS also sent letters to federal and state agencies inviting them to participate in the public scoping meeting and provide input on Project-related concerns. Thirty-nine tribes were also invited to participate in the National Historic Preservation Act Section 106 review process, attend the public scoping meeting, and provide relevant information for inclusion in the EIS.

Project and Alternatives

RUS regulations (7 CFR 1970.5 (b)(3)(iii)) require the Applicant to "develop and document reasonable alternatives that meet their purpose and need while improving environmental outcomes." As part of initial planning efforts, the Applicant prepared an alternative evaluation study and site selection study (AES/SSS) (SWCA Environmental Consultants 2020), which evaluates alternative technology and location-based options for the Project. Based on this study and on subsequent Project design refinement, three alternatives were carried forward for analysis in this EIS:

No Action Alternative: Under the No Action Alternative, the Project would not be constructed, and physical, biological, and human impacts associated with the Project would not occur. However, this alternative would not help increase WFEC's generation capacity to meet electricity demand within its service territories of member cooperatives. In addition, WFEC would forego opportunities to increase renewable energy generation within its portfolio and offer its member cooperatives a source of low-cost, emissions-free energy. As a result, the No Action Alternative would not meet the Project's purpose and need, but per Council on Environmental Quality regulations (40 CFR 1502.14), this alternative is carried forward as a baseline for all action alternatives.

Proposed Action: Under the Proposed Action, the Project would be constructed, and physical, biological, and human impacts associated with the Project would occur. The Proposed Action would consist of a 250-megawatt (MW) solar array plus a 200-MW battery storage system with a capacity of approximately 800 megawatt-hours (MWh) in Garfield County, Oklahoma. Under the Proposed Action, the Project would consist of several major components: 1) PV panels and solar array, 2) solar trackers, 3) electrical collection system, 4) battery storage system, 5) substation, 6) point of interconnect, 7) Project facilities, and 8) access roads. These components are explained in detail in Section 2.3.2 of the EIS.

Other Action Alternative: Under the Other Action Alternative, the Project would be constructed, and physical, biological, and human impacts associated with the Project would occur. To allow for flexibility in design, the Applicant identified an additional 1,744 acres of buildable land located east of the Proposed Action that could be developed to support the Project. Land acquisition has not yet occurred for this alternative. However, this alternative would consist of the same components as the Proposed Action. All construction and operations and maintenance activities, as well as Applicant-committed minimization or avoidance measures, would also be the same as those described under the Proposed Action.

Identification and rationale for other alternatives considered but not carried forward for analysis are provided in Chapter 2 of the EIS.

Summary of Evaluated Resources by Alternative

NEPA requires agencies to assess the impacts of the alternatives carried forward for detailed analysis. Potential impacts were identified and evaluated for the following resources: air quality, geology and soils, water resources, vegetation (including invasive species, noxious weeds, and special-status plants), wetlands, wildlife (including special-status species), cultural and historic resources, land use, noise, public health and safety, socioeconomics and environmental justice, transportation, and visual quality and aesthetics.

Table 2.4-1 in Section 2.4 of the EIS presents a summary comparison of potential impacts to resources analyzed in the EIS for each action alternative.

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ABBREVIATIONS

1	Persistent (PEM) or Broad-Leaved Deciduous (PSS/PFO)
A	Temporary Flooded
AADT	annual average daily traffic
AC	alternating current
ACOG	Association of Central Oklahoma Governments
AES/SSS	alternative evaluation study and site selection study
AFB	air force base
APE	area of potential effects
Applicant	Skeleton Creek Energy Center, LLC
AVERT	Avoided Emissions and geneRation Tool
BGEPA	Bald and Golden Eagle Protection Act
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
BLS	Bureau of Labor Statistics
BMP	best management practice
BNSF	Burlington Northern-Santa Fe
C	Seasonally Flooded
CAA	Clean Air Act
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CO	carbon monoxide
CO_2e	carbon dioxide equivalent
COBRA	CO-Benefits Risk Assessment
CWA	Clean Water Act
db	decibel
dBA	A-weighted decibel
DC	direct current
DOI	U.S. Department of the Interior
EF Scale	enhanced Fujita Scale
EIA	U.S. Energy Information Administration

EIS	environmental impact statement
EIT	Enid Isolated Terrace
EJSCREEN	EPA's environmental justice mapping and screening tool
ELF	extremely low frequency
EM	Emergent
EMF	electromagnetic field
EO	executive order
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
F	Semi permanently Flooded
FAA	Federal Aviation Administration
FEMA	Federal Emergency Management Agency
FLAG	Federal Land Managers' Air Quality Related Values Work Group
FO	Forested
FPPA	Farmland Protection Policy Act
GHG	greenhouse gas
H	Diked/Impounded
HAP	hazardous air pollutant
HUC	Hydrologic Unit Code
Hz	hertz
ICNIRP	International Commission of Non-Ionizing Radiation Protection
JLUS	Joint Land Use Study
KOP	key observation point
MBTA	Migratory Bird Treaty Act
MCA	Military Compatibility Area
MLRA	major land resource area
mT	metric tons
MW	megawatt
MWh	megawatt-hour
NAAQS	National Ambient Air Quality Standards
NCO	North-Central Oklahoma

NEPA	National Environmental Policy Act
NHD	National Hydrography Dataset
NHPA	National Historic Preservation Act
NLCD	National Land Cover Dataset
NO_2	nitrogen dioxide
NOAA	National Oceanic and Atmospheric Administration
NO_X	nitrogen oxides
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NWI	National Wetlands Inventory
NWP	Nationwide Permit
O&M	operations and maintenance
O_3	ozone
OAS	Oklahoma Archaeological Survey
ODOT	Oklahoma Department of Transportation
ODWC	Oklahoma Department of Wildlife Conservation
OWP	Oklahoma Wetlands Program
°F	degrees Fahrenheit
OG&E	Oklahoma Gas and Electric
OIPC	Oklahoma Invasive Plant Council
OK	Oklahoma
ONHI	Oklahoma Natural Heritage Inventory
OWRB	Oklahoma Water Resources Board
P	Palustrine
PEM	Palustrine Emergent
PFO	Palustrine Forested
PM	particulate matter
$PM_{2.5}$	particulate matter less than 2.5 microns in diameter
PM_{10}	particulate matter less than 10 microns in diameter
POI	point of interconnect
PPA	power purchase agreement

Project	Skeleton Creek Solar and Battery Storage Project
PSS	Palustrine Scrub-Shrub
PV	photovoltaic
ROW	right-of-way
RUS	Rural Utilities Service
SCAQMD	South Coast Air Quality Management District
SHPO	state historic preservation office
SO_2	sulfur dioxide
SO_X	sulfur oxides
SPCC plan	spill prevention, control, and countermeasure plan
SS	Scrub-Shrub
SWCA	SWCA Environmental Consultants
SWPPP	stormwater pollution prevention plan
TDI	terrestrial development index
THPO	tribal historic preservation office
USACE	U.S. Army Corps of Engineers
USC	United States Code
USDA	U.S. Department of Agriculture
USDOT	U.S. Department of Transportation
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UST	underground storage tank
VOC	volatile organic compound
WFEC	Western Farmers Electric Cooperative
WOTUS	waters of the United States

CHAPTER 1. INTRODUCTION

Skeleton Creek Energy Center, LLC (the Applicant), a wholly owned subsidiary of NextEra Energy Resources, LLC, intends to construct the Skeleton Creek Solar and Battery Storage Project (Project). The Project would be located on privately owned land in Garfield County, Oklahoma, and would comprise a 250-megawatt (MW) solar array and a 200-MW battery storage system with a capacity of approximately 800 megawatt-hours (MWh).

The Applicant plans to apply for a Project loan from the U.S. Department of Agriculture (USDA), Rural Utilities Service (RUS). RUS administers the USDA's rural utilities programs. RUS has determined that a loan for the Project would be a federal action and is therefore subject to National Environmental Policy Act (NEPA) review (42 United States Code [USC] 4321 et seq.; 7 Code of Federal Regulations [CFR] 1970.8(c)). RUS has further determined that preparation of an environmental impact statement (EIS) is required to evaluate the Applicant's planned request for funding (7 CFR 1970.9).

This chapter provides a description of the Project, Applicant and agency purpose and needs, the regulatory framework and authorizing actions that are pertinent to the Project, a description of public participation activities held for the Project to date, and a summary of issues analyzed in this EIS.

1.1 NEED FOR PROJECT PROPOSAL

1.1.1 Description of Project and Proposal

As proposed, the Project would consist of photovoltaic (PV) solar panels and a lithium ion–based (or similar battery technology) battery storage system. Energy generated from these components would be transferred by a 1-mile-long 345-kilovolt (kV) generation tie (gen-tie) transmission line to the Oklahoma Gas and Electric (OG&E) 345-kV Woodring Substation for use by the energy buyer, Western Farmers Electric Cooperative (WFEC).[2] The Project would be located entirely on privately owned land in Garfield County, Oklahoma. The Project's Application Area encompasses 12,262 acres (Figure 1.1-1). Current technology allows for 1 MW of generation per 6 to 9 acres of land use, depending on the buildable area available and final design parameters. This technology-based spacing allows for 250 MW of electrical production within approximately 4,500 to 6,000 acres.

The Applicant has executed a 20-year power purchase agreement (PPA)[3] with Western Farmers Electric Cooperative (WFEC), with an optional 5-year extension, for the Project. Project construction is expected to begin in May 2022, with a commercial operation date on or around November 30, 2023. All necessary permits, easements, interconnection, site control, and other development agreements would be in place prior to construction.

A detailed description of the Proposed Action is provided in Section 2.3.2.

[2] OG&E and WFEC are both members of the Southwest Power Pool (SPP), the regional transmission organization mandated by the Federal Energy Regulatory Commission to ensure reliable supplies of power, adequate transmission infrastructure, and competitive wholesale electricity prices in the region. The interconnection and market rules established by the SPP allow for the interconnection of the Project into a substation owned by one SPP member and sale of electricity generated by the Project to a different SPP member without the need for additional agreements.

[3] A power purchase agreement (PPA) refers to a long-term electricity supply agreement between two parties, usually between a power producer and a customer.

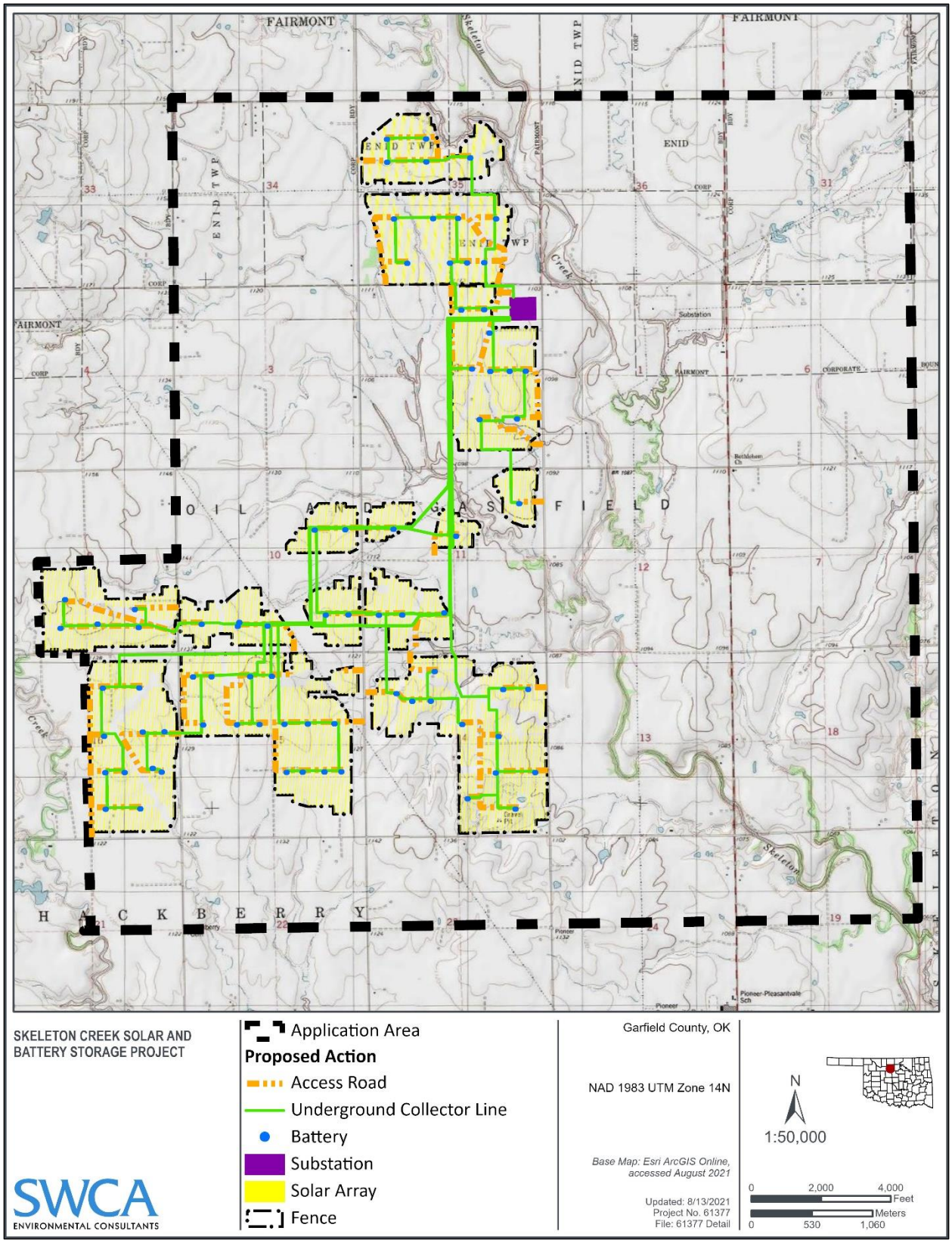

Figure 1.1-1. Proposed Action footprint.

1.1.2 Purpose and Need for the Project

Since the Applicant entered into a PPA with WFEC for the Project, the Project's purpose and need is focused on meeting the energy buyer's (WFEC) needs.

WFEC's objective is to provide safe, adequate, and reliable power to its members at the lowest reasonable cost. WFEC is continuously evaluating capacity needs for both present and future needs to ensure the adequacy and reliability of capacity resources to meet the system peak demand for electricity and to maintain an additional reserve margin to address potential higher system demand or lower-than-anticipated availability of capacity resources caused by unforeseen events, such as extreme weather or forced outages. The Project would allow the Applicant to provide the additional generation capacity needed by WFEC and their member cooperatives to achieve these goals within the service territories of their member cooperatives. Specifically, the Project would provide a source of non-dispatchable power via solar panels that increase capacity, whereas battery storage would provide a source of dispatchable power that increases the reliability of generated power to the grid. The pairing of battery storage with solar panels would further allow WFEC to meet peak demand needs without adding additional fossil fuel consumption to the system.

In addition, the Project would help WFEC and the Southwest Power Pool (SPP) continue to comply with Oklahoma legislative declarations to facilitate the delivery of renewable energy. In 2006, the Oklahoma Energy Security Act was enacted, which established a goal that 15% of all installed electric generation capacity within the State of Oklahoma be generated from renewable energy sources such as wind, solar, hydropower, hydrogen, geothermal, and biomass by the year 2015. According to the U.S. Energy Information Administration (EIA), by 2015, the goal had been exceeded statewide, and 25.9% of Oklahoma's installed capacity came from eligible renewable energy resources and demand side management[4] (EIA 2020a). By 2019, approximately one third of Oklahoma's installed electric generation capacity used renewable resources (EIA 2020b). The 2018 *The State of Oklahoma's Electric System Planning Report* (Oklahoma Corporation Commission Public Utility Division 2018) also reached the following conclusions about statewide electric generation from 2017 to 2026:

- Generation facilities of the major service providers are generally expected to trend to increasing wind and natural gas fuel generation, reducing the role of coal in the overall power production mix.
- Solar and distributed generation are expected to make gains while still remaining relatively minor contributors to Oklahoma's overall power supply.
- Access to regional generation resources through SPP integrated marketplace is expected to continue to provide increased flexibility and savings to Oklahoma load-serving utilities and for their Oklahoma customers.

The diversity of WFEC's current generation reflects these conclusions by relying on a variety of technologies, fuel types, and owned and contract resources, including substantial amounts of wind energy under existing PPAs. In their *2019 Annual Report*, WFEC announced that solar power generation would represent a greater portion of WFEC's overall fuel mix in upcoming years (WFEC 2020a). WFEC owns or contracts almost 51 MW of solar generation, which comprises 18 MW from five utility-scale solar farms in Oklahoma, 30 MW from two utility-scale sites in New Mexico, and almost 3 MW from 13 community solar locations. Under contract are the 220-MW Tip Top solar facility with commercial operation planned for 2022 and the Applicant's Project considered in this EIS, planned for 2023 (WFEC 2020a). WFEC (2020a) stated that these projects would help further diversify its generation portfolio to

[4] Demand side management programs consist of the planning, implementing, and monitoring activities of electric utilities, which are designed to encourage consumers to modify their level and pattern of electricity usage.

include 523 MW of solar generation, 957 MW of wind generation, and 268 MW of hydroelectric generation. When completed, WFEC anticipates that more than 40% of the energy it sells to the SPP will be generated with renewables (WFEC 2020a).

The reader is referred to the Applicant's alternative evaluation study and site selection study (AES/SSS) (SWCA Environmental Consultants [SWCA] 2020) for additional information about WFEC's purpose and need, including their planning history, existing owned and contracted electrical generation resources, demand/load forecast, and consideration of power pool resources and transmission system constraints.

1.2 PURPOSE OF AND NEED FOR AGENCY ACTION

Several federal agencies will make decisions related to funding, authorizing, or permitting various components of the Project. The following sections describe the purpose and need for agency action, as considered by RUS (the lead federal agency) and four other federal cooperating or participating agencies: U.S. Army Corps of Engineers (USACE), U.S. Fish and Wildlife Service (USFWS), Bureau of Land Management (BLM), and Bureau of Indian Affairs (BIA).

1.2.1 Rural Utilities Service

The Rural Electrification Act of 1936, as amended (7 USC 901 et seq.) authorizes the Secretary of Agriculture to make rural electrification and telecommunication loans, and specifies eligible borrowers, references, purposes, terms and conditions, and security requirements. RUS is authorized to make loans and loan guarantees to finance the construction of electric distribution, transmission, and generation facilities, including system improvements and replacements required to furnish and improve electric service in rural areas, as well as demand-side management, electricity conservation programs, and on- and off-grid renewable electricity systems.

The Applicant is requesting financing assistance from RUS for the Project's 250-MW solar array and 200-MW 800-MWh battery storage system in Garfield County, Oklahoma. RUS's proposed federal action is to decide whether or not to provide financing assistance for the Project.

As part of its review process, RUS is required to complete the NEPA process along with other technical and financial considerations in processing the Applicant's application. RUS agency actions include the following:

- Provide engineering reviews of the purpose and need, engineering feasibility, and cost of the Project.
- Ensure that the Project meets the borrower's requirements and prudent utility practices.
- Evaluate the financial ability of the borrower to repay its potential financial obligations to RUS.
- Ensure that NEPA and other environmental laws and requirements and RUS environmental policies and procedures are satisfied prior to taking a federal action.

1.2.2 U.S. Army Corps of Engineers

The USACE has been involved in interagency coordination as a cooperating agency for the Project. The USACE would need to issue a permit under Section 404 of the Clean Water Act (CWA) for any activities that discharge fill into waters of the United States (WOTUS), including wetlands, to allow the Project to be constructed.

Section 404 of the CWA establishes a permit program for the discharge of dredged or fill material into WOTUS, including wetlands. This permit program is jointly administered by the USACE and the U.S. Environmental Protection Agency (EPA). The immediate regulatory decision regarding which activities fall under Section 404 of the CWA lies with the USACE Tulsa District. The USACE will determine whether a Section 404 permit is required and, if so, which method for obtaining a Section 404 permit applies to the Project: authorization under a Nationwide Permit (NWP), authorization under a regional general permit, or issuance of an individual permit.

1.2.3 U.S. Fish and Wildlife Service

The USFWS has been involved in interagency coordination as a participating agency for the Project. The USFWS is responsible for ensuring compliance with the Endangered Species Act (ESA), the Bald and Golden Eagle Protection Act (BGEPA), and the Migratory Bird Treaty Act (MBTA). RUS, as the lead federal agency for ESA Section 7 consultation, is responsible for initiating consultation (e.g., communication) with the USFWS to determine the likelihood of effects on federally listed species.

RUS has assessed potential Project impacts on federally listed species and critical habitats as part of the EIS. The USFWS will issue either a letter of concurrence with EIS findings, or issue a biological opinion, depending on the level of effects on listed species. Any conservation measures resulting from USFWS consultation will be incorporated as part of the record of decision.

1.2.4 Bureau of Land Management

The BLM has been involved in interagency coordination as a cooperating agency for the Project. BLM is responsible for managing surface and subsurface public lands under their jurisdiction for commercial, recreational, and conservation uses. For this reason, the agency provides expertise and guidance regarding potential environmental and land use issues related to BLM's land use management goals, objectives, and actions.

1.2.5 Bureau of Indian Affairs

The BIA has been involved in interagency coordination as a cooperating agency for the Project. The BIA is responsible for enhancing the quality of life, promoting economic opportunity, and carrying out the responsibility to protect and improve the trust assets of American Indians, Indian tribes, and Alaska Natives. For this reason, the agency provides expertise and guidance regarding potential environmental and land use issues related to the BIA's goals and objectives.

1.3 AUTHORIZING ACTIONS

1.3.1 Applicable Statutory Requirements

Key federal and state permits, other approvals, and statutory requirements pertinent to the Project are summarized in Table 1.3-1. These laws are addressed throughout this EIS.

1.3.2 Federal and State EIS Requirements

Oklahoma has not established any state EIS requirements. Therefore, this EIS complies with federal NEPA guidance for EIS preparation, as established in Council on Environmental Quality (CEQ) Regulations (40 CFR 1500–1508 and 1515–1518, amended September 14, 2020), as well as RUS guidance set forth in RD 1970 Environmental Policies and Procedures.

1.3.3 Decisions to be Made Based on this Analysis

Based on the analysis disclosed in this EIS, the RUS decision-maker will determine whether to provide financing assistance for the Project and, if issued, any Project-specific conditions established as part of the loan.

1.3.4 Federal and State Permits, Other Approvals, and Statutory Requirements Required to Implement Project Proposal

Table 1.3-1 identifies the permits, other approvals, and statutory requirements that may be required by federal or state agencies for the Project.

Table 1.3-1. Federal and State Permits, other Approvals, and Statutory Requirements

Agency	Permits or Other Approvals	Statutes and Regulations
Federal Agencies		
RUS	NEPA and other environmental regulatory compliance	Environmental Policies and Procedures (7 CFR 1794] NEPA compliance (42 USC 4321) Executive Order 11988, Floodplain Management Executive Order 11990, Protection of Wetlands Executive Order 13112, Invasive Species Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations
USFWS	Section 7 consultation to determine the likelihood of effects on listed species Review of biological assessment and biological opinion preparation, if necessary	Section 7 of the ESA (16 USC 1531–1544) BGEPA (16 USC 668; 50 CFR 22) MBTA of 1918 (16 USC 703–712)
USACE	NWP or individual permit under Section 401 and Section 404 of the CWA	Section 401 and 404 of the CWA of 1977 (33 USC 1344)
Federal Aviation Administration	Determination of No Hazard to Air Navigation	Safe, Efficient Use, and Preservation of the Navigable Airspace (14 CFR 77)
Natural Resources Conservation Service	Farmland Protection Policy Act compliance	Agriculture and Food Act of 1981 (Public Law 97-98)
EPA	National Pollutant Discharge Elimination System	CWA of 1977 (33 USC 1344) Federal Insecticide, Fungicide, and Rodenticide Act Pollution Prevention Act Resource Conservation and Recovery Act Noise Control Act
State Agencies		
Oklahoma Department of Wildlife Conservation	Authorization if impacts to state endangered or threatened species cannot be avoided	Title 29. Game and Fish. Chapter 1. Oklahoma Wildlife Conservation Code.
Oklahoma Department of Transportation	Application to Construct and Operate and Maintain Utility Facilities on Highways Rights-of-Way Access Driveway Permit (may be required) Drainage Permit (may be required) Road Crossing Authorization Oversize Loads or Excessive Weights on Highways	Not applicable

Agency	Permits or Other Approvals	Statutes and Regulations
State Historic Preservation Office	National Historic Preservation Act compliance, Section 106 consultation	Public Law 102-575
Oklahoma Department of Environmental Quality	Construction Site Erosion Control and Stormwater Discharge Permit General Utility Crossings Permit Construction Stormwater Permit Authorization	Not applicable

1.4 PUBLIC PARTICIPATION

This section summarizes public participation that has occurred to-date for the Project. The notice of intent for the Project was published in the *Federal Register* on March 15, 2021. The notice of intent serves as the official public announcement of the intent to prepare an EIS and initiated a 30-day public scoping period, which ended on April 19, 2021. The announcement included a brief overview about the Proposed Action and alternatives, potential resource concerns, opportunities to provide input and attend a public meeting, and the RUS Project contact.

1.4.1 Public Scoping Process

A combination of legal announcements, display advertisements, and press releases were provided to the local newspaper, television stations, and radio stations during the public scoping period to provide public scoping meeting details, the scoping period deadline, and basic details about the Project to individuals within the Project vicinity. RUS also provided scoping notice and associated scoping materials on their website: https://www.rd.usda.gov/environmentalstudy/skeleton-creek-solar-and-battery-storage-project-garfield-county-oklahoma. From March 15 to 17, 2021, letters were sent to 11 federal and state agencies and 39 tribes inviting them to participate in the National Historic Preservation Act Section 106 review process, attend public meetings, and/or provide relevant information for inclusion in the EIS.

Details about the scoping public outreach effort can be found in the Project scoping report (SWCA 2021a).

RUS held one virtual public scoping meeting on March 30, 2021, from 4 to 8 pm (central time) using Zoom Video Webinar to present the RUS NEPA process and timeline, and to answer questions and receive comments regarding the Project. In all, 11 attendees participated in this meeting, based on meeting registration information.

Three comment letters were received by email during the scoping period. Key issues identified during scoping included consideration of air quality and environmental justice impacts. Additional detail on submitted comments can be found in the Project scoping report (SWCA 2021a).

1.5 ISSUES ASSOCIATED WITH THE PROJECT PROPOSAL

1.5.1 Key Issues

Based on a preliminary desktop assessment conducted as part of the AES/SSS, as well as input provided during the scoping period, RUS identified the following key issues to be addressed in the EIS:

- Air quality
- Cultural and historic resources
- Geology and soils
- Land use
- Noise
- Public health and safety
- Socioeconomics and environmental justice
- Transportation
- Vegetation, including invasive species, noxious weeds, and special-status plants
- Visual quality and aesthetics
- Water resources
- Wetlands
- Wildlife, including special-status species

1.5.2 Issues Considered but Dismissed

Issues that were considered but dismissed from further analysis are summarized in Table 1.5-1, along with reason for dismissal.

Table 1.5-1. Issues Considered but Dismissed

Issue	Rational for Dismissal
Coastal resources	The Project would not impact any geographic areas designated as “Coastal Barrier Resources System Units.”
Recreation and formal classified lands	There are no public recreation sites, parks, wildlife management areas, or major scenic viewpoints or byways (USFWS 2020b; U.S. Geological Survey 2020a) within the Application Area.

CHAPTER 2. SUMMARY OF ALTERNATIVES

This chapter describes the Project and includes information on how alternatives were developed. In particular, this chapter describes alternatives evaluated in this EIS, comprising the Proposed Action, Other Action Alternative, No Action Alternative, and alternatives that were considered but not carried forward for detailed analysis.

2.1 DEVELOPMENT OF ALTERNATIVES

2.1.1 Evaluation Process and Criteria

Per RUS guidance in RD Instruction 1970-O (USDA 2016), a two-stage alternatives development and screening process was conducted for the Project. Stage 1 considered alternative technologies to the Project, whereas Stage 2 considered alternative locations for the Project.

2.1.1.1 Stage 1: Alternative Technologies

Stage 1 of the alternative development process considered alternative technologies to the Project. RUS considered alternative means of meeting the Project's purpose and need by considering the strengths and weaknesses of other technologies and natural resources. Alternatives were assessed based on natural resource availability or abundance within WFEC's service area (if applicable); technological, environmental, operational (including permitting), or economic constraints; and ability of the alternative technology to meet the Project's purpose and need.

Table 2.1-1 provides a summary of evaluated technology alternatives and summarizes the screening findings. Alternatives were dismissed from further consideration if they failed one or more screening metrics. The reader is referred to the Applicant's AES/SSS (SWCA 2020) for additional information.

Table 2.1-1. Technology Alternatives Considered and Screening Findings

Alternative	Description	Natural Resource Availability/ Abundance within WFEC Service Area	Technological, Environmental, Operational (including permitting), or Economic constraints	Meets Purpose and Need	Carried Forward for Analysis?
Load management	Planning, implementing, and monitoring activities of electric utilities, which are designed to encourage consumers to modify their level and pattern of electricity usage	Not applicable	No strict load management programs are currently being implemented by WFEC. Therefore, alternatives related to load management and energy conservation and efficiency programs are not feasible at this time.	No	No
Distributed generation	Use of fuel cells, micro-turbines, or internal combustion engines[5]	Not applicable	Not currently economically viable on a commercial scale as a primary source of meeting demand and could result in additional associated fuel costs or air emissions (RUS 2013). Additionally, economies-of-scale are lost when installing distributed generation as opposed to utility-scale generation (The Brattle Group 2015). Would not provide reliability benefits or congestion relief because typically installed on a piecemeal basis by a variety of owners.	No	No
Re-powering/uprating of existing units	Re-powering and uprating of existing generation units owned or operated by WFEC	Not applicable	There are no known WFEC re-powering or uprating opportunities that could both satisfy the current need and provide a more diverse energy portfolio (RUS 2013).	No	No
Participation in another company's generation project (or joint owned projects)	Participation in another company's generation project, or collaboration with another company in creating a joint owned project	Not applicable	There are no known WFEC or other company projects where participation is an option to meet the purpose and need.	No	No
Non-renewable fuel sources	Use of non-renewable fuel sources such as natural gas, nuclear, or coal	Varies; coal and natural gas are available/abundant. However, Oklahoma does not have any nuclear power plants (EIA 2020b).	Nuclear power and coal are capital intensive and a complex technology that carries significant risks associated with investment, cost, permitting, and political support. Because of the high efficiency and relatively low capital cost, natural gas generation is fully capable of supplying WFEC's energy needs. However, it does not address WFEC's desire to diversify its energy portfolio by using additional renewable energy resources.	No	No

[5] Battery storage is included as part of the Project, so was not evaluated as a separate technology alternative under this category.

Alternative	Description	Natural Resource Availability/ Abundance within WFEC Service Area	Technological, Environmental, Operational (including permitting), or Economic constraints	Meets Purpose and Need	Carried Forward for Analysis?
Other renewable energy sources	Use of other renewable energy resources such as wind, hydropower, geothermal, or biomass	Wind and biomass are available. Currently, biomass resources provide a small amount of power generation in Oklahoma (EIA 2020b). Suitable locations for new hydroelectric facilities are limited and are not anticipated to be available within WFEC's service area. Geothermal sources have similar location-based restrictions.	WFEC has identified several concerns with biomass (RUS 2013), including the seasonal availability of biomass fuels and risk of interruptions and variability in both quality and quantity. WFEC has historically pursued wind energy as part of its portfolio expansion, and wind energy alternatives would meet their purpose and need for reliable, renewable energy resources. However, the PPA is exclusively for solar and battery storage associated with the Project. Energy demand peaks during the daytime hours and peak solar production are coincident with that demand. Pairing solar with battery storage allows for WFEC to better balance peak demand needs across its service area.	No	No
Other purchased power/power purchase agreements	Other projects evaluated for potential to meet WFEC's needs	Not applicable	WFEC evaluated a variety of projects including 350 MW of wind in Alfalfa, Major, and Garfield Counties, Oklahoma, and 200 MW of wind in Nemaha, Kansas. The Project was selected by WFEC as the best means to meet WFEC's needs. No other PPAs or proposals were carried forward for analysis.	No	No
New transmission capacity	Improvements to existing transmission capacity	Not applicable	Based on current transmission system characteristics (SWCA 2020), transmission capacity is not expected to be a significant constraint to the transfer of available and economical generation capacity.	No	No

2.1.1.2 Stage 2: Alternative Locations

Stage 2 of the alternative development process considered alternative locations to the Proposed Action, both outside and within the Application Area. The Applicant initially considered the entire service area covered by WFEC member cooperatives; this service area is located primarily in Oklahoma and New Mexico, with some areas extending into parts of Texas and Kansas. However, the Applicant ultimately selected the proposed 12,262-acre Application Area (Figure 2.1-1) based on previous land acquisition; NextEra's history of working in Garfield County and adjacent counties; and placement of this area within WFEC's primary service area (Oklahoma) and near existing points of interconnect (POIs), low load congestion, and high solar irradiance.

To identify potential alternative locations within the Application Area, SWCA (2020) identified both suitable and unsuitable areas for Project development. Suitable area (opportunities) as described by the USDA (2016) include areas where construction of facilities is consistent with current land use, results in efficient facility operation, and reduces the likelihood of adverse impacts. Unsuitable areas (constraints) consist of lands where siting should be 1) excluded because of regulatory restrictions or significant adverse impacts, or 2) generally avoided because of conflicts with existing land use, development, or land features. Examples of exclusion areas include federally designated critical habitat for federally listed species, some formally classified lands (e.g., national parks, wild and scenic rivers, and monuments), and sites on or eligible for the National Register of Historic Places (NRHP). Areas that should be avoided where practicable include sensitive environmental resources such as wetlands or streams, as well as public features such as airports or federally regulated facilities.

As the next step in the process, the Applicant developed a buildable land layer containing all lands within the Application Area that were technically and economically feasible for construction. The Applicant then used a proprietary optimization software tool to identify potential Project layouts within the buildable layer. The software sought to achieve optimal panel placement for the Project within buildable land parcels, while taking into consideration a range of criteria, including distance to the POI, ground cover ratio, landowner status, and setbacks from unsuitable areas that were excluded from the buildable layer.

The Proposed Action and three additional action alternatives were originally identified for analysis based on the Applicant's optimization effort in the AES/SSS (SWCA 2020). Subsequent to further Project design layout refinement, however, RUS determined that only one additional location alternative was reasonably capable of being sited within the Application Area, based on land requirements (1 MW of generation per 6 to 9 acres of land use) to achieve 250 MW of electrical production. Figure 2.1-1 shows the proposed layout of the other location alternative (the Other Action Alternative) relative to the Proposed Action.

Both alternative locations would meet the Project purpose and need and were therefore carried forward for analysis.

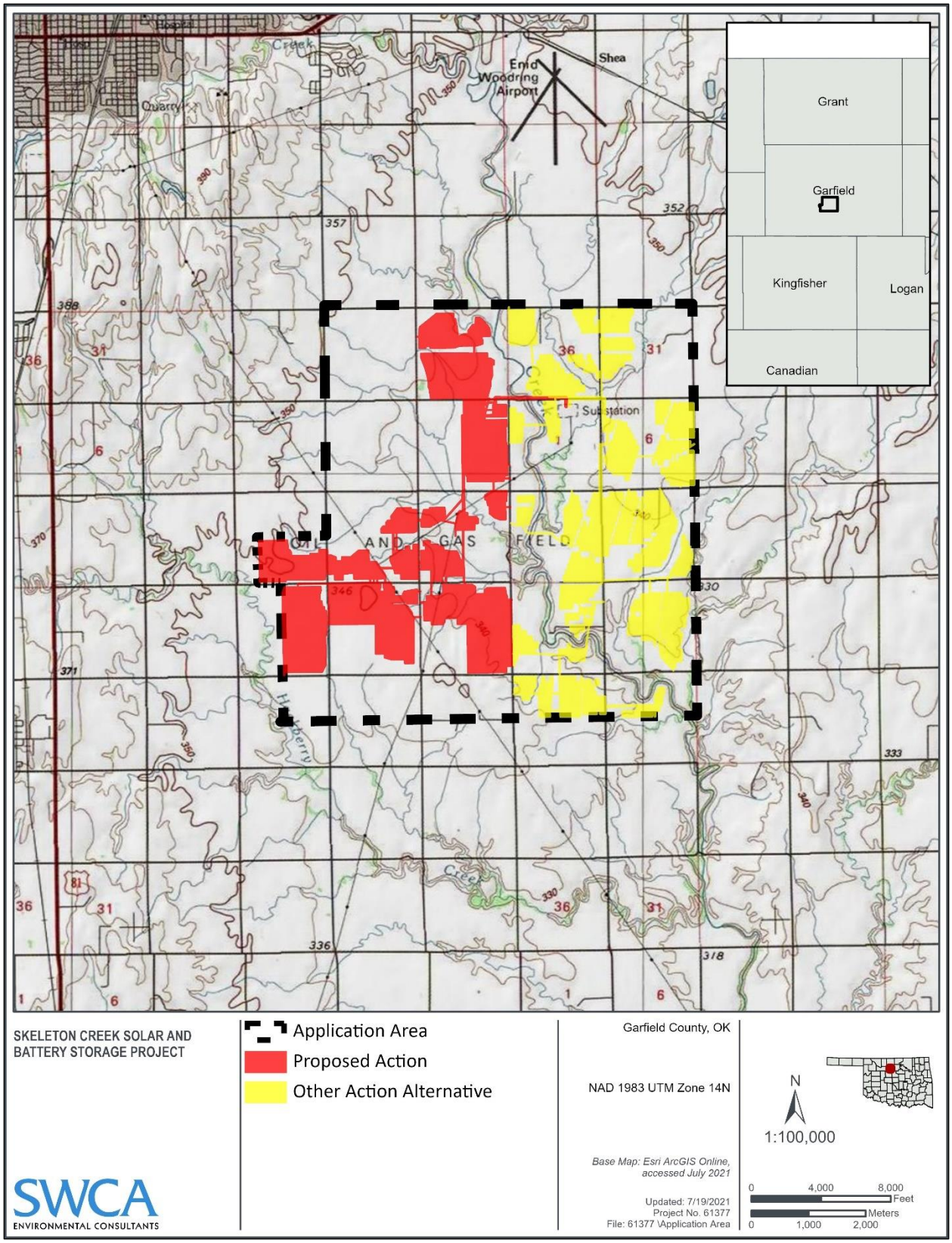

Figure 2.1-1. Proposed Action and Other Action Alternative layout.

2.1.2 Previous Studies

This EIS incorporates information from the AES/SSS (SWCA 2020) as well as additional Applicant, RUS, SWCA, and other public studies listed in Appendix A (Literature Cited).

2.2 ALTERNATIVES CONSIDERED BUT NOT EVALUATED IN DETAIL

In addition to technology and location alternatives considered in Section 2.1.1, the Applicant and RUS considered several additional Project design alternatives. Table 2.2-1 provides a summary of these considered design alternatives and rationale for dismissal from further evaluation.

Table 2.2-1. Other Design Alternatives Dismissed from Further Evaluation

Alternative	Description and Rational for Dismissal from Further Evaluation
Lower alternative current/direct current (AC/DC) ratio	The Applicant considered a 1.4 AC/DC ratio, which would reduce the land requirements per MW and could reduce the overall Project size and associated environmental impacts. However, the Applicant determined that a reduced AC/DC ratio would not be economically feasible. Therefore, the alternative was not carried forward for analysis.
Different PV technology	PV technology is rapidly improving, and RUS acknowledges the potential for new technology to generate greater energy production that could reduce the solar panel footprint. However, the Applicant intends to use proven, state-of-the-art, commercially available technology. Because other PV technology is relatively new or yet to be introduced at a commercial scale, there are risks for long-term performance reliability. Manufacturing capacity to supply large-scale utility projects has also not been proven to date.
Alternative solar technologies	PV technology is specified in the existing PPA for the Project. Therefore, alternative technologies were not carried forward for detailed analysis.
Site reconfiguration to reduce impacts	The Applicant has sited the Project as proposed under the Proposed Action to avoid or minimize impacts to sensitive resources to the maximum extent practicable. This includes establishment of a minimum 22 foot setback for solar panels from the following features: Mapped wetlands Transmission corridors Pipelines Private residences Mapped surface waters 100-year floodplain This setback provides sufficient spacing to preserve riparian vegetation, maintain natural hydrology, and protect existing infrastructure. Therefore, RUS did not evaluate an alternative to expand the setback buffer distance. The Applicant would also use a minimal grading approach. All vegetation would be typically left intact to the greatest extent possible, except where mowing is necessary for panel maintenance and safety. Grading would only occur in the areas where the elevation would need to be changed to accommodate the tracker/racking system tolerances, site drainage, roads, laydown areas, substation and foundations. Therefore, no reduced grading/vegetation alternative was identified for analysis.
Reduced MW alternative	The Applicant has executed a 20-year PPA with WFEC to provide a 250-MW) solar array and a 200-MW battery storage system with a capacity of approximately 800 megawatt-hours (MWh). A reduced MW alternative would not allow the Applicant to meet their PPA, and therefore would not meet the Project's purpose and need.
Alternative battery technologies	Lithium ion technology is specified in the existing PPA for the Project. Therefore, alternative technologies were not carried forward for detailed analysis.
Alternative gen-tie options	The Applicant's gen-tie line provides the shortest route to the interconnection facility based on land availability. All other routes would be longer, resulting in greater impacts or infeasible due to lack of land access.

Alternative	Description and Rational for Dismissal from Further Evaluation
Alternative interconnection options	The existing PPA and the interconnection request with OG&E specify delivery of the power generated by the Project to the Woodring Substation. There is no flexibility for a different POI.
Reduced prime farmland alternative	RUS evaluated an alternative that would alter the Project design to move Project components to lower value farmlands or reduce the total amount of prime farmlands impacted by the Project within the Application Area. Because of the extent of prime farmlands within the Application Area, no alternative design was identified that could reduce prime farmland impact without causing greater impacts to other sensitive resources (i.e., aquatic feature and floodplains). Therefore, this alternative was not carried forward for analysis.

2.3 DESCRIPTION OF ALTERNATIVES

2.3.1 No Action Alternative

Under the No Action Alternative, the Project would not be constructed, and physical, biological, and human impacts associated with the Project would not occur. However, this alternative would not help increase WFEC's generation capacity to meet electricity demand within its service territories of member cooperatives. In addition, WFEC would forego opportunities to increase renewable energy generation within its portfolio and offer its member cooperatives a source of low-cost, emissions-free energy. As a result, the No Action Alternative would not meet the Project's purpose and need, but per CEQ regulations (40 CFR 1502.14), this alternative is carried forward as a baseline for all action alternatives.

Other (non-Project related) existing and reasonably foreseeable trends and actions would continue to affect resources under the No Action Alternative. Section 4.4.1 provides a description of these trends and activities. Impacts associated with these actions are described by resource in Chapter 3.

2.3.2 Proposed Action

Under the Proposed Action, the Project would be constructed, and physical, biological, and human impacts associated with the Project would occur. The Project would consist of a 250-MW solar array plus 200-MW 800-MWh battery storage system that would use PV panels that comply with RUS's Buy American requirement. The Project would provide renewable energy to WFEC through the electrical transmission grid at the OG&E 345-kV Woodring Substation via a 1-mile 345-kV gen-tie transmission line.

The Project would be located entirely on privately owned land in Garfield County, Oklahoma. The Project's Application Area encompasses 12,262 acres (Figure 2.3-1). Current technology allows for 1 MW of generation per 6 to 9 acres of land use, depending on the buildable area available and final design parameters. Therefore, generation of 250 MW electrical production would require approximately 4,500 to 6,000 acres in the Application Area. The siting of the Project has not been finalized; however, the Project would be designed to avoid or minimize resource concerns, where applicable. The term *Proposed Action footprint,* where used in this EIS, encompasses both the Proposed Action's construction and operational footprints.

The Applicant executed a 20-year PPA with WFEC with an optional 5-year extension. The Project is expected to operate as merchant during the remaining non-contract period (between 5 and 10 years). The Project is expected to achieve a commercial operation date on or around November 30, 2023, and is expected to create approximately 300 temporary construction jobs to construct the Project and up to 10 long-term jobs to operate the facility. The necessary permits, easements, interconnection, site control, and other development agreements are in place or in process. Project construction is expected to commence in May 2022. The Project would operate for approximately 30 years from the commercial operation date.

2.3.2.1 Project Components

Table 2.3-1 provides a summary of estimated Project component footprints by component. Each of these components is explained in detail in the following sections.

Table 2.3-1. Project Component Footprints within Application Area

Project Component	Area (acres)*	Length (miles)
Additional fenced land	1,466	Not applicable (N/A)
Battery storage system	0.7	N/A
Electrical collection system (solar inverters)	0.3	N/A
Electrical collection system (underground collection lines)	51	39.2
Gen-tie line foundation	1	N/A
Long-term access roads	33	16.4
Overhead gen-tie line	11	0.9
Solar array and solar trackers	528	N/A
Substation	12	N/A
Temporary access roads	16	N/A

* Rounded to nearest acre. Acreage subject to change based on additional layout refinement.

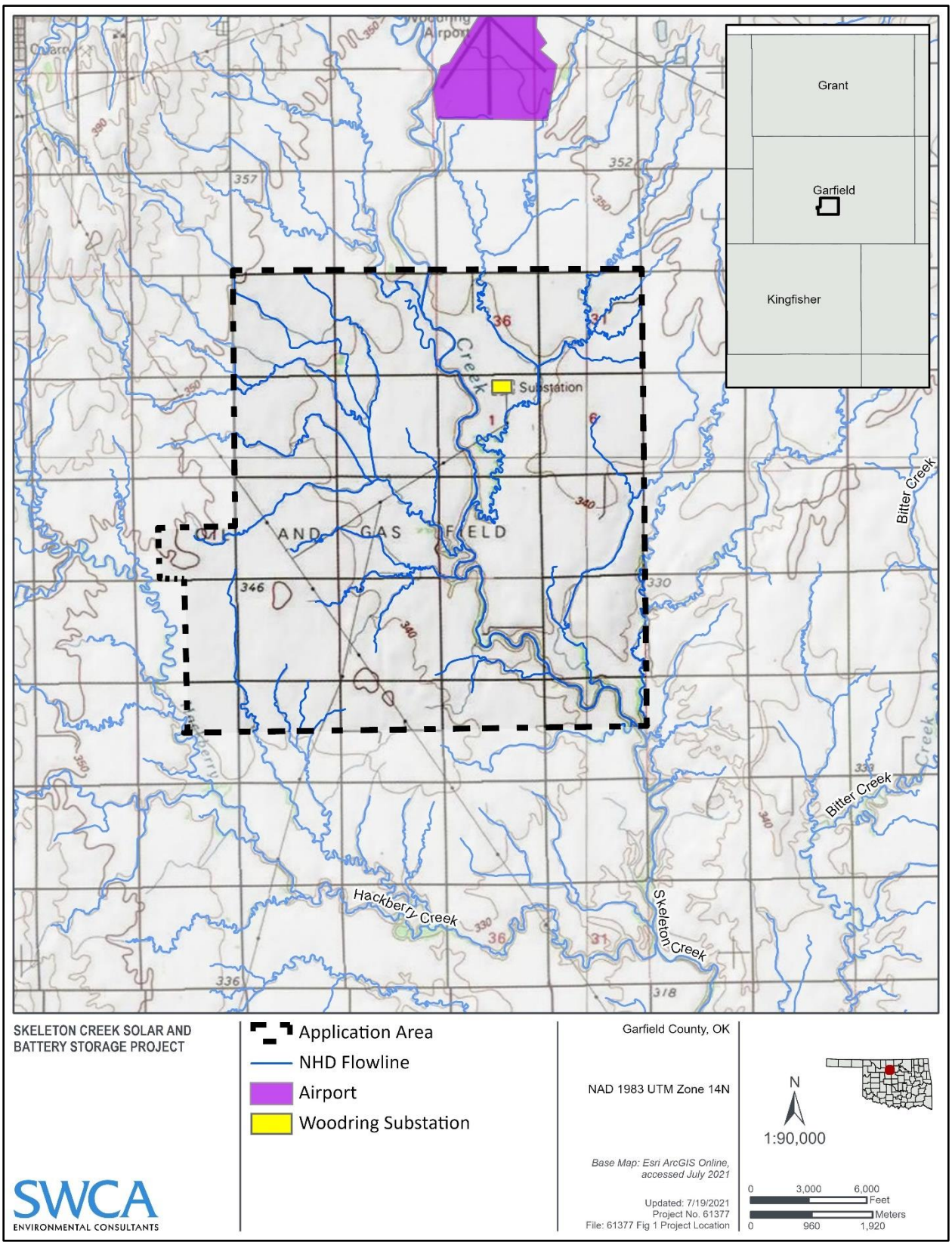

Figure 2.3-1. Location of the Application Area.

2.3.2.1.1 PHOTOVOLTAIC SOLAR PANELS AND SOLAR ARRAY

The Project would use state-of-the-art PV technology that has been widely deployed at a commercial scale by the Applicant and other developers. PV technology uses the sun's light energy and converts it directly into DC electrical energy within the PV panels. The PV panels can be mounted together in different configurations, depending on the equipment selected, on a common support framework.

The panels are grouped together in a solar array. The size of the array is based on the capacity of the equipment selected and is intended to generate the desired overall voltage and current output. The overall capacity of the conceptual Project design (250-MW alternating current [AC]) is achieved with a sufficient AC array to deliver 250 MW at the point of delivery. Solar energy technologies continue to evolve at a rapid rate and as a result, the exact arrangement and nature of the PV systems would be determined during the final design, and appropriate updates would be made to prior to construction.

2.3.2.1.2 SOLAR TRACKERS OR FIXED SUPPORT STRUCTURES

There are two types of mounting structures for the PV panels: 1) solar trackers and 2) fixed support structures. Solar trackers track the sun's motion during the day. Fixed support structures orient the panels in a long-term position toward the south at a certain angle to optimize production throughout the year without any mechanical movement or drive motors.

Solar trackers are used to maximize the solar energy conversion efficiency by keeping the panels perpendicular to the sun's energy rays throughout the day. This completed assembly of PV panels mounted on a framework structure is called a "tracker" because it tracks the sun from east to west. The PV panels would typically be oriented from north to south based on the mounting structure design; however, exact panel support structure types would be determined during the final design.

At this time, two types of solar tracker systems may be selected for the Project: 1) a ganged tracker system or a 2) a standalone tracker system. However, if other technologies are developed, they may be employed for the Project during final Project design. A ganged tracker system uses one actuator to control multiple rows of PV panels through a series of mechanical linkages and/or gearboxes. A standalone tracker system uses a single actuator for each row of PV panels. The exact tracker manufacturer and model would be determined in the final design. All trackers are identical in intended function, following the motion of the sun to increase the amount of electricity generated.

Panel layout and spacing are optimized to balance energy production versus peak capacity and depend on the sun's angle and shading caused by the horizon surrounding the Project. The spacing between the rows of trackers is dependent on site-specific features and tracker selection and would be identified in the final design.

2.3.2.1.3 ELECTRICAL COLLECTION SYSTEM

PV panels generate a lower-voltage DC electrical output that is not suitable for direct connection to the AC utility grid used in the United States. The electrical collection system would be designed to convert the output power from the PV panels from DC to AC and then transform the power from lower voltage to transmission-level voltage for connection to the grid, and to supply auxiliary power to the tracker systems. The DC output from the solar array would be transmitted to solar inverters through DC electrical cables. As currently configured, the Project could use up to 100 power conversion units to accomplish the DC–AC power conversion process. The number of panels connected to each inverter is dependent on the specific model of panels, solar inverters, and their capacities, which would be selected in the final design. In order to allow for greater electrical production in off-peak hours and an overall increase in power production, the DC quantity exceeds the AC plant rating. The resulting AC from each individual solar

inverter package is then routed to the corresponding medium-voltage step-up transformer. Based on the preliminary design, the output voltage from each solar inverter would be increased to the desired AC collection system voltage (34.5 kV) by these medium-voltage transformers.

2.3.2.1.4 BATTERY STORAGE SYSTEM

The Project would use a battery storage system that has a capacity of approximately 800 MWh and would be connected using a DC-coupled system.

The DC-coupled system batteries would be stored in containers. Those containers make use of the solar inverters by feeding them in DC power. Therefore, the battery containers would be distributed throughout the solar array, adjacent to their respective solar inverters. The battery and solar inputs would be metered separately prior to signal inversion. The charge and discharge of the DC-coupled batteries would be controlled by signal from the solar inverters. As is typical for the industry, solar inverters are controlled by a central control system. The protections to the batteries would be internal to the battery management systems and control boxes located within the containers and solar inverters.

Because of changing markets, a battery supplier has not been selected at this time; however, the final battery supplier(s) would be selected prior to Project construction and would meet RUS's Buy American requirements and be subject to an industry-standard pre-qualification process.

2.3.2.1.5 MEDIUM-VOLTAGE TRANSFORMATION/ON-SITE PROJECT SUBSTATION

The AC would leave the medium-voltage transformers via 34.5-kV lateral lines, which would terminate at an on-site Project substation. The Project substation would consist of parallel sets of internal power distribution systems (i.e., 34.5-kV buses and circuit breakers, disconnect switches, and main step-up transformer) to increase the voltage to the 345-kV transmission line voltage. The Project substation and interconnections would be built for 345 kV and operate at that nominal voltage.

2.3.2.1.6 INTERCONNECTION TO THE POINT OF INTERCONNECT

The electrical power from the on-site Project substation would be transmitted through an estimated 1-mile gen-tie line for delivery to the OG&E Woodring Substation. The gen-tie line would be constructed for the nominal operating voltage of the substation, which is 345 kV. If required, the conductor wires would be supported by an intermediate structure. Final hardware design would be determined during final engineering of the gen-tie line.

2.3.2.1.7 ADMINISTRATION-OPERATIONS AND MAINTENANCE BUILDING, CONTROL ROOM, AND WAREHOUSE LOCATIONS

Operations and maintenance (O&M) staff would operate out of an existing, nearby Applicant-owned facility; no new O&M facilities would be constructed for the Project. Up to three CONEX boxes could be placed next to the Project substation for storage of maintenance materials and equipment. The storage area would include a small parking area but would not include toilets or a connection to water and sewer.

2.3.2.1.8 ROADS AND ACCESS

Access to Project facilities would be obtained from county roads. Auxiliary roads inside the facility footprint would be 12 to 20 feet wide and would likely use compacted native materials or gravel surface.

All road improvements would be located on private land or along county road rights-of-way (ROWs) within the Application Area. Current Project plans do not anticipate the need to conduct road work on existing roads. However, if plans change during the design process that determine that road improvements are needed, the Applicant would prepare a traffic management plan prior to construction. The finished width of the internal roads and roads between the sub-areas would be up to 20 feet wide and graded. Most of the Application Area would remain unpaved, with select roadways improved with road base or gravel. The entire site would be fenced appropriately using security fencing to restrict public access during construction and O&M.

2.3.2.1.9 TEMPORARY CONSTRUCTION WORKSPACE, YARDS, STAGING AREA

A temporary staging area would be established on-site, including fenced parking, covered trash disposal facilities, construction trailers, a laydown yard, and sufficient portable toilets and potable water for the construction staff. Mobile trailers or similar suitable facilities (e.g., modular offices) would be used as construction offices for Project and subcontractor personnel. Construction laydown and parking areas would be located within the Proposed Action footprint. Laydown yards would be selected to minimize the amount of disturbance and preparation required from grading and clearing, such as paved sites, parking lots, old gravel pits, and fields.

During construction, temporary utilities would be provided for the construction offices, laydown yard, and other Project construction areas. Temporary construction power would either be provided by a local distribution line extended to the Project or by temporary diesel generators. Temporary area lighting would be provided and strategically located for safety and security.

The following site services would be provided by the Applicant or its contractors during construction:

- Environmental, health, and safety training
- Site security
- Site first-aid
- Construction and testing
- Site fire protection and extinguisher maintenance
- Furnishing and servicing of sanitary facilities
- Trash collection and disposal
- Disposal of hazardous materials and waste in accordance with local, state, and federal regulations

Construction materials such as concrete, pipe, wire and cable, fuels, reinforcing steel, and small tools and consumables would be delivered to the site by truck. Site access would be controlled for personnel and vehicles. Fencing that would protect the Project after full build-out would be installed during or after site preparation and clearing (grading, mowing, etc.) is complete, but before large components are brought in for assembly and installation. During the initial site preparation and clearing, equipment would be stored overnight and during weekends and holidays in a secure, fenced, and gated equipment storage area within the future footprint of the solar array. This area would be moved periodically to allow for completion of grading across the site.

All temporary disturbance areas would be restored in accordance with a restoration and revegetation plan.

2.3.2.1.10 GEOTECHNICAL STUDIES

To determine soil and geology suitability, a geotechnical analysis would be needed before preparing detailed engineering design for the Project. Geotechnical investigations would be performed to identify subsurface conditions, which would dictate much of the design specifications of the roads, underground trenching, and electrical grounding systems. Testing would also be completed to measure the soil's electrical properties to ensure proper grounding system design. The specific geotechnical testing locations would be determined closer to final Project engineering design.

2.3.2.1.11 EROSION CONTROL AND STORMWATER DRAINAGE

Erosion would be controlled during construction by implementing a stormwater pollution prevention plan (SWPPP), as required by the Oklahoma Department of Environmental Quality for projects disturbing more than 1 acre. The Project SWPPP would include information regarding existing and proposed drainage, permits and governing documents, potential discharges and sources, protection measures and best management practices (BMPs), training requirements, storm event planning and preparation, and maintenance and reporting procedures. The SWPPP would also outline specific water erosion-control measures such as seeding, mulch, blankets, detention basins, certified weed-free straw bales, or silt fences to be implemented to minimize soil erosion and loss of soil productivity.

2.3.2.1.12 VEGETATION TREATMENT AND WEED MANAGEMENT

A restoration and revegetation plan and an invasive species and noxious weed management plan would be developed prior to construction. The restoration and revegetation plan would be implemented following construction-related activities. Temporary disturbance areas from construction would be revegetated as practicable (e.g., revegetation/reseeding, regrading, and decompaction). Revegetation/re-seeding would be done using approved seed mixes consisting of weed-free grasses and forbs that are appropriate to the geographic and elevation characteristics of the area to be seeded. The restoration and revegetation plan would incorporate fire safety requirements for mowed vegetation maintained below PV panels. Maintaining this vegetative cover would minimize losses to soil resources and maintain soil health. Infestations of nonnative and invasive plant species would be treated in accordance with the invasive species and noxious weed management plan. The invasive species and noxious weed management plan would include a description of the site, a prioritized list of potential invasive and weed species, management goals, restoration success criteria, a weed management schedule, weed removal procedures, and monitoring requirements. If needed, only approved herbicides would be used within the Proposed Action footprint. Any use of specific herbicides would be outlined in the invasive species and noxious weed management plan.

2.3.2.2 Construction Process and Schedule

The following subsections describe civil/structural features of the Project. The Project would be designed in conformance with the latest edition of the International Building Code, state and local requirements, and with applicable wind and seismic criteria for the Project. The engineering, procurement, and construction of the Project would be performed under multiple contracts. Project construction would be undertaken in a sequential approach in accordance with a construction plan, which would be developed and finalized prior to the start of construction, in conjunction with the selected contractors.

2.3.2.2.1 CONSTRUCTION SCHEDULE, PERSONNEL, AND EQUIPMENT

Construction of the entire Project in a single phase would occur over approximately 18 months and would include mobilization, construction/installation, commissioning/testing, and demobilization.

The on-site workforce would consist of laborers, craftsmen, supervisory personnel, support personnel, and construction management personnel. On-site residential areas would not be provided for construction workers. Construction workers would most likely commute from Oklahoma City and Stillwater areas. For a single-phase project, construction typically requires a monthly average of approximately 200 to 300 employees during the construction period. During peak construction times, up to 400 workers would be on-site. Approximately 25 trucks per day would deliver various materials and construction equipment. Multiple, smaller phases would require fewer employees. As experience has shown, special circumstances could warrant an increased number of on-site workers for a short period of time, which is typically a few weeks.

Construction would generally occur between 7:00 a.m. and 7:00 p.m., Monday through Friday. Additional hours could be necessary to make up schedule deficiencies or to complete critical construction activities. For instance, during placement of concrete or during hot weather, it could be necessary to start work earlier to avoid some activities during high ambient temperatures. During the start-up phase of the Project, some activities (such as equipment and system testing) could continue 24 hours per day, 7 days per week. However, construction times would comply with local permit requirements. Table 2.3-2 depicts a proposed construction plan for the Project by activity.

Table 2.3-2. Preliminary Construction Schedule

Activity	Duration
Site preparation and clearing/grading	3 months
Road construction	3 months
System installation	16 months
Gen-tie line construction	3 months
Battery storage system assembly and installation	4 months
On-site substation construction	6 months
Commissioning/testing	2 months

Note: Some construction activities would overlap or occur simultaneously.

Table 2.3-3 identifies the construction activity and corresponding type and number of equipment to be used for Project construction. In addition, other light/delivery trucks, flatbed trucks, all-terrain vehicles, water supply trucks, trenching equipment, and survey equipment could also be used to support construction activities.

Table 2.3-3. Anticipated Construction Activity and Equipment

Activity	Type and Numbers of Equipment
Site preparation and clearing/grading	1 grader, 1 excavator, 1 bulldozer, 1 backhoe, cutting machines, 1 crane, 1 roller, 1 forklift, 1 concrete truck, 1 compaction machine,
Road construction	1 grader, 1 excavator, 1 bulldozer, 1 backhoe, cutting machines, 1 crane, 1 roller, 1 forklift, 1 concrete truck, 1 compaction machine,
System installation	1 cutting machine, 1 loader, 1 trenching machine, 1 pile driver, 1 crane, 1 roller, 1 forklift, 1 concrete truck, 1 compaction machine
Gen-tie line construction	1 grader, 1 excavator, 1 bulldozer, 1 backhoe, cutting machine, 1 crane, 1 roller, 1 forklift, 1 concrete truck, 1 compaction machine, 1 loader
Battery storage system assembly and installation	1 cutting machine, 1 loader, 1 trenching machine, 1 pile driver, 1 crane, 1 roller,1 forklift, 1 concrete truck, 1 compaction machine

Activity	Type and Numbers of Equipment
On-site substation construction	1 grader, 1 excavator, 1 bulldozer, 1 backhoe, 1 cutting machine, 1 loader, 1 trenching machine, 1 crane, 1 roller, 1 forklift, 1 concrete truck, 1 compaction machine,
Commissioning/testing	Electrical test equipment

Note: This equipment list is based on anticipated construction conditions and could be modified, as necessary.

2.3.2.2.2 WATER USE

Water for construction is typically sourced by the Project construction contractor. Water would either be trucked to the Project, leased from an existing on-site well, or pumped from a new well drilled by the construction contractor. Construction water needs would include soil conditioning and dust suppression. Approximately 270 to 540 acre-feet of water would be required over the 18-month construction period.

2.3.2.2.3 CIVIL WORKS DESCRIPTION

Site Preparation, Surveying, and Staking

Before construction, a land surveyor would obtain or calculate benchmark data, grades, and alignment from plan information and provide control staking to establish the alignments, benchmarks, and elevations. Final design documents would furnish data for the horizontal and vertical control points and horizontal alignments, profiles, and elevations. During construction, the surveyor would reestablish and set additional control points to maintain the horizontal and vertical control points, as needed.

Site Cleaning, Grading, and Excavation

To prepare the Project for construction, vegetated areas within the fenced boundary where the solar array, roads, and other site facilities would be located would be mowed to a height of no more than 3 inches. All other vegetation would be left intact to the greatest extent possible. Grading would only occur in the areas where the elevation would need to be changed to accommodate the tracker system tolerances, site drainage, roads, laydown yards, and foundations. The minimal grading approach helps preserve the underground root structure, topsoil nutrients, seed base, and preconstruction site hydrology. The organic matter that remains after mowing would remain within the construction area (except in trenches and under equipment foundations). During the site-clearing process, the site would also be cleared of refuse, as necessary. Refuse materials encountered would be recycled or disposed of, as applicable. For roadways, accessways, and areas where concrete foundations are used for solar inverter equipment, substations, drainage facilities, and other structures, grading could be required. Grading consists of the excavation and compaction of earth to meet the design requirements. Grading within the solar array would match existing grades as closely as possible. Some existing contours would need to be smoothed out for access purposes, but the macro-level topography and stormwater drainage would be similar to preconstruction conditions. To the extent practicable, grading of an area would take place shortly before trenching and post installation are ready to begin in order to minimize the area of open, uncovered ground present at any one time during construction. The portions of the Proposed Action footprint that need to be graded would be subject to a balanced cut-and-fill quantity of earthwork to maintain the existing conditions to the extent practicable for the protection of the equipment and facilities. Fill would be compacted as necessary, and appropriate dust abatement measures implemented. These measures could include restricting vehicle speeds; watering active areas; watering stockpiles; watering roadways; ensuring track-out control at site exits; and employing other measures outlined in the SWPPP, restoration and revegetation plan, and invasive species and noxious weed management plan.

Materials suitable for compaction would be stored in stockpiles at designated locations, using proper erosion prevention methods. Materials unsuitable for compaction, such as debris and large rocks, would be stockpiled at designated locations for subsequent disposal at an acceptable off-site location. Contaminated materials are not anticipated, but if any are encountered during excavation, they would be disposed of in accordance with applicable laws, ordinances, regulations, and standards.

Major Equipment Installation

Construction of the solar trackers could be conducted in a single laydown yard within the Proposed Action footprint, and then the assemblies would be transported to the proper location and placed on the pre-installed supports. Alternately, the array assembly could occur at the installation point. Final assembly would involve tractors and forklifts to place the solar trackers onto the support structures. During this work, there would be multiple crews working the site with vehicles, including special vehicles for transporting the PV panels.

Solar tracker installation would be constructed using driven steel posts or possibly concrete foundations, if required. As the PV panels are installed, the balance of the plant would be constructed concurrently. Within the solar array, the electrical and instrumentation/control wiring would be installed in underground trenches or overhead where underground is impractical. The wiring would run to the location of the solar array controls and the circuits would be checked.

The construction of the substation is planned to begin early in the construction process. Heavy foundations and equipment pads would be constructed using trenching machines, compactors, concrete trucks and pumpers, vibrators, forklifts, boom trucks, and large cranes. Similar to site grading and excavation, appropriate dust abatement measures would be identified in a dust control plan. Concrete foundations for the substation structures would be placed as the construction progresses.

Battery Storage System Installation

For the DC-coupled system, the container sizes would be optimized per market conditions and distribution among the solar inverters. The containers would be placed on foundations, per the manufacturer’s recommendations and soil conditions, as prescribed by the engineers of record. The thermal controls of the cabinets would be packaged within the cabinets and could include fans, liquid coolants, or refrigerants. The batteries would be commissioned concurrently with the Project, demonstrating the charge and discharge, per the control scheme.

These activities are contingent on final design and selection of batteries and solar inverters manufacturers, and other supporting equipment.

Testing and Commissioning

After the equipment is connected, electrical service would be verified, motors would be checked, and control logic would be verified. The various hydraulic systems and electrical transformers would be charged with their appropriate fluids and would go through individual start-up testing. Once all of the individual systems are tested, the overall plant would be ready to be tested under fully integrated conditions.

2.3.2.3 Operations and Maintenance

2.3.2.3.1 OPERATIONS STAFF AND VEHICLES

The Applicant intends to staff the Project with up to 10 operations personnel during daytime working hours. Operations personnel typically work a single shift from 7:00 a.m. to 4:00 p.m., Monday through Friday. During time periods when the facility is not fully staffed, the Project would be monitored remotely from Applicant's parent company's Fleet Performance and Diagnostic Center in Juno Beach, Florida. If emergency conditions are encountered, Project staff would be notified and would return to the facility, as required. Specialty personnel could also be located on-site during non-working hours to perform specific maintenance functions, as required.

O&M vehicles typically include ¾-ton pick-up trucks and small utility vehicles to perform on-site welding, lubricating, and other maintenance activities. In addition, flatbed trucks, dump trucks, and front-end loaders could be present on-site at various times. Heavy-haul transport equipment could be brought to the site, as needed, to facilitate any major maintenance or equipment repair or replacement.

2.3.2.3.2 OPERATIONS AND MAINTENANCE ACTIVITIES

Regular preventative maintenance of the plant would be performed by plant personnel. This would include inspection of field components, condition assessment of critical equipment, and routine lubrication of equipment.

Grading and drainage would be maintained for gravel and earthen roads and damage to the road repaired as soon as practical. Water would be applied, as needed, to limit fugitive dust when road maintenance is conducted. The Applicant would develop a site-specific vegetation management plan would implement it during operations.

The Project could operate as either a manned or unmanned site to be determined after final design. Under normal circumstances for an unmanned site, the Project substation would be controlled remotely, and routine in-person inspections would occur on a weekly or as-needed basis. In addition, all of the Project substation structures would be annually inspected from the ground for corrosion, misalignment, and foundation condition. Ground inspection includes the inspection of hardware, insulator keys, and conductors. This inspection also checks conductors and fixtures for corrosion, breaks, broken insulators, and bad splices.

Electric lines, support systems, and instrumentation and controls would be inspected regularly to ensure the safe, efficient, and economical operation of the Project.

Any water storage tanks installed as part of the Project would require frequent inspection and could need occasional repairs. This maintenance typically includes routine painting of the storage tanks to protect them from corrosion.

2.3.2.3.3 WATER USE

The PV technology proposed for the Project does not require water for the generation of electricity. During operations, water use would be limited primarily to periodic dust control and maintenance applications. Based on the anticipated uses, the estimated quantity of water needed for operation of the Project would be approximately 25 acre-feet per year. This assumes no generation of wastewater on-site that would require treatment and no sewer or water connections during O&M.

2.3.2.3.4 WASTE AND HAZARDOUS MATERIALS MANAGEMENT

Project wastes could include nonhazardous solid waste, hazardous solid waste, and hazardous liquid waste. O&M of the Project could generate nonhazardous solid wastes typical of power generation or other industrial facilities. The plant wastes produced typically include oily rags, worn or broken metal and machine parts, defective or broken electrical materials, other scrap metal and plastic, insulation material, empty containers, paper, glass, and other miscellaneous solid wastes including the typical refuse generated by workers. These materials would be disposed by means of contracted refuse collection and recycling services. Waste collection and disposal would be conducted in accordance with applicable regulatory requirements to minimize health and safety effects.

To prevent exposure to the elements and reduce the potential for accidental releases, hazardous materials that could be used at the facility during operations would be stored in either the O&M warehouse or in CONEX boxes on-site if the warehouse is not built. The chemicals would be segregated by type, and spill containment would be provided inside the warehouse building storage area or CONEX boxes.

The quantities of wastes stored on-site would be evaluated to identify the required usage and to maintain sufficient inventories to meet use rates without stockpiling excess chemicals. Chemicals that could be present include some or all of the following: fuel (diesel), fertilizers, hydraulic fluid, transformer oil, spent cleaning solutions, and spent batteries. A variety of safety-related plans and programs would be developed and implemented to ensure safe handling, storage, and use of hazardous materials. A spill prevention, control, and countermeasure (SPCC) plan and waste and hazardous materials plan would be developed prior to construction. Personnel would be supplied with appropriate personal protective equipment and would be properly trained in the use of personal protective equipment and the handling, use, and cleanup of hazardous materials used at the facility, as well as procedures to be followed in the event of a leak or spill. Adequate supplies of appropriate cleanup materials would be stored on-site.

2.3.2.4 Decommissioning

A PV solar plant has a typical life of at least 30 years. Once the useful life of the plant is exhausted, the plant could be refurbished to continue operating as a power plant or decommissioned and removed. At the end of the life the Project, the Applicant would implement a decommissioning plan that would address the proper removal of Project components, including the reuse and recycling of materials, the removal of hazardous materials, the restoration of terrain and contours, and other actions to safely dismantle the Project and restore the landscape. During improvement removal, the site would remain fenced and gated. Materials that could be reused or recycled would be hauled away from the site and sold. Materials that could neither be reused nor recycled would be dismantled and hauled to the nearest approved landfill. Hazardous materials that could not be reused or recycled would be disposed of at approved facilities. The Applicant would remove foundations to 3 feet below ground surface, restore contours over the foundations to original conditions, remove the stormwater management berms, and restore the pre-Project contours to the maximum extent possible. During these reclamation operations, fugitive dust abatement measures comparable to those applied during the Project construction would be implemented.

When the transmission line and substation are no longer operational, all structures and fencing could be remove unless otherwise required to remain in place based on final interconnection agreements. Conductors would be sold for reuse or recycling. Foundations and substation facilities would be removed to 3 feet below ground surface and contours restored.

Plant re-powering would involve many of the same steps as above for decommissioning. Depending on the state of future technology, different combinations of equipment could be removed and replaced, including PV panels, inverters, and foundations, to facilitated continued plant operation.

2.3.2.5 Applicant-Committed Measures and Management Plans

The following Applicant-committed measures and management plans are considered part of the Proposed Action. The Applicant would implement these measures and plans to avoid or reduce impacts to the resources analyzed in this EIS. Table 2.3-4 summarizes these measures and plans by resource. Additional detail on Applicant management plans is provided in Sections 2.3.2.1 to 2.3.2.4.

Table 2.3-4. Applicant-Committed Measures and Management Plans per Resource

Resource	Applicant-Committed Measure	Management Plan
Air quality	Not applicable (N/A)	Dust suppression plan, maintenance plan, waste and hazardous materials plan, decommissioning plan
Geology and soils	Within areas of the Proposed Action footprint where grading and leveling must be completed, the existing terrain would be smoothed to accommodate site design requirements. Significant change to grades or slopes would be avoided whenever possible, and existing drainage patterns would be generally maintained (grading BMP).	SWPPP, SPCC plan, grading plan, maintenance plan, vegetation management plan, waste and hazardous materials plan, decommissioning plan
Water resources	Trenching would be completed along the length of the underground collection lines, but the Applicant would bore the collection lines crossing wetlands or other aquatic resources to minimize impacts (boring/trenching BMP). The Applicant would develop an environmental training that must be completed by contractors, workers or visitors to the Project site (environmental training BMP).	SWPPP, SPCC plan, maintenance plan, herbicide application plan, vegetation management plan, waste and hazardous materials plan, decommissioning plan
Vegetation, including Invasive Species, Noxious Weeds, and Special-Status Species	Grading BMP Environmental training BMP	Dust suppression plan, SWPPP, SPCC plan, grading plan, maintenance plan, herbicide application plan, vegetation management plan, waste and hazardous materials plan, decommissioning plan
Wetlands	Boring/trenching BMP Environmental training BMP	Dust suppression plan, SWPPP, SPCC plan, maintenance plan, herbicide application plan, waste and hazardous materials plan, decommissioning plan
Wildlife, including Special-Status Species	The Applicant would mark the overhead gen-tie line with bird diverters following Avian Power Line Interaction Committee standards. (bird diverters BMP). The Applicant would lower relevant equipment at night during whooping crane (*Grus americana*) migration (construction equipment BMP). The Applicant would institute a “stop work” mandate if a species of concern is observed within a specified distance of construction work areas (wildlife “stop work” BMP). All contractors, workers, or visitors to the Project site would be required to follow a speed limit within construction work areas and maintenance and operation areas (speed limit BMP). Boring/trenching BMP Environmental training BMP	Dust suppression plan, SWPPP, SPCC plan, maintenance plan, herbicide application plan, vegetation management plan, waste and hazardous materials plan, decommissioning plan
Cultural and historic resources	Environmental training BMP	Maintenance plan, decommissioning plan

Resource	Applicant-Committed Measure	Management Plan
Land use	Grading BMP	SWPPP, SPCC plan, grading plan, maintenance plan, decommissioning plan
Noise	N/A	Traffic management plan, maintenance plan, decommissioning plan
Public health and safety	Speed limit BMP	Dust suppression plan, traffic management plan, SPCC plan, maintenance plan, herbicide application plan, waste and hazardous materials plan, decommissioning plan
Socioeconomics and environment justice	See BMPs associated with air quality, water quality, land use, public health and safety, transportation, and cultural resources.	See plans associated with air quality, water quality, land use, public health and safety, transportation, and cultural resources.
Transportation	Speed limit BMP	Traffic management plan, maintenance plan, decommissioning plan
Visual quality and aesthetics	Boring/trenching BMP Construction equipment BMP	Dust suppression plan, maintenance plan, vegetation management plan, decommissioning plan

2.3.3 Other Action Alternative

Although the Applicant has identified a primary location for the Project (described in Section 2.3.2 Proposed Action), final siting and layout are subject to change prior to construction. To allow for flexibility in design, the Applicant identified an additional 1,744 acres of buildable land located east of the Proposed Action that could be developed to support the Project (see Figure 2.1-1). Land acquisition has not yet occurred for this alternative, referred to in this EIS as the Other Action Alternative. However, to achieve 250 MW of energy production, up to an estimated 472 acres of land within this alternative could be allocated to solar panels. The Project would connect to the POI via a 1-mile transmission line. For the purposes of EIS analysis, the Applicant developed a conceptual layout for other supporting infrastructure, including access roads, collection lines, solar inverters, and battery storage system (Table 2.3-5). However, this layout is subject to future change, based on land availability and siting efforts. The term *Other Action Alternative footprint*, where used in this EIS, encompasses both the Other Action Alternative's construction and operational footprints.

Table 2.3-5. Other Action Alternative Components

Project Component	Area (acres)*	Length (miles)
Additional fenced land	1,185	Not applicable (N/A)
Battery storage system	0.7	N/A
Electrical collection system (solar inverters)	0.3	N/A
Electrical collection system (underground collection lines)	30	25.8
Gen-tie line foundation	1	N/A
Long-term access roads	28	15.2
Overhead gen-tie line	10	0.9
Solar array and solar trackers	472	N/A
Substation	7	N/A
Temporary access roads	12	N/A

* Rounded to nearest acre. Acreage subject to change based on additional layout refinement.

All construction and O&M activities, as well as Applicant-committed minimization or avoidance measures, would be the same as those described under the Proposed Action.

2.4 COMPARISON OF ALTERNATIVES

This section provides a summary of potential project effects as identified in this EIS. Information provided in Table 2.4-1 focuses on effects that help distinguish differences across considered alternatives.

Table 2.4-1. Summary of Effects, by Alternative and Issue

Resource	No Action Alternative	Proposed Action	Other Action Alternative
Air quality	Continuation of existing air quality trends and sources of air pollution	There would be a temporary increase in pollutant and greenhouse gas (GHG) emissions from equipment exhaust during construction, vehicle exhaust caused by travel to and from the Project, and fugitive dust from soil disturbance. A long-term benefit would occur due to reduced air emissions and a reduced risk of health events.	Impacts would be the same as those described under the Proposed Action.
Geology and soils	Continuation of existing geology and soil trends/issues	There would be a short-term displacement of soil and rock or alteration of geologic features during construction. No geologic impacts would occur during O&M. There would be an increased potential for soil erosion, soil compaction, and loss of soil productivity during construction. Soil impacts associated with O&M would be limited to continued soil compaction along access roads and in long-term operations areas, and soil disturbance from maintenance tasks.	Impacts would be the similar to those described under the Proposed Action; however, a negligibly smaller proportion of total soils, but a greater acreage of soils with severe erosion risk, would be affected.
Water resources	Continuation of existing water quality and use trends	Approximately 831 linear feet of ephemeral streams and four waterbodies would be impacted in the long term, whereas approximately 250 linear feet of ephemeral streams, one waterbody, and 108 linear feet of intermittent stream would be temporarily impacted. In all, 4 acres of impacts to floodplains would occur. Groundwater use would be limited and restricted to amounts allowable by the state water agency.	Impacts would be the similar to those described under the Proposed Action; however, approximately 285 linear feet of intermittent streams and 40 linear feet of a perennial stream would be temporarily impacted. No waterbodies would be impacted. There would be negligibly greater temporary impacts to intermittent streams and perennial streams, and lower impacts to waterbodies, as compared to the Proposed Action. In all, 3 acres of impacts to floodplain would occur. Groundwater use would be limited and restricted to amounts allowable by the state water agency.
Vegetation, including invasive species, noxious weeds, and special-status plants	Continuation of effects to plant species from natural and human-caused stressors	Approximately 575 acres of long-term impacts to vegetation and 67 acres of temporary impacts to vegetation would occur. An additional 1,467 acres of vegetation within the additional fenced land would be mowed, resulting in conversion from cultivated crops to grassland/herbaceous land cover. No impacts to special-status plant species would occur. Introduction and growth of invasive and noxious plant species could occur.	Impacts would be the similar to those described under the Proposed Action; however, there would be fewer temporary (42 acres) and long-term (506 acres) impacts to vegetation than under Proposed Action.
Wetlands	Continuation of existing trends/issues for wetland resources	Approximately 1.8 acres of wetlands would be impacted by Project activities. Clearing and maintenance activities would convert approximately 0.3 acre of Palustrine Scrub Shrub wetlands to Palustrine Emergent wetlands.	Impacts would be the similar to those described under the Proposed Action; however, there would be reduced temporary and long-term impacts to wetlands (approximately 0.1 acre) than under the Proposed Action.

Resource	No Action Alternative	Proposed Action	Other Action Alternative
Wildlife, including special-status species	Continuation of population trends and continuation of effects to wildlife species from natural and human-caused stressors	Approximately 2,120 acres of total wildlife habitat would be impacted, of which 575 acres would represent long-term habitat loss and 67 acres would represent short-term habitat loss. The remaining 1,466 acres of habitat would be altered due to mowing activity. RUS made a determination of "no effect" for the piping plover (*Charadrius melodus*), rufa red knot (*Calidris canutus rufa*), and Arkansas river shiner (*Notropis girardi*), and a determination of "may affect, but is not likely to adversely affect," for whooping crane (*Grus americana*).	Impacts would be the similar to those described under the Proposed Action; however, approximately 1,744 acres of totally wildlife habitat would be impacted. Of this total, 506 acres would represent long-term habitat loss and 42 acres would represent short-term habitat loss. The remaining 1,185 acres of habitat would be altered because of mowing activity.
Cultural and historic resources	Continuation of existing trends/issues to cultural and historic resources	No archaeological resources were identified in the analysis area. Potential exists for archaeological resources to be discovered during construction or tribally significant resources to be identified in RUS's ongoing tribal consultation efforts. Unanticipated discoveries would be addressed by RUS pursuant to the National Historic Preservation Act (NHPA) Section 106 regulations (36 CFR 800.13) and through implementation of an Applicant-committed unanticipated discovery plan. Any tribally significant resources identified in consultation would have potential impacts assessed based on the Criteria for Adverse Effects under the NHPA Section 106 regulations (36 CFR 800.5) and, in the case of adverse effects, have impacts avoided, minimized, or mitigated in consultation with the state historic preservation office (SHPO) and consulting tribes per the NHPA Section 106 regulations. Two Centennial Farm and Ranch Properties occur in the area of potential effects; however, these properties would not be physically impacted, and visual impacts would be minimized through vegetative screening.	Impacts would be the same as those described under the Proposed Action.
Land use	Continued activity in accordance with established land use patterns and regulations	Approximately 2,042 acres of land cover would be converted to developed use in the long term, and approximately 67 acres would be converted to developed use in the short term. The predominant land cover impacted would be cropland. This alternative is consistent with zoning and land use regulations. There would be negligible impacts to existing infrastructure, long-term impacts to 1,697 acres of prime farmland, and a temporary to long-term loss of land use by landowners.	Approximately 1,692 acres of land cover would be converted to developed use in the long term, and approximately 42 acres would be converted to developed use in the short term. The predominant land cover impacted would be cropland. There would be long-term impacts to 1,449 acres of prime farmland. All other impacts would be the same as those described under the Proposed Action.
Noise	Current noise sources would continue	There would be a temporary increase in noise levels due to traffic and construction activities. There would be no significant impacts to four noise-sensitive receptors or from long-term noise sources (e.g., gen-tie line or other facilities).	Temporary impacts would be the same as those described under the Proposed Action. There would be no significant impacts to seven noise-sensitive receptors or from long-term noise sources (e.g., gen-tie line or other facilities).

Resource	No Action Alternative	Proposed Action	Other Action Alternative
Public health and safety	Continuation of public health and safety risks from natural and human-caused sources	Solid and hazardous waste would be managed in accordance with applicable regulatory requirements. There would be a long-term risk associated with fire and severe weather; a temporary increase in potential for traffic/worker incidents; and a long-term, negligible increase in potential electromagnetic field (EMF) exposure.	Impacts would be the same as those described under the Proposed Action.
Socioeconomics and environmental justice	Continuation of existing trends for population and employment	There would be a temporary and long-term benefit to employment and economic activity, temporary increase in public service and housing demand, and no disproportionately high and adverse impacts to environmental justice populations.	Impacts would be the same as those described under the Proposed Action.
Transportation	Continuation of existing trends for transportation	There would be a temporary and long-term increase in traffic due to vehicle and equipment travel; compliance with all federal, state, and local regulations; and no adverse impacts associated with glint/glare.	Impacts would be the same as those described under the Proposed Action.
Visual quality and aesthetics	Continuation of impacts to viewshed from past and current activities	In all, 528 acres of agricultural lands would be converted to a solar farm. Views from Key Observation Points (KOPs) 3 and 4 would be most affected because they are directly adjacent to the proposed PV panels and access roads with unobstructed views of construction activities.	In all, 472 acres of agricultural lands would be converted to a solar farm. Views from KOPs 6, 7, and 8 would be the KOPs most affected because they are directly adjacent to the proposed PV panels and access roads with unobstructed views of construction activities. Views from KOP 1 would have their viewsheds further modified by utility development compared to the Proposed Action because the Project under this alternative would be sited adjacent to the residence.

CHAPTER 3. AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

3.1 INTRODUCTION

Based on previous environmental reviews, subject-matter expert input, consultation efforts, and public involvement to date, RUS identified the resources addressed in Section 3.2 Physical Resources, 3.3 Biological Resources, and 3.4 Human Resources as potentially affected by the Project.

With regard to temporal extent, the EIS assumes that potential construction effects generally diminish once construction ends; however, ongoing O&M activities could result in additional impacts for the 30-year life of the Project. Therefore, the EIS considers the timeframe beginning with construction and ending when the Project's decommissioning is complete, unless otherwise noted.

The EIS uses the following duration terms:

- Long-term effects: Effects that last for a long period of time (e.g., years, decades, or longer). An example would be the loss of habitat where a foundation has been installed.
- Short-term effects: Effects that extend beyond construction but that are not long term. An example would be clearing of vegetation within temporary access roads during construction; the area would be revegetated when construction is complete, and once revegetation is successful, this effect would end.
- Temporary effects: Effects that end as soon as the activity ceases. An example would be traffic delays caused by construction. Once construction is complete, the effect would end.

Each resource section identifies a unique geographic analysis area that is used to analyze Project-specific effects, as well as impacts of Project actions when added to other present and reasonably foreseeable actions (e.g., cumulative effects). These resource-specific spatial analysis areas are described in Sections 3.2, 3.3, and 3.4. In accordance with revised NEPA regulations (40 CFR 1501.3), the EIS evaluates Project impacts (or effects; the terms *impact* and *effect* are used interchangeably as nouns) based on the potentially affected environment and degree of the effects of the action. Impact indicators and thresholds were developed based on scientific literature, regulatory requirements, and best professional judgment and are presented by resource in this chapter. These metrics were used to assess the severity of resource impacts from Project actions.

3.2 PHYSICAL RESOURCES

3.2.1 Air Quality

3.2.1.1 Introduction

Air quality within a region is measured in comparison to the National Ambient Air Quality Standards (NAAQS), which are standards established by the EPA pursuant to the Clean Air Act (CAA) (42 USC 7409) for criteria pollutants to protect human health and welfare (primary standards) and provide public welfare protection, including protection against decreased visibility and damage to animals, crops, vegetation, and buildings (secondary standards).

Air quality near the Project could be impacted from emissions associated with the construction, O&M, and decommissioning of the Project. Additionally, during scoping, concerns were expressed that the EIS

provide a detailed discussion of ambient air conditions, NAAQS, Nonattainment Areas for Criteria Pollutants, and federal Class I areas near the Project, as well as emission estimates and duration during construction and operations. Scoping comments also indicated that the EIS should identify appropriate measures to minimize emissions.

This analysis describes the air quality conditions within a specific analysis area. The effects of the No Action Alternative and action alternatives on air quality are subsequently described and discussed.

3.2.1.1.1 SPATIAL AND TEMPORAL SCOPE OF ANALYSIS

The spatial scale for analyzing potential effects to air quality is Garfield County, Oklahoma. This area is referred to as the *air quality analysis area* or, more generally in this section, the *analysis area*. The spatial scale is considered an appropriate geographic unit for assessing air quality effects because the county and its communities are most likely to be impacted by emissions associated with construction and operation of the Project.

The temporal scale for analyzing potential effects to air quality considers the timeframe beginning with construction and ending after decommissioning.

3.2.1.2 Affected Environment

3.2.1.2.1 CLEAN AIR ACT AND NATIONAL AMBIENT AIR QUALITY STANDARDS

The CAA established the principal framework for national, state, and local air quality protection (42 USC 7401–7642). The EPA prescribes regulations and standards implementing the requirements of the CAA. Although the EPA retains authority for certain air quality rules, including most pertaining to emission standards for mobile sources, it may authorize states and, in some cases tribal governments, to implement portions of the CAA.

In Oklahoma, the EPA has delegated responsibility for implementing the CAA to the air quality division of the Oklahoma Department of Environmental Quality except on tribal lands, where EPA Region 6 is the permitting authority. Because Garfield County does not contain any tribal lands, the Oklahoma Department of Environmental Quality is responsible for most permitting under the CAA; however, the EPA retains responsibility for some parts of the CAA.

Under the authority of the CAA, the EPA has established nationwide air quality standards known as the NAAQS (Table 3.2-1) (2021a). These standards represent the maximum allowable atmospheric concentration of the six criteria pollutants that are considered to be key indicators of air quality: carbon monoxide (CO), nitrogen dioxide (NO_2), ozone (O_3), sulfur dioxide (SO_2), lead, and two categories of particulate matter (less than 10 microns in diameter [PM_{10}] and less than 2.5 microns in diameter [$PM_{2.5}$]).

There are primary and secondary standards for these six pollutants. Primary standards set limits to protect public health, including the health of sensitive populations, such as asthmatics, children, and the elderly. Secondary standards set limits to protect public welfare, including against decreased visibility and damage to animals, crops, vegetation, and buildings. Averaging periods vary by pollutant, based on the potential health and welfare impacts of each pollutant. Individual states must meet the NAAQS but have the option of adopting their own standards that are at least as stringent at the NAAQS. Oklahoma has adopted all of the NAAQS as presented.

The EPA periodically reviews the standards and the science that they are based on. The existing standards can be revised, or new standards can be introduced, to ensure that they provide adequate health and environmental protection.

Table 3.2-1. National Ambient Air Quality Standards

Pollutant	Averaging Period	Standards	
		Primary	Secondary
SO_2	1-hour[##,***]	75 ppb 196 µg/m^3	
	3-hour[†]	–	0.5 ppm 1300 µg/m^3
	Annual*,***	0.03 ppm 80 µg/m^3	–
	24-hour[†,***]	0.14 ppm 365 µg/m^3	–
PM_{10}	24-hour[§]	150 µg/m^3	150 µg/m^3
$PM_{2.5}$ (2012 standard)	Annual[¶]	12.0 µg/m^3	15.0 µg/m^3
$PM_{2.5}$ (2006 standard)	24-hour[#]	35 µg/m^3	35 µg/m^3
NO_2	Annual*	0.053 ppm (53 ppb) 100 µg/m^3	0.053 ppm (53 ppb) 100 µg/m^3
	1-hour[‡]	100 ppb 188 ug/m^3	–
CO	8-hour[†]	9 ppm 10,000 µg/m^3	–
	1-hour[†]	35 ppm 40,000 µg/m^3	–
O_3 (2008 standard)	8-hour**,[††]	0.075 ppm	0.075 ppm
O_3 (2015 standard)	8-hour[‡‡]	0.070 ppm	0.070 ppm
O_3	1-hour 10[§§],11[¶¶]	0.12 ppm	0.12 ppm
Lead	Rolling 3-month*	0.15 µg/m^3	0.15 µg/m^3

Notes:

* Not to be exceeded.

† Not to be exceeded more than once per year.

‡ Compliance based on 3-year average of the 98th percentile of the daily maximum 1-hour average at each monitor within an area.

§ Not to be exceeded more than once per year on average over 3 years.

¶ Compliance based on 3-year average of weighted annual mean $PM_{2.5}$ concentrations at community-oriented monitors.

Compliance based on 3-year average of 98th percentile of 24-hour concentrations at each population-oriented monitor within an area.

** Compliance based on 3-year average of fourth-highest daily maximum 8-hour average O_3 concentrations measured at each monitor within an area.

†† The 2008 8-hour O_3 standard remained in effect until 1 year after an area is designated for the 2015 8-hour O_3 standard, which corresponds with August 3, 2019, based upon attainment designations for the 2015 O_3 standard issued on August 3, 2018.

‡‡ Permit applications that have not met the EPA's grandfathering criteria would have to demonstrate that the Project does not cause or contribute to a violation of any revised O_3 standards that are in effect when the permit is issued, including the 2015 revised standards.

§§ Maximum 1-hour daily average not to be exceeded more than 1 day per calendar year on average.

¶¶ The 1-hour O_3 standard has been revoked in all areas in which Project activities would occur.

Compliance based on 3-year average of 99th percentile of the daily maximum 1-hour average at each monitor within an area.

*** The 24-hour and annual average primary standards for SO_2 remain in effect until 1 year after an area is designated for the 1-hour standard.

ppm = parts per million by volume.

ppb = parts per billion by volume.

µg/m^3 = micrograms per cubic meter.

Section 176(c) of the CAA also requires that federal actions conform to the appropriate state implementation plan. The EPA has promulgated rules establishing conformity analysis procedures for transportation-related actions and for other general federal agency actions (40 CFR 6, 51, and 93). The EPA general conformity rule requires a formal conformity determination document for federal agency actions that are undertaken, approved, or funded in federal nonattainment or maintenance areas. Garfield County is not in a nonattainment or maintenance area; therefore, CAA conformity does not apply and is not evaluated in this EIS.

In addition to the NAAQS, the CAA has prevention of significant deterioration (PSD) provisions. These provisions establish a permitting process to limit increases of specific pollutant concentrations above a legally defined baseline level for new or modified major stationary sources in attainment or unclassified areas. The purpose of the program is to protect public health and welfare. The program also preserves, protects, and enhances the air quality of national parks and wilderness areas; national monuments; seashores; and other areas of recreational, scenic, or historic value.

The CAA directs the EPA to classify areas of the United States as PSD Class I, II, or III. Class I areas are national parks and wilderness areas of a certain size that existed before 1977 or additional areas that have since been designated by federal regulation. The PSD regulations place limits on the total increase in ambient pollution levels above established baseline levels for SO_2, NO_2, and PM_{10} that are allowed in these areas (Table 3.2-2). Class II areas allow a greater degree of degradation and comprise the remaining areas in the United States (outside of nonattainment and maintenance areas). National Park System units over 10,000 acres are given more resource protection than other Class II areas. No Class III areas, which would allow the greatest level of degradation, have been designated in the United States.

Table 3.2-2. Prevention of Significant Deterioration Class I and Class II Increments

Pollutant	Averaging Period	NAAQS (µg/m^3)	PSD Class I Increment (µg/m^3)	PSD Class II Increment (µg/m^3)
NO_2	1-hour	188	–	–
	Annual	100	2.5	25
O_3	8-hour	137	–	–
$PM_{2.5}$	24-hour	35	2	9
	Annual	12	1	4
PM_{10}	24-hour	150	8	30
	Annual	–	4	17
SO_2	1-hour	196	–	–
	3-hour	1,300	25	512
	24-hour	365	5	91
	Annual	80	2	20

There is one Class I airshed in Oklahoma, the Wichita Mountains Wilderness, which is located approximately 115 miles southwest of the Project (National Park Service 2020; USFWS 2013). There are no designated tribal Class I, Class II, or Class III airsheds in Oklahoma.[6]

[6] In 2010, the U.S. Forest Service, National Park Service, and USFWS collaborated on the publication of the *Federal Land Managers' Air Quality Related Values Workgroup (FLAG)* report (U.S. Forest Service et al. 2010), which offers guidance on the protection of visual resources and addresses assessments for sources proposed near Class I airsheds. Specifically, if "Q" (tons per year)/d (kilometers) < 10, no further analysis is required, where Q is the combined emissions increase from a source of SO_2,

3.2.1.2.2 COUNTY EMISSION INVENTORY

The National Emissions Inventory is a detailed annual estimate of criterial pollutants and hazardous air pollutants (HAPs) from air emission sources. Data are collected from state, local, and tribal air agencies and supplemented with data from the EPA (2020a). Emission inventories provide an overview of the types of pollution sources in a geographic area, as well as the amount of pollution being emitted on an annual basis. Emission inventories are useful in comparing emission source categories to determine which industries or practices are contributing to air emissions in a given year. The emissions inventory includes estimates of emissions from many sources, including point sources (facilities such as power plants, airports, and commercial sources), nonpoint sources (such as asphalt paving, solvent use, and residential heating), on-road vehicles, non-road sources (such as construction equipment, lawn and garden equipment, trains, barges, ships, and other marine vessels), and event sources (such as wildfires).

Table 3.2-3 summarizes the emission inventory data for criteria pollutants and HAPs for Garfield County (EPA 2021d).

Table 3.2-3. 2017 Emissions Inventory in Tons per Year for Garfield County, Criteria Pollutants and Hazardous Air Pollutants

Source	CO	NO_X	SO_X	PM_{10}	$PM_{2.5}$	VOC	HAPs	CO_2e (mT)
Agriculture	0	0	0	8,139	1,634	39	2.3	0
Biogenics*	1,194	953	0	0	0	3,446	953	0
Dust	0	0	0	4,799	523	0	0	0
Fires	8,267	164	71	916	735	1,839	320	92,295
Fuel combustion	1,487	1,526	18	148	139	309	93	0
Industrial processes	1,151	1,963	16,684	266	134	1,139	183	2,271,911
Miscellaneous†	19	0.45	0.03	3.7	3.0	9.58	2.2	0
Mobile	6,976	2,104	69	129	97	872	250	396,073
Waste disposal	83	5	1	25	23	8	10	0
Total	**19,177**	**6,715**	**16,843**	**14,426**	**3,288**	**7,662**	**1,814**	**2,760,279**

Source: EPA (2021d).

Note: NO_X = nitrogen oxides; SO_X = sulfur oxides; VOC = volatile organic compound; CO_2e = carbon dioxide equivalent; mT = metric tons.

* Biogenic emissions are those emissions derived from natural processes (such as vegetation and soil).

† Miscellaneous categories include bulk gasoline terminals, commercial cooking, gas stations, miscellaneous non-industrial (not elsewhere classified), and solvent use.

Agriculture sources are the biggest contributors to PM_{10} and $PM_{2.5}$ emissions in Garfield County. Prescribed fires are the biggest contributors to VOC and CO emissions, and mobile sources are the biggest contributors of NO_X emissions. Biogenic sources are the biggest contributors to HAP pollution, and industrial processes are the biggest contributors to carbon dioxide equivalent (CO_2e) in Garfield County.

NO_X, PM_{10}, and sulfuric acid mist in tons per year based on 24-hour maximum allowable emissions (which are annualized) and "d" is the nearest distance to a Class I area in kilometers from the source. Based on the proximity of the closest Class I area (Wichita Mountains Wilderness, approximately 188 kilometers east of the Project) and the total combined emissions of 418 tons per year of SO_2, NO_X, PM_{10} from the Project, the Q/d screening approach demonstrates a value of 10, and no further analysis is required in this EIS.

3.2.1.2.3 OTHER AIR QUALITY DATA

Adjacent counties contain ambient air quality monitors that collect data of existing levels of various air pollutants. Summary data from the EPA AirData database were reviewed to characterize maximum or near-maximum existing concentrations representative of Garfield County (EPA 2021b). In all cases, ambient air quality concentrations from the nearest monitoring station for the Project were taken.

Ambient air quality monitoring data from the 3-year period (2017–2019) are summarized in Table 3.2-4 for those monitoring stations nearest to the Project. Table 3.2-4 lists the maximum annual mean concentration and a near-maximum short-term concentration in each year. Second-high short-term concentrations are listed for most pollutants, but Table 3.2-4 includes the fourth-highest 8-hour average concentration for O_3, the 98th percentile 1-hour average concentration for NO_2, the 98th percentile 24-hour average concentration for $PM_{2.5}$, and the 99th percentile 1-hour average concentration for SO_2, consistent with the structure of the NAAQS for those pollutants and averaging periods.

Table 3.2-4. Ambient Air Quality Concentrations Representative of the Analysis Area

Pollutant	Averaging Period	Rank	2017	2018	2019	Units	Monitoring Station ID
SO_2	1-hour	99th	54	44	45	Ppb	40-047-0555*
	24-hour	2nd	15.7	9.4	11.7	Ppb	–
	Annual	Mean	0.66	0.42	0.35	Ppb	–
PM_{10}	24-hour	2nd	52	54	63	µg/m^3	40-109-0097†
$PM_{2.5}$	24-hour	98%	16	22	19	µg/m^3	40-109-0097†
	Annual	Mean	8.1	9.6	9.1	µg/m^3	–
NO_2	1-hour	98%	46	41	40	Ppb	40-109-0097†
	Annual	Mean	16.05	6.55	11.52	Ppb	–
CO	1-hour	2nd	1.0	0.9	1.0	Ppm	40-109-0097†
	8-hour	2nd	0.8	0.8	0.7	Ppm	–
O_3	8-hour	4th	0.071	0.072	0.066	ppm	40-109-0097†

Notes:
* 11826 North 30th Street, Kremlin, Oklahoma 73753, Garfield County
† 3112 North Grand Boulevard, Oklahoma City, Oklahoma 73112
ppm = parts per million by volume.
ppb = parts per billion by volume.
µg/m3 = micrograms per cubic meter.

3.2.1.2.4 CLIMATE

The analysis area is classified as part of the Central Great Plains, a region that was once grasslands and has since become some of the best agricultural land in Oklahoma. Average annual precipitation ranges from approximately 32 inches in western Garfield County to nearly 36 inches in the east. May and June are the wettest months, on average, and winters tend to be quite dry. Enid holds the statewide record for the greatest daily rainfall with a total of 15.68 inches on October 11, 1973. Most winters have at least 1 inch of snow, with almost half having 10 or more inches (Oklahoma Climatology Survey 2021).

Winds from the south are dominant, averaging almost 11 miles per hour measured from 1994 to 2015. Relative humidity, on average, ranges from 46% to 89% during the day, with a decrease during the summer. Winter months tend to be cloudier than summer months. The percentage of possible sunshine ranges from an average of slightly under 60% in winter to nearly 80% in summer. Thunderstorms occur on approximately 51 days each year, predominantly in the spring and summer. Section 3.4.4.2.2 discusses in more detail severe weather conditions in Oklahoma and Garfield County.

The National Climatic Data Center's 1981–2010 Climate Normals (National Climatic Data Center 2021) were evaluated from the nearest meteorological station to the Project with complete meteorological data, which is Enid, Oklahoma. Temperatures near the Project are generally highest in July and lowest in January. Maximum temperatures of 90 degrees Fahrenheit (°F) or higher occur approximately 23 days per year on average, whereas minimum temperatures of 0°F or lower occur less than 1 day per year on average. The mean annual precipitation is approximately 34.2 inches, with monthly average precipitation ranging from a low of approximately 1.1 inches in January to a maximum of 5.2 inches in June. Precipitation of 0.01 inch or greater occurs on approximately 83 days per year on average. Precipitation of 1.0 inch or greater occurs on average approximately 10 days per year.

Table 3.2-5 provides a summary of the monthly average temperatures and precipitation as well as monthly ranges for minimum and maximum temperature and frequency of heavy rain events from the Enid, Oklahoma, meteorological station.

Table 3.2-5. Representative Climate Data

Month	Average Temperature (°F)	Daily Minimum Temperature (°F)	Daily Maximum Temperature (°F)	Average Precipitation (inch)	Average Number of Days with Precipitation > 1.0 inch
January	35.1°F	24.4°F	45.7°F	1.07	0.2
February	39.5°F	28.1°F	50.8°F	1.49	0.5
March	47.9°F	36.1°F	59.6°F	2.82	0.7
April	58.0°F	46.2°F	69.8°F	3.09	0.8
May	68.5°F	57.6°F	79.3°F	4.35	1.2
June	77.6°F	66.6°F	88.6°F	5.20	1.8
July	83.0°F	71.6°F	94.4°F	2.78	0.9
August	81.7°F	70.1°F	93.2°F	3.41	1.3
September	73.0°F	61.4°F	84.7°F	3.10	1.0
October	60.3°F	48.7°F	72.0°F	3.49	1.0
November	47.5°F	36.7°F	58.4°F	2.03	0.3
December	36.6°F	26.6°F	46.5°F	1.41	0.5

Source: National Climatic Data Center (2021).

Climate change is a global issue that results from several factors, including the release of greenhouse gases (GHGs); land use management practices; and the albedo effect, or reflectivity of various surfaces (including reflectivity of clouds). An analysis of regional climate impacts prepared by the Third National Climate Assessment (U.S. Global Change Research Project 2014) recognizes the Great Plains as a diverse region where climate is woven into the fabric of life. Projected climate trends toward more dry days and higher temperatures across the Southern Plains could increase evaporation, decrease water supplies, reduce electricity transmission capacity, and increase cooling demands. These changes could also add stress to limited water resources and affect management choices related to irrigation, municipal use, and energy generation. Increased drought frequency and intensity can turn marginal lands into deserts (U.S. Global Change Research Project 2014).

The most recently available data on GHG emissions in the United States indicate that annual GHG emissions in 2019 were an estimated 6,558 million metric tons of GHG (EPA 2021c).

3.2.1.3 Environmental Consequences

3.2.1.3.1 METHODOLOGY

Emissions calculations for the Project were organized into construction- and operational-related emissions as follows:

- Exhaust from on- and off-road construction vehicles and equipment
- Exhaust from on-road construction worker commuter vehicles
- Exhaust from on-road construction material and equipment delivery vehicles
- Fugitive dust from vehicle travel on paved and unpaved roads
- Fugitive dust from earthmoving and general construction activities

The following assumptions were also used to complete the air quality impact analysis for the Project:

- Emissions associated with heavy-duty on-road construction equipment were estimated using South Coast Air Quality Management District (SCAQMD) emission factors for heavy-heavy-duty-vehicles (with vehicle weights ranging from 33,001 to 60,000 pounds) for 2020 (SCAQMD 2016). The 100-year Global Warming Potential was used for CO_2e emissions (CO_2 = 1; methane = 28 and NO_2 = 265).
- Emissions from off-road construction equipment and vehicles were estimated using composite off-road emission factors for the 2020 vehicle fleet from the California Air Resource Board's Off-Road Model (SCAQMD 2007a). The type of equipment used for construction and the quantity of each type was provided by the Applicant and is based on similar projects. The appropriate emission factor, equipment type, quantity of equipment needed, and duration of use during construction of the Project were used in determining emissions from construction equipment.
- Exhaust emissions from construction worker commuting, some on-road construction equipment, and equipment delivery were calculated using SCAQMD emission factors for on-road passenger vehicles and delivery trucks for the vehicle fleet (SCAQMD 2007b).
- An estimated maximum number of 400 construction worker commuters are assumed to commute from Oklahoma City, Oklahoma to the Project, an average distance of 120 miles round-trip per day.
- Heavy-hauling trucks would be used to deliver materials and equipment from Oklahoma City, Oklahoma (approximately 80 miles away), or from Stillwater, Oklahoma (approximately 60 miles away), to the Project.
- Fugitive dust emissions from vehicle travel on paved and unpaved roads were estimated using emission factor calculations from the EPA's compilation of air pollutant emission factors (Sections 13.2.1 and 13.2.2 in EPA 2006 and 2011, respectively).
- Fugitive dust emissions from earthmoving were estimated using the *WRAP Fugitive Dust Handbook* (Countess Environmental 2006).
- Construction and operational emissions were estimated using published and agency-accepted emission factors, such as AP-42 emission factors when appropriate, to estimate GHG emissions.

Table 3.2-6 lists the issues identified for this resource and the indicators and impact thresholds used to assess impacts for this EIS.

Table 3.2-6. Air Quality Issues, Indicators, and Impact Thresholds

Issues	Indicators	Impact Thresholds
Fugitive dust, equipment, and vehicle (on- and off-road) combustion emissions	Acres of surface disturbance, including access roads Emission estimates (tons per year) of regulated air pollutant emissions from construction and operations Project emission estimates' percentage of the total county emission inventory estimate of avoided emissions and associated health impacts	Project emissions would exceed NAAQs. Project emission would exceed the Federal Land Manager's Air Quality Related Values Workgroup screening-level criteria
GHG emissions	GHG emissions estimates (tons per year) during construction and operations	There are currently no impact thresholds for GHG emissions.

The potential construction and operational air quality impacts from implementation of any alternative were determined by comparing the estimated change in air quality emissions that would occur from Project actions to the existing county emission inventory.

Potential avoided emissions are also considered under the Proposed Action and Other Action Alternative if the Project offsets other non-renewable energy sources. Estimates of annual emissions that could be avoided by using non–fossil fuel energy sources were calculated using the EPA's Avoided Emissions and geneRation Tool (AVERT). The EPA's CO-Benefits Risk Assessment (COBRA) screening model was also used to estimate the health impacts of avoided emissions in the analysis area.

3.2.1.3.2 NO ACTION ALTERNATIVE

Under the No Action Alternative, the Project would not be constructed, and there would be no impacts on air quality or any contribution to GHGs from the Project. However, existing reasonably foreseeable trends and actions would continue to affect air quality in the analysis area. The analysis area is primarily used for agricultural purposes, and these land uses would continue under the No Action Alternative. Typical agricultural equipment use (tractors, planters, tillers, combines, etc.) is a source of combustion emissions, and the application of fertilizers, herbicides, and pesticides is a source of fugitive dust and chemical emissions. These actions contribute to the current air quality and would continue under the No Action Alternative. Future development could result in additional farmland conversion, which could affect air quality by removing native habitat and potentially increasing wind erosion and fugitive dust; however, based on current trends discussed in Section 3.4.2, this conversion would be limited in nature.

Reasonably foreseeable trends and actions within the analysis area that could generate air emissions include reconstruction of the 13/31 runway at the Enid Woodring Regional Airport (2022–2023); reconstruction of the center runway at the Vance Air Force Base (AFB) (2021–2022); construction of the Kaw Lake Water Pipeline (slated to begin by 2023); construction of State Highway 74, U.S. Highway 60, and U.S. Highway 412 (2021–2028); and replacement or rehabilitation of one bridge in Garfield County. These projects would require construction activity within Garfield County and would have a temporary impact on air quality due to equipment exhaust, vehicle exhaust caused by travel to and from the project site, and fugitive dust from soil disturbance. Long-term air impacts would be minimal; only operations of the new water treatment plant associated with the Kaw Lake Water Pipeline in North Enid would generate emissions through potential increased mobile sources from worker traffic and any potentially permitted stationary sources, such as a boiler system or emergency generator.

As was identified in Section 3.2.1.2.3, air quality monitors demonstrate that current pollutant levels do not exceed NAAQS. Further, RUS anticipates that all current and future activities would occur in compliance with all federal, state, and local air quality regulations.

3.2.1.3.3 PROPOSED ACTION

Construction

Project construction activities would result in air pollutant emissions from equipment exhaust during construction, vehicle exhaust caused by travel to and from the Project, and fugitive dust from soil disturbance. Table 3.2-7 presents the estimated total Project construction emissions that would be emitted during the 18-month construction period. These emissions would be temporary and would cease when construction stops. Overall, the total pollutants emitted from Project construction would be much smaller than Garfield County's total projected annual emissions. Table 3.2-7 also presents the annual emissions at the county level and emissions from the construction of the Project as a percentage of the county's total emissions. The Proposed Action's construction emissions would represent less than 3% of the county's total emission inventory for each evaluated air pollutant.

GHG emissions from construction would result in a maximum of 15,981 metric tons of CO_2e being emitted during the construction phase of the Project due to fuel combustion in construction and maintenance vehicles and equipment. As with other air emissions, GHG emissions from Project construction would be much smaller than Garfield County's total projected annual emissions. Project emissions would equal up to 0.58% of the county's total emission inventory for CO_2e.

Table 3.2-7. Estimated Construction Emissions in Tons per Year for Criteria Pollutants and Hazardous Air Pollutants under the Proposed Action

Project Component	CO	NO_X	SO_X	PM_{10}	$PM_{2.5}$	VOC	HAPs	CO_2e
Construction equipment (off-road)	23.50	26.22	0.07	1.17	1.04	4.15	0.41	5,593
Worker and on-road construction equipment commuting	36.65	3.73	0.09	120.08	13.69	4.34	0.43	8,357
Equipment/material delivery	6.73	7.07	0.02	8.17	1.61	1.02	0.10	2,031
Fugitive dust from construction	–	–	–	251.45	25.15	–	–	–
Total	**66.88**	**37.02**	**0.18**	**380.87**	**41.49**	**9.51**	**0.95**	**15,981**
Garfield County emissions inventory total	19,177	6,715	16,843	14,426	3,288	7,662	1,814	2,760,279
Proposed Action's construction emissions increase as a percentage of Garfield County emissions inventory total	+ 0.35%	+ 0.55%	+ < 0.01%	+ 2.64%	+ 1.26%	+ 0.12%	+ 0.05%	+ 0.58%

Source: EPA (2021d).

Notes: SO_X = sulfur oxides; VOC = volatile organic compound.

CO_2e is expressed in metric tons, where 1 metric ton = 2,204.6 pounds.

The top of the table presents construction activity emission sources by pollutant. The next segment of the table presents the annual emissions at the county level and emissions from the construction of the Project as a percentage of the county's total emissions.

Applicant-committed measures would be employed to further reduce emissions, as practicable. These measures would also appear in the Dust Control and Air Quality Plan and could include fugitive dust and equipment controls to minimize emissions such as minimal grading only where needed to accommodate for the project, restriction of vehicle speeds, watering of active areas, watering of stockpiles, watering on roadways, track-out control at site exits, and other measures such as the SWPPP, restoration and revegetation plan, and invasive species and noxious weed management plan.

Operations, Maintenance, and Decommissioning

Table 3.2-8 presents the estimated total project O&M and maintenance emissions that would be emitted annually. O&M emissions would consist of vehicle exhaust caused by travel to the Project for routine inspection and maintenance. These Project emissions represent up to 0.01% of the county's total emission inventory for each evaluated air pollutant.

GHG emissions from the O&M of the Project would result in 246 metric tons of CO_2e being emitted annually for the duration of the Project. For comparison, Project-related GHG emissions represent only 0.01% of the county's total emission inventory for CO_2e, annually.

Table 3.2-8. Estimated Operations Emissions in Tons per Year for Criteria Pollutants and Hazardous Air Pollutants under the Proposed Action

Project Component	CO	NO_X	SO_X	PM_{10}	$PM_{2.5}$	VOC	HAPs	CO_2e
Project maintenance and inspection activities	1.07	0.51	0.00	1.20	0.17	0.15	0.01	246
Total	**1.07**	**0.51**	**0.00**	**1.20**	**0.17**	**0.15**	**0.01**	**246**
Garfield County emissions inventory total	19,177	6,715	16,843	14,426	3,288	7,662	1,814	2,760,279
Proposed Action's operations emissions increase as a percentage of Garfield County emissions inventory total	+ 0.01%	+ 0.01%	+ 0.01%	+ 0.01%	+ 0.01%	+ 0.01%	+ 0.01%	+ 0.01%

Source: EPA (2021d).

Note: SO_X = sulfur oxides; VOC = volatile organic compound.

CO2e is expressed in metric tons, where 1 metric ton = 2,204.6 pounds

The top of the table presents O&M and maintenance activity emission sources by pollutant. The next segment of the table presents operational emissions compared with the Garfield County emission inventories by calculating the operational emissions as a percentage of the county's annual emissions.

The use of solar to generate electricity could also reduce the need for electricity generation from new traditional fossil fuel power plants. Avoided emissions were obtained from EPA's AVERT (2021) for the Oklahoma region. The EPA's AVERT is not a long-term projection tool. It is not intended to analyze avoided emissions more than 5 years from baseline. The estimated annual and lifetime (25 years, plus up to an additional 2 years for conceptual) emissions are based on design capacity of the Project (250 MW). To provide a rough estimate of the lifetime avoided emissions of the Project, the annual avoided emissions estimated by AVERT were multiplied by the life of the solar facility. As presented in Table 3.2-9, the Project would annually displace CO_2, NO_X, and SO_2 produced by the Oklahoma electric grid and decrease the creation of air pollutant emissions in the atmosphere from traditional fossil fuel power plants. It must be recognized that this is just a general upper-boundary estimate of the potential lifetime avoided emissions and the AVERT model is unable to provide any type of certainty for the long-term avoided emissions associated with the Project.

Table 3.2-9. Estimated Annual and Lifetime Avoided Emissions (tons) for the Operation of the Project over a 25-year Period

Pollutant	CO_2	NO_X	SO_X	$PM_{2.5}$
Annual avoided emissions	97,572	84.5	27.1	6.5
Lifetime avoided emissions	2,634,444	2,282.2	732.1	176.7

Note: Emissions are presented in tons and were obtained from AVERT (EPA).

The EPA's COBRA screening model Web Edition was used to estimate the health impacts of these avoided emissions in the state of Oklahoma. The model used the following inputs:

- Oklahoma was selected as the state where the emission changes would occur,
- Fuel Combustion: Electric Utility was selected as the sector where the emission changes would occur, and
- the change of emissions used the annual avoided emissions for NO_X, SO_X, and $PM_{2.5}$ as noted in Table 3.2-9 (84.52 tons of NO_X, 27.12 tons of SO_X, and 6.55 tons of $PM_{2.5}$).

The model provides estimated ranges of reduced occurrences of health events due to air pollution, such as mortality, nonfatal heart attacks, and hospitalizations. It also estimates the total health benefit, which encompasses all saved costs of the avoided health events. For Oklahoma, COBRA estimates the 2023 total health benefit ranges to be $272,615 to $614,670 at a 3% discount rate and $243,346 to $548,154 at a 7% discount rate.[7] COBRA estimates statistical lives saved within the state of Oklahoma for calendar year 2023 to range from 0.02 to 0.06 (EPA 2021e). This would represent a long-term, beneficial impact due to avoided health events.

Decommissioning or plant re-powering would require similar activities as for construction; therefore, impacts to air quality from decommissioning or plant re-powering are anticipated to be similar to those reported for the construction phase in Table 3.2-7.

Cumulative Effects

The Proposed Action would add to air pollutants and GHGs produced by present and reasonably foreseeable trends and actions. As was identified in Section 3.2.1.2.3, air quality monitors demonstrate that current county pollutant levels do not exceed NAAQS. Project-related emissions represent only a small fraction of total county emissions. Additionally, Project construction GHG emission increases could be offset in whole or in part by reductions in GHG emissions from current or future non-renewable electric generation displaced by the Project. Therefore, the Project in combination with other current and reasonably foreseeable trends and actions would not result in significant cumulative impacts on air quality.

3.2.1.3.4 OTHER ACTION ALTERNATIVE

Construction, Operations, Maintenance, and Decommissioning

Potential air quality and GHG impacts from construction, O&M, and decommissioning (or plant re-powering) would be the same as those described under the Proposed Action because the construction actions and schedule would be similar in scope and duration. Therefore, construction activities would be the same as those reported in Table 3.2-7. These emissions would be temporary and cease when construction stops. Likewise, O&M would be the same as those reported in Table 3.2-8. The Project would also annually displace CO_2, NO_X, and SO_2 produced by the Oklahoma electric grid and provide a long-term, beneficial impact due to avoided health events.

Cumulative Effects

Cumulative effects to air quality and GHGs under the Other Action Alternative would be the same as those described under the Proposed Action. Construction actions and the Project schedule would be similar in scope and duration and other reasonably foreseeable trends and actions would occur regardless of the Project.

[7] COBRA includes a discount rate of either 3%, to account for the interest that may be earned from government backed securities, or 7%, to account for private capital opportunity costs. The EPA recommends using both for a bounding approach.

3.2.1.4 Summary of Impacts

Impacts to air quality were assessed based on best available data and compared between the No Action Alternative, Proposed Action, and Other Action Alternative. Under the No Action Alternative, the Project would not be constructed, and there would be no impacts to air quality from the Project. However, existing (e.g., agricultural activities) and reasonably foreseeable trends and actions would continue to introduce air pollutants and influence air quality. Temporary adverse and long-term beneficial impacts to air quality are anticipated as a result of Project construction, O&M, and decommissioning under both action alternatives. With the implementation of BMPs described in Section 2.3.2.5, no impact thresholds would be triggered as a result of the Project, either individually or when considered in conjunction with other present and reasonably foreseeable trends and actions.

3.2.2 Geology and Soils

3.2.2.1 Introduction

Soil is the unconsolidated mineral or organic material on the immediate surface of the earth that serves as the natural medium for plant growth. A productive soil can sustain biological productivity, maintain environmental quality, and promote plant and animal health. Geology and soils within the Proposed Action footprint could be impacted from surface disturbance and sub-surface excavation associated with the construction, O&M, and decommissioning of the Project.

This analysis describes soil and geologic conditions within a specific analysis area, and it subsequently describes and discusses the effects of the No Action and action alternatives on these resources.

3.2.2.1.1 SPATIAL AND TEMPORAL SCOPE OF ANALYSIS

The spatial scale for analysis of potential effects to geology and soil resources consists of the Proposed Action footprint. This area is referred to as the *soils and geology analysis area* or, more generally in this section, the *analysis area*. The spatial scale is considered an appropriate geographic unit for assessing soil effects because soil productivity and geology are site-specific attributes of the land and are not dependent on the productivity of an adjacent area. Additionally, the assessment of soil quality within too large an area can mask or "dilute" site-specific effects.

The temporal scale for analysis of soil and geology effects considers the timeframe beginning with construction and ending when revegetation is complete after decommissioning.

3.2.2.2 Affected Environment

The analysis area lies within the Central Rolling Red Prairies major land resource area (MLRA) (USDA Natural Resources Conservation Service [NRCS] 2006). MLRAs are distinct ecological divisions with unique physical attributes, including geology and soil attributes. This MLRA is located on a dissected plain and primarily consists of Ustulls soils, which are common throughout the Western Great Plains (USDA 1981).

3.2.2.2.1 GEOLOGIC FORMATIONS

The analysis area lies within the Anadarko Shelf geologic province of northern Oklahoma, which is characterized by Permian and Pennsylvanian-age sedimentary strata that are relatively flat lying, but gently dip toward the west (Northcutt and Campbell 1995). Three marine and fluvial sedimentary bedrock foundations outcrop within the analysis area: 1) Permian-age Salt Plains Formation (Psp), 2) Kingman Siltstone Formation (Pk), and 3) Fairmont Shale Formation (Pfa). A fourth foundation, Quaternary-age Alluvium Formation, has also been deposited on top of the Permian bedrock units generally within the floodplain area of Skeleton Creek (Heran et al. 2003).

The Psp Formation is described as an interbedded red-brown blocky shale and orange-brown siltstone that grades southward into the Purcell Sandstone in the Norman area. This formation is approximately 200 feet thick and is part of the Hennessey Group. The Psp Formation overlies the Pk Formation, which is approximately 30 feet thick and comprises orange-brown to greenish-gray, even-bedded siltstones with some fine-grain sandstone interbedded with red-brown shale. The Psp Formation grades southward into the Purcell Sandstone. The Psp Formation overlies the Pfa Formation, which is an approximately 30-foot-thick red-brown blocky shale, the base of which grades into the Garber Sandstone. The Pfa Formation is approximately 120 feet thick near Kingfisher, Oklahoma. The Psp, Pk, and Pfa Formations are all formations within the Hennessey Group.

The permeability of the formations varies, based on lithology of specific units within the formations. In general, the sandstone units are more permeable than the shales and siltstone units. The formations are not permeable enough to form a major aquifer. The Psp, Pk, and Pfa Formations among other Permian-age and Pennsylvanian-age formations make up the North-Central Oklahoma (NCO) minor bedrock aquifer (Belden 1997).

The Psp, Pk, and Pfa Formations are not limestone bearing in the Application Area and therefore are not karst-forming formations.[8]

3.2.2.2.2 MAPPED SOIL TYPES

Seventeen soil units mapped by the USDA NRCS (2019) are located in the analysis area. These soil units and their general properties are presented in Table 3.2-10. Ten of the 17 soil units are considered prime farmland by the USDA and account for approximately 80% of the acreage within the analysis area. Prime farmland is discussed further in Section 3.4.2, Land Use.

As summarized in Table 3.2-10, approximately half (53%) of the soils within the analysis area have a slight erosion hazard rating value, 42% of the soils have a moderate erosion hazard rating, and 5.1% have a severe erosion hazard (USDA NRCS 2019). All of the soil units in the analysis area have a moderate compaction rating (USDA NRCS 2019). Soil erosion can have detrimental impacts to plant growth and runoff, which can lead to water quality issues (USDA NRCS 2004). Likewise, compaction can result in higher runoff, erosion, nutrient loss, and other potential water-quality problems, and can reduce penetration by plant roots and thus inhibit plant growth (USDA NRCS 2004).

None of the soil units in the analysis area meet USDA hydric criteria[9] (USDA NRCS 2019). However, approximately 71% of the soil units in the analysis area are within the Hydraulic Soil Group D, which consists of soils having a slow infiltration rate when thoroughly wet. Soils with low infiltration rates (such as Hydraulic Soil Group D) can lead to unfavorable conditions such as ponding, erosion, or inadequate moisture for plants (USDA NRCS 2008). Based on NRCS land capability classifications, most (52%) of the soil units are rated two, which indicates moderate limitations that reduce the choice of plants or that require moderate conservation practices. Roughly one-third (37%) of the soil units are rated three or four, which indicates severe limitations that reduce the choice of plants or that require special conservation practices. Approximately 9% of soil units are rated as generally unsuitable for cultivation.

The terrain within the analysis area ranges from relatively flat to undulating with lower elevations along drainages.

[8] Karst is a landform formed by dissolution of bedrock and is characterized by losing streams, springs, sinkholes, and caves.

[9] Soil that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part.

Table 3.2-10. Properties of Mapped Soil Units within the Soils and Geology Analysis Area

Soil Map Unit Symbol	Soil Map Unit Name	Soil Description	Thickness (feet)	Hydraulic Soil Group	Land Capability Classification (Irrigated/non-irrigated)	Prime Farmland?	Crop/Range/ Pastureland	Acres and Percentage of Analysis Area*	Erosion Hazard (off-road, off-trail)	Compaction Rating	Meet Hydric Criteria
BeA	Bethany silt loam, 0 to 1 percent slopes	Silty loam and clay loam	7	C	2/2	All areas are prime farmland	Cropland	44 (2.1%)	Slight	Medium	No
Bk	Grainola, Ashport frequently flooded, and Grant soils, 0 to 20 percent slopes	Silty loam, silty clan, and clay loam	4–7	B	-/6	Not prime farmland	Cropland and rangeland	0.2 (< 0.1%)	Severe	Medium	No
Br	Pulaski and Ashport soils, 0 to 1 percent slopes, frequently flooded	Sandy loam	7	B	-/5	Not prime farmland	Cropland	7 (0.3%)	Slight	Medium	No
KfB	Grant silt loam, 1 to 3 percent slopes	Silt loam	6	B	-/2	All areas are prime farmland	Cropland	92 (4.3%)	Moderate	Medium	No
KfC2	Kingfisher silt loam, 3 to 5 percent slopes, eroded	Silt loam	3	C	-/3	Not prime farmland	Cropland	4 (0.2%	Severe	Medium	No
KnA	Kirkland silt loam, 0 to 1 percent slopes, cool	Silt loam	8	D	2/2	All areas are prime farmland	Cropland	498 (23.5%)	Slight	Medium	No
KrB	Kirkland-Renfrow complex, 1 to 3 percent slopes	Silt loam and silty clay	7	D	-/3	All areas are prime farmland	Cropland	596 (28.1%)	Moderate	Medium	No
KsA	Kirkland-Pawhuska complex, 0 to 3 percent slopes	Silt loam, clay, and clay loam	7	D	2/2	All areas are prime farmland	Cropland	81 (3.8%)	Moderate	Medium	No
Ms	Miller-Drummond complex, 0 to 1 percent slopes, occasionally flooded	Clay	5.5	D	-/4	All areas are prime farmland	Cropland	< 0.1 (< 0.1%)	Slight	Medium	No
NoB	Norge loam, 1 to 3 percent slopes	Loam	7	B	-/2	All areas are prime farmland	Cropland	65 (3.1%)	Moderate	Medium	No
NoC2	Norge loam, 3 to 5 percent slopes, eroded	Loam	5.5	C	-/3	Not prime farmland	Pastureland	15 (0.7%)	Severe	Medium	No
PrA	Port silt loam, 0 to 1 percent slopes, occasionally flooded	Silt loam	6	B	-/2	All areas are prime farmland	Cropland	78 (3.7%)	Slight	Medium	No
RsC	Piedmont silt loam, 3 to 5 percent slopes	Silt loam	5.5	D	-/3	All areas are prime farmland	Pasture and cropland	61 (2.9%)	Moderate	Medium	No
RvC2	Renthin-Masham complex, 3 to 5 percent slopes, eroded	Clay loam Clay	5 2.5	D	-/3	Not prime farmland	Cropland	280 (13.2%)	Moderate	Medium	No
TaA	Tabler silt loam, 0 to 1 percent slopes	Silt loam	6.5	D	-/2	All areas are prime farmland	Cropland	182 (8.6%)	Slight	Medium	No
VcC2	Grainola-Masham complex, 3 to 5 percent slopes, eroded	Gravelly clay loam Silty clay loam	3.5 1.5	D	-/4	Not prime farmland	Rangeland and pastureland	86 (4.1%)	Slight	Medium	No
VrD	Grainola-Masham-Ironmound complex, 5 to 12 percent slopes	Clay loam Loam	4 3.5	D	-/6	Not prime farmland	Rangeland	30 (1.4%)	Severe	Medium	No

Source: USDA NRCS (2019).
* May not sum to 100% due to rounding.

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3.2.2.3 Environmental Consequences

3.2.2.3.1 METHODOLOGY

Table 3.2-11 lists the issues identified for this resource and the indicators and impact thresholds used to assess impacts for this EIS.

Table 3.2-11. Geology and Soil Issues, Indicators, and Impact Thresholds

Issues	Indicators	Impact Thresholds
Disturbance to existing geologic resources	Acreage graded/excavated, depths of grading/excavation, and types of geologic formations impacted	No impact thresholds established by regulation; best professional judgment
Creation of migration pathways between previously unconnected water-bearing strata	Proposed depths of excavation vs. depths of water bearing strata	
Soil disturbance, removal, or compaction	Acreage and depth of impacted soils by soil types and activities	
Decreased soil quality	Change in nutrient cycling, soil erosion, displacement and redistribution of topsoil; potential for spill/contamination events to occur	

Data from a digital geologic map database for the state of Oklahoma (Heran et al. 2003) and the USDA NRCS (2006) were used to assess types and locations of geologic strata as well as water depths to determine the extent that Project activities would affect geologic resources. The thicknesses of soils and bedrock formations were evaluated to determine the likelihood that construction activities would penetrate the formations. The depth to water, the potential water-bearing capabilities of the formations, and the types of aquifers (confined versus unconfined) were reviewed to evaluate the potential for encountering karst features and creating pathways for groundwater to migrate between formations that would otherwise not be interconnected if the Project is not constructed.

Data from the NRCS Web Soil Survey and Soil Survey Geographic Database were used to assess soil conditions and determine the extent that Project activities would affect soils (USDA NRCS 2019). The Proposed Action footprint was overlaid on a map of soil units so that the acreages and relative percentages of potential impacts to the various soil units could be calculated. The specific attributes of the soil units assessed included prime farmland designation, hydraulic soil group, erosion hazard, compaction rating, and hydric designation.

3.2.2.3.2 NO ACTION ALTERNATIVE

Under the No Action Alternative, the Project would not be constructed, and there would be no impacts on geology or soil resources from the Project. However, existing and reasonably foreseeable trends and actions would continue to affect geology and soils in the analysis area.

The current land use in the analysis area is predominantly cropland, which would continue into the future. Depending on crop type and management activities, the continuation of cropland could lead to varied soil impacts including degradation of nutrients, increased potential for erosion, and infiltration of herbicides and pesticides into the soils. Continued crop production would have a limited impact to geology. Additional low-density, single-family developments could also be constructed, but the county has experienced limited land cover change over the last 15 years (see Section 3.4.2). Therefore, large-scale soil or geologic disturbance due to new residential development is not anticipated. Oil and gas exploration outside the analysis area could also contribute to long-term and temporary surface and subsurface disturbance including soil instability and erosion as well as potential for infiltration of contaminants and leaks.

No reasonably foreseeable trends and actions are anticipated within the analysis area. However, reasonably foreseeable trends and actions within adjacent lands in Garfield County, such as renewable energy, generation, and transportation development (as described in Table 4.4-1 in Section 4.4), could cause short- to long-term impacts through surface and subsurface soil disturbance, as well as subsurface impacts associated with boring and installation of pilings and other infrastructure. This EIS assumes that future development would comply with local, state, or federal regulatory requirements to avoid or minimize soil resource and geology impacts, as applicable. However, not all actions on private lands would be subject to regulatory requirements.

3.2.2.3.3 PROPOSED ACTION

Construction

Geology

Geologic formations (units) potentially impacted by the Proposed Action are listed in Table 3.2-12 and displayed on Figure 3.2-1. Potential geologic impacts could include displacement of soil and rock during construction activities and alteration of geologic features from earth-moving activities during construction. However, the Pk Formation is generally concealed by varying thicknesses of soil that range in thickness from 2.5 to 8 feet. Likewise, the Psp Formation consists of fine-grained sandstone and siltstone with a thickness of approximately 70 feet. Therefore, geologic impacts for these two formations would likely be limited to no more than an estimated 580 acres of subsurface rock disturbance during drilling and excavation for the solar array and collection lines. The Alluvium Formation consists of gravel, sand, silt, and clay substrates and could be impacted by the gen-tie line. However, the gen-tie line installation would only coincide with an estimated 3 acres of this formation, of which less than 1 acre would be disturbed by installation of foundations.

Where possible, grading and excavation associated with construction would be minimized (see Table 2.3-4 in Section 2.3.2.5).

Table 3.2-12. Impacts to Geologic Formations under the Proposed Action

Project Component	Kingman Siltstone Formation (Pk) (acres)	Acres within Salt Plains Formation (Psp) (acres)	Acres within Alluvium Formation (Qal) (acres)
Long-term access roads	18	15	0
Temporary access roads	8	8	0
Battery storage system	< 1	< 1	0
Additional fenced land	772	694	0
Solar inverter	< 1	< 1	0
Gen-tie line	8	3	3
Solar array	273	255	0
Substation	12	0	0
Underground collection lines	36	15	0
Total	**1,128**	**988**	**3**

Source: Heran et al. (2003).

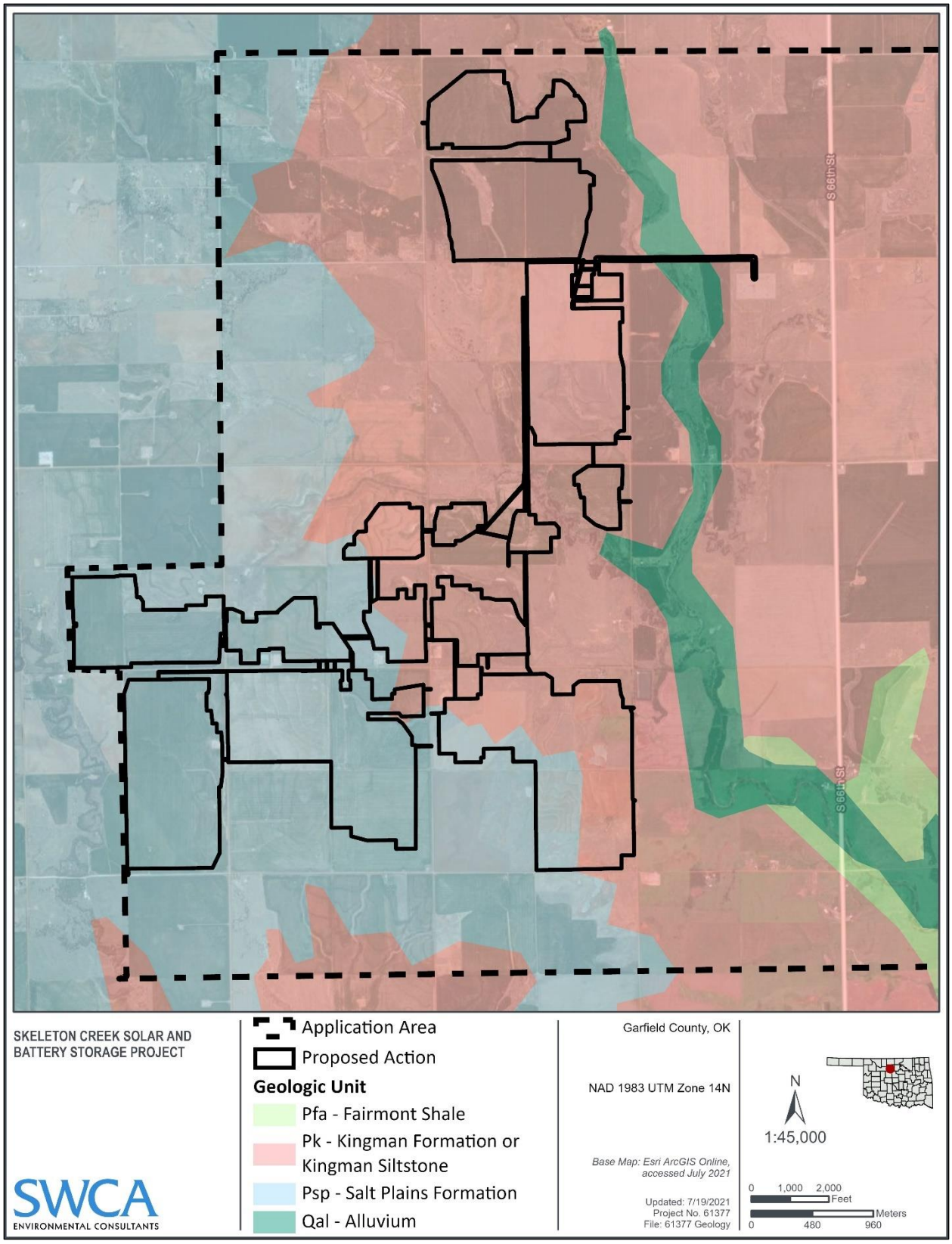

Figure 3.2-1. Geologic formations (units) in the Proposed Action footprint.

Karst geology can create environmental engineering hazards such as sinkholes and caverns (Luza and Johnson 2008). However, the bedrock strata under the Proposed Action generally comprise clay, shale, and sandstone and lack carbonates such as limestone and dolostone and other soluble rocks such as gypsum, anhydrite, and salt (Heran et al. 2003). Therefore, karst development within these formations does not occur, and no karst impacts are anticipated.

The NCO minor bedrock aquifer present beneath the Project is an unconfined aquifer (Belden 1997). Unconfined aquifers do not have impermeable strata that confine water under artesian pressure. The groundwater table is free to move up and down based on the amount of recharge and discharge from the aquifer. However, the depth to groundwater for this aquifer is generally greater than 20 feet below the surface; therefore, the water table is unlikely to be encountered by construction activities, and creation of pathways for fluid migration from one water-bearing unit to another is not anticipated.

Soils

Soil units potentially impacted by the Proposed Action are disclosed in Table 3.2-13. In all, 653 acres of soil would be disturbed during construction (of which 4% (27 acres) would be temporary roads and gen-tie line ROW), and the remainder acres would undergo long-term impacts associated with the solar array, Project facilities, long-term access roads, collection lines, and gen-tie foundations. Soils within the additional fenced land would not be impacted by the Project because these lands would retain vegetative cover.

Project construction would require vegetation clearing and grading of structure sites for construction, equipment laydown, and vehicle access, and excavation for structure placement. Vegetation removal and grading could disturb soils and increase soil erosion potential, even on soils with a low risk of erosion, because roots help to hold soil in place, and low-lying vegetation impedes the velocity of surface flow of water. As summarized in Table 3.2-13, less than 2% of disturbed soil units would have a “severe” erosion hazard rating. However, the Applicant would minimize grading activities to the extent practicable and implement BMPs as outlined in Section 2.3.2.5. Where possible, existing slopes would be retained and smoothed to gradual grades as opposed to leveling within the Proposed Action footprint. A SWPPP would be implemented prior to construction to address short-term soil loss concerns prior to large-scale revegetation activities. The Project SWPPP would incorporate BMPs for erosion control and outline specific water erosion control measures (e.g., seeding, mulch, blankets, detention basins, certified weed-free straw bales, or silt fences) to be implemented to minimize soil erosion and loss of soil productivity. Temporary disturbance areas from construction would also be revegetated as practicable (e.g., through revegetation/seeding, regrading, and decompaction) to minimize losses to soil resources, maintain soil health, and maintain infiltration capabilities of the soil. Dust suppression activities such as wetting of soils would also be conducted during construction to minimize soil loss due to wind dispersal, until vegetation has been re-established.

Table 3.2-13. Impacts to Soils under the Proposed Action

Soil Map Unit Symbol	Total Construction Acreage	Total Short-Term Acreage	Total Long-Term Acreage	Severe Erosion Risk
BeA	16	1	15	No
Br	5	3	2	No
KfB	29	1	29	No
KfC2	1	0	1	Yes

Soil Map Unit Symbol	Total Construction Acreage	Total Short-Term Acreage	Total Long-Term Acreage	Severe Erosion Risk
KnA	155	4	151	No
KrB	176	4	172	No
KsA	23	1	22	No
NoB	22	1	21	No
NoC2	6	1	5	Yes
PrA	28	4	24	No
RsC	19	0	19	No
RvC2	83	3	80	No
TaA	60	4	56	No
VcC2	24	0	24	No
VrD	5	0	5	Yes
Total	**653**	**27**	**626**	

Project actions could also affect soil productivity due to loss or mixing of organic matter during site preparation. Additionally, in the process of grading and subsequent construction of the solar array, roads, batteries, solar inverters, aboveground and below-ground utilities, soil compaction could occur as a result of heavy equipment traffic. The thickness of the organic layer of soils within the analysis area varies, and the layer is typically underlain by softened, weathered bedrock with little organic matter. However, because of the typically shallow depth of grading relative to the depth of the organic soil layer, grading activities would not completely remove critical layers of organic matter from the soil horizons down to the bedrock. Project-impacted soils have a moderate susceptibility to compaction from the operation of ground-based equipment. The degree of compaction would be a factor of equipment weight, tire or track width, moisture content, soil composition, and soil compaction rating. However, decompaction would be a component of a site restoration and revegetation plan that would be implemented after construction-related activities are complete.

Spills could also occur during construction from earth-moving and other heavy equipment. To minimize the risk of spills, the Applicant would administer an SPCC plan that includes spill tracking and routine inspections. Spills and leaks would be cleaned up primarily through dry-absorbent techniques. Stained soils and spent absorbent materials would be properly contained and disposed to avoid chemical impacts to soils.

Operations, Maintenance, and Decommissioning

No geologic impacts are anticipated during O&M. Soil impacts associated with O&M would be limited to continued soil compaction along long-term access roads and infrastructure and maintenance tasks that result in new soil disturbance. These impacts would be intermittent and localized, as well as minimized by Applicant-committed measures to stabilize soils against erosion and prevent spills (see Section 2.3.2.5).

During decommissioning or plant re-powering, equipment and impervious surfaces would be removed and revegetated in a similar manner as during construction. Therefore, impacts would likely be similar to those described under the Construction section.

Cumulative Effects

Crop production would continue to influence soil quality within the analysis area, as could other activities currently occurring or forecasted to occur on adjacent lands in Garfield County. The Project would add an additional approximately 653 acres of short- to long-term soil impacts to these present and reasonably foreseeable trends and actions impacts. This disturbance represents 30% of total soils within the analysis area, but less than 3% of soils within Garfield County. More specifically, Project soil impacts would disturb less than 1 acre of highly erodible soils, and no impacts to aquifers or karst features are anticipated. Additionally, the Applicant would implement BMPs to reduce soil impacts. Therefore, no significant cumulative effects to soils or geology are anticipated to result from the Project when considered in combination with other present and reasonably foreseeable trends and actions.

3.2.2.3.4 OTHER ACTION ALTERNATIVE

Construction, Operations, Maintenance, and Decommissioning

Potential soil resource and geology impacts from construction, O&M, and decommissioning (or plant re-powering) activities under the Other Action Alternative are similar to the Proposed Action because, in general, the Project actions and schedule under both action alternatives would be similar in scope, duration, and location. Geologic formations under both action alternatives consist predominantly of the Pk Formation (1,128 acres under the Proposed Action and 1,586 acres under the Other Action Alternative). However, the Other Action Alternative contains slightly more acres of the Alluvium Formation (41 acres under the Other Action Alternative vs. 3 acres under the Proposed Action) (Figure 3.2-2). The Other Action Alternative also contains 116 acres of the Pfa Formation (vs. 294 acres of the Psp Foundation under the Proposed Action). However, these two formations have similar characteristics (and potential Project impacts) because they are both marine and fluvial sedimentary bedrock foundations. Similar to the Proposed Action, no karst is present in any of the formations under the Other Action Alternative (karst can be an environmental hazard due to potential sinkholes and other geological instability). The NCO minor bedrock aquifer is present beneath both action alternatives, and the unconfined groundwater depths would not vary significantly in the Other Action Alternative. Unique soil effects associated with the Other Action Alternative are described below.

Soils

Soil units potentially impacted by the Other Action Alternative are listed in Table 3.2-14. Based on the conceptual layout, the Other Action Alternative would impact a smaller proportion of total soils (559 vs. 653 acres under the Proposed Action), but a greater acreage of soils with severe erosion risk (16 acres vs. 12 acres under the Proposed Action [see Table 3.2-14]). The Other Action Alternative would implement the same Applicant-committed measures as the Proposed Action to minimize soil resource impacts.

Table 3.2-14. Impacts to Soils under the Other Action Alternative

Soil Map Unit Symbol	Total Construction Acreage	Total Short-term Acreage	Total Long-term Acreage	Severe Erosion Risk
BeA	28	2	26	No
Br	5	1	4	No
Ec	1	< 1	< 1	Yes
KnA	226	14	212	No
KrB	67	8	59	No

Soil Map Unit Symbol	Total Construction Acreage	Total Short-term Acreage	Total Long-term Acreage	Severe Erosion Risk
KsA	< 1	0	0	No
NoC2	12	1	12	Yes
NoD2	1	< 1	1	Yes
PrA	60	9	50	No
PrB	1	< 1	0	No
Rfa	4	1	4	No
RsC	10	< 1	9	No
RvC2	78	8	70	No
TaA	64	8	56	No
VcC2	1	0	1	No
VrD	2	< 1	1	Yes
Total	**559**	**53**	**506**	

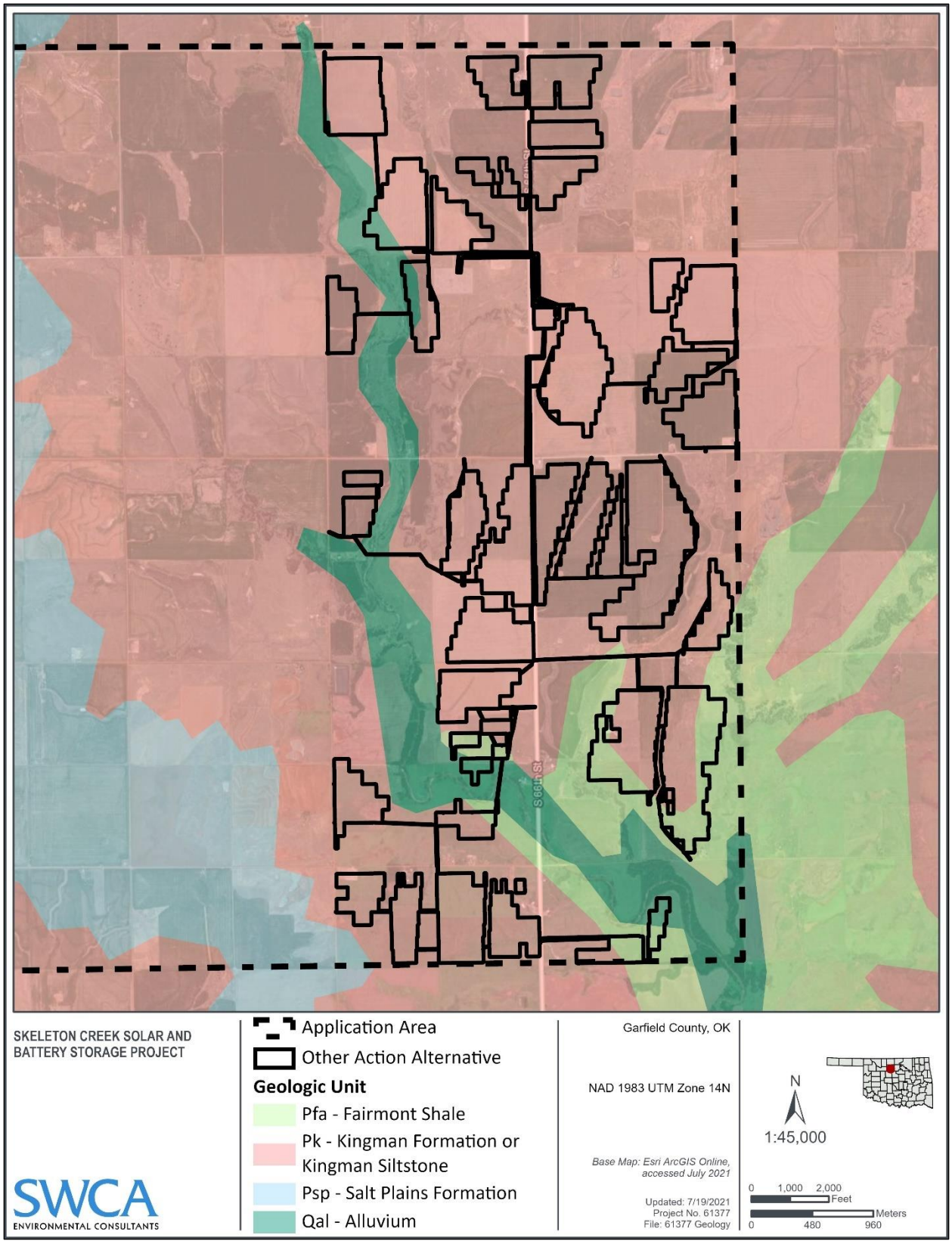

Figure 3.2-2. Geologic formations (units) in the Other Action Alternative footprint.

Cumulative Effects

Cumulative impacts to soil resources and geology under Other Action Alternative would be the same as those described under the Proposed Action because, in general, the Project actions and schedule would be similar in scope and duration, as would other reasonably foreseeable trends and actions that would occur regardless of the Project.

3.2.2.4 Summary of Impacts

Impacts to soil resources and geology were assessed quantitatively between the No Action Alternative, Proposed Action, and the Other Action Alternative using the best available data. Under the No Action Alternative, the Project would not be constructed, and there would be no impacts to soil resources and geology. However, existing activities such as agricultural practices and other reasonably foreseeable trends and actions could represent a source of degradation of soil nutrients, increased potential for erosion, soil compaction, and infiltration of herbicides and pesticides into the soils. Under the Proposed Action and Other Alternative Action, Project construction would disturb soils and increase soil erosion potential and compaction. Impacts to geologic resources would be limited because most construction activities would not be deep enough to penetrate bedrock geologic formations, and the formations under both the Proposed Action and Other Action Alternative do not contain karst geology; therefore, no pathways for cross-communication of different water-bearing strata could occur. With the implementation of BMPs described in Section 2.3.2.5, no impact thresholds for soils or geology would be triggered as a result of the Project, either individually or when considered in combination with other present and reasonably foreseeable trends and actions.

3.2.3 Water Resources

3.2.3.1 Introduction

Surface and groundwater resources near the Project could be impacted from actions associated with the construction, O&M, and decommissioning of the Project. This analysis describes the surface and groundwater conditions and floodplains within a specific analysis area. The effects of the No Action Alternative and action alternatives on water resources are subsequently described and discussed. Information regarding wetlands can be found in Section 3.3.2.

3.2.3.1.1 SPATIAL AND TEMPORAL SCOPE OF ANALYSIS

The spatial scale for analysis of water resources encompasses the two watersheds that overlap Project activities. This area is referred to as the *water resources analysis area* or, more generally in this section, the *analysis area*. Because watersheds occur at a variety of scales, this EIS uses an area defined by the 12-digit Hydrologic Unit Code (HUC), which more commonly is referred to as a "subwatershed." The Project straddles two different subwatersheds: Hackberry Creek (HUC 110500020903) and Town of Fairmont-Skeleton Creek (HUC 110500020904) (Figure 3.2-3).

Potential effects to water resources from surface disturbance become diluted as downstream distance increases. Therefore, using the subwatersheds as the analysis area is appropriate because it allows consideration of Project effects to downstream waters without expanding the analysis to a scale where potential effects would be inconsequential, no matter their magnitude.

The temporal scale for analysis of water resource effects considers the timeframe beginning with construction and ending when revegetation is complete after decommissioning.

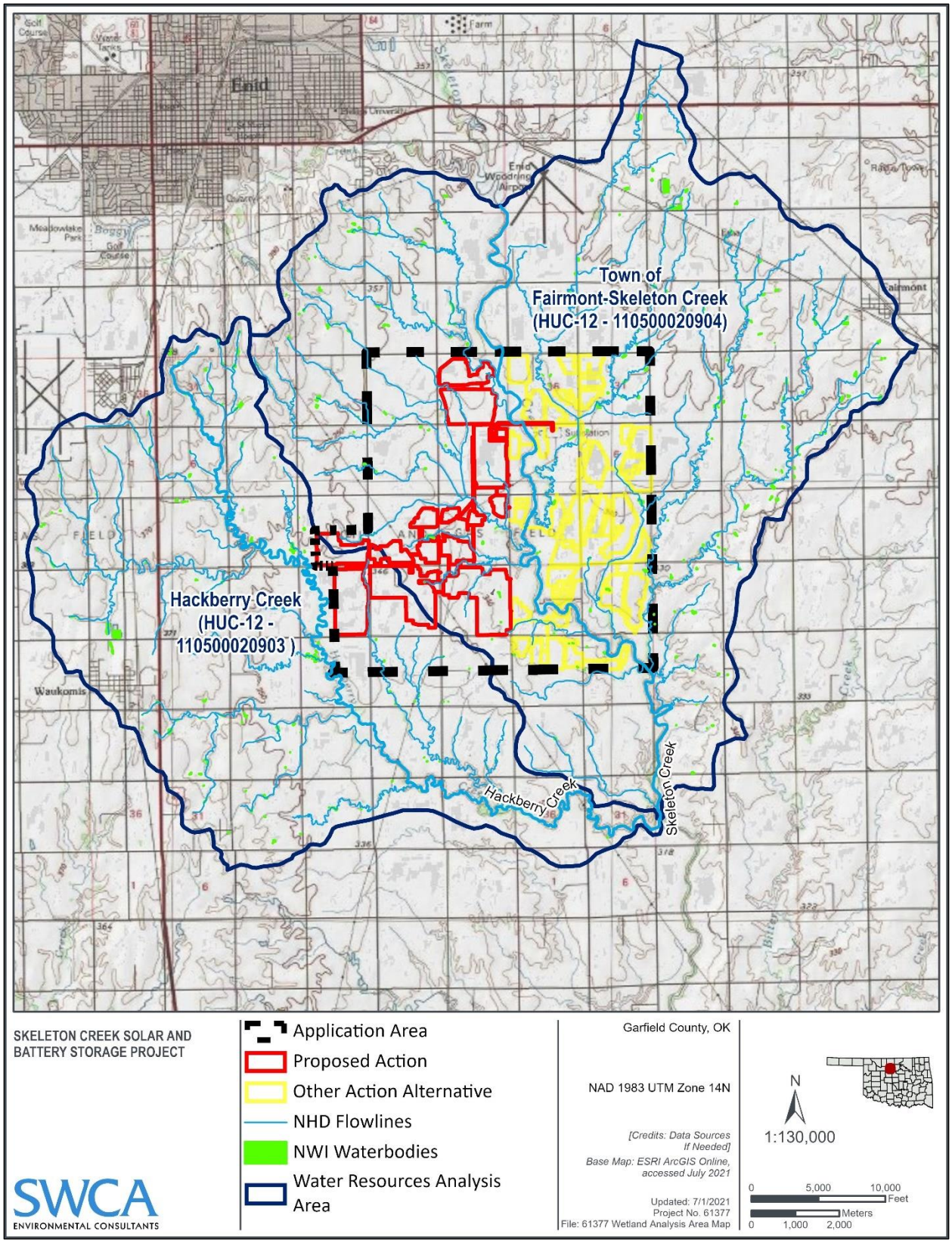

Figure 3.2-3. Water resources analysis area.

3.2.3.2 Affected Environment

3.2.3.2.1 SURFACE WATER

In all, 72% (1,497 acres) of the Proposed Action footprint is within the Town of Fairmont-Skeleton Creek subwatershed, whereas 28% (586 acres) is within the Hackberry Creek subwatershed (Table 3.2-15; see Figure 3.2-3). Surface water within the analysis area primarily consists of runoff from agricultural fields and generally drains to the southeast via Skeleton Creek and Hackberry Creek. The confluence of Skeleton Creek and Hackberry Creek is approximately 3.5 miles southeast of the Project. The confluence of Skeleton Creek and Hackberry Creek is the southeastern extent of the analysis area. The analysis area is bordered by the city of Enid to the northwest, the town of Fairmont to the northeast, and the town of Waukomis to the southwest. Although all surface water within the state receives broad protection through the Oklahoma Water Quality Standards, the analysis area does not contain waterbodies or watersheds with special provisions (e.g., outstanding resources waters, nutrient-limited watershed, or sensitive public and private water supply) (OWRB 2021a; 2021b) There are no impaired waters (i.e., 303[d]-listed waters) within the analysis area (Oklahoma Department of Environmental Quality 2020). The analysis also has no navigable waters subject to Section 10 of the Rivers and Harbors Act of 1899 (USACE Tulsa District 2021). Based on available data, livestock watering accounts for 51% of surface water use within Garfield County, whereas mining, irrigation, and public supply account for 44%, 5%, and < 1%, respectively (USGS 2015).

Table 3.2-15. Subwatersheds within the Analysis Area

Subwatershed Name	HUC No.	Acres in the Proposed Action Footprint	Total Acres
Hackberry Creek	110500020903	586	20,386
Town of Fairmont-Skeleton Creek	110500020904	1,497	35,258

Surface water features within the analysis area were determined by using the U.S. Geological Survey's (USGS's) National Hydrography Dataset (NHD) and the USFWS's National Wetlands Inventory (NWI). Based on a review of NHD and NWI data, there are 121 canals, ditches, or artificial paths; 244 intermittent streams; 18 perennial streams; and 341 waterbodies within the analysis area (USGS 2016; USFWS 2021a). SWCA also conducted an aquatic resources delineation in November 2020 and May 2021 within the Proposed Action footprint. During the delineation, SWCA field-identified 24 ephemeral streams, one intermittent stream, one perennial stream (Skeleton Creek), and eight waterbodies within the Proposed Action footprint (SWCA 2021b) (Figure 3.2-4). The delineation was performed using the routine on-site delineation methods in accordance with the *Corps of Engineers Wetlands Delineation Manual* (USACE 1987) and the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual*: *Great Plains Region (Version 2.0)* (USACE 2010).

Table 3.2-16 provides the quantities of surface water feature types within the analysis area (USGS 2016; USFWS 2021a) as well as surface water feature types within the Proposed Action footprint as identified during SWCA's delineation.

Table 3.2-16. Surface Water Features within the Analysis Area and Proposed Action Footprint

Surface Water Features	Linear Feet	Acres
Analysis Area*		
Canals, ditches, and artificial paths	37,154	–
Intermittent streams	970,048	–
Perennial streams	195,683	–
Waterbodies	–	207
Proposed Action Footprint†		
Ephemeral streams	8,096	–
Intermittent stream	502	–
Perennial stream (Skeleton Creek)	1,080	
Waterbodies	–	7

* Data from USGS (2016) and USFWS (2021a).

† Data from SWCA (2021).

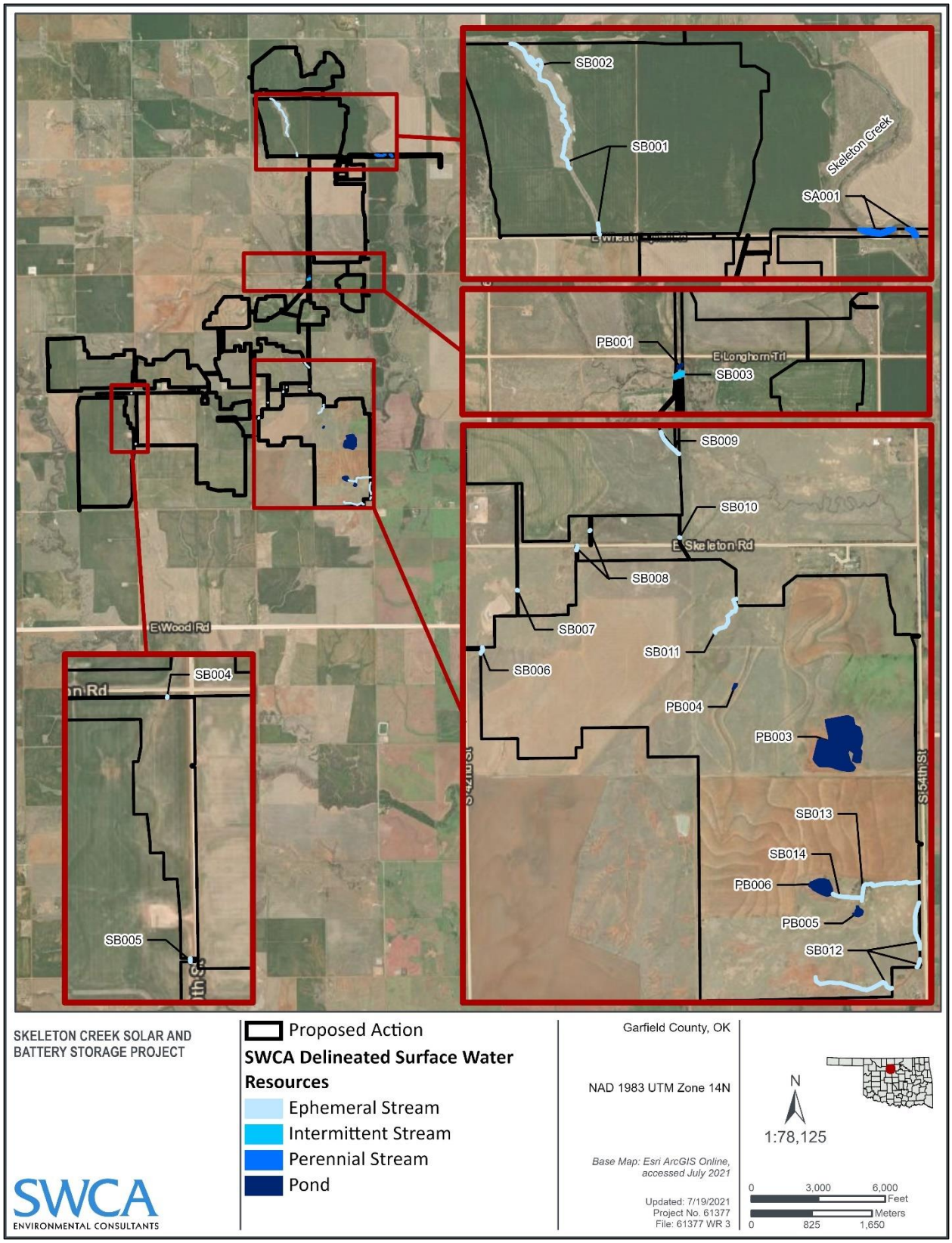

Figure 3.2-4. SWCA delineated surface water resources within the Proposed Action footprint.

3.2.3.2.2 GROUNDWATER

Approximately 96% of the analysis area is located on the NCO minor bedrock aquifer (OWRB 2020b) (Figure 3.2-5). Because this aquifer if unconfined, the groundwater table within this aquifer is free to move up and down based on the amount of recharge and discharge from the aquifer. The depth to water is generally greater than 20 feet below the ground surface. A small portion (4%) of the analysis area is located on the Enid Isolated Terrace (EIT) major alluvial aquifer (OWRB 2020b) (see Figure 3.2-5). The OWRB reports wells within the EIT aquifer are capable of producing over 100 gallons per minute (OWRB 2014). Water wells within minor bedrock groundwater basins yield less than 50 gallons per minute on average. The average reported yield within the NCO minor bedrock aquifer is 12 gallons per minute (Belden 1997). The low discharge rate is evident by the concentrations of groundwater wells over the NCO aquifer compared to the concentrations of wells over the EIT aquifer (OWRB 2021a). Therefore, well pumping accounts for a small fraction of groundwater discharge within the NCO aquifer (Belden 1997).

Groundwater wells within the NCO minor bedrock aquifer support agricultural, commercial, industrial, mining, domestic, and livestock needs (Belden 1997). Belden (1997) also reports two public water systems (Fairmont and Waukomis) within the analysis area that obtain drinking water from the NCO aquifer. Groundwater use within the EIT major alluvial aquifer primarily consists of irrigation and public water supply (OWRB 2014). However, no sole source aquifers are present in the analysis area (EPA 2020b).

All non-domestic groundwater use must be permitted by the OWRB. In Oklahoma, groundwater use is a legal property right tied to the ownership of the land. There are four legal requirements that must be satisfied when obtaining a water use permit: 1) the applicant must own or lease the land from which the water will be withdrawn, 2) the land overlies a fresh groundwater basin, 3) the water will be put to beneficial use, and 4) waste of the water would not occur (OWRB 2021a).

3.2.3.2.3 FLOODPLAINS

Executive Order (EO) 11988, Floodplain Management (44 CFR 9), directs federal agencies to take action to reduce or eliminate flood loss risks; minimize the impacts of floods on human health, safety, and welfare; and restore and preserve the natural and beneficial values served by floodplains. According to the Federal Emergency Management Agency (FEMA) National Flood Hazard Layer (FEMA 2020), 8,202 acres of mapped 100-year floodplains floodplain is in the analysis area (Figure 3.2-6). These FEMA-mapped floodplains represent 100-year floodplains that have a 1% chance of being inundated in a given year. In addition, approximately 36 acres of the analysis area is mapped as the 500-year floodplain. These FEMA-mapped floodplains represent 500-year floodplains that have a 0.2% annual chance of being inundated in a given year. The remaining portions of the analysis area are mapped as Zone X, or areas outside of the 100-year and 500-year floodplains. However, the Project has been sited to avoid floodplains, as applicable. Therefore, only 15 acres of 100-year floodplain and 1 acre of the 500-year floodplain are mapped within the Proposed Action footprint.

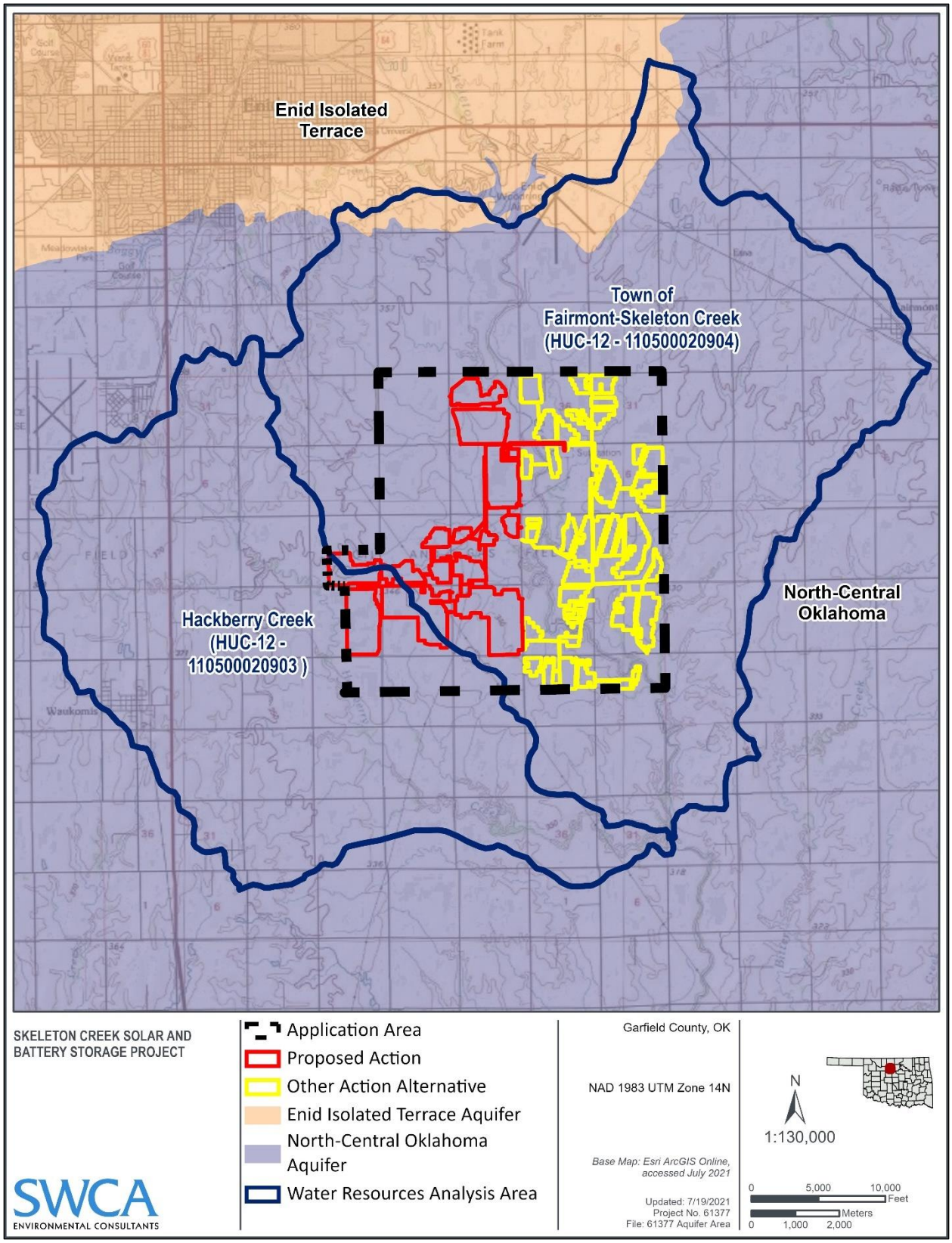

Figure 3.2-5. Aquifers beneath the analysis area.

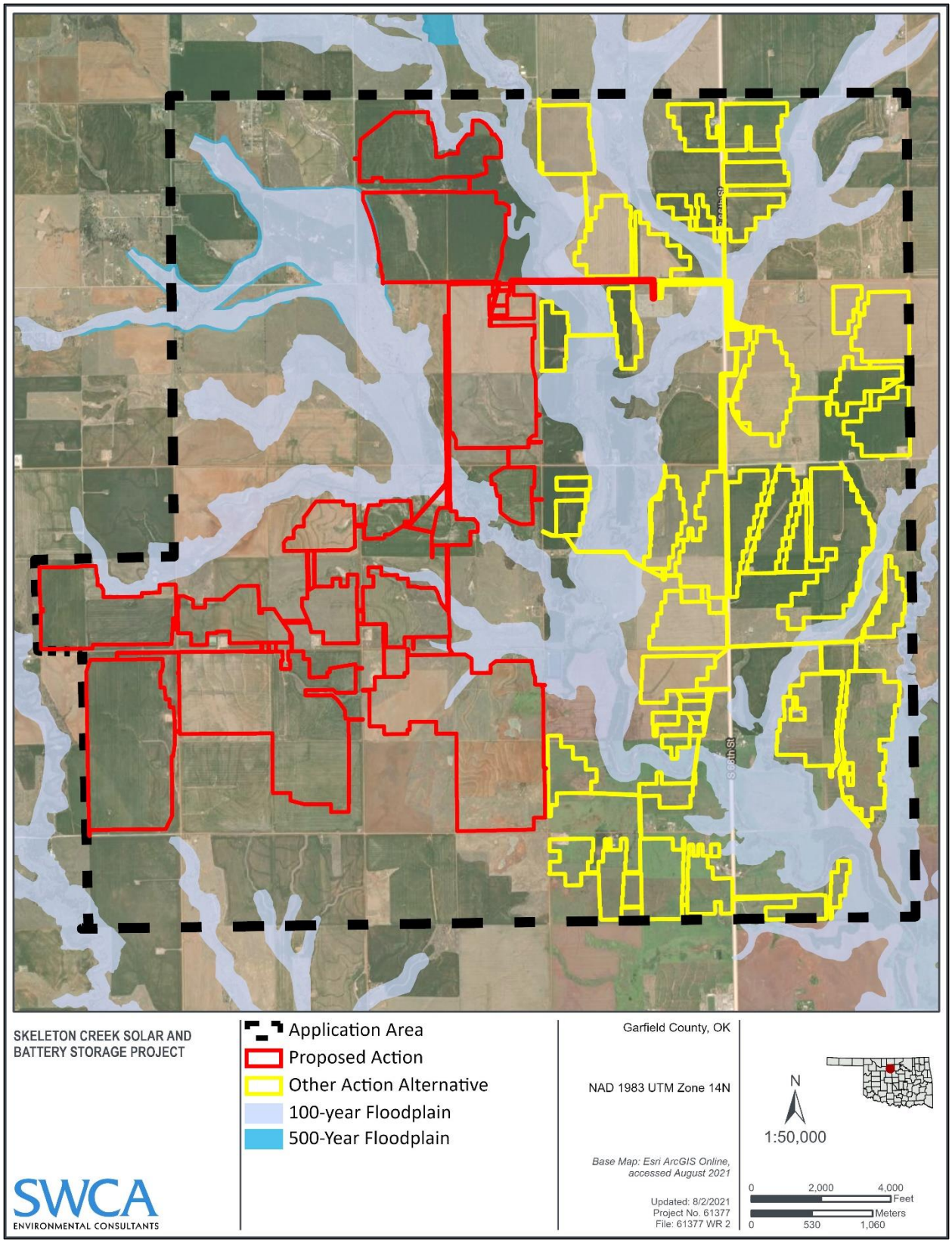

Figure 3.2-6. FEMA-mapped floodplains within the Proposed Action and Other Action Alternative footprints.

3.2.3.3 Environmental Consequences

3.2.3.3.1 METHODOLOGY

Table 3.2-17 lists the issues identified for this resource and the indicators and impact thresholds used to assess impacts for this EIS.

Table 3.2-17. Water Resources Issues, Indicators, and Impact Thresholds

Issues	Indicators	Impact Thresholds
Surface water impacts	Acres of impacts to surface waters	Exceeds a Nationwide Permit threshold (≥ 0.5 acre of permanent impact).
Impacts to floodplains	Acres of floodplain impacted Installation or construction of aboveground features	Impacts cannot not be permitted, e.g., activities in floodplains would result in an increase in flood levels.
Impacts to groundwater	Acre-feet of water used by the Project	Water use exceeds permitted amounts allowed by OWRB.

Surface water data collected during the November 2020 and May 2021 aquatic resources delineation were overlaid, along with desktop NWI and NHD data, on each alternative footprint to estimate impacts to surface water within the analysis area. Additionally, long-term impacts to surface water potentially meeting the criteria for WOTUS were assessed. Impacts to groundwater were assessed in this EIS using surface and subsurface disturbance thresholds that would occur as a result of the Project. Impacts to floodplains were assessed by determining acres of disturbance within floodplains compared to the overall floodplains mapped within the analysis area.

For this resource analysis, impacts to surface water resulting from construction of access roads and installation of underground collection lines are considered temporary because these surface waters would be restored to preconstruction contours or properly culverted. Impacts resulting from installation of the PV panels are considered long-term impacts because grading and fill in these surface waters could be required for the life of the Project. RUS assumes that the gen-tie line associated with the Project would span Skeleton Creek and not result in long-term or temporary impacts to surface water resources. Likewise, the additional fenced land that is outside the construction footprint of specific Project infrastructure would be mowed but not graded or otherwise disturbed. Therefore, mowing would not result in impacts to surface water resources.

3.2.3.3.2 NO ACTION ALTERNATIVE

Under the No Action Alternative, the Project would not be constructed, and there would be no impacts on water resources from the Project. However, existing and reasonably foreseeable trends and actions would continue to affect water resources in the analysis area.

The predominant current land use in the analysis area is cropland, which would continue into the future. Soil disturbance and herbicide-pesticide use associated with agricultural activities could introduce sedimentation and pollutants into analysis area waters. Likewise, other ongoing commercial and industrial activities could result in accidental spills that could affect surface or groundwater in proximity. Reasonably foreseeable trends and actions such as renewable energy, generation, and transportation development, as described on Table 4.4-1, could also cause long-term and or temporary impacts to water resource through floodplain modifications, groundwater use, and fill or alteration of surface water features. However, as noted in Section 3.2.3.2, current activities have not resulted in impaired waters (i.e., 303[d]-listed waters) within the analysis area. This EIS assumes that future development would comply with local, state, or federal regulatory requirements to avoid or minimize water resource impacts. However, not all actions on private lands would be subject to regulatory requirements.

3.2.3.3.3 PROPOSED ACTION

Construction

Surface Water

Site preparation, installation of the PV panels, construction of access roads, and installation of underground collection lines could increase sedimentation into surface waters from stormwater runoff or potentially introduce contaminants into surface water resources during construction.

Based on SWCA's 2021 delineation data, two surface water features (SA001 [perennial stream] and SB003 [intermittent stream]) are likely considered WOTUS (SWCA 2021b). However, none of the ephemeral streams or waterbodies delineated within the Proposed Action footprint would meet the criteria for WOTUS (see Section 3.3.2).

Approximately 831 linear feet of ephemeral streams and four waterbodies would be impacted in the long term by the installation of PV panels. Additionally, approximately 250 linear feet of ephemeral streams, one waterbody, and 108 linear feet of intermittent stream would be temporarily impacted by open trenching associated with the installation of underground collection lines and construction of access roads (Table 3.2-18). Because all WOTUS impacts would be temporary, no long-term impacts to WOTUS would occur. Impacts to surface waters would account for less than 4% of the total surface water features within the analysis area. The Applicant would implement a restoration and revegetation plan following construction activities. Temporary disturbance areas from construction would be revegetated as practicable (e.g., revegetation/reseeding, regrading, and decompaction) using seed mixes consisting of weed-free grasses and forbs that are appropriate to the geographic and elevation characteristics of the area to be seeded. By restoring vegetative cover, risk of runoff carrying sediment or pollutants to adjacent surface or groundwater would be minimized. Because no special provision watersheds are present in the analysis area, they would not be affected (OWRB 2021b).

As described in Section 2.3.2.5, the Applicant would implement erosion control and stormwater BMPs in accordance with Oklahoma Department of Environmental Quality standards to avoid or minimize impacts to surface water, including the implementation of a SWPPP. The SWPPP would identify the specific structural control measures and BMPs to be implemented. To minimize the risk of spills, the Applicant would administer an SPCC plan that includes spill tracking and routine inspections.

Table 3.2-18. Impacts to Surface Water Features within the Analysis Area under the Proposed Action

Features	Long-term Impacts (linear feet or acres)	Short-term Impacts (linear feet or acres)	Total Impacts (linear feet or acres)	Size of Features within Analysis Area (linear feet or acres)	Percentage of Impacts within Analysis Area
Ephemeral streams	831 linear feet	251 linear feet	1,082 linear feet	37,154 linear feet	2.9%
Intermittent stream	0 linear feet	108 linear feet	108 linear feet	978,238 linear feet	< 0.1%
Perennial stream (Skeleton Creek)	0 acre	0 acre*	0 acre	195,683 acre	–
Waterbodies	1 acre	0.1 acre	1 acre	208 acre	0.6%

Groundwater

Approximately 270 to 540 acre-feet of water would be required over the Project's 18-month construction period for soil conditioning and dust suppression. If groundwater from a leased existing or new well is used, withdraw amounts would be within allotted groundwater limits of the permitted well. Therefore, no significant impacts to groundwater would result from the Project. As noted above, the Applicant would administer an SPCC plan that includes spill tracking and routine inspections to minimize spill risks to analysis area groundwater sources.

Potential impacts to groundwater flow in karst features are discussed in Section 3.2.2 Geology and Soils.

Floodplains

Of the 15 acres of 100-year floodplain and 36 acres of 500-year floodplain mapped within the Proposed Action footprint, only 5 acres (4 acres of 100-year and 1 acre of 500-year floodplain) would be temporarily impacted by construction of underground collection lines and access roads. Construction of these features would not result in a change in elevation, and floodplains would be restored to preconstruction contours once construction is complete. Therefore, no long-term impacts to floodplains would result from the Project.

Operations, Maintenance, and Decommissioning

O&M activities would consist of vegetation management, road grading, water application for periodic dust control and maintenance applications, normal inspection of equipment and hardware, minor repairs activities to transmission structures, and emergency repairs, as needed. These actions could result in transport of sedimentation or pollutants to surface water resources if they result in ground disturbance or accidental spills. However, these actions would be localized and intermittent. Applicant compliance with the SPCC plan and maintenance of vegetative cover would reduce the likelihood of impacts to surface or groundwater.

Batteries associated with the battery storage system would be lithium ion–based, or similar, which includes industry standard design features to significantly reduce the potential of a spill or leak. The battery storage system would also be designed to provide secondary containment. The Applicant would be required to inspect the battery storage system for damage prior to installation and during routine O&M. Damaged systems would be handled in accordance with manufacturers specifications. Damaged or spent batteries would be removed from the site and disposed of or recycled in accordance with federal and state laws. All releases of potentially hazardous materials would be handled in accordance with the waste and hazardous materials plan, emergency response plan, or other applicable plan for O&M of the facility.

The Applicant would selectively apply herbicides to only those areas where vegetation is posing a threat to infrastructure, in compliance with the invasive species and noxious weed management plan (see Section 2.3.2.1.12).

During decommissioning or plant re-powering, equipment and impervious surfaces would be removed and revegetated in a similar manner as during construction. Therefore, impacts would likely be similar to those described under the Construction section.

Cumulative Effects

The Project would result in an up-to-4% increase in surface water impacts as compared to the No Action Alternative. The Project would also add 5 acres of impacts to floodplains, although this accounts for < 1% of the overall floodplains mapped within the analysis area (see Table 3.2-18). Current land use activities

are within water quality limits and have not resulted in impaired water designations. BMPs described in Section 2.3.2.5 would be implemented to reduce short-term and long-term impacts that the Project would have on water resources. Groundwater use would also be limited and restricted to amounts allowable by OWRB. Therefore, no significant cumulative effects to water resources would result from the Project when considered in combination with other present and reasonably foreseeable trends and actions.

3.2.3.3.4 OTHER ACTION ALTERNATIVE

Construction, Operations, Maintenance, and Decommissioning

Potential water resource impacts from construction, O&M, and decommissioning (or plant re-powering) activities under this alternative are similar to the Proposed Action because the construction actions and schedule under both action alternatives would be similar in scope, duration, and location. In addition, the Proposed Action and Other Action Alternative are similar in landscape and available water resources. Unique effects associated with the Other Action Alternative are described below.

Surface Water and Floodplains

Based on the conceptual layout and review of the NHD and NWI data, 285 linear feet of intermittent streams (< 0.1 acre) and 40 linear feet of perennial stream (< 0.1 acre) would be temporarily impacted by open trenching associated with the installation of underground collection lines and construction of access roads (Table 3.2-19). No waterbodies would be impacted by the Other Action Alternative (USGS 2016; USFWS 2021a) (Figure 3.2-7 and Table 3.2-19). Therefore, no long-term impacts to WOTUS would occur. The Other Action Alternative would result in negligibly greater temporary impacts to intermittent streams and perennial streams, and lower impacts to waterbodies, as compared to the Proposed Action. However, impacts would still account for less than 1% of total surface water features within the analysis area. Additionally, 3 acres of FEMA-mapped 100-year floodplain would be impacted by Project construction (see Figure 3.2-7). No FEMA-mapped 500-year floodplains would be impacted by Project construction. Construction of Project features would not result in a change in elevation, and floodplains would be restored to preconstruction contours once construction is complete. Therefore, all effects to floodplains under this alternative would be temporary (see Table 3.2-19).

Table 3.2-19. Impacts to Surface Water Features and Floodplains within Analysis Area under the Other Action Alternative

Features	Impacts (linear feet or acres)	Features within Analysis Area (linear feet or acres)	Percentage of Impacts within Analysis Area	Net Gain/Loss Compared to Proposed Action (linear feet or acres)
Ephemeral streams	0 linear feet	37,154 linear feet	–*	Not applicable
Intermittent streams	285 linear feet	978,238 linear feet	< 0.1%	+ 177 linear feet
Perennial streams	40 linear feet	195,683 linear feet	< 1%	+ 40 linear feet
Waterbodies	0 acre	208 acres	–	- 1 acre
100-year floodplains	3 acres	8,202 acres	< 1%	- 1 acre

* NHD data do not include ephemeral streams.

± There are no Other Action Alternative Project components that would cause long-term impacts to surface waters (i.e., PV panels).

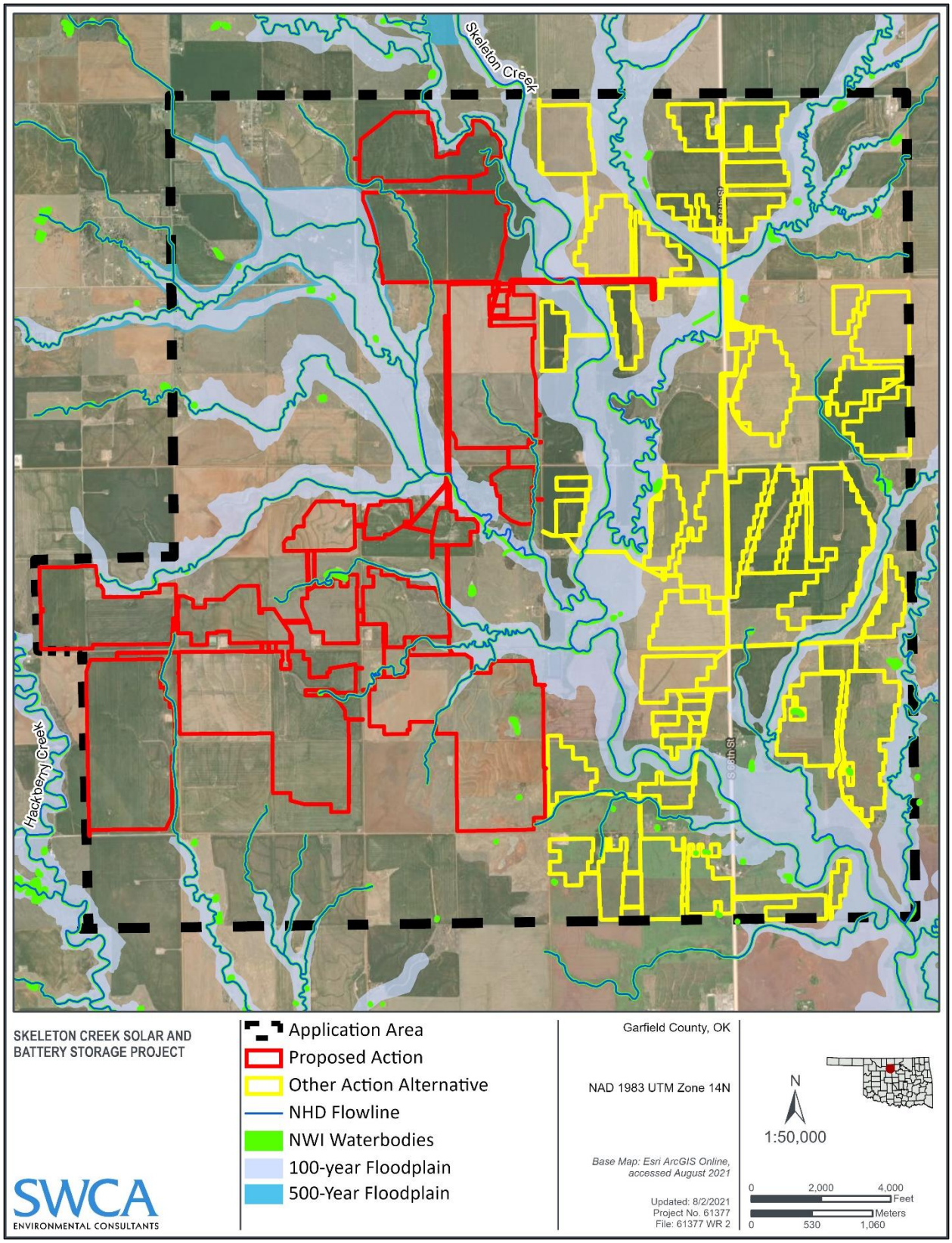

Figure 3.2-7. Surface water features within the Other Action Alternative footprint.

Cumulative Effects

Cumulative impacts to water resources under the Other Action Alternative would be the same as those described under the Proposed Action because the construction actions, schedule, and reasonably foreseeable trends and actions would be similar in scope and durations under both action alternatives.

3.2.3.4 Summary of Impacts

Impacts to water resources were assessed quantitatively between the No Action Alternative, Proposed Action, and the Other Action Alternative using the best available data. Under the No Action Alternative, the Project would not be constructed, and there would be no impacts to water resources. However, existing activities such as agricultural practices and reasonably foreseeable trends and actions would represent a potential source of sedimentation or pollutants to water resources in the analysis area. Under the Proposed Action and Other Alternative Action, ground-disturbing activities associated with construction, O&M, and decommissioning of the Project could result in sedimentation or accidental spills. However, with the implementation of BMPs described in Section 2.3.2.5, no impact thresholds would be triggered as a result of the Project, either individually or when considered in combination with other present and reasonably foreseeable trends and actions.

3.3 BIOLOGICAL RESOURCES

3.3.1 Vegetation, including Invasive Species, Noxious Weeds, and Special-Status Plants

3.3.1.1 Introduction

Federal regulations require that agencies take into account the effects of federal undertakings on any plant species or habitat considered to be special status. The term *special status* refers to individuals or populations of plants that are listed federally as threatened, endangered, or candidate species, or that are state-listed. Project actions associated with the construction, O&M, and decommissioning of the Project could disturb or remove vegetation cover, or result in the spread of invasive species and noxious weeds. Additionally, during scoping, concerns were expressed that grading activities, consisting of excavation and compaction of earth, would inhibit the success rate of postconstruction vegetation establishment.

This analysis describes the presence of vegetation communities within a specific analysis area. The effects of the No Action Alternative and the action alternatives on vegetation are subsequently described and discussed.

3.3.1.1.1 SPATIAL AND TEMPORAL SCOPE OF ANALYSIS

The spatial scale for analysis of potential effects to vegetation is the Application Area. This area is referred to as the *vegetation analysis area* or, more generally in this section, the *analysis area*. Although certain vegetation communities may extend beyond this boundary, all Project impacts are anticipated to occur within the boundary of the analysis area.

The temporal scale of effects for vegetation considers the timeframe beginning with construction and ending when revegetation is complete following decommissioning.

3.3.1.2 Affected Environment

3.3.1.2.1 VEGETATION COMMUNITIES

The analysis area is located within the Central Great Plains EPA Level III ecoregion and the Prairie Tableland EPA Level IV ecoregion (Woods et al. 2005). Topography within the Prairie Tableland ecoregion is primarily level, and vegetation is dominated by a cultivated cropland vegetation community fragmented with native mixed grass prairie and riparian forests vegetation communities. These characteristics are consistent with vegetation present in the analysis area. These vegetation communities are described below, as derived from the Woods et al. (2005) ecoregion description, and supplemented by vegetation descriptions collected during the aquatic resource delineation completed within the analysis area.

Mixed Grass Prairie

According to the Prairie Tableland ecoregion description, the most dominant native vegetation communities, although fragmented throughout the analysis area, is a mixed grass prairie. Within the Prairie Tableland, mixed grass prairie is typically characterized by little bluestem (*Schizachyrium scoparium*), side-oats grama (*Bouteloua curtipendula*), blue grama (*Bouteloua gracilis*), Indiangrass (*Sorghastrum nutans*), big bluestem (*Andropogon gerardii*), switchgrass (*Panicum virgatum*), and buffalograss (*Bouteloua dactyloides*) within its dominant herbaceous stratum (Woods et al. 2005).

Grassland vegetation documented within the analysis area during the aquatic resource delineation (SWCA 2021b) includes native and invasive herbaceous species, including johnsongrass (*Sorghum halepense*), field brome (*Bromus arvensis*), bermudagrass (*Cynodon dactylon*), catchweed bedstraw (*Galium aparine*), common ragweed (*Ambrosia artemisiifolia*), curly dock (*Rumex crispus*), wooly plantain (*Plantago patagonica*), and yellow bluestem (*Bothriochloa ischaemum*).

Riparian Forests

Woods et al. (2005) describes the dominant species within riparian forests of the Prairie Tableland ecoregion as woody species such as cottonwood (*Populus* spp.), willow (*Salix* spp.), ash (*Fraxinus* spp.), and elm (*Ulmus* spp.). During the aquatic resources delineation within the analysis area, riparian forest vegetation was observed along streams and other waterbodies and typically consisted of sugarberry (*Celtis* spp.), eastern cottonwood (*Populus deltoides*), and eastern redcedar (*Juniperus virginiana*). Sapling species within the riparian forests included sugarberry and cedar elm (*Ulmus crassifolia*) with bermudagrass and Indian Canadian horsetail (*Conyza canadensis*).

Cultivated Cropland

Although the mixed grass prairie and riparian forests represent the predominant historic vegetation communities in the analysis area, these vegetation communities have been significantly altered and fragmented by agricultural activity and largely converted to cultivated cropland. The most common cultivated croplands in this ecoregion include winter wheat (*Triticum aestivum*), grain sorghum (*Sorghum bicolor*), and alfalfa (*Medicago sativa*). Within areas of higher precipitation in the Prairie Tableland ecoregion, soybeans (*Glycine max*) are also cultivated, and cotton (*Gossypium* spp.) is cultivated wherever mechanization is suitable on smooth terrain (Woods et al. 2005). In addition, other crops typically grown in prime farmland in this region typically include hay and canola (*Brassica napus*) (NRCS 2021). During the aquatic resource delineation completed within the analysis area, winter wheat and maize (*Zea mays*) were observed in the cultivated cropland (SWCA 2021b).

3.3.1.2.2 INVASIVE SPECIES AND NOXIOUS WEEDS

The Oklahoma Invasive Plant Council ([OIPC] 2014) provides a list of invasive plant species split by physical regions. The analysis area is located within the Red Carpet Country, which is situated within the broader Northwest Region of Oklahoma (OIPC 2014). Table 3.3-1 lists these invasive plant species as well as noxious weeds found within the Red Carpet Country Region (OIPC 2014; Oklahoma State Department of Agriculture 2000).

Table 3.3-1. Invasive Plant Species and Noxious Weeds within the Red Carpet County Region of Oklahoma

Common Name	Scientific Name	Invasive Species	Noxious Weed
Giant reed	*Arundo donax*	X	
Plains bluestem	*Bothriochloa bladhii*	X	
Paper mulberry	*Broussonetia papyrifera*	X	
Canada thistle	*Cirsium arvense*	X	X
Musk thistle	*Carduus nutans*		X
Field bindweed	*Convolvulus arvensis*	X	
Thorny olive	*Elaeagnus pungens*	X	
Autumn olive	*Elaeagnus umbellata*	X	
Blackspot	*Glaucium corniculatum*	X	
Purple loosestrife	*Lythrum salicaria*	X	
Scotch thistle	*Onopordum acanthium*	X	X
Sulfur cinquefoil	*Potentilla recta*	X	
Ravennagrass	*Saccharum ravennae*	X	

3.3.1.2.3 SPECIAL-STATUS SPECIES

There are no known special-status plant species in the analysis area. The Oklahoma Natural Heritage Inventory ([ONHI] 2005; OHNI 2021) and the USFWS (2021b) do not list any federally protected plant species in Garfield County. Therefore, special-status plant species are not analyzed in this EIS.

3.3.1.3 Environmental Consequences

3.3.1.3.1 METHODOLOGY

Table 3.3-2 lists the issues identified for this resource and the indicators and impact thresholds used to assess impacts for this EIS.

Table 3.3-2. Vegetation Issues, Indicators, and Impact Thresholds

Issues	Indicators	Impact Thresholds
Disturbance (trampling, compaction) or removal of vegetation	Acres of surface disturbance Vegetation communities affected	No impact thresholds established by regulations; best professional judgment
Inhibition of vegetation growth	Vegetation communities affected Qualitative assessment of the success of root formation, risk of contact with spills, dust accumulation on foliage, and postconstruction revegetation	
Introduction of invasive species or noxious weeds	Qualitative assessment of potential for introduction	

Comprehensive vegetation community surveys and mapping have not been completed for the Project. Therefore, the analysis relies on desktop evaluations, agency coordination (ONHI 2021), and geographic information systems analysis of land use and land cover data obtained from the USGS National Land Cover Dataset (NLCD) (Homer et al. 2016). NLCD is a land cover database for the nation that provides spatial reference and descriptive data for characteristics of the land surface such as thematic class (e.g., barren land, cultivated crops, developed, grassland/herbaceous, open water, and pasture/hay). Acreage of land cover by classification was calculated for the analysis area and for the Proposed Action and Other Action Alternative footprints.

Generally, the vegetation communities described in Section 3.3.1.2.1 exist within the stricter NLCD classifications as shown below in Table 3.3-3. To support evaluation of impacts to vegetation communities from the Project, the vegetation communities that occur near the Project are cross-referenced with the NLCD land cover types. Impacts from the Project were then estimated quantitatively by evaluating the acreage of surface impacts to the vegetation communities.

For the purposes of analysis, certain Project components (long-term access roads, solar inverter, energy store system, solar array, and substation) would have long-term impacts. Temporarily impacted areas would consist of the temporary access roads, gen-tie line, additional fenced land, and underground collection lines.

Table 3.3-3. Land Cover Types and Vegetation Communities Present in the Analysis Area

Land Cover Type	Vegetation Community	Comments
Barren land (rock/sand/clay)	–	Lacking vegetation because of human activity
Cultivated crops	Cultivated cropland	–
Deciduous forest	Riparian forest	–
Developed, low intensity	–	Lacking vegetation because of human activity
Developed, medium intensity	–	Lacking vegetation because of human activity
Developed, open space	–	Lacking vegetation because of human activity
Grassland/herbaceous	Mixed grass prairie	–
Open water	–	Lacking vegetation because of human activity
Pasture/hay	Mixed grass prairie	–

The inhibition of root growth, the risk of vegetation contact with spills, dust accumulation on foliage, and the introduction of invasive species and noxious weeds were assessed qualitatively for each vegetation community.

3.3.1.3.2 NO ACTION ALTERNATIVE

Under the No Action Alternative, the Project would not be constructed, and there would be no impacts on vegetation from the Project. However, existing and reasonably foreseeable trends and actions, primarily preexisting agricultural use, would continue to affect the general vegetation in the analysis area. The typical application of mechanical and chemical measures (e.g., applying fertilizers, herbicides, and pesticides) would be directed at maintaining or expanding cultivated cropland. Potential run-off of chemical measures used in agricultural practices could impact neighboring native vegetation communities by altering species composition, reducing the number of plant species and relative frequencies of some plants, and decreasing overall plant diversity.

Reasonably foreseeable trends and actions, as described in Table 4.4-1, could also result in long-term and temporary impacts through removal of vegetation, soil compaction, and vegetation maintenance. Although specific construction footprints are not known, RUS anticipates that these actions would either occur within developed land cover types (for projects adjacent to existing roads, bridges, or airport) or could impact cultivated cropland or mixed grass prairie because the makeup of the vegetation community is fairly uniform throughout the analysis area.

3.3.1.3.3 PROPOSED ACTION

Construction

The primary impacts to vegetation during Project construction would be associated with

- removal or crushing of vegetation communities;
- decreased plant productivity as a result of fugitive dust, soil compaction, introduction of invasive species, or exposure to contaminants; and
- plant community fragmentation.

Long-term removal of vegetation during construction would occur from the construction of the long-term access road, battery storage system, solar inverter, solar array, substation, and gen-tie line foundation. Temporary impacts to vegetation during construction would occur from the construction of the temporary access roads and underground collection lines. Of the approximately 2,120 acres of vegetation impacted by the Proposed Action, up to approximately 575 acres (27%) of vegetation could be removed during the Project's 30-year lifespan, whereas up to 67 acres (3%) of vegetation could be removed during construction but would be revegetated postconstruction (Table 3.3-4 and Figure 3.3-1).[10] The degree of these temporary impacts would depend on the type and amount of vegetation affected and the rate at which vegetation would regenerate postconstruction. Cultivated cropland (521 acres) and mixed grass prairie (50 acres) represent the dominant vegetation communities impacted in the long term. The remaining 4 acres includes land cover previously impacted by other human activity (e.g., barren land, developed, and open water).

Vegetation within 1,467 acres of additional fenced land would be mowed to a height of no more than 3 inches but otherwise would not be impacted by the Proposed Action. Within this fenced land, most of the vegetation (88%) would consist of cultivated crops. The conversion of cultivated crops to grassland/herbaceous cover due to mowing and other maintenance tasks may provide some benefit to vegetation communities by increasing plant species richness (Dee et al. 2016) and may provide benefit to certain wildlife habitat by better providing foraging opportunities (Elmore 2018).

[10] These estimates represent the most conservative scenario in which all vegetation is removed within the Proposed Action footprint. If the Applicant limits grading within the solar array and gen-tie line solely to foundations, the total vegetation removal could be reduced.

Table 3.3-4. Impacted Land Cover Types and Vegetation Communities under the Proposed Action

Land Cover Type*	Vegetation Community	Temporary Vegetation Removal (acres)	Long-term Vegetation Removal (acres)	Long-term Habitat Conversion (acres)	Total Impacted Acreage
Barren land (rock/sand/clay)	Lands impacted by other human activity*	–	< 1	0	< 1
Cultivated crops	Cultivated cropland	60	521	1,293	1,876
Developed, low intensity	Lands impacted by other human activity	–	< 1	< 1	< 1
Developed, open space	Lands impacted by other human activity	2	2	5	16
Grassland/herbaceous	Mixed grass prairie	5	50	163	221
Open water	Lands impacted by other human activity	–	1	5	6
Subtotal cultivated cropland		*60*	*521*	*1,293*	*1,876*
Subtotal mixed grass prairie		*5*	*50*	*163*	*221*
Subtotal lands impacted by other human activity		*2*	*4*	*11*	*23*
Total		**67**	**575**	**1,467**	**2,120**

* The impacts in this table do not account for the gen-tie line foundations (1 acre) because the specific foundation locations have not yet been identified.

Project construction could also alter factors that influence plant productivity. Soil compaction caused by foot travel, construction vehicles, grading activities, and equipment could inhibit root formation and result in lowered individual plant vigor or changes in plant abundance and species. Based on a study by Tracy et al. (2012), winter wheat was examined under two levels of soil compaction. Although root density was greater in the compacted soil, the root length was reduced overall. Soil porosity increased with time in the uncompacted treatment. Another study by Najafi et al. (2019) looked at impacts of low-disturbance construction methods and the overall low impact to mixed grass prairie soils. In comparing the industrial construction methods of access matting (low-disturbance methods) to sod-stripping (high-disturbance methods), the soil's physical properties, which include soil compaction, recovered significantly faster after applying low-disturbance methods. The root biomass also declined 77% under the high-disturbance method. This indicates that the compaction of soils temporarily impacted during construction could recover postconstruction.

In addition to soil compaction, fugitive dust from construction traffic could affect photosynthetic rates and decrease plant productivity (Hirano et al. 1990). Accidental spills could result in plant mortality. Likewise, with the disturbance of the soil surface and the temporary removal of previously established vegetation, invasive species and noxious weeds would have the opportunity to outcompete the preconstruction vegetation communities. In addition, total vegetation removal also would expose soils to potential wind and water erosion (Morrow et al. 2017). This could result in further loss of soil and vegetation, and potentially to increased sediment into water resources.

The Applicant would implement BMPs and design features to minimize impacts to vegetation (see Section 2.3.2.5). Vehicular traffic would remain on access roads, and foot traffic would be kept at a minimum to minimize wetland impacts, and wetland buffers would be maintained where able to increase the amount of undisturbed wetland areas. Hazardous materials would be handled properly in areas with secondary containment away from wetlands to avoid spills. To support these and other BMPs, relevant environmental documents (e.g., SWPPP, restoration and revegetation plan, invasive species and noxious weed management plan, SPCC plan, and hazardous waste materials plan) would be implemented as well

as used to properly train employees and contractors during construction. The Applicant's proposed dust abatement practice would also discourage layers of dust forming on vegetation (which inhibits photosynthesis) and provide additional watering to encourage vegetation growth and supplement hydrology.

Operations, Maintenance, and Decommissioning

Similar measures and practices are anticipated during the O&M and decommissioning (or plant re-powering) process of the Proposed Action as for the construction process. Up to 575 acres of vegetation would be removed for the duration of the Project. Additional, short-term vegetation impacts could occur during O&M activities due to soil compaction caused by foot travel, construction vehicles, and equipment, potentially hazardous material spills, and potential invasive species and noxious weed encroachment. However, foot and vehicle traffic and equipment activity would primarily occur within the previously disturbed or developed Proposed Action footprint. Vegetation maintenance would be applied at solar array, roads, and site facilities. Mowing turf too short as well as the application of herbicides to vegetation overgrowth on the constructed infrastructure could inhibit vegetation growth (Martin and Hillcock 2017). The herbicide application could also potentially runoff into buffering vegetation communities causing impacts just beyond the analysis area. However, the Applicant would use selective application of herbicides to only those areas where vegetation is posing a threat to infrastructure, in compliance with the invasive species and noxious weed management plan (Section 2.3.2.1.12).

Cumulative Effects

In general, cumulative impacts to vegetation from the Proposed Action could occur where other existing and reasonably foreseeable trends and actions occur within the analysis area. As noted in Section 3.3.1.3.2, current and reasonably foreseeable trends and actions could result in limited or altered species composition, a reduced number of plant species and relative frequencies of some plants, and decreased overall plant diversity. The Proposed Action would add to these vegetation impacts through up to 642 acres of short- to long-term vegetation removal, of which cultivated cropland would represent the largest vegetation community impacted (see Table 3.3-4). The Project could also influence factors affecting vegetation growth (e.g., revegetation, root formation, exposure to spills, and watering via dust abatement) and invasive species and noxious weed encroachment. However, BMPs and design features would be applied to minimize Project adverse impacts. Therefore, the Proposed Action when combined with other present and reasonably foreseeable trends and actions would not have a significant cumulative impact.

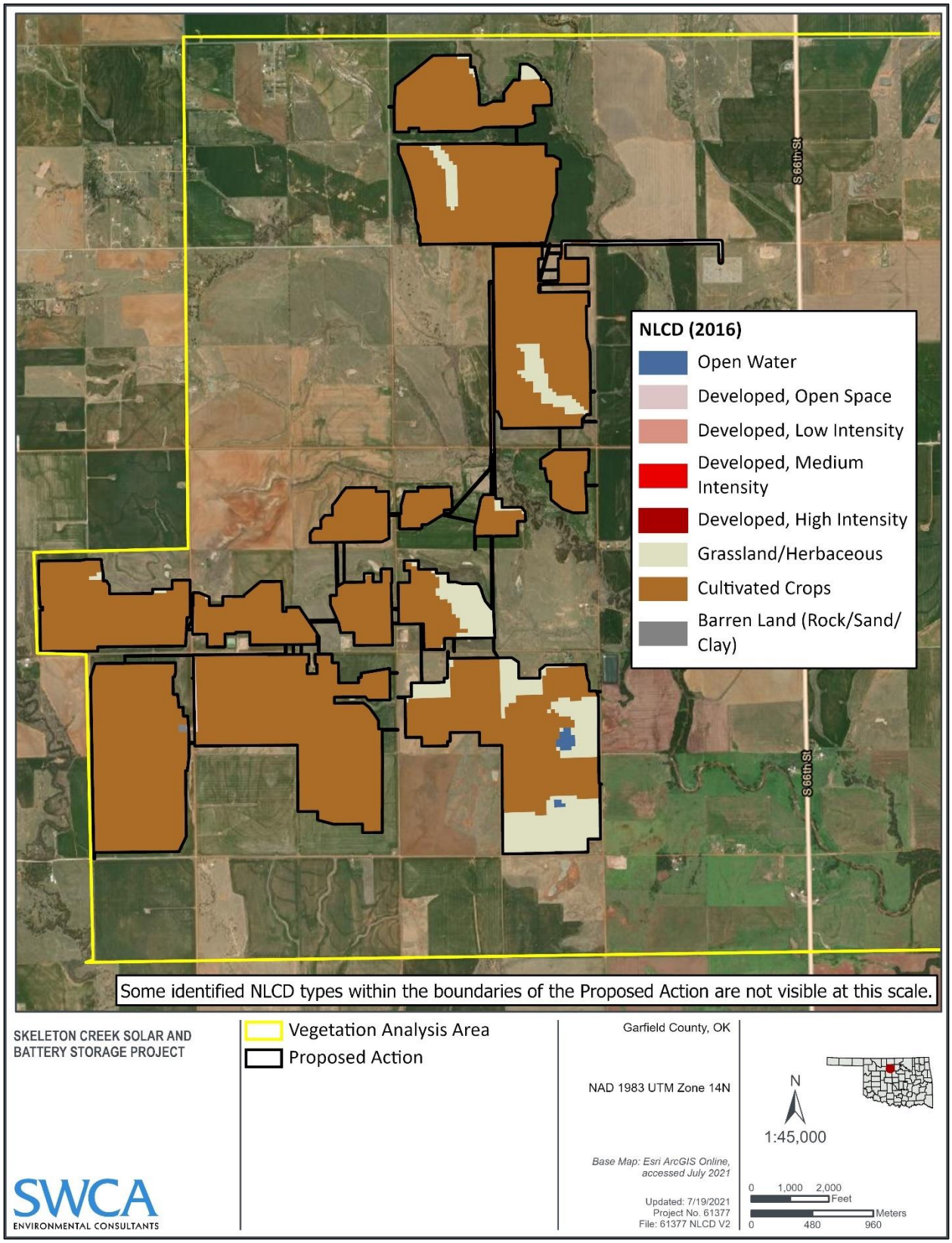

Figure 3.3-1. National Land Cover Dataset data in the Proposed Action footprint.

3.3.1.3.4 OTHER ACTION ALTERNATIVE

Construction, Operations, Maintenance, and Decommissioning

Potential impacts to vegetation resource from construction, O&M, and decommissioning (or plant re-powering) activities under the Other Action Alternative are similar to the Proposed Action because the construction actions and schedule would be similar in scope, duration, and location under both action alternatives. In addition, the makeup of the vegetation community is fairly uniform throughout the analysis area. Unique effects associated with the Other Action Alternative are described below.

The same criterion used in the Proposed Action analysis was used in the Other Action Alternative below in regard to short- and long-term impacts to vegetation. Based on the conceptual layout, up to an estimated 549 acres of vegetation would be removed under the Other Action Alternative (Figure 3.3-2). Of this total, approximately 42 acres (8%) is expected to be short-term impacts and approximately 506 acres (92%) is expected to be long-term impacts (Table 3.3-5). Most of the long-term impacts would be to cultivated crops (Table 3.3-5). An additional 1,185 acres of vegetation would be mowed to a height no more than 3 inches, which would result in vegetation conversion (predominately cultivated crops to grassland/herbaceous cover).

When comparing the quantitative impacts of the Proposed Action to the Other Action Alternative, the Other Action Alternative results in a slightly lower (14%) total impact with 549 acres less in total impacts, 69 acres less in long-term impacts, and 25 acres less in temporary impacts (see Table 3.3-4 and Table 3.3-5).

Table 3.3-5. Impacted Land Cover Types and Vegetation Communities under the Other Action Alternative.

Land Cover Type*	Vegetation Community	Temporary Vegetation Removal (acres)	Long-term Vegetation Removal (acres)	Long-term Habitat Conversion (acres)	Total Impacted Acreage
Cultivated crops	Cultivated cropland	30	424	988	1,443
Deciduous forest	Riparian forest	–	< 1	< 1	< 1
Developed, low intensity	Lands impacted by other human activity	< 1	< 1	< 1	< 1
Developed, open space	Lands impacted by other human activity	3	3	8	17
Grassland/herbaceous	Mixed grass prairie	9	79	187	279
Pasture/hay	Lands impacted by other human activity	< 1	1	2	3
Open water	Lands impacted by other human activity	–	< 1	< 1	< 1
Subtotal cultivated cropland		*30*	*424*	*1,185*	*1,744*
Subtotal mixed grass prairie		*9*	*79*		*87*
Subtotal riparian forest		*–*	*< 1*		*< 1*
Subtotal lands impacted by other human activity		*3*	*3*		*6*
Total		**42**	**506**		**549**

* The impacts in this table do not account for the gen-tie line foundations (1 acres) because the specific foundation locations have not yet been identified.

Cumulative Effects

As noted above, the Other Action Alternative would add an estimated 506 acres of long-term vegetation loss, 42 acres of short-term vegetation removal, and 1,185 acres of habitat alteration (through fencing and mowing) to future conditions under the No Action Alternative. However, this conversion represents no more than < 1% (temporary impacts) to 4% (long-term impacts) of these vegetation communities acreage within the 12,262-acre analysis area. Based on previous land cover trends, anticipated land use of the analysis area is projected to continue to be primarily agricultural. If Other Action Alternative construction activities coincide with other reasonably foreseeable trends and actions, cumulatively the Other Action Alternative could also contribute to changes in wetland quality through ground fragmentation, vegetation disturbance, vegetation die-off, hydrology alterations, and changes in water quality. Additionally, these measures could introduce and promote the growth of invasive and noxious plant species. However, the Applicant would implement measures to minimize vegetation impacts. RUS also assumes that other projects would comply with local, state, or federal regulatory requirements to avoid or minimize vegetation impacts, if actions are subject to regulatory requirements. Therefore, no significant cumulative impacts would occur.

3.3.1.4 Summary of Impacts

Impacts to vegetation communities were assessed quantitatively and compared between the No Action Alternative, Proposed Action, and the Other Action Alternative. Under the No Action Alternative, the Project would not be constructed, and there would be no impacts to existing vegetation from the Project. However, existing and reasonably foreseeable trends and actions, primarily caused by preexisting agricultural use, would continue to affect the general vegetation in the analysis area. Approximately 2,120 acres would be impacted through vegetation removal or alteration under the Proposed Action, whereas approximately 1,744 acres would be impacted under the Other Action Alternative (see Table 3.3-4 and Table 3.3-5). However, with the implementation of BMPs described in Section 2.3.2.5, no impact thresholds would be triggered as a result of the Project, either individually or when combined with other present and reasonably foreseeable trends and actions.

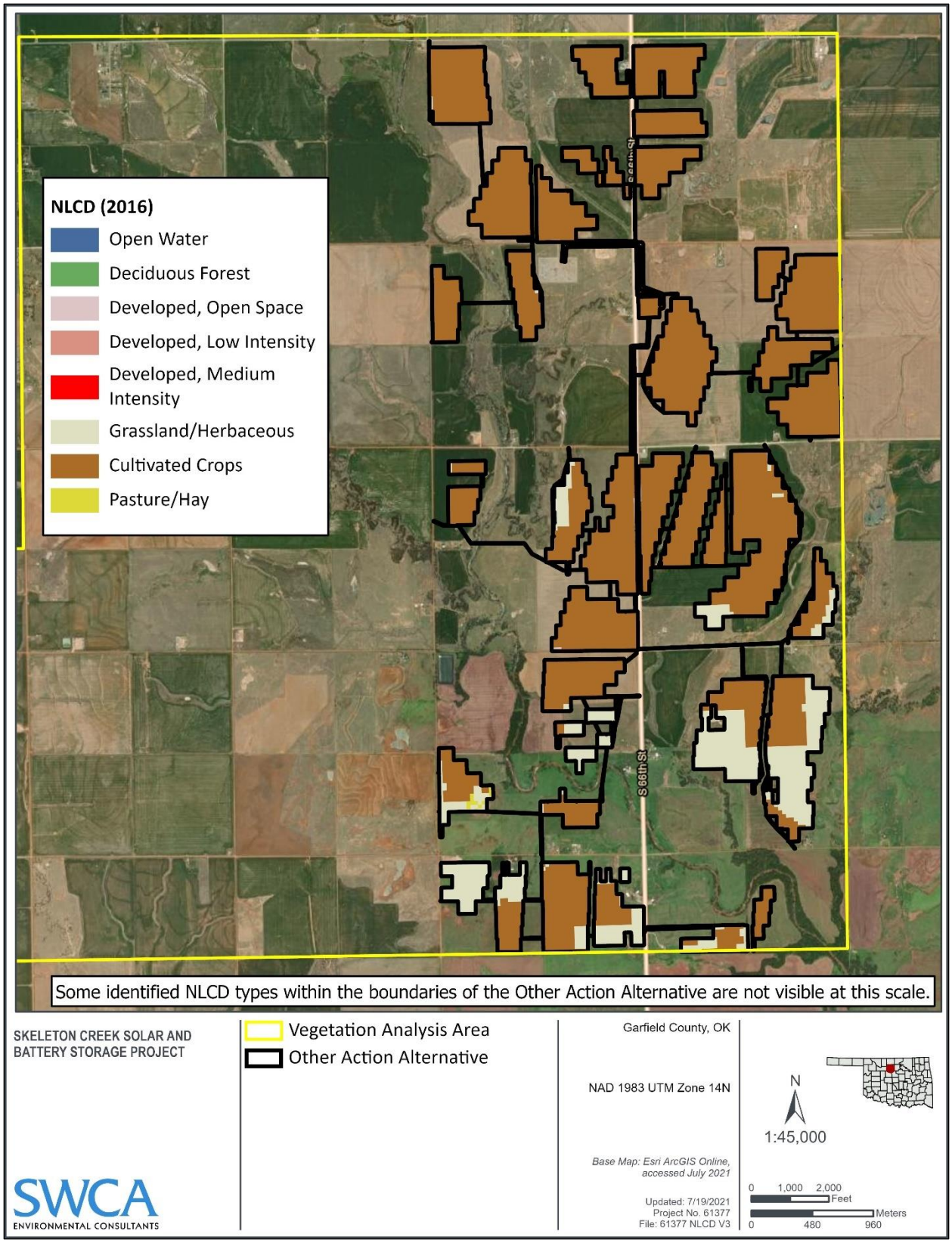

Figure 3.3-2. National Land Cover Dataset data for the Other Action Alternative footprint.

3.3.2 Wetlands

3.3.2.1 Introduction

EO 11990, Protection of Wetlands, requires federal agencies to avoid, to the extent practicable, long- and short-term adverse impacts associated with the destruction or modification of wetlands. The EO states further that where wetlands cannot be avoided, the Proposed Action must include all practicable measures to minimize harm to the wetlands.

According to the Navigable Waters Protection Rule that went into effect on June 22, 2020 (33 CFR 328), WOTUS include territorial seas and traditional navigable waters, perennial and intermittent tributaries, impoundments of the previously stated waters, and adjacent wetlands. Special aquatic sites associated with these waters are also considered WOTUS and include sanctuaries and refuges, wetlands, mud flats, vegetated shallows, coral reefs, and riffle and pool complexes.

This section describes the current condition of wetlands that could be present within a specific analysis area. The effects of the No Action Alternative, Proposed Action, and Other Action Alternative on wetlands are subsequently described and discussed. See the Water Resources section (see Section 3.2.3) for an analysis on other WOTUS such as streams, ponds, and lakes that occur within the water resources analysis area.

3.3.2.1.1 SPATIAL AND TEMPORAL SCOPE OF ANALYSIS

The spatial scale for analysis of potential effects to wetlands is the same analysis area defined for water resources in Section 3.2.3 and encompasses the two HUC-12 subwatersheds that overlap Project activities: Hackberry Creek (HUC 110500020903) and Town of Fairmont-Skeleton Creek (HUC 110500020904). These subwatersheds are referred to in this section as the *wetlands analysis area* or, more generally in this section, the *analysis area* (Table 3.3-6 and Figure 3.3-3). Defining the wetlands analysis area using the HUC-12 subwatersheds is appropriate because it allows for the analysis of Project effects to both upstream and downstream riparian and floodplain wetlands.

Table 3.3-6. Subwatersheds within the Wetland Analysis Area

Subwatershed Name	HUC-12	Acreage of Subwatershed*
Hackberry Creek	110500020903	20,397
Town of Fairmont-Skeleton Creek	110500020904	35,272
Total	**–**	**55,669**

* Data from USGS (2021).

The temporal scale for analysis of wetland effects considers the timeframe beginning with construction and ending when revegetation is complete after decommissioning.

3.3.2.2 Affected Environment

3.3.2.2.1 WETLAND HABITAT TYPES

USFWS NWI data and the Oklahoma Wetlands Program (OWP) wetland mapping data were used to identify wetlands within the analysis area (USFWS 2021c; OWP 2017). According to the NWI data, the analysis area contains 86 mapped NWI features, which account for approximately 147.5 acres (Table 3.3-7 and Figure 3.3-3). No wetland data have been mapped by the OWP for the analysis area. In

addition, SWCA completed an aquatic resource delineation for a portion of the analysis area overlapping the Proposed Action footprint. The delineation identified four Palustrine Emergent (PEM) wetlands totaling approximately 3.9 acres and one Palustrine Scrub-Shrub (PSS) wetland totaling approximately 1.1 acres (SWCA 2021b).

Table 3.3-7. National Wetland Inventory Wetland Habitat Types within the Analysis Area

Wetland Habitat Type	NWI Classification Code*	Acreage within Analysis Area	Count of NWI Features within Analysis Area
Hackberry Creek Subwatershed			
Palustrine Emergent wetlands	PEM1A	14.2	11
	PEM1Ah	2.0	4
	PEM1C	3.3	2
	PEM1Ch	4.4	5
	PEM1Fh	2.2	2
Palustrine Scrub-Shrub wetlands	N/A	N/A	N/A
Palustrine Forested wetlands	PFO1A	67.2	16
	PFO1Ah	3.6	3
Subtotal	*N/A*	*96.9*	*43*
Town of Fairmont-Skeleton Creek Subwatershed			
Palustrine Emergent wetlands	PEM1A	3.1	10
	PEM1Af	0.2	1
	PEM1Ah	0.6	1
	PEM1Ch	6.9	12
	PEM1Cx	3.8	2
	PEM1Fh	0.5	2
Palustrine Scrub-Shrub wetlands	PSS1A	< 0.1	1
Palustrine Forested wetlands	PFO1A	35.5	14
Subtotal	*N/A*	*50.6*	*43*
Total	**N/A**	**147.5**	**86**

Source: USFWS (2021c).

Notes: N/A = Not applicable.

* P = Palustrine; EM = Emergent; SS = Scrub-Shrub; FO = Forested; 1 = Persistent (PEM) or Broad-Leaved Deciduous (PSS/PFO); A = Temporary Flooded; C = Seasonally Flooded; F = Semipermanently Flooded; h = Diked/Impounded; x = Excavated.

Wetland systems within Oklahoma comprise three ecological systems: 1) palustrine, 2) lacustrine, and 3) riverine. Of these, palustrine wetlands are the dominant system within Oklahoma and include the following: bottom-land hardwood forests, swamps, marshes, wet meadows, aquatic-bed wetlands characterized by submersed or floating plants in ponds, lakes, rivers, sloughs, and sparsely vegetated wetlands (Fretwell et al. 1996). Lacustrine and riverine systems include both wetlands and deepwater habitats (Fretwell et al. 1996). Lacustrine systems are confined within intermittently to permanently flooded lakes or reservoirs, whereas riverine systems are confined within channels (Fretwell et al. 1996). The *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Great Plains Region (Version 2.0)* states that "many waters of the U.S. are unvegetated and thus are excluded from the Corps/EPA definition of wetlands, although they may still be subject to Clean Water Act regulation" (USACE 2010). Although USFWS NWI data include lacustrine and riverine systems, as well as

palustrine ponds, most of these systems include little to no vegetation and are typically considered deepwater habitats such as streams, rivers, ponds, lakes, and reservoirs. Although an aquatic resource delineation was completed within the Proposed Action footprint, a similar delineation within the analysis area could be used to determine the classification of wetland and waterbody features. Because of this classification, lacustrine and riverine NWI wetlands, as well as palustrine ponds, were not included in this section. See the Water Resources section (see Section 3.2.3) for an analysis on these surface water features.

Wetlands are typically the most common special aquatic resources and are defined by the USACE 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" (40 CFR 230.3(t)). Based on this definition, for an area to be considered a wetland, it must possess the following parameters under normal circumstances: 1) a predominance of vegetation adapted to live in water or saturated soils (i.e., hydrophytic vegetation), 2) soil characteristics of frequent saturation (i.e., hydric soils), and 3) the presence of hydrology showing evidence of regular flooding or ponding (i.e., wetland hydrology).

Wetlands are a federally regulated resource under the CWA (33 USC 1251) and EO 11990, Protection of Wetlands. Section 404 of the CWA (33 USC 1344) established a program to regulate the discharge of dredged or fill material in WOTUS, including wetlands. Activities regulated under this program include fill for development, water resource projects, and infrastructure development. Section 404 requires a permit before dredged or fill material may be discharged into WOTUS, including wetlands. In general, the USACE regulates impacts on wetlands or other WOTUS through its Section 404 Permit program.

A more detailed description of wetland habitats in the analysis area is provided below. See Table 3.3-7 for an overview of the NWI wetland habitat types, NWI classification codes, acreages, and counts of each NWI feature that occurs within the analysis area.

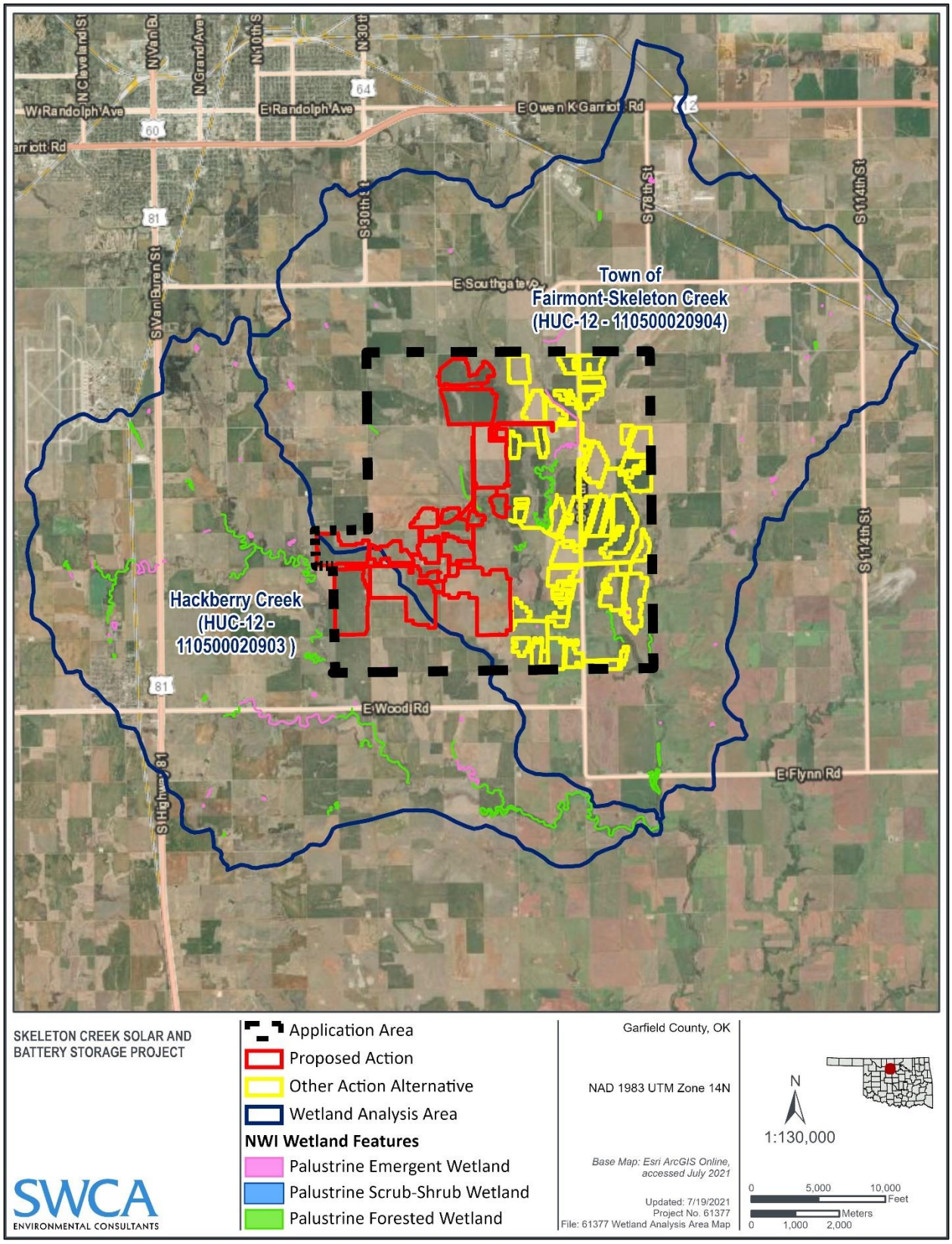

Figure 3.3-3. National Wetland Inventory data within the wetland analysis area and action alternative footprints.

Palustrine Emergent Wetlands

PEM wetlands are characterized as non-tidal, freshwater wetland habitats dominated by hydrophytic herbaceous vegetation (Cowardin et al. 1979).

Based on the NWI data, PEM wetlands are the second largest wetland habitat by acreage within the analysis area at 41.2 acres; however, PEM wetland accounts for the largest count of individual NWI features (52). All PEM wetlands are classified as being dominated by persistent vegetation (USFWS 2021c). The PEM wetlands within the analysis area have water regime classifications of temporary flooded, seasonally flooded, or semipermanently flooded (USFWS 2021c).

Palustrine Scrub-Shrub Wetlands

PSS wetlands are characterized as non-tidal, freshwater wetland habitats and are dominated by woody vegetation that is less than 20 feet in height. Woody vegetation in PSS wetlands can include shrubs and trees (Cowardin et al. 1979).

PSS wetlands are the smallest wetland habitat by both acreage and count at less than 0.1 acre and one NWI feature, respectively, within the analysis area, based on the NWI data (USFWS 2021c). The PSS wetland is dominated by broad-leaved deciduous vegetation and has a water regime classification of temporary flooded (USFWS 2021c).

Palustrine Forested Wetlands

Palustrine Forested (PFO) wetlands are characterized as non-tidal, freshwater wetland habitats and are dominated by hydrophytic woody vegetation that is greater than 20 feet in height and/or more than 3 inches in diameter at breast height (Cowardin et al. 1979; USACE 2010).

PFO wetlands account for the largest wetland habitat by acreage with 106.3 acres; however, they account for the second largest count with 33 NWI-mapped PFO features within the analysis area. The PFO wetlands are dominated by broad-leaved deciduous vegetation and have a water regime classification of temporary flooded (USFWS 2021c).

3.3.2.3 Environmental Consequences

3.3.2.3.1 METHODOLOGY

Table 3.3-8 lists the issues identified for this resource and the indicators and impact thresholds used to assess impacts for this EIS.

Table 3.3-8. Wetlands Issues, Indicators, and Impact Thresholds

Issues	Indicators	Impact Thresholds
Wetlands	Acres of disturbance or loss of wetlands by wetland type Impacts to wetland function	Project results in an individual permit (0.5 or more acres per impact) and requires mitigation.

As discussed in Section 3.2.3.2.1, an aquatic resources delineation of potential WOTUS, including the delineation of wetlands, was conducted in November 2020 and May 2021 (SWCA 2021b). The aquatic resource delineation was only completed for a portion of the analysis area; a desktop resources review of available background information was conducted to identify potential wetlands within the portion of the

analysis area that were not delineated. The main resource reviewed for the desktop portion of this analysis included USFWS NWI data (USFWS 2021c)[11] because the OWP has not mapped the watersheds near the analysis area (OWP 2017).

3.3.2.3.2 NO ACTION ALTERNATIVE

Under the No Action Alternative, the Project would not be constructed, and there would be no impacts to wetlands from the Project. However, existing and reasonably foreseeable trends and actions would continue to affect wetlands within the analysis area. Currently, the analysis area is primarily used for agricultural purposes, and these land uses would continue under the No Action Alternative. Wetlands not currently impacted by agriculture would be at risk of loss from future agricultural activities. The use of typical mechanical (tractors, planters, tillers, combines, etc.) and chemical (e.g., applying fertilizers, herbicides, and pesticides) agricultural measures within or near existing wetlands could also contribute to ground fragmentation, vegetation disturbance, vegetation die-off, hydrology alterations, and changes in water quality. Additionally, these measures could introduce and promote the growth of invasive and noxious plant species within existing wetlands.

Reasonably foreseeable trends and actions, as described in Table 4.4-1, also could result in short- to long-term impacts similar to those described above. Although specific construction footprints are not known, RUS anticipates that most actions would either occur within developed land cover types (for projects adjacent to existing roads, bridges, or airport) or impact cultivated cropland or mixed grass prairie because the makeup of the vegetation community is fairly uniform throughout the analysis area. Therefore, the likelihood of impact to wetlands under the No Action Alternative is low because open water represents less than 1% of total land within the analysis area. Additionally, RUS assumes that future development would comply with local, state, or federal regulatory requirements to avoid or minimize wetland impacts. However, not all actions on private lands would be subject to regulatory requirements.

3.3.2.3.3 PROPOSED ACTION

Construction

Potential impacts to wetlands from Project construction would include wetland loss and changes to wetland quality. Wetland fill activities from site grading and the installation of long-term equipment and impervious surfaces (e.g., fill material and long-term access roads) are considered long-term impacts resulting in wetland loss and long-term displacement of wetland vegetation, soils, and hydrology. Short-term wetland impacts could also result from foot travel, temporary access roads, construction vehicles, equipment movement, the temporary staging area, temporary construction areas, and underground collection lines. Wetlands impacted by these latter activities, as presented in Table 3.3-10, would be returned to preconstruction contours and allowed to revegetate once construction activities are complete.

Similar to the vegetation analysis in Section 3.3.1.3.3, long-term impacts to wetlands would result from the following Proposed Action components: long-term access roads, battery storage system, solar inverter, solar array, and substation. Short-term impacts to vegetation during construction would result from the temporary access roads and underground collection lines. There are no wetlands mapped within the aboveground gen-tie line footprint for the Proposed Action and one PEM wetland is mapped by NWI within the aboveground gen-tie line footprint for the Other Action Alternative. The length of this PEM wetland along the gen-tie centerline totals approximately 100 feet and could be spanned. Therefore, the gen-tie line was not included in the wetlands impact analysis. This EIS also assumes that the Applicant would avoid fill of wetlands within the additional fenced land and therefore was not included in the

[11] Although the USFWS NWI data and OWP wetland data are the best, publicly available data sources for preliminary wetland data within the analysis area, these sources may not account for recent land changes, and are based on aerial imagery and have not been ground-truthed.

wetlands impact analysis. However, the additional fenced land would be mowed during construction and maintenance; therefore, PSS or PFO wetlands within the additional fenced land would be converted to PEM wetlands. Project impacts to wetlands by wetland habitat type are summarized in Table 3.3-9 and impacts by delineated wetland feature are outlined in Table 3.3-10.

According to the aquatic resource delineation (SWCA 2021b) and above assumptions, the Proposed Action footprint could overlap approximately 1.8 acres of wetland (see Table 3.3-9 and Figure 3.3-4). Of this total, approximately 1.5 acres is PEM wetlands and approximately 0.3 acre is PSS wetlands. However, RUS anticipates that the Applicant would design and construct the Project in a manner that avoids or reduces disturbance to these wetlands. Therefore, no individual wetland impact would exceed the NWP threshold of 0.5 acre (see footnote in Table 3.3-9). Up to an additional approximately 0.3 acre would be converted from PSS wetlands to PEM wetlands due to mowing within the additional fenced land.[12] Mowing within the additional fenced land would not result in conversion of PEM wetlands because mowing would not cause a change in the vegetation type.

Table 3.3-9. Maximum Impacts to Wetlands by Construction Activities under the Proposed Action by Wetland Habitat

Wetland Habitat Type	Acreage Delineated within Proposed Action	Maximum Short-Term Wetland Impacts (acres) ††	Maximum Long-Term Wetland Impacts (acres) ‡	Long-Term Conversion (acres)	Maximum Total Impact (acres)
PEM	2.8	< 1	1.5	0	1.5
PSS	0.5	0.1	0.2	0.3	0.3
PFO*	0	0	0	0	0
Total	**3.3**	0.1	**1.7**	**0.3**	**1.8†**

* According to the USFWS NWI data, one NWI feature could occur within the Proposed Action footprint. This feature is classified as a PFO1A, or a PFO broad-leaved deciduous temporarily flooded wetland (USFWS 2021c). However, the aquatic resources delineation disproved the PFO1A NWI as a wetland, and it was subsequently mapped as an intermittent stream (discussed in Section 3.2.3 Water Resources).

† Excludes conversion impact acreage.

‡ This acreage represents a worst-case scenario in which all delineated wetlands are impacted by Project activities. However, RUS assumes that some wetland impacts would be avoided or minimized by Applicant design and installation; therefore, impacts would be lower and are expected to fall within NWP thresholds.

Table 3.3-10. Maximum Impacts to Wetlands by Construction Activities under the Proposed Action by Delineated Wetland Feature

Delineated Wetland Feature	Wetland Habitat Type	Project Component	Duration of Impact (short-term/long-term/conversion)	Maximum Impacted Acreage
WB001	PEM	Solar array	Long-term	< 0.1
WB002	PEM	Solar array	Long-term	0.8
		Temporary access roads	Short-term	< 0.1
		Long-term access roads	Long-term	< 0.1
WB002	PSS	Solar array	Long-term	0.1
		Temporary access roads	Short-term	< 0.1
		Long-term access roads	Long-term	< 0.1
		Additional fenced land	Conversion	0.3

[12] These estimates represent the most conservative scenario in which all vegetation is removed within these Project component footprints. If the Applicant limits grading within the solar array and gen-tie solely to foundations, the total wetland loss could be reduced.

Delineated Wetland Feature	Wetland Habitat Type	Project Component	Duration of Impact (short-term/long-term/conversion)	Maximum Impacted Acreage
WB003	PEM	Solar array	Long-term	0.5
		Underground collection lines	Short-term	< 0.1
WB004	PEM	Solar array	Long-term	0.2
Subtotal maximum short-term impacts				*0.1*
Subtotal maximum long-term impacts				*1.7*
Subtotal conversion impacts				*0.3*
Maximum Total				**1.8***

* Excludes conversion impact acreage

In addition to wetland loss, Project actions could result in impacts to wetland quality through increased sediment deposition in nearby wetlands, dust formation on vegetation (which inhibits photosynthesis), alteration of long-term wetland hydrology, and residual effects resulting from the fragmentation of wetland habitats. Fragmenting wetland habitats can affect adjacent areas by increasing edge habitat and altering light regimes, ultimately driving changes in wetland species composition and function. With respect to species composition, noxious weeds and other invasive species could also be introduced and spread through ground disturbances and transfer by equipment. Any potentially hazardous material spill within or near wetlands could distress the vegetation, sometimes beyond recovery, and could contaminate both ground and standing water (i.e., wetland hydrology).

The Applicant would also implement BMPs to minimize wetland impacts as outlined in Section 2.3.2.5. Vehicular traffic would remain on access roads, and foot traffic would be kept at a minimum to minimize wetland impacts. Hazardous materials would be handled properly in areas with secondary containment away from wetlands to avoid spills. Relevant environmental documents (e.g., SWPPP, restoration and revegetation plan, invasive species and noxious weed management plan, SPCC plan, and waste and hazardous materials plan) would be implemented as well as used for properly training employees and contractors during construction. The Applicant's proposed dust abatement practice would also discourage layers of dust forming on vegetation which inhibits photosynthesis as well as provide additional watering to encourage vegetation growth and supplement hydrology.

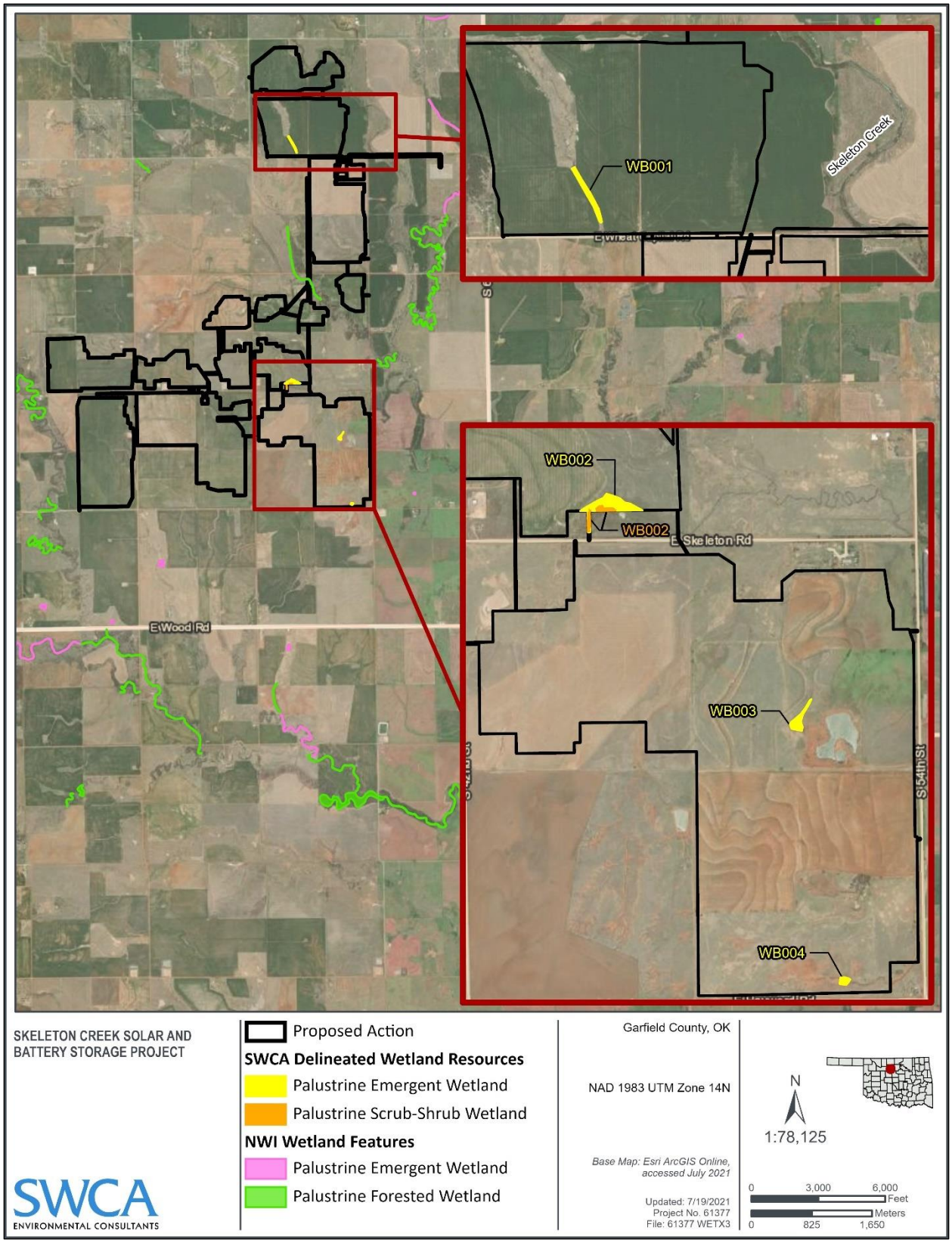

Figure 3.3-4. Delineated wetlands and National Wetlands Inventory data in and near the Proposed Action footprint.

Operations, Maintenance, and Decommissioning

Similar measures and practices are anticipated during the operation, maintenance, and decommissioning (or plant re-powering) process of the Proposed Action as for the construction process. Up to 1.7 acres of wetland loss would persist for the duration of the Project, as would 0.3 acres of wetland conversion due to mowing. However, RUS anticipates that the Applicant would design and construct the Project in a manner that avoids or reduces disturbance to these wetlands. Therefore, no individual wetland impact would exceed the NWP threshold of 0.5 acre. Additional, short-term wetland impacts could occur during O&M activities due to disturbance by foot travel, potentially hazardous material spills, and potential noxious and invasive plant species encroachment and herbicide use. The Applicant would implement BMPs established in environmental documents, as previously described, to educate employees and contractors during the operation, maintenance, and decommissioning process and minimize wetland impacts.

Cumulative Effects

In general, cumulative impacts to wetlands from the Proposed Action could occur where other existing and reasonably foreseeable trends and actions occur within the analysis area. As noted in Section 3.3.2.3.2, current and reasonably foreseeable trends and actions could result in ground fragmentation, vegetation disturbance, vegetation die-off, hydrology alterations, and changes in water quality. Additionally, these measures could introduce and promote the growth of invasive and noxious plant species within existing wetlands.

The Proposed Action would add to these wetlands impacts through up to 2.1 acres of wetland fill or conversion (see Table 3.3-9). However, RUS anticipates that the Applicant would design and construct the Project in a manner that avoids or reduces disturbance to these wetlands. Therefore, no individual wetland impact would exceed the NWP threshold of 0.5 acre. The Project could also influence factors affecting wetland quality (e.g., revegetation, root formation, exposure to spills) and invasive species and noxious weed encroachment. However, BMPs and design features would be applied to minimize Project adverse impacts. Therefore, the Proposed Action, when combined with other present and reasonably foreseeable trends and actions, would not have a significant cumulative impact.

3.3.2.3.4 OTHER ACTION ALTERNATIVE

Construction, Operations, Maintenance, and Decommissioning

Potential wetland impacts from construction, O&M, and decommissioning (or plant re-powering) activities under the Other Action Alternative would be similar to the Proposed Action because the construction actions and schedule would be similar in scope and duration. In addition, the makeup of the vegetation community is fairly uniform throughout the analysis area. Unique effects associated with the Other Action Alternative are described below.

Because an aquatic resource delineation was not completed within the Other Action Alternative, USFWS NWI data were used for this alternative's analysis. According to the USFWS NWI data, only two NWI wetlands could occur within the Other Action Alternative footprint: PEM1Fh (palustrine emergent persistent semi permanently flooded diked/impounded wetland) and PEM1Cx (palustrine emergent persistent seasonally flooded excavated wetland) (USFWS 2021c). Construction of the Other Action Alternative would result in approximately 0.1 acre of total impacts to these wetlands (see Figure 3.3-5). A breakdown of Project construction impacts by NWI wetland is provided in Table 3.3-11.

The Other Action Alternative would result in up to 1.7 fewer acres of total wetland impacts as compared to the Proposed Action. Additionally, based on the conceptual layout, the Other Action Alternative would not result in conversion of approximately 0.3 acre of PSS wetlands to PEM wetlands (see Table 3.3-9;

Table 3.3-11).[13] However, as noted above, RUS anticipates that the Applicant would design and construct the Project in a manner that avoids or reduces disturbance to these wetlands. Therefore, no individual wetland impact would exceed the NWP threshold of 0.5 acre.

Table 3.3-11. Maximum Impacts to NWI Wetlands by Construction Activities Under the Other Action Alternative

NWI Classification Code*	Wetland Habitat Type	Project Component	Duration of Impact (short-term/long-term/conversion)	Maximum Impacted Acreage
PEM1Fh	PEM	Temporary access roads	Short-term	< 0.1
		Long-term access roads	Long-term	< 0.1
PEM1Cx	PEM	Gen-tie line	Short-term	< 0.1
		Underground collection lines	Short-term	< 0.1
Subtotal maximum short-term impacts				0.1
Subtotal maximum long-term impacts				< 0.1
Total Maximum Impacts				**0.1**

Source: USFWS (2021c).

Notes:

* P = Palustrine; EM = Emergent; SS = Scrub-Shrub; FO = Forested; 1 = Persistent (PEM) or Broad-Leaved Deciduous (PSS/PFO); A = Temporary Flooded; C = Seasonally Flooded; F = Semipermanently Flooded; h = Diked/Impounded; x = Excavated.

Cumulative Effects

As noted above, the Other Action Alternative would add no more than 0.1 acre of long-term wetland loss, as well as 0.1 acre of temporary impacts, to wetland impacts under the No Action alternative. If Other Action Alternative construction activities coincide with other current or reasonably foreseeable trends and actions, cumulatively the Proposed Action could also contribute to changes in wetland quality through ground fragmentation, vegetation disturbance, vegetation die-off, hydrology alterations, and changes in water quality. Additionally, these measures could introduce and promote the growth of invasive and noxious plant species within existing wetlands. However, the Applicant would implement measures to minimize wetland impacts. RUS also assumes that other projects would comply with local, state, or federal regulatory requirements to avoid or minimize wetlands impacts, if actions are subject to regulatory requirements. Therefore, no significant cumulative impacts would occur.

[13] However, the Other Action Alternative was assessed based only on USFWS NWI data and no aquatic resource delineation data are available to ground-truth wetland habitats within the Other Action Alternative construction footprint.

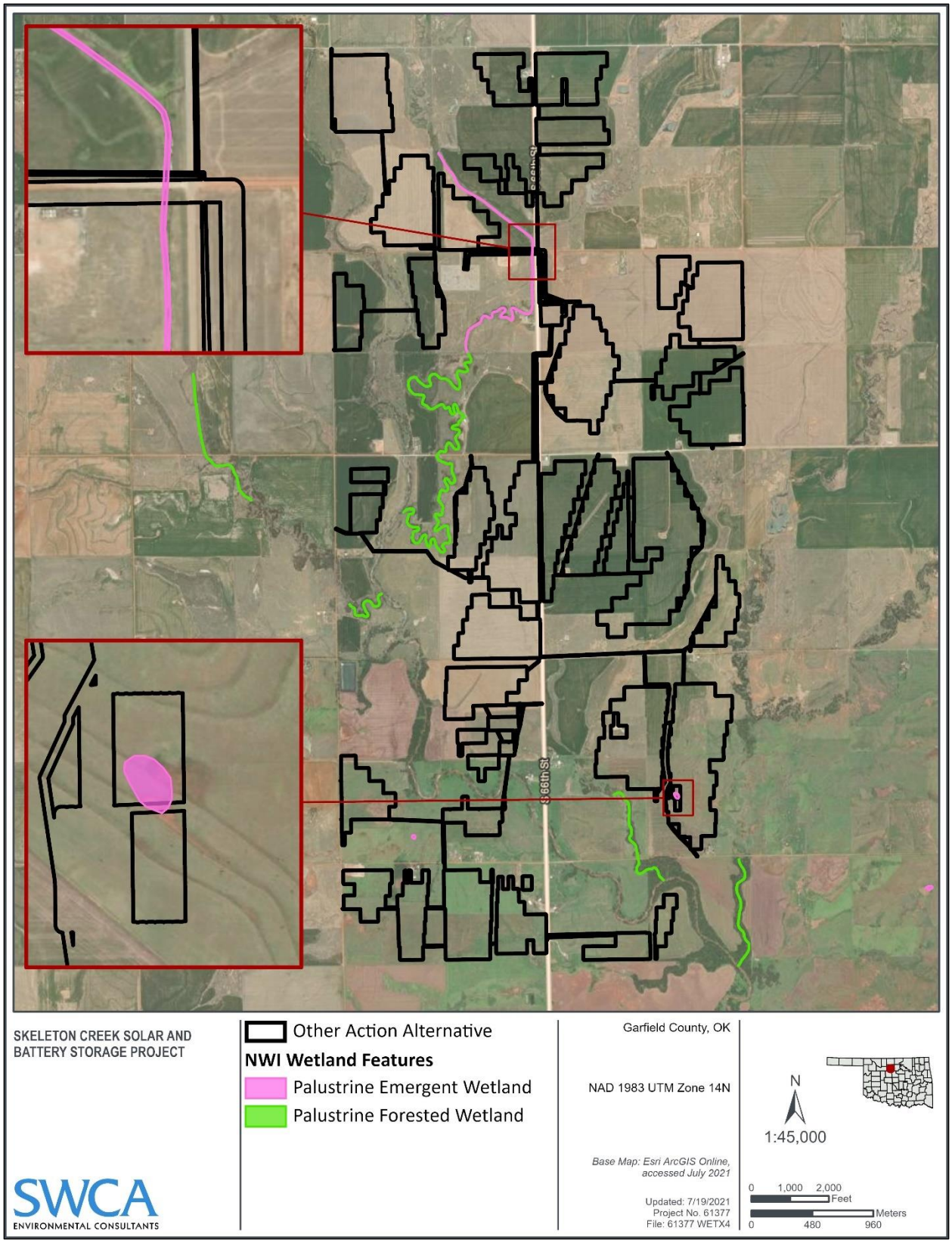

Figure 3.3-5. Delineated wetlands and National Wetlands Inventory data in and near the Other Action Alternative footprint.

3.3.2.4 Summary of Impacts

Impacts to wetland habitats were assessed quantitatively and compared between the No Action Alternative, Proposed Action, and the Other Action Alternative. Under the No Action Alternative, the Project would not be constructed, and there would be no impacts to wetland habitats from the Project. However, existing and reasonably foreseeable trends and actions, primarily agricultural activities, would continue to affect wetlands within the analysis area. The Proposed Action would result in long-term impacts of no more than 1.7 acres of PEM and PSS wetlands, a conversion impact of PSS wetlands to PEM wetlands of approximately 0.3 acre, and a temporary impact of approximately 0.1 acre of PEM wetlands (see Table 3.3-9). The Other Action Alternative would result in a long-term impact to approximately less than 0.1 acre of PEM wetlands and a temporary impact of approximately 0.1 acre of PEM wetlands (see Table 3.3-11). However, RUS anticipates that the Applicant would design and construct the Project in a manner that avoids or reduces disturbance to these wetlands. Therefore, no individual wetland impact would exceed the NWP threshold of 0.5 acre. With the implementation of BMPs described in Section 2.3.2.5, no impact thresholds would be triggered as a result of the Project, either individually or when combined with other present and reasonably foreseeable trends and actions.

3.3.3 Wildlife, including Special-Status Species

3.3.3.1 Introduction

A variety of laws, regulations, and memoranda of understandings, including the ESA, MBTA, and BGEPA, mandate that wildlife resources be protected and managed. The existence of healthy wildlife populations is also important to the public to fulfill recreation, economic, and social values.

The term *wildlife species* applies to any animal (mammals, reptiles, amphibians, birds, invertebrates, and fish) with the potential to occur in the analysis areas. The term *special-status species* refers to wildlife species that are protected by the ESA, wildlife species that are protected by the BGEPA, and threatened and endangered species defined within Title 29 of the Oklahoma Wildlife Conservation Code. Wildlife habitat refers to an area that contains the resources (food, water, cover) necessary for the survival of a particular species or group of species. This analysis describes the existing condition of wildlife species and habitats within two specific analysis areas. The effects of the No Action Alternative and the action alternatives on wildlife species are subsequently described and discussed.

3.3.3.1.1 SPATIAL AND TEMPORAL SCOPE OF ANALYSIS

The spatial scale for analysis of potential effects to wildlife resources varies by species, depending on the biology and best available science for each species (Table 3.3-12). The spatial scale used for terrestrial wildlife species (including amphibians, reptiles, and small mammals) consists of the Application Area. This area is referred to in this section as the *Project analysis area* (Figure 3.3-6 and Table 3.3-12). The spatial scale of the Project analysis area is appropriate for species with small home ranges or territories that are not likely to extend beyond the Application Area within a lifetime. The Project analysis area is also used for threatened and endangered bird species (i.e., the whooping crane, rufa red knot [*Calidris canutus rufa*], and piping plover [*Charadrius melodus*]). The USFWS's (2019) recommended conservation measure is to stop work if an individual whooping crane is observed within 1,000 feet of the Project during construction activities. Because the Project analysis area is inclusive of this buffer, this analysis area is used for all listed bird species.

A landscape spatial scale is used for aquatic wildlife species (including the threatened Arkansas River shiner [*Notropis girardi*]) and encompasses two HUC-12 subwatersheds that overlap Project activities: Hackberry Creek (HUC 110500020903) and Town of Fairmont-Skeleton Creek (HUC 110500020904). This area is referred to as the *landscape analysis area* (see Figure 3.3-6 and Table 3.3-12). The landscape analysis area includes aquatic wildlife that maintain a territory or home range that may extend beyond the Application Area within a lifetime. Watersheds, in this case subwatersheds, are appropriate for these species because they provide easily defined boundaries and units within which impacts for wide-ranging species can be meaningfully considered. Although biotic effects could occur outside of these units (i.e., in the larger watershed, river sub-basin, or river basin), they become more difficult to accurately predict with increased distance from the source of the impact.

Migratory birds and also flying invertebrates (i.e., monarch butterfly [*Danaus plexippu*]) and flying mammals (i.e., bat species) are discussed on both project and landscape spatial scales. Because the migratory bird group is such a large and varied group, each scale would apply to certain species. Also, all these species may occupy the analysis area in varying capacities depending on time of day or year as seasonal residents, stopovers, or as migrants.

The temporal scale for analysis of wildlife effects considers the timeframe beginning with construction or other Project-related human activity and ending when revegetation is complete after decommissioning and human disturbance has ceased.

Table 3.3-12. Spatial Scope of Analysis for Wildlife Species

Analysis Area	Species/Species Type	Acres
Project analysis area	Terrestrial wildlife species (amphibians, reptiles, small mammals, local bird populations, local bat populations) and special-status bird species	12,262
Landscape analysis area	Aquatic wildlife species (fish, mollusks), migratory birds, bats, flying invertebrates (i.e., monarch butterfly)	55,644

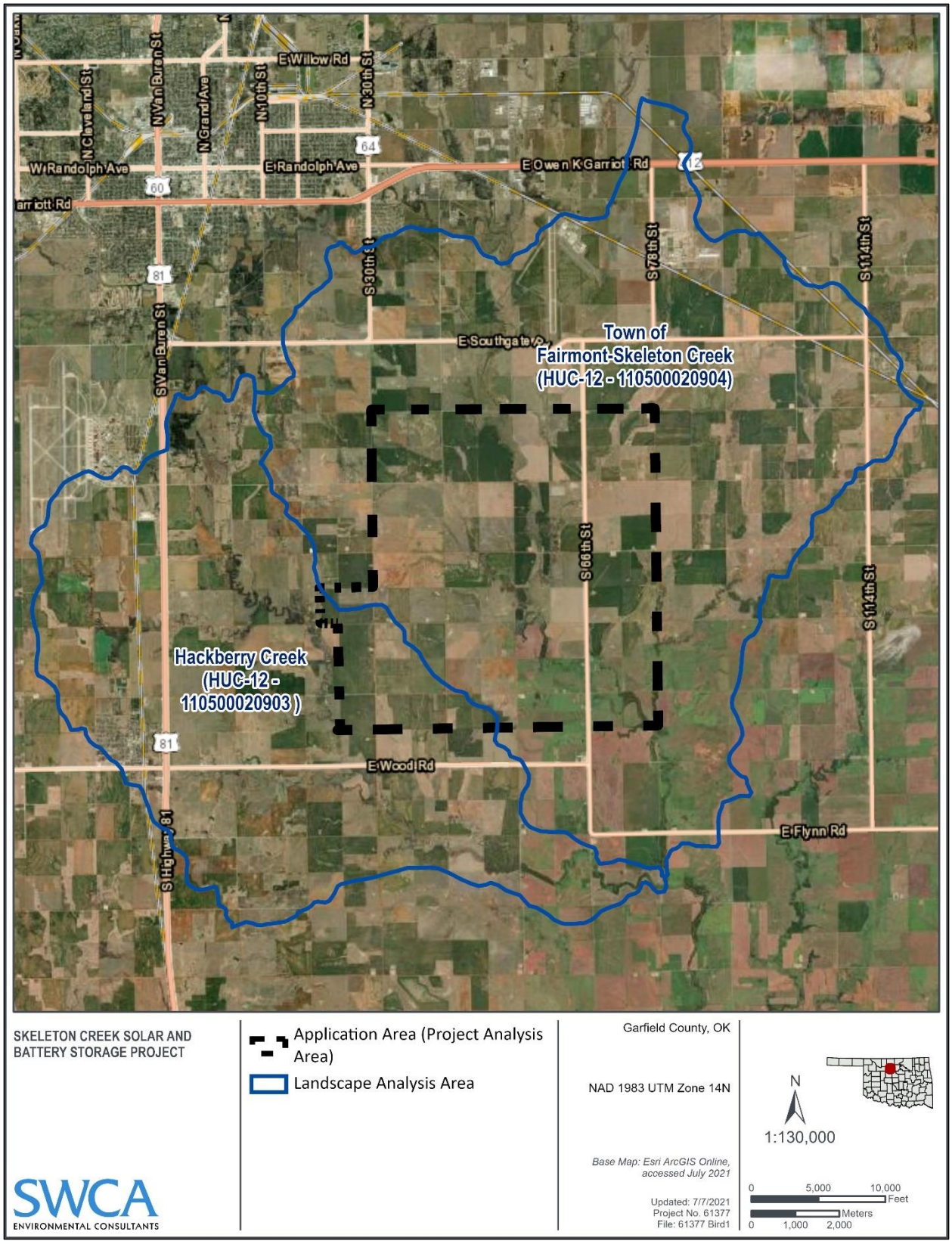

Figure 3.3-6. Wildlife landscape analysis area and Project analysis area (Application Area).

3.3.3.2 Affected Environment

3.3.3.2.1 GENERAL WILDLIFE

The Project analysis area is located within the Central Great Plains EPA Level III ecoregion and the Prairie Tableland EPA Level IV ecoregion (Woods et al. 2005). The Central Great Plains ecoregion within Oklahoma is a mixed grass prairie that serves as a transition between tallgrass and shortgrass prairies and historically contained approximately 341 wildlife species (Oklahoma Department of Wildlife Conservation [ODWC] 1996. Historically, bison (*Bison bison*), elk (*Cervus canadensis*), and wild turkey (*Meleagris gallopavo*) were characteristic wildlife of the Central Great Plains in Oklahoma; however, these species only exist as reintroduced species today (USFWS 2014a). Additional historic species that have been reintroduced to this area include river otter (*Lontra canadensis*), burrowing owl (*Athene cunicularia*), and black-tailed prairie dog (*Cynomys ludovicianus*) (USFWS 2014a).

The ODWC (2021) lists 164 species of wildlife occurring in Oklahoma, comprising 31 species of amphibians, 57 species of birds, 12 species of fish, 10 species of invertebrates, 16 species of mammals, and 38 species of reptiles. Table 3.3-13 lists the terrestrial wildlife species with potential occurrence in the Project analysis area. These species tend to have broad distributions and secure populations. Migratory birds and aquatic wildlife are discussed below; threatened and endangered species are discussed in Section 3.3.3.2.2.

Table 3.3-13. Terrestrial Wildlife that May Occur within the Project Analysis Area

Common Name	Scientific Name
Amphibians	
American toad	*Anaxyrus americanus*
Barred tiger salamander	*Ambystoma mavortium*
Blanchard's cricket frog	*Acris blanchardi*
Bullfrog	*Lithobates catesbeianus*
Great plains toad	*Anaxyrus cognatus*
Plains leopard frog	*Lithobates blairi*
Plains spadefoot	*Spea bombifrons*
Red-spotted toad	*Anaxyrus punctatus*
Small-mouthed salamander	*Ambystoma texanum*
Strecker's chorus frog	*Pseudacris streckeri*
Western narrow-mouthed toad	*Gastrophryne olivacea*
Woodhouse's toad	*Anaxyrus woodhousii*
Invertebrates	
Monarch	*Danaus plexippus*
Mammals	
Big brown bat	*Eptesicus fuscus*
Black-tailed jackrabbit	*Lepus californicus*
Eastern mole	*Scalopus aquaticus*
Eastern spotted skunk	*Spilogale putorius*
Eastern woodrat	*Neotoma floridana*
Fulvous harvest mouse	*Reithrodontomys fulvescens*

Common Name	Scientific Name
Mexican free-tailed bat	*Tadarida brasiliensis*
Nine-banded armadillo	*Dasypus novemcinctus*
Tri-colored bat	*Perimyotis subflavus*
Reptiles	
Common snapping turtle	*Chelydra serpentina*
Dekay's brownsnake	*Storeria dekayi*
Eastern collared lizard	*Crotaphytus collaris*
Eastern racer	*Coluber constrictor*
Five-lined skink	*Plestiodon fasciatus*
Graham's crayfish snake	*Regina grahamii*
Great plains skink	*Plestiodon obsoletus*
Lesser earless lizard	*Holbrookia maculata*
Little brown skink	*Scincella lateralis*
Milksnake	*Lampropeltis gentilis*
Northern diamond-backed watersnake	*Nerodia rhombifer*
Ornate box turtle	*Terrapene ornata*
Plain-bellied watersnake	*Nerodia erythrogaster*
Prairie kingsnake	*Lampropeltis calligaster*
Prairie lizard	*Sceloporus consobrinus*
Red-eared slider	*Trachemys scripta* ssp. *elegans*
Ring-necked snake	*Diadophis punctatus*
Rough greensnake	*Opheodrys aestivus*
Six-lined racerunner	*Aspidoscelis sexlineatus*
Smooth softshell	*Apalone mutica*
Speckled kingsnake	*Lampropeltis holbrooki*
Spiny softshell	*Apalone spinifera*
Texas horned lizard	*Phrynosoma cornutum*

Sources: iNaturalist (2021); ODWC (2021).

Migratory Birds

The MBTA provides protection for all bird species native to the United States and its territories (16 USC 703–712). The USFWS is responsible for enforcing the MBTA.

The MBTA provides that it is unlawful at any time, by any means or in any manner, to

> pursue, hunt, take, capture, kill, attempt to take, capture or kill, possess, offer for sale, sell, offer to purchase, purchase, deliver for shipment, ship, cause to be shipped, deliver for transportation, transport, cause to be transported, carry, or cause to be carried by any means whatsoever, receive for shipment, transportation or carriage, or export, at any time, or in any manner, any migratory bird, included in the terms of this Convention . . . for the protection of migratory birds . . . or any part, nest, or egg of any such bird. (16 USC 703)

The MBTA was enacted in response to four international conventions addressing observed declines of migratory birds due to commercial trade of feathers, un-regulated hunting practices, and other factors. Almost all native birds in the United States are protected by the MBTA, including many nonmigratory, year-round residents.

The statute's language is clear that actions resulting in a "taking" or possession (long-term or temporary) of a protected species, in the absence of a USFWS permit or regulatory authorization, are a violation. The MBTA states the following: "Unless and except as permitted by regulations . . . it shall be unlawful at any time, by any means or in any manner, to pursue, hunt, take, capture, kill . . . possess, offer for sale, sell . . . purchase . . . ship, export, import . . . transport or cause to be transported . . . any migratory bird, any part, nest, or eggs of any such bird" (16 USC 703). The word *take* is defined by this regulation as "to pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to pursue, hunt, shoot, wound, kill, trap, capture, or collect" (50 CFR 10.12). Destruction or alteration of bird habitat that does not result in the direct taking of birds, nests, or eggs is not prohibited by the MBTA.

In December 2017, the Office of the Solicitor of the U.S. Department of the Interior (DOI) reinterpreted the definition of incidental take in Section 2 of the MBTA. The DOI stated that the statute's prohibitions on take apply "only to affirmative actions that have as their purpose the taking or killing of migratory birds, their nests, and their eggs" and that take of a migratory bird or its active nest that is incidental to, and not the purpose of, a lawful activity does not constitute prohibited take (DOI 2017). In November 2020, the USFWS released an EIS (DOI 2020) reviewing the impacts of this current interpretation of the MBTA in preparation of limiting coverage to intentional actions. The USFWS published its final rule on January 7, 2021, which became effective on March 8, 2021, stating, "that the MBTA's prohibitions on pursuing, hunting, taking, capturing, killing, or attempting to do the same, apply only to actions directed at migratory birds, their nests, or their eggs" (*Federal Register* 86:1134–1165).[14] Under current interpretation, bird mortalities that result from activities such as collision with the gen-tie line or accidental destruction of nests during vegetation-clearing activities are incidental losses that do not violate the MBTA.

Birds protected by the MBTA occur in every habitat type, and nests may be found in trees and on forest floors, in grassland or shrubland, and in uplands and wetlands. The Salt Plains National Wildlife Refuge (approximately 30 miles northwest of the Project analysis area; see Figure 3.3-7) has published a bird species list for the area, which includes 63 year-round residents, 183 migratory birds, and 77 incidental species (vagrants during migration or following extreme weather events) (USFWS 2014b). From this list, the Project analysis area and the larger landscape analysis area are most likely to support species that use pasture and agriculture land cover. Birds that generally inhabit crops and rangeland include icterids like the red-winged blackbird (*Agelaius phoeniceus*) and brown-headed cowbird (*Molothrus ater*) and doves including the white-winged dove (*Zenaida asiatica*), mourning dove (*Zenaida macroura*), and Eurasian collared-dove (*Streptopelia decaocto*). Water features (see Section 2.3.2) in the analysis areas may attract wading birds, cranes, or shorebirds (e.g., sandpipers) that may or may not use the surrounding agricultural cropland for nesting and foraging. In the spring and fall there may be a higher concentration of migrating songbirds (e.g., flycatchers, warblers, vireos) in the area.

[14] Although this is the final rule, changes to the balance of the U.S. Congress create the possibility that the Congressional Review Act could be used to repeal this regulation. It is also possible that opinions and guidance provided by the DOI regarding interpretation of the MBTA may change under the new presidential administration. Additionally, environmental groups may file legal challenges to the regulation that may take time to resolve.

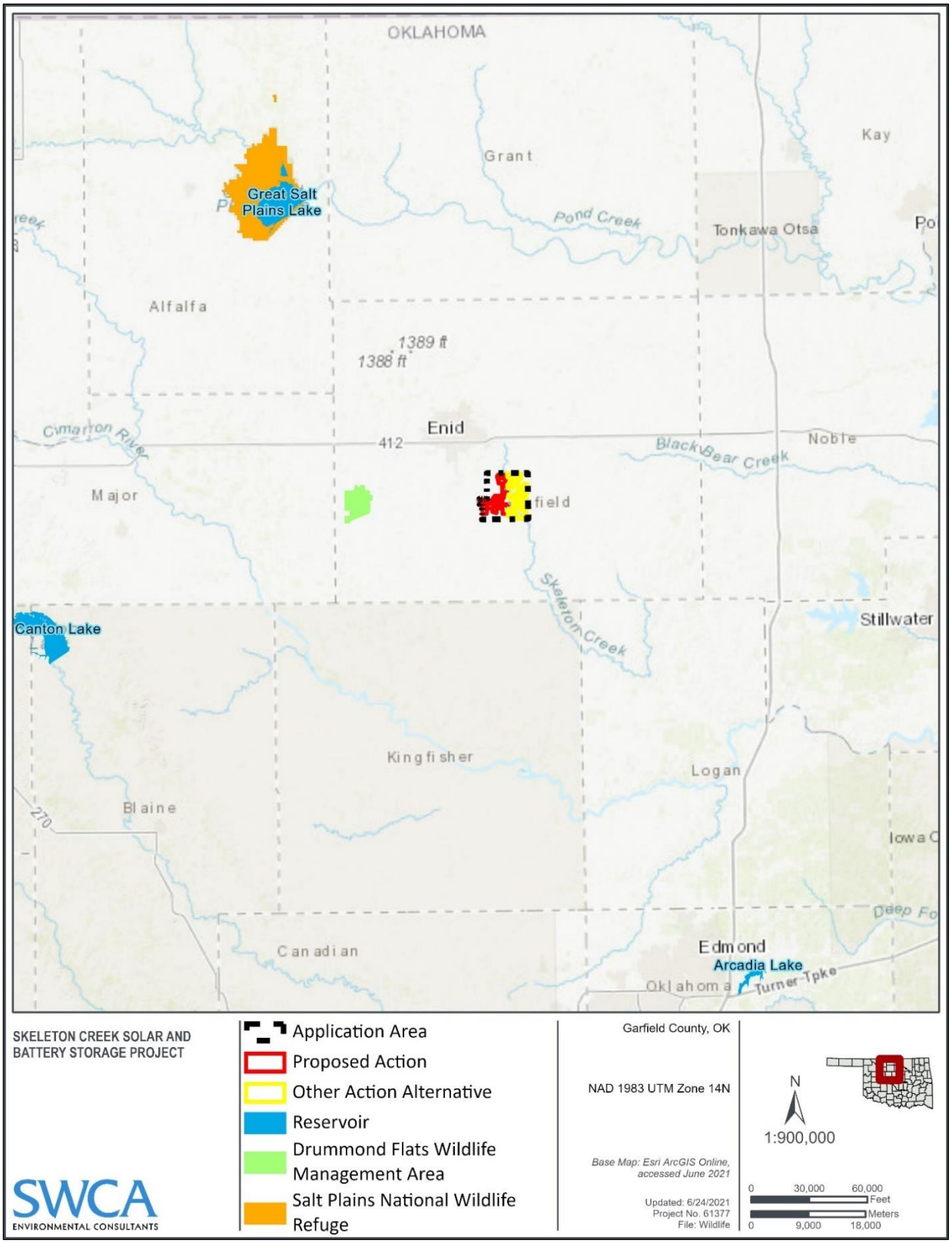

Figure 3.3-7. Wildlife refuges, wildlife management areas, and other areas of interest for wildlife in and near the Application Area.

Aquatic Wildlife

The ODWC (1996) recognizes 175 species of fish in the state, encompassing 26 families with over 70% of native fish species belonging to just five families: minnows, darters, sunfishes, suckers, and catfishes. The Salt Plains National Wildlife Refuge (see Figure 3.3-7) has a refuge list of 37 fish species including catfish, bass, minnows, and gar (USFWS 2014b). Historically, Oklahoma has also been home to 201 mollusk species, which include 31 species of aquatic snails and 59 bivalve (clams and mussels) species (ODWC 1996). Human-caused activities that affect aquatic wildlife in the state include "altered water flow regimes; changes in turbidity; sedimentation and temperature (especially below reservoirs; and increased levels of domestic, agricultural, and industrial pollutants" (ODWC 1996).

The Arkansas River shiner, a federally threatened fish, is discussed in Section 3.3.3.2.2.

3.3.3.2.2 SPECIAL-STATUS SPECIES

Bald and Golden Eagle Protection Act

The bald eagle (*Haliaeetus leucocephalus*) and golden eagle (*Aquila chrysaetos*) are protected by the federal BGEPA. The BGEPA prohibits the taking, possessing, or transporting of bald and golden eagles (or their parts, nests, or eggs) without authorization from the USFWS. Under the BGEPA, *take* is defined as actions that pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest, or disturb bald or golden eagles (16 USC 668–668c; 50 CFR 22.3). A permit, issued by USFWS on behalf of the Secretary of the Interior, is required for any activities that may result in the taking of bald and golden eagles.

The bald eagle is a year-round resident throughout most of Oklahoma. The species nests primarily in the eastern three-quarters of Oklahoma and is an uncommon winter resident in the analysis areas' ecoregions (ODWC 2016). The golden eagle occurs primary in the western third of Oklahoma during the winter (Katzner et al. 2020; ODWC 2016). Bald and golden eagles also occur as migrants throughout much of Oklahoma and use habitat (wooded tree lines near lakes and reservoirs) within Garfield County during the winter (Tulsa Audubon Society 2014). Eagles have been observed arriving in Oklahoma in late fall, with populations spiking in January and slowly decreasing until mid-March; eagles have been observed as late as May, but this is rare (Lish 1975). A raptor nest survey was completed within the Project analysis area in the spring of 2021, and one active bald eagle nest was identified (Valeron 2021). No additional details regarding the location or status of the nest are available. Other known eagle nests in the area center around large waterbodies (lakes) in the northwest near Salt Plains National Wildlife Refuge, and in the southeast near Stillwater, Oklahoma, where there are many open-water lakes (e.g., Lake Carl Blackwell and Lake McMurty) (Sullivan et al. 2009). The OHNI (2021) did not include known locations of bald eagles in or near the Project analysis area.

Federally Listed Threatened and Endangered Species

The ESA prohibits *take* of federally listed threatened and endangered plant and animal species and protects the critical habitats designated to those listed species from federal actions or any actions with a federal nexus. The ESA defines *take* as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct" (16 USC 1532 [19]). *Harm* is defined by USFWS regulations as an "act which actually kills or injures wildlife and may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns including breeding, feeding or sheltering" (50 CFR 17.3).

If a listed species may be affected by a federal action, even if entirely beneficial, consultation (either formal or informal) with the USFWS is necessary as required by Section 7(a) of the ESA. If an action is not likely to adversely affect a listed species or designated critical habitat, informal consultation may be

conducted and then a USFWS concurrence letter may can be issued. If an action is likely to adversely affect a listed species or designated critical habitat, formal Section 7 consultation must be initiated with the USFWS. If a single listed species or designated critical habitat triggers formal Section 7 consultation, all listed species and designated critical habitats are considered during the formal process. Further, the USFWS must ensure that actions are not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of designated critical habitats.

The USFWS and the National Marine Fisheries Service are responsible for administering the ESA and implementing the ESA Section 7 consultation process. The USFWS consults on terrestrial and freshwater aquatic plants and animals, whereas the National Marine Fisheries Service consults on marine aquatic animals and anadromous fish.

For listed species that may be affected by a federal action, the affected environment under evaluation is often larger than the immediate Proposed Action footprint and differs based on species biology (see Section 3.3.3.1.1 Spatial and Temporal Scope of Analysis).

The USFWS Information for Planning and Consultation (IPaC) online database was used to develop a list of federally listed species that are known or have potential to occur in Garfield County, Oklahoma (USFWS 2021b). The list consists of four federally listed species (three birds and one fish). In addition, a data request through the OHNI was completed in June 2021 for species occurrences within Garfield County, Oklahoma (OHNI 2021).

Table 3.3-4 identifies the species listed by USFWS (2021b) and summarizes their likelihood of occurrence in the Project analysis area. Determination of the potential for species occurrence was based on 1) existing information on controls on distribution and 2) qualitative comparisons of the habitat requirements of each species within the Project analysis area. The potential for occurrence of species is identified by using the following categories:

- *Known to occur*: The species has been documented in the Project analysis area by a reliable observer.
- *May occur*: The Project analysis area is within the species' currently known range, and vegetation communities, soils, and water quality conditions, among other factors, resemble those known to be used by the species.
- *Unlikely to occur:* The Project analysis area is within the species' currently known range, but vegetation communities, soils, and water, among other factors, do not resemble those known to be used by the species.
- *None:* The Project analysis area is clearly outside the species' currently known and expected range.

Table 3.3-14. Federally Listed Species and their Potential to Occur within the Project Analysis Area

Common Name Scientific Name	Federal Status	Habitat Description	Within Current Range of Species (Y/N)	Habitat Present in Application Area (Y/N)	Potential to Occur
Birds					
Piping plover *Charadrius melodus*	Threatened	Non-breeding incidental (vagrant during migration or following extreme weather events) (USFWS 2014b). Select reservoirs in Oklahoma, with nearby mudflats for foraging, may attract migrating piping plovers for brief periods as a stopover; when observed in these areas, piping plover are usually documented as a single bird (ODWC 2021b). Potential occurrence of migrating and stopover piping plovers in the Northern Great Plains is from March to May and July to September (ODWC 2021b).	Yes	No	Unlikely to occur
Rufa Red knot *Calidris canutus rufa*	Threatened	Non-breeding migrant (August 20 through September 14) with potential for stopover at Oklahoma mudflats for foraging (ODWC 2021c; USFWS 2014b). Foraging habitat is limited within Oklahoma, and on average, five rufa red knots are documented annually within the state (ODWC 2021c).	Yes	No	Unlikely to occur
Whooping crane *Grus americana*	Endangered	Non-breeding migrant (April 1–April 15; October 17–November 10) through the western part of the state, west of Interstate 35 (ODWC 2021d; USFWS 2014b). While migrating through Oklahoma, whooping cranes may stopover using “shallow wetlands, marshes, the margins of ponds and lakes, sandbars, shorelines of shallow rivers, wet prairies and cropland near water” (ODWC 2021d). The Salt Flats National Wildlife Refuge (approximately 30 miles northwest of the Project analysis area) is considered to be a “very important migration stopover area” (ODWC 2021d) and has been listed as critical habitat for the species by the USFWS (1978).	Yes	Yes	May occur
Fish					
Arkansas River Shiner *Notropis girardi*	Threatened	Small, freshwater minnow that historically occurred throughout the Arkansas River basin, including the Arkansas, Cimarron, and Canadian Rivers in Oklahoma (ODWC 2021e; USFWS 2018). The current known range of this fish is limited to five subunits within the South Canadian River (USFWS 2018).	No	No	None

No ESA listed species are known to occur in the Project analysis area, and there is no designated critical habitat within the Project analysis area. However, potentially suitable stopover habitat for whooping crane is present in the analysis area. The Project analysis area is also within the current range for migrating piping plovers and rufa red knots, and critical habitat for the Arkansas River shiner occurs in the Cimarron River approximately 25 miles south of the Project analysis area. The following subsections provide a brief overview the biology and status of these four species.

Piping Plover

The piping plover is a small shorebird that may occur in Oklahoma as either a rare migrant or following extreme weather events or weather patterns (USFWS 2014b). During migration, piping plovers may stop in habitats similar to their wintering and breeding habitat, including sandbars along large rivers, salt flats, shallow wetlands, and mudflats along reservoirs (National Audubon Society 2021; USFWS 2011). In Oklahoma, potential stopover habitat during migration for this species includes open-water lakes or reservoirs within mudflats for foraging (ODWC 2021b).

The closest documented occurrences of piping plovers are from Drummond Flats Wildlife Management Area approximately 12 miles west of the Project analysis area; Salt Plains National Wildlife Refuge approximately 30 miles northwest of the Project analysis area; and a reservoir near Stillwater, Oklahoma, approximately 40 miles southeast of the Project analysis area (Sullivan et al. 2009) (see Figure 3.3-7).

Piping plovers may fly over the Project analysis area on rare occasion, but such birds would most likely be flying at high altitudes during migration. No suitable stopover habitat for this species is present in the Project analysis area. If a piping plover were to, on rare occasion, stopover, it would likely stopover at Salt Plains National Wildlife Refuge, Drummond Flats Wildlife Management Area, or at large open-water lakes and reservoirs with adjacent foraging habitat (see Figure 3.3-7). Therefore, this species is unlikely to occur within the Project analysis area based on lack of appropriate habitat.

Rufa Red Knot

The rufa red knot is a medium-sized migrant shorebird that may stopover at appropriate habitat types from late August to mid-September during migration (USFWS 2014b). Like the piping plover, stopover habitat for the rufa red knot primarily consists of large open-water lakes and reservoirs with nearby foraging habitat (i.e., mudflats) (ODWC 2021c). This species is rarely encountered in the state, and most sightings are attributed to inexperienced or malnourished birds or follow inclement weather, which pushes migrating birds to the ground (ODWC 2021c).

The closest known documented occurrences of rufa red knot are all at the Salt Plains National Wildlife Refuge (see Figure 3.3-7) approximately 30 miles northwest of the Project analysis area; the latest observation took place in 2018 (Sullivan et al. 2009). Also, like the piping plover, if a rufa red knot were to, on rare occasion, stopover in Garfield County, it would likely stopover at Salt Plains Wildlife National Wildlife Refuge or at other large open-water lakes and reservoirs with adjacent foraging habitat. Therefore, this species is unlikely to occur within the Project analysis area based on lack of appropriate habitat.

Whooping Crane

The whooping crane is a large diurnal wading bird of open, mostly wetland, habitats**.** Members of this species' only wild population nest within and directly adjacent to Wood Buffalo National Park in the Northwest Territories and Alberta, Canada; this population mostly overwinters in and adjacent to Aransas National Wildlife Refuge along the central Texas coast in Aransas, Calhoun, and Refugio Counties, Texas (Canadian Wildlife Service and USFWS 2005). The birds migrate between the two areas each spring and

fall by flying across the Great Plains through an approximately 200-mile-wide corridor. The birds begin to arrive at their wintering grounds in mid-October, with most birds arriving from late October through mid-November; spring migration generally begins in late March, with some birds remaining on the wintering grounds into early May (Canadian Wildlife Service and USFWS 2005). The species also occasionally visits nearby rangeland and cropland to forage. During migration, whooping cranes use cropland; shallow freshwater wetlands; and wide, shallow rivers as stopover habitat. The species sometimes joins sandhill cranes (*Antigone canadensis*), a common migrant and wintering species in the region, for portions of migration and at foraging areas (Urbanek and Lewis 2020). Whooping cranes may also stopover on the marshy edges of large reservoirs or sandbars of major rivers (Armbruster 1990; Watershed Institute, Inc. 2013).

The Project analysis area is on the west side of the whooping crane migration corridor, approximately 30 miles east of the corridor centerline within the portion of the corridor that encompasses 75% of the whooping crane observation records held by the USFWS (2009) (Figure 3.3-8). The USFWS (2020d) tracks records of whooping cranes observed in the United States that are away from their traditional wintering grounds. The closest record of a whooping crane to the Project analysis area reported to the USFWS (2020d) comprised a group of four cranes observed in April 2011 on the ground near a pond 8 miles south of the Project analysis area (see Figure 3.3-8). The USFWS (2020d) has several other records of whooping crane near the Project analysis area (see Figure 3.3-8). Other records recorded in this region of the state include a group of whooping cranes seen in March 2020 and 2021 at Drummond Flats Wildlife Management Area, approximately 12 miles west of the Project analysis area (Sullivan et al. 2009; iNaturalist 2021). There are several documented occurrences of whooping cranes at Salt Plains National Wildlife Refuge, a critical habitat unit (USFWS 1978), from late March to mid-April and in October and November each year (iNaturalist 2021; Sullivan et al. 2009). The OHNI (2021) has reported occurrences of three whooping cranes in Garfield County outside of the Project analysis area.

A whooping crane or family group of cranes could stop over and forage within cropland in and surrounding the Project analysis area during migration. This potential is likely low in any given year but could rise to moderate with time as the possibility of cranes stopping over each year increases. Adjacent habitats such as the Salt Plains National Wildlife Refuge and Drummond Flats Wildlife Management Area (see Figure 3.3-8) may attract migrating cranes away from the Project analysis area. Therefore, although whooping cranes may occur within this area, the potential for stopover is low.

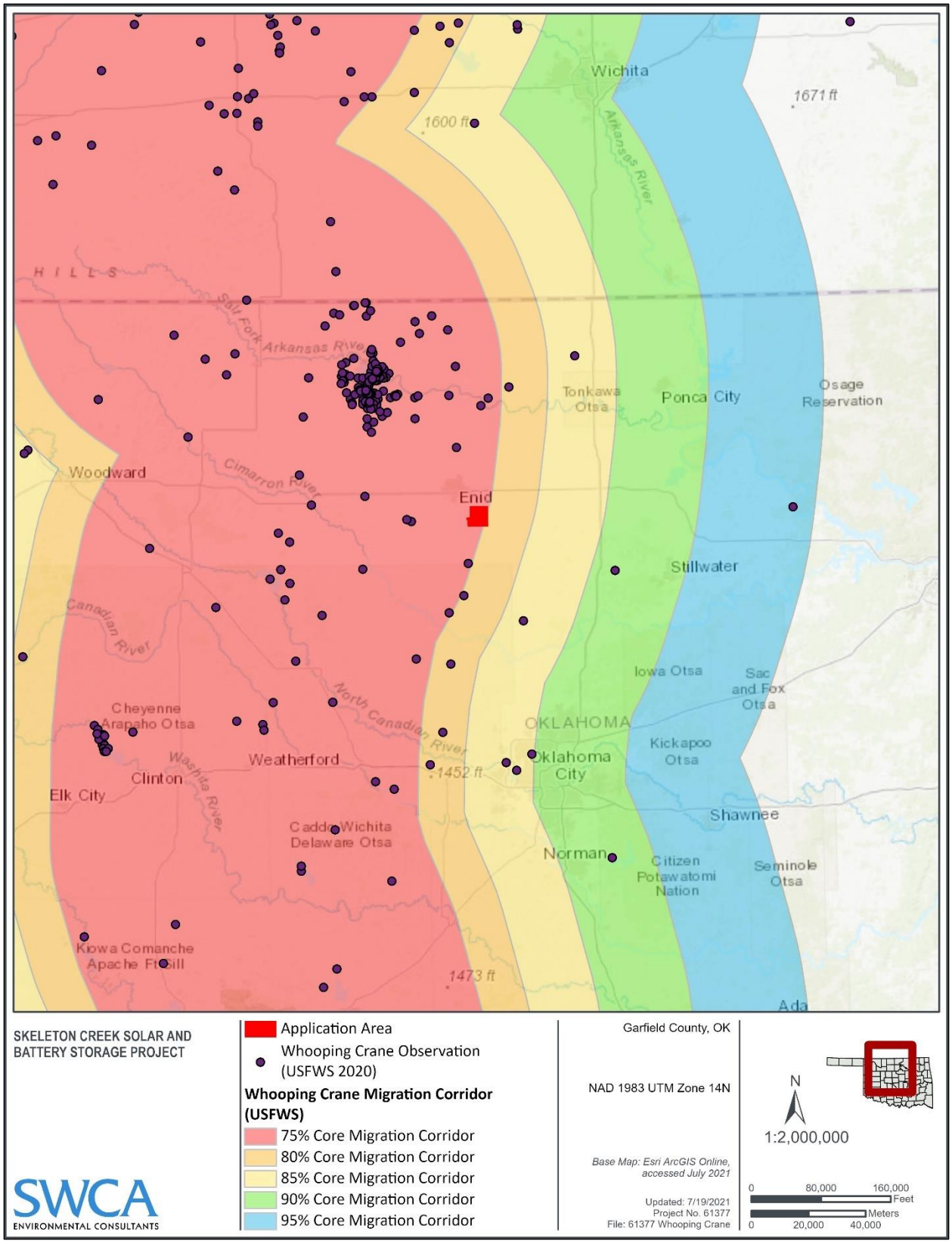

Figure 3.3-8. Whooping crane sightings and migration corridor.

Arkansas River Shiner

The Arkansas River shiner is a small minnow that is endemic to the Arkansas River basin. This species prefers shallow waters of wide prairie rivers with sandy substrate bottoms and is considered a generalist in terms of foraging; Arkansas river shiners will forage straight from the water column or within the river substrate, with one study revealing that gut contents consisted mainly of sand-sediment and detritus (ODWC 2021e; USFWS 2018). In Oklahoma, approximately 470 miles of river has been designated as critical habitat for the Arkansas River shiner (USFWS 2005). The South Canadian River critical habitat unit extends from the State Highway 33 bridge near Thomas, Oklahoma, downstream to the Indian Nation Turnpike bridge northwest of McAlester, Oklahoma; the Cimarron River critical habitat extends from the U.S. Highway 54 bridge in Seward County, Kansas, to the U.S. Highway 77 bridge in Logan County, Oklahoma (USFWS 2021d). The lateral extent of these critical habitat units extends for 300 feet of riparian zone beyond the river's reach (USFWS 2021d). According to the USFWS (2018), the South Canadian River critical habitat unit is the only critical habitat unit known to be occupied by this species.

The landscape analysis area is located within the historical range of the Arkansas River shiner; however, it is not within the current known range of this species (USFWS 2018). The landscape analysis area does not occur within any designated critical habitat units for this species, and no records of this species have been submitted to iNaturalist (2021) from within or close to the landscape analysis area. OHNI (2021) reported the closest occurrence of the Arkansas River Shiner in Kingfisher County, south of the landscape analysis area.

The landscape analysis area is within the Cimarron River watershed (Oklahoma Established Program to Stimulate Competitive Research 2021); therefore, any surface water effects could affect the downstream reaches of the Cimarron River, of which portions of critical habitat for the Arkansas River shiner are designated. However, this species is not currently known to occur within this river's reach.

State Listed Threatened and Endangered Species

There are no threatened and endangered species listed by the ODWC in Garfield County, Oklahoma (ONHI 2018). According to the ONHI (2018), the whooping crane is the only species of concern for this county. The whooping crane and its potential for presence with the Project analysis area are discussed in Section 3.3.3.2.2.

3.3.3.3 Environmental Consequences

3.3.3.3.1 METHODOLOGY

Table 3.3-15 lists the issues identified for this resource and the indicators and impact thresholds used to assess impacts for this EIS.

Table 3.3-15. Wildlife Issues, Indicators, and Impact Thresholds

Issues	Indicators	Impact Thresholds
Habitat loss or modification	Acres of affected habitat and acres of disturbance	No impact thresholds established by regulations; best professional judgment
Injury or mortality of individuals	Acres of affected habitat and acres of disturbance Collision risk estimates (based on literature) Presence of equipment taller than 15 feet for whooping crane	Take of federally listed species
Displacement or barriers to movement	Acres of affected habitat and acres of disturbance Noise levels and duration Miles of fencing	No impact thresholds established by regulations; best professional judgment

For general wildlife, a qualitative description of potential direct and indirect impacts to individuals is provided. For federally and state-protected species, a qualitative description of potential impacts to populations is provided and the appropriate "effect determination" language is incorporated to help inform the federal decision-maker.

Habitat assessments and threatened and endangered species–specific surveys and mapping have not been completed for the Project. The description of wildlife habitat, their potential for occurrence within the analysis areas, and their effects analysis rely on desktop evaluations, including species range information (iNaturalist 2021; ODWC 2021a; Sullivan et al. 2009), geographic information analysis of land use and land cover data (see Section 3.3.1), and water and wetland resource presence (see Section 3.2.3 and 3.3.2).

Impacts from the Project on wildlife, including special-status species, are estimated quantitatively by evaluating the acreage of impacts to the wildlife analysis areas (i.e., the Project analysis area and landscape analysis area [see Figure 3.3-6]) based on habitat needs for the species or species groups.

3.3.3.3.2 NO ACTION ALTERNATIVE

Under the No Action Alternative, the Project would not be constructed, and there would be no impacts on general wildlife or special-status wildlife species from the Project. However, existing and reasonably foreseeable trends and actions would continue to affect wildlife in the analysis areas. The analysis areas are predominantly cultivated cropland, and typical agricultural activities would continue under the No Action alternative. These activities currently affect vegetation (see Section 3.3.1), water resources (see Section 3.2.3), and wetlands (see Section 3.3.2), which are components of wildlife habitat. Current wind farms and transmission lines in the county represent a collision risk to certain bird species; these risks would persist for the duration of project lifespans, although operators would implement monitoring and BMPs to reduce bird impacts.

Reasonably foreseeable trends and actions within the landscape analysis area that could impact individual wildlife species and habitat include reconstruction of the 13/31 runway at the Enid Woodring Regional Airport (2022–2023); reconstruction of the center runway at the Vance Air Force Base (AFB) (2021–2022); construction of the Kaw Lake Water Pipeline (slated to begin by 2023); construction of State Highway 74, U.S. Highway 60, and U.S. Highway 412 (2021–2028); and replacement or rehabilitation of one bridge in Garfield County. These projects would require construction activity within portions of Garfield County and would have a temporary to long-term impact on individual wildlife species and habitat due to changes in noise and human activity, traffic, vegetation alteration, and water quality.

3.3.3.3.3 PROPOSED ACTION

Construction

Effects Common to All Wildlife Species

Potential impacts to general wildlife and special-status species from construction include the loss, degradation, and fragmentation of breeding, feeding, and sheltering habitats; collisions with or crushing by construction vehicles or equipment; loss of underground nesting or burrowing animals and their shelter in areas where grading would occur; increased invasive species establishment and spread; and increased noise and vibration levels.

Approximately 575 acres of the Proposed Action (5% of total Project analysis area) would be cleared of vegetation for installation of impervious surfaces (i.e., long-term access road, battery storage system, solar inverter, solar array, substation, and gen-tie line foundation), and would not be returned to its natural state for the 30-year life of the Project. In addition to long-term impacts to habitat, an additional 67 acres

(0.5% of total Project analysis area) of the Proposed Action would be impacted in the short term by temporary access roads and underground collection lines. Lastly, approximately 1,466 acres (12% of total Project analysis area) of habitat alteration could result from mowing activity within the additional fenced land. The reader is referred to Sections 3.2.3, 3.3.1, and 3.3.2 for Proposed Action impacts to water resources, vegetation, and wetlands.

In addition to the short- to long-term habitat loss or alteration, construction activities could lead to habitat fragmentation that alters species movement and dispersal or shifts local species population composition. Fragmentation impacts would be greatest for habitat specialists, such as amphibians that rely on specific wetland habitats or bat species that rely on specific roosting habitat. Habitat generalists use a range of habitat types and therefore would be less impacted by habitat fragmentation; however, even some generalist species that have poor (short-distance) dispersal abilities may also be area-sensitive and intolerant of any habitat disturbance (BÜchi 2016). Because long-term Project construction activities would only impact 4% of vegetation within the Project analysis area, most species would be able move into adjacent available habitat. Although most of the species listed in Table 3.3-13 are habitat or diet generalists, suitable replacement habitat for species that are more habitat-specific, such as water and wetland-dependent species, could be limited.

Noise, human activity, and vibration associated with construction activities would also change habitat use patterns for some species. Some individuals would move away from the source of the noise or vibration to adjacent habitats, which could increase competition for resources within adjacent areas with other individuals. Noise and vibration and other disturbances (e.g., introduction of invasive plant species) could also lead to increased stress on individuals, which could decrease individual fitness due to increased metabolic expenditures.

To limit or minimize these impacts to wildlife and special-status species within the analysis areas, the Applicant would implement BMPs and design features such as marking the gen-tie line, as summarized in Section 2.3.2.5. Applicant-committed measures that avoid or minimize impacts to water resources, wetlands, and vegetation would also be beneficial to wildlife and special-status species (see Section 3.2.3, 3.3.1, and 3.3.2). Additionally, BMPs for special-status bird species would be employed to further minimize impacts from construction activities. These include stopping work if a special-status species is observed within 1,000 feet of construction activities and lowering all equipment taller than 15 feet at night to prevent possible collision of special-status bird species (and migratory birds, in general) (USFWS 2019).

Effects to Federally Listed Threatened and Endangered Wildlife

PIPING PLOVER

The piping plover is unlikely to stopover within the Proposed Action footprint because of the lack of large open-water lakes and reservoirs with adjacent mudflats for foraging. Approximately 6 acres of open water would be removed from the Project analysis area; however, this represents smaller waterbodies scattered throughout the analysis area that lack nearby mudflats, which are an essential component of piping plover stopover habitat. All wetland features that would be impacted by the Proposed Action are less than 1 acre (see Table 3.3-10). There is available suitable habitat at Drummond Flats Wildlife Management Area, Salt Plains National Wildlife Refuge, and at several lakes and reservoirs near Stillwater, Oklahoma, that would attract piping plovers away from the Proposed Action footprint. Therefore, any impacts to piping plover in the Project analysis area are unlikely. Implementation of BMPs (i.e., equipment lowering) would further reduce the potential for construction impacts on migrating piping plovers flying over the analysis area. Therefore, the Proposed Action would have *no effect* on the piping plover.

RUFA RED KNOT

Like the piping plover, the rufa red knot is unlikely to occur within the Proposed Action footprint because of the lack of large open-water lakes and reservoirs with adjacent mudflats for foraging. There is available suitable habitat at Salt Plains National Wildlife Refuge that would attract rufa red knots away from the Proposed Action footprint. Therefore, any impacts to this species in the Project analysis area are unlikely. Implementation of BMPs (i.e., equipment lowering) would further reduce the potential for construction impacts on any migrating rufa red knots flying over the analysis area. Therefore, the Proposed Action would have *no effect* on the rufa red knot.

WHOOPING CRANE

The whooping crane could stopover within the Proposed Action footprint near wetlands, in flooded cropland, or in dry cropland near waterbodies. Project impacts to whooping cranes from construction activities could occur as a result of collision with vehicles or equipment or as a result of human disturbance (e.g., noise, vibration). Approximately 1,882 acres of suitable water and cropland habitat that could be used by whooping cranes during migration would be removed or temporarily modified by the Proposed Action. Although this species may occur within the Proposed Action footprint, there are more suitable areas for stopover near this area (i.e., Drummond Flats Wildlife Management Area, Salt Plains National Wildlife Refuge), and no whooping cranes have been observed within the Proposed Action footprint (iNaturalist 2021; OHNI 2021; Sullivan et al. 2009; USFWS 2020d). Two BMPs would be employed to further minimize any construction-related impacts to whooping cranes that may occur within the Proposed Action footprint (see Section 2.3.2.5): 1) employing a stop-work order when a whooping crane is observed within 1,000 feet of construction activities and resume work after the bird has left the area; and 2) lowering all vehicles and equipment taller than 15 feet at night in order to minimize risk of collision during migration. With implementation of the BMPs, the Proposed Action "may affect, but is not likely to adversely affect," the whooping crane.

ARKANSAS RIVER SHINER

The Arkansas River shiner does not occur in the landscape analysis area but does occur within five sub-units of critical habitat within the South Canadian River. Portions of the Cimarron River are also designated as critical habitat for the species; however, the species does not occupy any portions of this unit. The two subwatersheds that constitute the landscape analysis area are part of the larger Cimarron River watershed, in which critical habitat for the Arkansas River shiner is located. However, any potential downstream impacts from the Proposed Action to the Arkansas River shiner's critical habitat within this watershed would be difficult to accurately predict at this distance from the source of the impact. Additionally, as described in Section 2.3.2.2.11, erosion control and stormwater BMPs would be implemented in accordance with Oklahoma Department of Environmental Quality standards to avoid indirect impacts to water that flows outside of the landscape analysis area and into the larger Cimarron River watershed unit. Effects to this species are not expected due to current range, and any effects to critical habitat would be limited based on distance of the landscape analysis area to reach of critical habitat units and the implementation of BMPs. Therefore, the Proposed Action would have *no effect* on the Arkansas River shiner.

Operations, Maintenance, and Decommissioning

Potential impacts from O&M and decommissioning (or plant re-powering) would be similar to those previously discussed for construction activities. However, impacts from maintenance activities would be lower in magnitude because maintenance impacts would be localized and intermittent. O&M activities would include human presence, grading and drainage maintenance, vegetation management, use of herbicides, dust abatement, and the potential for hazardous spills. BMPs for vegetation and water

resources would continue to take place during O&M to reduce impacts to wildlife and special-status species within the analysis areas. BMPs for special-status bird species (i.e., stop-work orders, lowering of equipment) would also continue to be employed. In addition, the gen-tie line would be marked with bird flight diverters to minimize collision risk for special-status species and other migratory birds.

Any long-term impacts as a result of perimeter fencing would be limited to wildlife species that cannot pass through or under fence openings such as white-tailed deer (*Odocoileus virginianus*) or other large mammals. However, the additional fenced land constitutes 12% of the Project analysis area, which is minimal when compared to the larger ecological region. Perimeter fencing does not pose as a barrier to the movement and dispersal for small wildlife (e.g., mammals, amphibians, reptiles), and birds would be able to fly though or over and perch on perimeter fencing.

Cumulative Effects

The Proposed Action would add to habitat loss, habitat fragmentation, and individual wildlife species risk or displacement (due to collision, noise, etc.) from present and reasonably foreseeable trends and actions. Project-related disturbance would represent a small fraction of total vegetative cover within the analysis areas, and many actions would be both short term and localized. However, the Project would add 575 acres of long-term habitat loss to present and reasonably foreseeable trends and actions. To limit or minimize these impacts to wildlife and special-status species within the analysis areas, the Applicant would implement BMPs and design features as summarized in Section 2.3.2.5. Therefore, the Project is not anticipated to result in significant cumulative impacts to wildlife in the analysis area.

3.3.3.3.4 OTHER ACTION ALTERNATIVE

Construction, Operations, Maintenance, and Decommissioning

Potential impacts to wildlife from construction, O&M, and decommissioning (or plant re-powering) activities under the Other Action Alternative would be the same as those described under the Proposed Action because construction actions and schedule under both alternatives would be similar in scope and duration. Unique wildlife effects associated with the Other Action Alternative are described below. Sections 3.2.3, 3.3.1, and 3.3.2 describe the differences between the Proposed Action and the Other Action Alternative in detail for water resources, vegetation, and wetlands, respectively (all of which are features of general wildlife and special-status species habitat).

Based on the conceptual layout, construction of the Other Action Alternative would result in estimated long-term impacts to 424 acres of cropland, 79 acres of mixed grass prairie, 3 acres of developed lands, < 0.1 acres of riparian forest, and < 0.1 acre of open water (see Table 3.3-5). Less than 1 acre of wetland habitat (see Table 3.3-5), 425 linear feet of surface streams, and less than 1 acre of surface waterbodies (see Table 3.3-5) would be impacted by the Other Action Alternative. Similar to the Proposed Action, these long-term impacts would only impact 4% of vegetation within the 12,262-acre Project analysis area.

Cumulative Effects

As noted above, the Other Action Alternative would add up to an estimated 506 acres of long-term vegetation loss, 42 acres of short-term vegetation removal, and 1,185 acres of habitat alteration or fragmentation (through fencing and mowing) to future conditions under the No Action Alternative. However, these impacts would affect no more than 4% of vegetation within the Project analysis area. Based on previous land cover trends, land use of the Project analysis area is projected to continue to be primarily agricultural. If Other Action Alternative construction activities coincide with other reasonably foreseeable trends and actions, cumulatively the Proposed Action could also contribute to temporary, localized disturbance or displacement due to increases in traffic, human activity, and noise. However, the

Applicant would implement measures to minimize wildlife impacts. RUS also assumes that other projects would comply with local, state, or federal regulatory requirements to avoid or minimize wildlife impacts, if actions are subject to regulatory requirements. Therefore, no significant cumulative impacts would occur.

3.3.3.4 Summary of Impacts

Impacts to wildlife and special-status species were compared between the No Action Alternative, Proposed Action, and the Other Action Alternative using best available data. Under the No Action Alternative, the Project would not be constructed, and there would be no impacts on wildlife and special-status species from the Project. However, existing and reasonably foreseeable trends and actions, primarily caused by preexisting agricultural use, would continue to affect wildlife and special-status species in the analysis areas. Up to approximately 2,120 acres of total habitat could be removed, altered, or fragmented under the Proposed Action, whereas up to approximately 1,744 acres total would be impacted under the Other Action Alternative. To limit or minimize anticipated impacts to wildlife and special-status species within the analysis areas, the Applicant would implement BMPs and design features for wildlife, as well as for vegetation, water resources, and wetlands. Based on the evaluation conducted in the EIS, RUS made a determination of "no effect" for the piping plover, rufa red knot, and Arkansas river shiner, and a determination of "may affect, but is not likely to adversely affect," for whooping crane.

3.4 HUMAN RESOURCES

3.4.1 Cultural and Historic Resources

3.4.1.1 Introduction

The NEPA requirement that agencies consider the effects of their actions on human environment specifically includes the cultural and historic resources of a geographic area (40 CFR 1508.8 and 1508.27[b][3]). This further specifically includes consideration of "The degree to which the action may adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places or may cause loss or destruction of significant scientific, cultural, or historical resources" (40 CFR 1508.27[b][8]). A site, area, building, structure, district, object, or traditional cultural place that is included in or eligible for the NRHP is defined as a "historic property" under the National Historic Preservation Act (NHPA) as amended (at 54 USC 300308). NHPA Section 106 requires that federal agencies take into account the effects of their undertakings on historic properties (54 USC 306108). The NEPA review of cultural and historic resources integrates the NHPA Section 106 review in accordance with the guiding regulations of each law (40 CFR 1500-1508; 36 CFR 800.8).

This analysis describes identified cultural resources (including historic properties) in specific analysis areas (see Section 3.4.1.2, below). The analysis subsequently describes and discusses the effects of the No Action Alternative and action alternatives on these resources.

3.4.1.1.1 SPATIAL AND TEMPORAL SCOPE OF ANALYSIS

The spatial scale for the analysis of potential effects to cultural resources is the Application Area (see Figure 3.4-1). The Application Area is the area of potential effects (APE) for historic properties under NHPA Section 106. As defined in the regulations guiding the Section 106 process, the APE is "the geographic area or areas within which an undertaking may directly or indirectly cause changes in the character or use of historic properties, if any such properties exist" (36 CFR 800.16(d)).

The APE would not extend beyond the limits of the Application Area and encompasses historic properties (e.g., the Chris Leavengood Homestead and Mitchell Farm) as well as residences, a church, and a school (like those at KOPs identified in Section 3.4.7 Visual Quality and Aesthetics) that have not been assessed as historic properties (see Figure 3.4 6). The Application Area contains vegetated riparian corridors and many shelterbelt tree groves at rural residences that would help screen visual intrusions and dissipate noise over a short distance. Project actions also would not generate a vibration level sufficient to affect aboveground or belowground structures beyond the limits of Project actions.

3.4.1.2 Affected Environment

3.4.1.2.1 SUMMARY OF CULTURAL HISTORY

Cultural resources are the vestiges of our shared human past that remain on the land in the representation of history and architectural history, archaeology, and places of traditional cultural and religious significance to Native American peoples. Native Americans have occupied what is now Oklahoma for over 12,000 years, across periods archaeologically categorized (from oldest to newest) as the Paleoindian, Archaic, Woodland, Plains Village, Caddoan or Plains Village, and Historic. Two distinct phases of Native American occupation arise during the Historic period, consequent to the European colonization of the Americas after the fifteenth century. The first phase was the continued occupation of the area by indigenous groups there at the time of European contact, including the Apache, Comanche, Wichita, and Osage. The second phase is after the U.S. government's establishment of Indian Territory and forced removal of groups from their native lands to this territory beginning in the 1830s. The Cherokee were assigned lands in Garfield County and were removed to the Indian Territories with much loss of life and property along what became known as the Trail of Tears. Although these lands in the Indian Territories were originally set aside in treaties as tribal lands, they were rapidly reduced by the expansion of U.S. settlement through the end of the nineteenth century and into the twentieth century. Native American occupation in the Project vicinity is primarily represented by archaeological sites and traditional cultural places. Historic settlement is primarily rural agricultural, represented by historic buildings and structures or the artifacts of their occupation as they too become archaeological sites with the passage of time.

3.4.1.2.2 CULTURAL RESOURCES IDENTIFIED

Oklahoma Archaeological Survey (OAS) provided a files search of archaeological surveys and sites on record within the Application Area and within 1 mile of its boundary. OAS works with the state historic preservation office (SHPO) and federal agencies to research the state's archaeological record, preserve significant archeological sites, and disseminate information about Oklahoma's cultural heritage. OAS identified no known archaeological sites within the APE or within 1 mile of the APE. However, a few archaeological surveys were previously conducted within the 12,000-acre APE. For this reason, an initial archaeological field survey conducted for the Project investigated high probability areas and moderate probability areas coinciding with the Proposed Action's area of direct disturbance. These probability areas are where archaeological modeling by SWCA (Figure 3.4-1) identified land with the greatest potential to contain relatively intact archeological deposits, capable of providing significant information on past lifeways. These probability areas occur largely along drainage corridors where sediment deposits may best support archaeological site retention and where it was less likely that the land had been plowed for agriculture. Archaeologists from SWCA conducted surface inspection and subsurface archaeological shovel tests at 100-meter intervals in the high probability areas and with a sampling in the adjacent moderate probability areas in November 2020. This fieldwork identified no archaeological resources in the APE. Although no archaeological sites were identified, the potential still exists that post-review discoveries of archaeological resources could be identified during Project construction, and these would be addressed by RUS in accordance with the NHPA Section 106 regulations for post-review discoveries (36 CFR 800.13). For this purpose, the Applicant would create and implement an unanticipated discovery

plan. The Applicant will also conduct additional fieldwork prior to construction that incorporates SHPO recommendations and Osage Nation standard methodology; results from this survey will be incorporated into the final EIS.

The Oklahoma SHPO identified two historic Centennial Farm and Ranch Properties in the APE and the potential for other properties of this type to occur in the vicinity. The two properties in the APE are the Chris Leavengood Homestead and the Mitchell Farm (see Figure 3.4-6 in Visual Resources and Aesthetics, Section 3.4.7). The SHPO identified the potential for other properties that qualified for the program to be in the vicinity based on historic Works Progress Administration maps from 1936. Centennial Farm and Ranch Properties are those recognized by the Oklahoma Department of Agriculture, Food and Forestry and the SHPO as directly connected with the important contributions by Oklahoma's farm and ranch families to the state's development. The Applicant has committed to a minimum 22 foot setback for solar panels from private residences, which would include Centennial Farm and Ranch buildings.

3.4.1.2.3 TRIBAL CONSULTATION

RUS initiated consultation for the Project with 39 federally recognized Native American tribes from March 16 to 18, 2021 (see Appendix C). RUS tribal consultation will remain ongoing throughout RUS involvement on the Project. To date, responses have been received from the Choctaw Nation, Kaw Nation, and Osage Nation. RUS conducted a government-to-governmental meeting with the Osage Nation Historic Preservation Office on June 8, 2021. The Choctaw and Kaw Nations deferred consultation to other tribes closer to the Application Area, including the Osage Nation. All tribal correspondence is on file within RUS’s project record.

During government-to-government consultations with RUS, representatives from the Osage Nation expressed concerns about potential Project impacts to areas of importance within the APE.

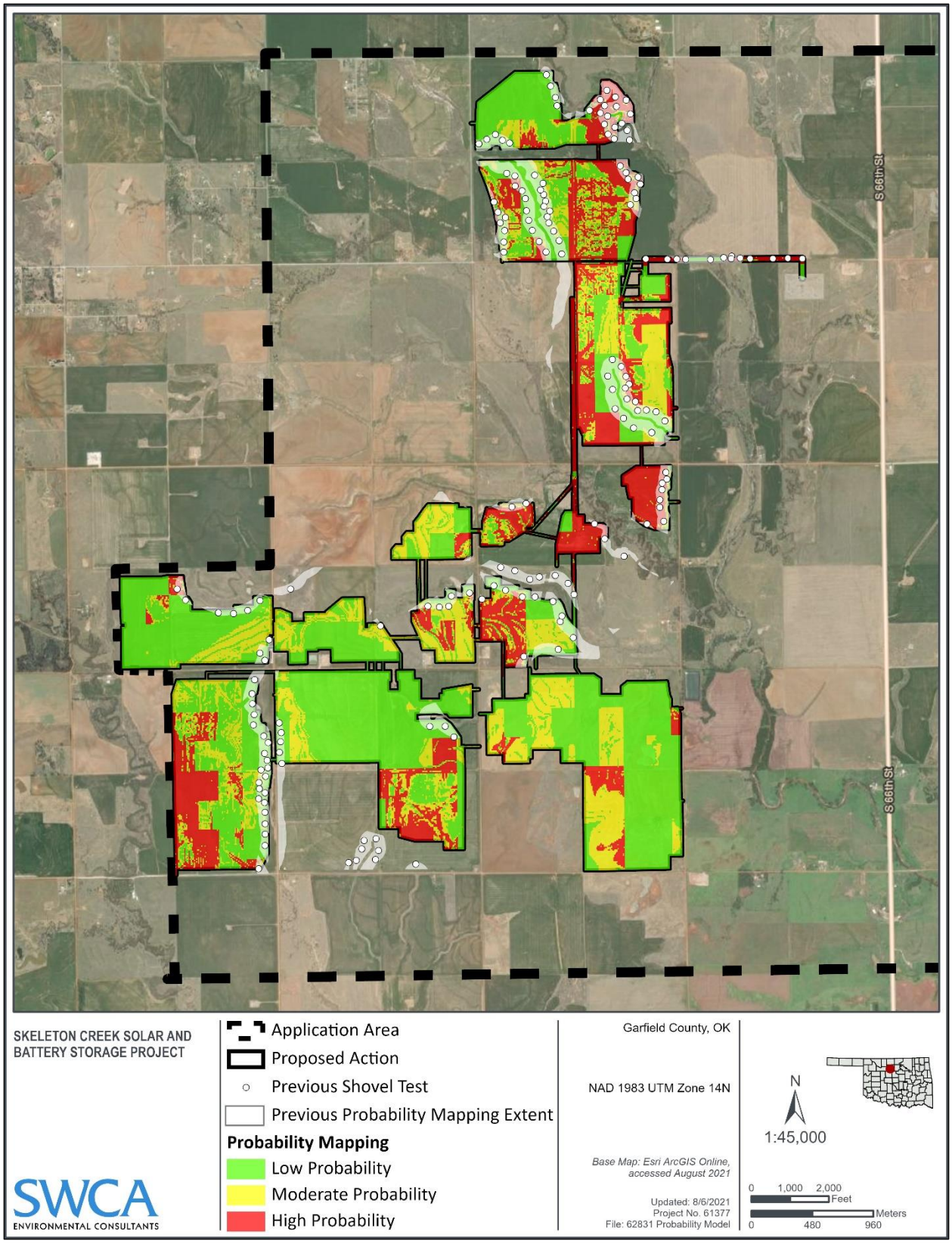

Figure 3.4-1. Probability mapping and shovel tests taken during preliminary field assessment.

3.4.1.3 Environmental Consequences

3.4.1.3.1 METHODOLOGY

Table 3.4-1 lists the issues identified for this resource and the indicators and impact thresholds used to assess impacts for this EIS.

Table 3.4-1. Cultural and Historic Resources Issues, Indicators, and Impact Thresholds

Issues	Indicators	Impact Thresholds
Potential physical or non-physical impacts to historic properties	Number of NRHP-listed, determined eligible, or assumed eligible cultural resources/historic properties (historic and prehistoric) affected and acres to be disturbed at each historic property	Loss of quality or change in characteristics that qualify a site for the NRHP in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association (36 CFR 800.5(a))

To determine effects on cultural resources, Project actions were qualitatively evaluated for the degree to which they would diminish each site's character and integrity. For this EIS, the Project was determined to have an effect if the Proposed Action would alter the characteristics that qualify a cultural resource for potential inclusion in the NRHP. The effect would be adverse if it diminishes the integrity of such characteristics, making the alteration significant.

This EIS considers potential Project impacts only to identified cultural resources within the APE. Should any previously unrecorded cultural resources be discovered during Project implementation, an unanticipated discovery plan would be followed. Activities that may affect that resource within the area of discovery would halt immediately; the resource would be evaluated by an archaeologist; and consultation would be initiated with the SHPO and interested tribal historic preservation offices (THPOs), as well as with the Advisory Council on Historic Preservation if required, to determine appropriate actions for protecting the resource and for mitigating any adverse effects on the resource. Project activities at the discovery site would not resume until the resource is adequately protected and until determined mitigation measures are implemented with RUS approval and SHPO/THPO agreement. RUS generally recommends a minimum 50-foot buffer for cultural resources and a 100-foot buffer for discovered human remains.

3.4.1.3.2 NO ACTION ALTERNATIVE

Under the No Action Alternative, the Project would not be constructed, and there would be no impacts on cultural resources from the Project. However, existing and reasonably foreseeable trends and actions would continue to affect cultural resources in the analysis area. Currently, the analysis area is primarily used for agricultural purposes and these land uses would continue under the No Action Alternative. Should undiscovered archaeological resources be in the area, these would be susceptible to future agricultural activity. The use of typical mechanical equipment (e.g., tractors, planters, tillers, combines, etc.) at such archaeological sites, should they occur, would physically impact these sites and contribute to loss of important archaeological site characteristics.

The possibility remains for reasonably foreseeable trends and actions to impact the analysis area if the No Action Alternative is taken. These projects, as described in Table 4.4-1 of Section 4.4.1, could permanently or temporarily impact archaeological resources should undiscovered archaeological resources be present. Not all reasonably foreseeable trends and actions would be subject to federal or state laws or policies requiring a plan for addressing unanticipated discoveries or considering visual impacts for historic properties. As such, unmitigated impacts could occur to unidentified historic properties from reasonably foreseeable trends and actions.

3.4.1.3.3 PROPOSED ACTION

Construction

According to the files searches of the OAS and SHPO and fieldwork by SWCA, no historic or archaeological resources other than two Centennial Farm and Ranch Properties occur in the APE. There is also potential for other historic farm and ranch properties to occur (see Figure 3.4-6 in Visual Resources and Aesthetics, Section 3.4.7).

The Applicant has committed to a minimum 22-foot setback for solar panels from private residences, including those in the APE that are not confirmed historic properties. Therefore, known and potential historical architectural resources would not be physically impacted. Visual impacts would be minimized to produce no adverse effect as result of setback distances and the implementation of BMPs. The Chris Leavengood Homestead buildings would be located approximately 1 mile from Proposed Action facilities, with vegetated stream corridors present in between. The Mitchell Farm would be located more than 2 miles from Proposed Action facilities, with vegetated stream corridors present in between. Screening by vegetation at drainages and residential landscaping would also minimize visual impacts. The Proposed Action would begin to visually dominate views from some residences of unknown history in the analysis area (like KOPs 3, 4, 6, 7, and 8; see Figure 3.4-6) with the construction and O&M of PV panels, solar trackers, and the distributed battery storage system. However, with the implementation of BMPs described in Chapter 2, no adverse effects would result to historic buildings or structures from visual impacts.

No archaeological resources or properties of traditional cultural or religious significance to Native American tribes were identified in the APE. However, the potential exists for archaeological resources to be discovered during construction or tribally significant resources to be identified in RUS's ongoing tribal consultation efforts. Unanticipated discoveries would be addressed by RUS pursuant to the NHPA Section 106 regulations (36 CFR 800.13), and through implementation of an Applicant-committed unanticipated discovery plan. Any tribally significant resources identified in consultation would have potential impacts assessed based on the Criteria for Adverse Effects under the NHPA Section 106 regulations (36 CFR 800.5) and, in the case of adverse effects, have impacts avoided, minimized, or mitigated in consultation with the SHPO and consulting tribes per the NHPA Section 106 regulations.

Operations, Maintenance, and Decommissioning

Project O&M activities would consist of routine site inspection and road maintenance (grading and drainage upkeep). These actions would generally not result in new ground disturbance and would not result in historic or archaeological impacts as long as activities stay within previously surveyed areas and any measures identified during the NHPA Section 106 process and required under the NEPA decision for the Project are implemented.

Decommissioning (or plant re-powering) impacts would be similar to those described under construction effects, above. Unanticipated discoveries would be addressed by RUS pursuant to the NHPA Section 106 regulations (36 CFR 800.13) and through implementation of an Applicant-committed unanticipated discovery plan.

Cumulative Effects

The Proposed Action would add to land disturbance when compared to No Action Alternative through the disturbance of 2,120 acres of predominately agricultural land for Project infrastructure. Project activities could add to the physical disturbance of archaeological sites that could occur under the No Action Alternative, should unanticipated discoveries of archaeological resources result from the Project. However, surveys for the Project have identified no significant archaeological materials. Should

archaeological resources be discovered, adverse effects to historic properties under the Proposed Action would be further avoided, minimized, and/or mitigated in accordance with the NHPA and NEPA, resolving any adverse or cumulative effects.

3.4.1.3.4 OTHER ACTION ALTERNATIVE

Construction, Operations, Maintenance, and Decommissioning

Potential cultural resources impacts from construction, O&M, and decommissioning (or plant re-powering) activities are generally assumed to be the same under the Proposed Action and the Other Action Alternative because, in general, the construction actions and schedule would be similar in scope and duration. Impacts unique to the Other Action Alternative are described below.

No surveys have been conducted within the Other Action Alternative construction footprint. However, according to the file searches of the OAS and SHPO, no archaeological resources and two Centennial Farm and Ranch Properties occur in the APE. The APE may also contain residences that have not been confirmed to be historic properties (the same locations identified under the Proposed Action). The Other Action Alternative footprint is estimated to disturb 1,744 acres, which is slightly less than the Proposed Action and could reduce the chance of encountering and impacting undiscovered archaeological resources should they occur or resources of tribal significance, should they be identified in consultation. However, actual disturbance extent is not yet finalized, as land access has not been obtained.

Potential impacts would be assessed based on the Criteria for Adverse Effects under the NHPA Section 106 regulations (36 CFR 800.5) and, in the case of adverse effects, these impacts would be avoided, minimized, or mitigated in consultation with the SHPO and consulting tribes per the NHPA Section 106 regulations.

There is also potential for impacts to other historic farm and ranch properties or historic residences to occur (see Figure 3.4-6 in Visual Resources and Aesthetics Section 3.4.7). The Chris Leavengood Homestead buildings would be located approximately 2 miles from the Other Action Alternative facilities, with vegetated stream corridors present in between. The Mitchell Farm would be located approximately 700 feet from Proposed Action facilities, with vegetated stream corridors present in between. This action, like the Proposed Action, would begin to visually dominate views from some residences of unknown history in the analysis area (like KOPs 3, 4, 6, 7, and 8; see Figure 3.4-6) with the construction and O&M of PV panels, solar trackers, and the distributed battery storage system. Although the location and layout of Project facilities would be different under this alternative, setback distances from buildings and the screening of vegetation at riparian corridors and the BMPs described in Chapter 2 would result in no adverse effects from visual impacts.

Cumulative Effects

The Other Action Alternative would add to land disturbance when compared to the No Action Alternative through the disturbance of 1,744 acres of predominately agricultural land for Project infrastructure. Project activities could add to the physical disturbance of archaeological sites that could occur under the No Action Alternative, should unanticipated discoveries of archaeological resources result from the Project. However, surveys for the Project have identified no significant archaeological materials. Should archaeological resources be discovered, adverse effects to historic properties under the Other Action Alternative would be further avoided, minimized, and/or mitigated in accordance with the NHPA and NEPA, resolving any adverse or cumulative effects.

3.4.1.4 Summary of Impacts

Impacts to historic and cultural resources were assessed qualitatively and compared between the No Action Alternative, Proposed Action Alternative, and the Other Action Alternative. Under the No Action Alternative, the Project would not be constructed, and there would be no impacts to historic and cultural resources from the Project. However, existing (e.g., expansion of agricultural activities) and reasonably foreseeable trends and actions could continue to affect these resources. Significant impacts to historic and cultural resources are not anticipated as a result of the construction of the Project under the Proposed Action and the Other Action Alternative. However, under any action alternative, should undiscovered archaeological resources exist in the analysis area, there is the potential for adverse effects to these resources during land development activities. Adverse effects to historic properties under any action alternative would be avoided, minimized, or mitigated in accordance with NHPA and NEPA to resolve any adverse or cumulative effects. Whereas, under the No Action Alternative and for reasonably foreseeable trends and actions without the requirements of federal or state historic preservation laws, adverse effects to historic properties are most likely to go unmitigated, resulting in greater impact.

RUS consultation with federally recognized Native American tribes remains ongoing. RUS will continue to consult with tribes specifically to identify and assess impacts to tribally significant resources, including those to which tribes attach traditional religious and cultural importance (pursuant to 36 CFR 800). Any tribally significant historic properties identified in consultation would have potential impacts assessed based on the Criteria for Adverse Effects under the NHPA Section 106 regulations (36 CFR 800.5); any adverse effects to historic properties would be resolved pursuant to 36 CFR 800.6.

3.4.2 Land Use

3.4.2.1 Introduction

Land use is defined as the human use of areas for economic, residential, recreational, conservational, and government purposes. This section evaluates the potential for temporary or long-term changes in current uses in a manner that is detrimental to local residents or inconsistent with local zoning and planning. Additionally, during scoping, concerns were expressed that the EIS evaluate Project consistency with local renewable energy requirements.

This analysis describes the current land use activities within specific analysis areas (Section 3.4.2.2). The effects of the No Action Alternative and action alternatives on land use are subsequently described and discussed.

3.4.2.1.1 SPATIAL AND TEMPORAL SCOPE OF ANALYSIS

The spatial scale for the analysis of potential effects to land use encompasses the 12,262-acre Application Area. This area is referred to as the land use analysis area or, more generally in this section, the analysis area. This analysis area contains land parcels and communities most likely to be impacted by the Project.

To allow for an assessment of land use effects throughout the Project's life cycle, the temporal scale of effects ranges from the 18-month construction period to the operational life of the Project, which is assumed to be 30 years for this EIS.

3.4.2.2 Affected Environment

The Project is located in Garfield County, Oklahoma, approximately 4 miles southeast of Enid, Oklahoma. The Application Area is rural, sparely populated, and solely composed of private farmland and rural residences. There are no federal, state, or tribal-designated lands in the analysis area. Most of the land is designated as prime farmland, which is defined and analyzed in Section 3.4.2.2.3. The landscape contains subtle rolling terrain at roughly 1,100 feet in elevation, with interspersed vegetative corridors.

3.4.2.2.1 LAND USE AND ZONING – LAND COVER, ZONING, PLANS, AND INFRASTRUCTURE

Land Cover

Approximately 70% of the land cover in the analysis area consists of cultivated crops (Table 3.4-2 and Figure 3.4-2). Grassland (27%) and developed open space (4%) account for the next two largest land uses. These land covers have exhibited limited change over the past 15 years, suggesting largely consistent land use in the analysis area over time (Homer et al. 2015). For comparison, Garfield County land cover is also provided in Table 3.4-2. As shown, the analysis area and county land coverage percentages are similar; however, the county contains other types of land cover that are not present in the analysis area, such as high intensity developed areas, evergreen and mixed forests, shrubs, and woody wetlands.

Table 3.4-2. Land Cover within the Analysis Area (2016)

Land Cover	Acres in Analysis Area (% of total land cover)*	% Change in Analysis Area from 2001*	Acres in Garfield County (% of total land cover)*
Open Water	15 (< 1%)	-6%	2,860 (< 1%)
Developed, Open Space	512 (4%)	-< 1%	29,118 (4%)
Developed, Low Intensity	14 (< 1%)	-4%	9,548 (1%)
Developed, Medium Intensity	1 (< 1%)	-< 1%	4,447 (< 1%)
Barren Land (Rock/Sand/Clay)	17 (< 1%)	-< 1%	66 (< 1%)
Deciduous Forest	108 (< 1%)	< 1%	14,470 (2%)
Grassland/Herbaceous	3,267 (27%)	< 1%	219,567 (32%)
Pasture/Hay	29 (< 1%)	-< 1%	2,582 (< 1%)
Cultivated Crops	8,298 (68%)	-< 1%	391,067 (58%)
Emergent Herbaceous Wetlands	0	Not applicable (N/A)	248 (< 1%)
Developed, High Intensity	0	N/A	2,015 (< 1%)
Evergreen Forest	0	N/A	1,669 (< 1%)
Mixed Forest	0	N/A	129 (< 1%)
Shrub/Scrub	0	N/A	109 (< 1%)
Woody Wetlands	0	N/A	134 (< 1%)
Total	**12,262**		**678,029**

* May not add to 100% due to rounding.

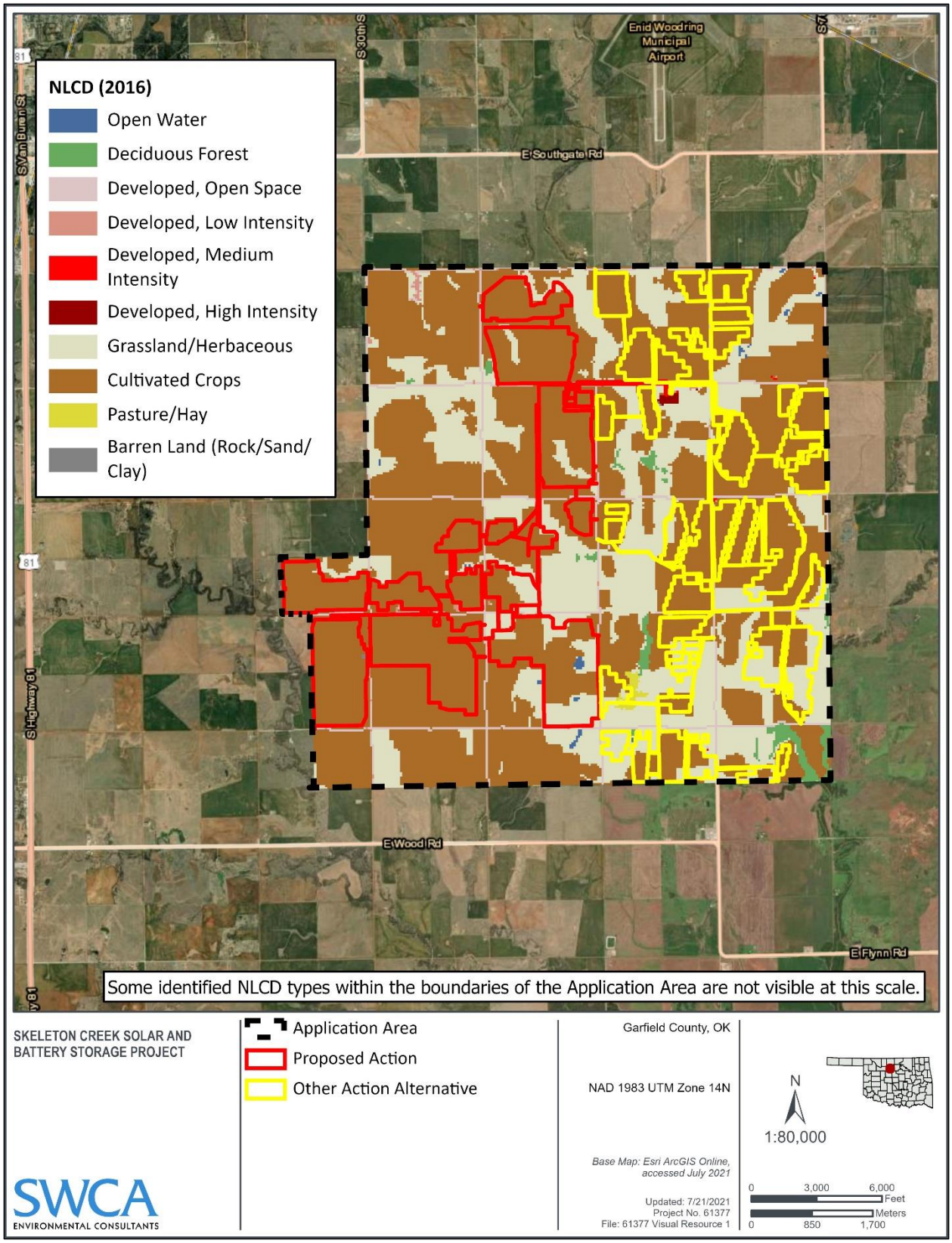

Figure 3.4-2. Land cover in the land use analysis area (Application Area).

Zoning and Plans

Per 40 CFR 1501.2, RUS is required to consult early with appropriate state, tribal, and local governments and with interested private persons and organizations when their involvement is reasonably foreseeable. The Project is situated within Garfield County and is subject to all county zoning laws and regulations, as well as pertinent state and federal regulations. Zoning regulations for Garfield County consist of 14 zoning classifications that establish permitted uses. The Project falls within the agricultural zone. The zoning regulations for the agricultural districts within the county are designed to prevent urbanization. Existing plans and studies for the City of Enid are available on the city's website: https://www.enid.org/business/community-development/comprehensive-plans-and-studies. This website includes present and future plans to accommodate changes and growth to the local economy, such as Master Plans for the Water Systems (2009), the Parks (2013), and the Sanitary Sewer (2008). The city's current comprehensive plan is the *Envision Enid Comprehensive Plan* (City of Enid 2015). The land use section of this plan details a 20-year vision for redevelopment of downtown Enid and city infrastructure within city limits.

The Project also falls within the Vance Jackson AFB military airspace and the Energy Military Compatibility Area (MCA) that was established by the 2018 Vance AFB Joint Land Use Study (JLUS). Vance Jackson AFB prepared the JLUS in order to protect the viability of current and future military mission and operations while simultaneously guiding community growth, sustaining the environmental and economic health of the region, and protecting public health, safety, and welfare (JLUS 2018). Siting within the Energy MCA requires alternative energy project developers to coordinate with the Department of Defense Siting Clearinghouse to analyze potential impacts to military operations and assist communities and developers with identifying mitigation strategies to minimize those impacts, as military training operations may be degraded by tall components of energy production facilities, such as wind turbines, solar panels, and related transmission lines (JLUS 2018).

The Project is also situated within Metropolitan Area Planning Commission Jurisdiction and is subject to associated requirements. Specifically, the State of Oklahoma requires a Mission Compatibility letter from the Department of Defense Siting Clearinghouse, a statement from the Federal Aviation Administration (FAA) showing Determination of No Hazard to Air Navigation, and a statement from the Vance AFB Wing Commander of approval or objection. The City of Enid requirements consist of a statement from the Woodring Regional Airport Director of approval or objection and Project location and height consistency with the Vance AFB Vertical Obstruction MCA and the Enid Woodring Regional Airport Vertical Obstruction MCA (Vance AFB 2018).

Infrastructure

Existing infrastructure within the analysis area includes approximately 53 oil-gas wells and several natural gas and hazardous liquid (crude oil) pipelines (Figure 3.4-3). The Woodring Substation is also located in the analysis area, along with 18.8 miles of existing transmission line. Within the ROW, there are an estimated 48 residences. See Section 3.4.6.2 for additional details regarding existing road infrastructure.

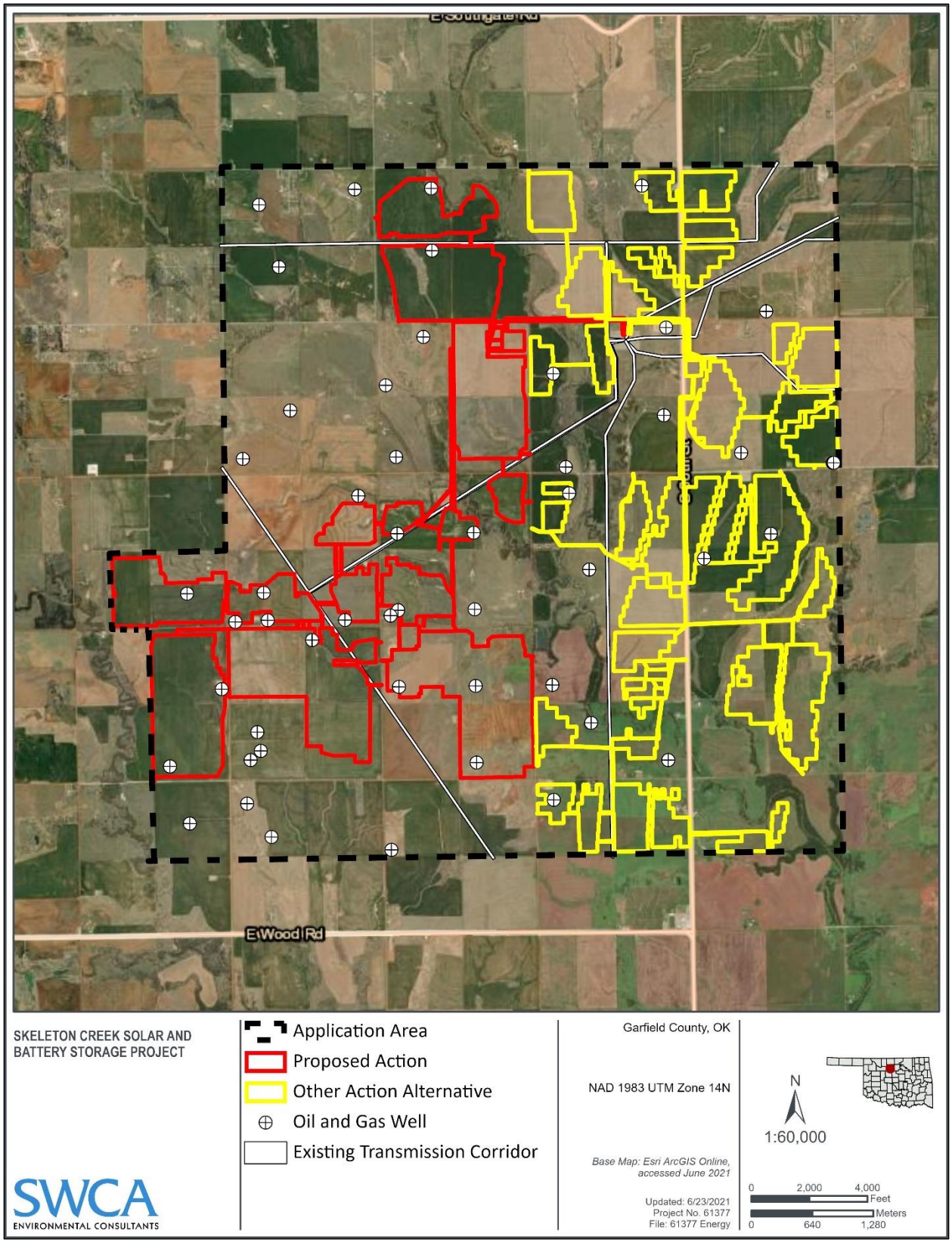

Figure 3.4-3. Infrastructure in the land use analysis area (Application Area).

3.4.2.2.2 PRIME AND IMPORTANT FARMLANDS

The Application Area consists predominantly (76%) of prime farmland (Figure 3.4-4). Based on NRCS land evaluation (2021), approximately 388,770 acres of farmland (57% of total land) is considered farmland as defined by the Farmland Protection Policy Act (FPPA). The FPPA defines prime farmland as land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops. Prime farmland is regulated through the FPPA when any federal funds are involved with a project or the land is irreversibly converted to nonagricultural use.

According to the most recent Census of Agriculture (USDA 2017), Garfield County has 936 farms totaling 674,900 acres. The average farm size is 721 acres. The crops cultivated by these farms are wheat for grain, soybeans, hay, canola, and sorghum for grain. Of the total farmland, 66% of the land that the farms use is cropland. The top crop for Garfield County is winter wheat, using 214,743 acres (32%) of the county farmland.

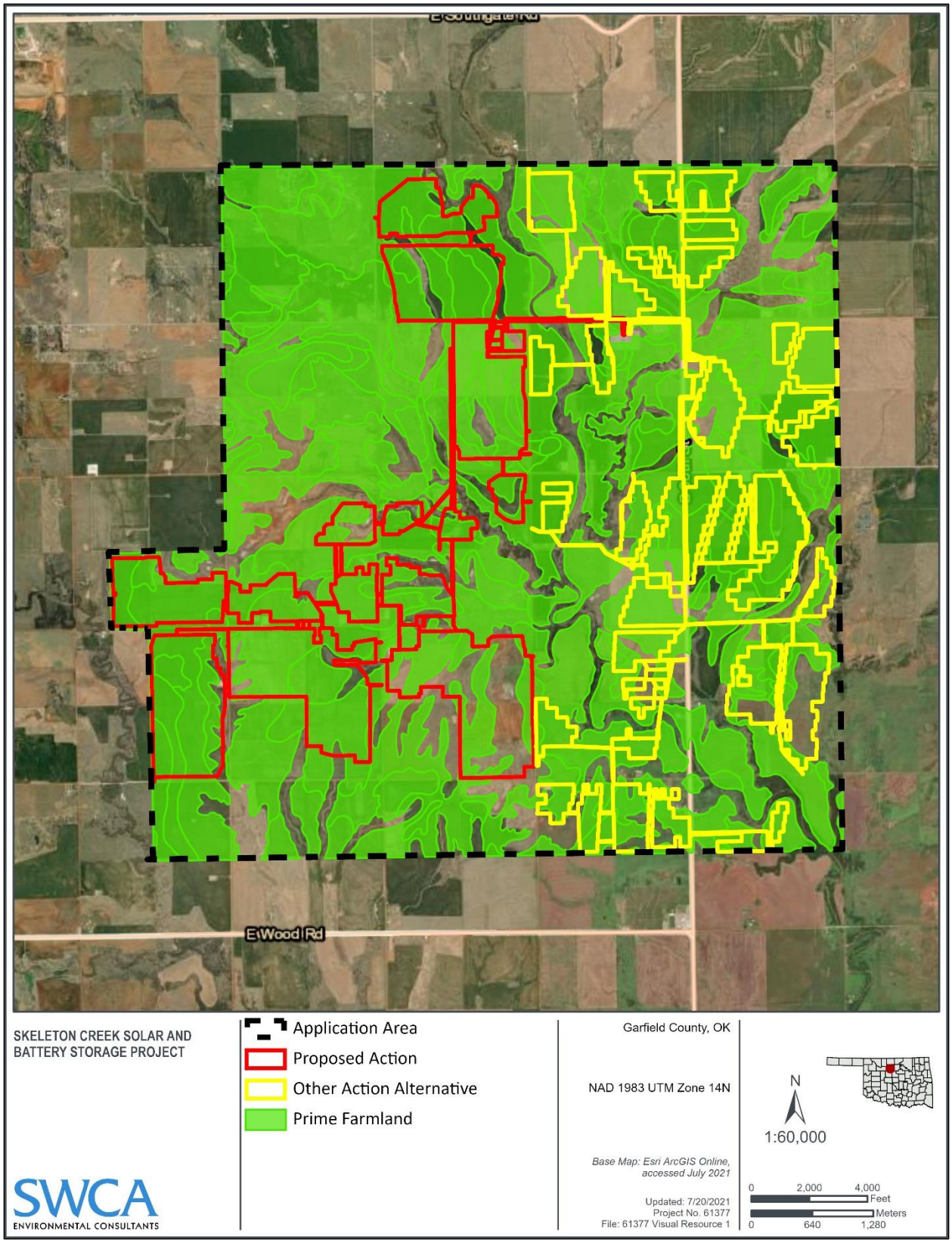

Figure 3.4-4. Prime and important farmlands in the Application Area.

3.4.2.2.3 LANDOWNERSHIP

As previously noted, the Application Area is rural, sparely populated, and solely composed of private farmland and rural residences. There are no federal, state, or tribal-designated lands in the Application Area.

3.4.2.3 Environmental Consequences

3.4.2.3.1 METHODOLOGY

Table 3.4-3 lists the issues identified for this resource and the indicators and impact thresholds used to assess impacts for this EIS.

Table 3.4-3. Land Use Issues, Indicators, and Impact Thresholds

Issues	Indicators	Impact Thresholds
Change in land cover, infrastructure, and zoning	Change in land use cover Consistency with county zoning and plans Consistency with Department of Defense/military and radar operations Qualitative evaluation of infrastructure impacts	No impact thresholds established by regulations; best professional judgment
Conversion of prime farmlands	Acres of prime farmland converted to other use	Exceeds NRCS land evaluation thresholds
Landownership	Consistency with current landownership patterns/uses	No impact thresholds established by regulations; best professional judgment

Land use and land cover data were obtained from the USGS NLCD. These datasets were overlaid with the Project layout to determine acres of overlap in land cover classes and farmland designations.

Project components considered to have long-term land use impacts include long-term access roads, the battery, the solar inverter, the solar array, substation, and gen-tie line foundations. The analysis also assumes that other land within Project fencing would be precluded from other, non-energy uses for the life of the Project. Temporary impacts were assumed to occur for collection lines, temporary access roads, and transmission line ROW (excluding foundations) because these areas could be capable of supporting previous land uses after construction is complete and site reclamation occurs.

3.4.2.3.2 NO ACTION ALTERNATIVE

Under the No Action Alternative, the Project would not be constructed, and there would be no impacts on land use from the Project. However, existing and reasonably foreseeable trends and actions would continue to affect land use in the analysis area. Anticipated land use of the analysis area is projected to continue to be primarily agricultural. Future development could result in additional farmland conversion; however, based on land cover trends (see Section 3.4.2.2.2), this conversion would be limited in nature. The presence of existing wind farms could impact private and military aircraft operations or radar due to associated vertical obstructions. However, RUS assumes that all wind developers would conduct coordination and permissions with local, state, and federal agencies and the Department of Defense prior to construction to resolve any potential for impact or interference.

No reasonably foreseeable trends and actions are anticipated within the analysis area. However, transportation and airport expansion projects scheduled within adjacent lands in Garfield County could contribute to temporary land use restrictions during construction. No long-term changes in land cover and

ownership are anticipated because projects would occur within lands already developed and owned or managed by current landowners. Additionally, this EIS assumes these future projects would be in compliance with local zoning and other county regulations and would be sited in a manner to avoid impacts to current on-the-ground infrastructure.

3.4.2.3.3 PROPOSED ACTION

Construction

Land Cover

Construction of the Project and associated clearing activities would result in temporary and long-term land cover conversion.

An estimated 749 acres of long-term land cover conversion (6% of total Application Area land cover) would occur as a result of clearing and construction of long-term access roads, installations of the solar array, battery, solar inverter, substation, and gen-tie line foundations. Additionally, 1,293 acres within the additional fenced land (11% of total Application Area land cover) would be converted to energy uses with restricted landowner access for the life of the Project (Table 3.4-4). Cropland is the predominant land cover type that would be impacted by Project activities. Construction of the Project and associated clearing and fencing would result in long-term disruptions to approximately 1,816 acres of cropland (22% of total cropland within the Application Area). Impacts to agricultural operations would include loss of use of lands, interference with movement of machinery and equipment, irrigation implements, and obstacles for aerial seeding and spraying. Potential crop loss could occur depending on the crop type and construction timing.

An estimated additional 67 acres of temporary land cover conversion (< 1% of total Application Area land cover) would occur for construction of temporary access roads and ROW for transmission line and collection lines. Additional temporary staging areas would be needed for parking, trash disposal, construction trailers, a laydown yard, and portable toilets and drinking water (Table 3.4-5). Details on the location of staging areas has not been defined, but staging areas would be selected to minimize land disturbance. Further, these areas would be revegetated and returned to previous use, in accordance with the Applicant's Restoration and Revegetation Plan.

Table 3.4-4. Proposed Action Long-Term Land Use

Project Feature	Acreages of Cropland*	Acreages of Developed, Open Space*	Acreages of Developed, Low Intensity*	Acreages of Grassland*	Acreages of Barren Land*	Acreages of Open Water*
Long-term access roads	30	< 1	0	3	0	0
Battery storage system	< 1	0	0	< 1	0	0
Additional fenced land	1,293	5	< 1	163	< 1	5
Solar inverter	< 1	0	0	< 1	0	0
Gen-tie line foundations	< 1	0	< 1	0	0	0
Solar array	478	1	< 1	48	< 1	1
Substation	12	0	0	0	0	0

* Acreages and percentages rounded to next whole number

Table 3.4-5. Proposed Action Temporary Land Use

Project Feature	Acreages of Cropland*	Acreages of Developed, Open Space*	Acreages of Grassland*
Temporary access roads	14	< 1	1
Underground collection lines	46	1	4

* Acreages and percentages rounded to next whole number

Zoning and Plans

With regard to local land use plans and zoning, the Proposed Action is consistent and compatible with the overall goals set forth by existing city and county documents, such as the Garfield County zoning regulations (Garfield County 1963) and Envision Enid Comprehensive Plan (City of Enid 2015). These regulations and plans promote preservation of agricultural land uses. Although 22% of cropland within the analysis area would be converted to energy use for the 30-year life of the Project, Garfield County, as a whole, would remain predominately rural and agricultural. Project cropland impacts represent less than 1% of the available cropland in Garfield County. The Proposed Action would not directly affect any planned development in the area, because none is currently planned, and the Applicant would obtain all applicable zoning and land use approvals prior to construction. An informal review by the Department of Defense Siting Clearinghouse determined that the Project may impact the U.S. Air Force missions of Vance AFB and their activities at the Enid Woodring Regional Airport (Department of Defense 2021). However, this review does not constitute a formal determination under 49 USC 44718 and that the Department of Defense is not bound by the conclusion arrived at under this informal review. The Applicant would conduct coordination and permissions with local, state, and federal agencies and the Department of Defense prior to construction to resolve any potential for impact or interference.

Infrastructure

The Proposed Action would intersect or overlap approximately 1,156 feet of existing transmission lines. This represents < 1% of all transmission lines present in the analysis area. The Applicant established a 22-foot setback from the solar array to minimize transmission line impacts, as practicable. Therefore, all Project intersection with existing pipelines would be limited to underground collection lines, which could be buried in a manner to avoid disruption or damage to these features.

Prime and Important Farmlands

The Proposed Action would impact 2,120 acres, of which 1,697 acres (80%) are classified as Prime Farmland. Impacts on Prime Farmland would include soil mixing, rutting, and soil compaction. Once construction and reclamation are complete, agricultural activities could resume for 64 acres under the gen-tie line, temporary access roads, and above the underground collection lines. Impacts would also be minimized to the Prime Farmland by restoring agricultural lands where practicable.

Landownership

Landowners could experience both a temporary and long-term loss of use in areas where Project construction occurs. An estimated 2,042 acres would be located within the additional fenced land or long-term infrastructure and unavailable for use for the life of the Project. An additional 67 acres associated with clearing of the land for temporary access roads and burial of the underground transmission lines would temporarily lead to loss of use. However, access to these latter lands would resume following successful revegetation. Other construction effects could include noise, dust, and additional traffic not typically associated with existing land uses. As discussed in Sections 3.4.3.3.3 and 3.4.6.4.3, there would

be localized, temporary impacts from increased traffic and noise during the construction period. Construction access roads and Project clearing could also increase public access to private lands, creating the potential for increased trespassing and unauthorized use of such lands if road construction occurs before Project fencing is installed.

Operations, Maintenance, and Decommissioning

As discussed in Section 3.4.2.3.3, an estimated 2,042 acres of land cover (17% of total land cover in Application Area) would be converted to developed use for the life of the Project, making land inaccessible for private use. The majority (1,816 acres) of the land cover type that would be impacted by the Project would be cropland. However, this represents less than 1% of the available cropland in Garfield County.

Project O&M actions would be consistent and compatible with zoning and City of Enid plans. Depending on the orientation and type of the panels installed, glint and glare could occur. However, a glint and glare analysis was conducted using the Solar Glare Hazard Analysis Tool to assess potential glare impacts resulting from the Project. Specifically, this analysis focused on potential glare on aircraft approaching the Vance AFB and Enid Woodring Regional Airport. Based on the analysis, there are no predicted glare occurrences for approaches for any runways associated with the air force base or regional airport (Capitol Airspace Group 2020). Additionally, the Applicant would conduct coordination and permissions with local, state, and federal agencies and the Department of Defense prior to construction to resolve any potential for impact or interference (see above Construction section for additional details). O&M activities would not impact existing infrastructure.

Long-term, the Project would require easements from private property owners. The landowner would maintain ownership of the property and continue to pay taxes on the property, but the Applicant would acquire an easement allowing them to use the land in exchange for a monetary payment to the landowner. The easement agreement would outline any use restrictions applying to the easement. Therefore, although the landowner still has use of the land under easement, the easement agreement could inhibit the ability of individual landowners to conduct certain actions on their property.

Decommissioning (or plant re-powering) would restore affected lands to preconstruction standards. During decommissioning, potential impacts to the landcover, zoning, and infrastructure (e.g., transmission lines) would mirror the impacts of construction. Temporary access roads would need to be created to remove existing structures and implement the Site Restoration and Revegetation Plan. Potential crop loss could occur depending on the crop type and timing of decommissioning, due to movement of machinery and equipment. Landowners could also experience the same temporary loss of use and access they did during construction. Access to infrastructure not associated with the Project would also be impacted temporarily.

Cumulative Effects

Based on previous land cover trends, anticipated land use of the analysis area is projected to continue to be primarily agricultural. The Proposed Action would add up to 2,042 acres of long-term, land use conversion from agricultural to energy development to future conditions under the No Action Alternative. However, this conversion represents no more than 1% of total cropland within Garfield County. Although no reasonably foreseeable trends and actions are anticipated in the analysis area, if Proposed Action construction activities coincide with any future projects, cumulatively the Proposed Action could also contribute to temporary, localized loss of land access and increases in traffic and noise. However, RUS assumes that other projects would occur where land development regulations, such as zoning and land use plan designations, allow such uses. Therefore, no significant cumulative impacts would occur.

3.4.2.3.4 OTHER ACTION ALTERNATIVE

Construction, Operations, Maintenance, and Decommissioning

Potential land use impacts from construction, O&M, and decommissioning (or plant re-powering) activities are generally assumed to be the same under the Proposed Action and the Other Action Alternative because, in general, the construction actions and schedule would be similar in scope and duration. Impacts unique to the Other Action Alternative are described below.

Land Cover

Based on the conceptual layout, an estimated 705 acres of long-term land cover conversion (6% of total Application Area land cover) would occur for construction of long-term access roads, installation of the solar array, battery, solar inverter, substation, and gen-tie line foundations. Additionally, 987 acres within the additional fenced land (8% of total Application Area land cover) would be converted to energy uses with restricted landowner access for the life of the Project (Table 3.4-6). An estimated 42 acres of temporary land cover conversion (< 1% of total Application Area land cover) could occur for construction of temporary access roads and ROW for transmission line and collection lines (Table 3.4-7).

As with the Proposed Action, cropland would be the land cover type that would be the most impacted by the Project. However, the total amount of impacted cropland could decrease from 1,876 acres to 1,442 acres (17% of the cropland in the Application Area).

Table 3.4-6. Other Action Alternative Long-Term Land Use

Project Feature	Acreages of Cropland*	Acreages of Developed, Open Space*	Acreages of Developed, Low Intensity*	Acreages of Grassland*	Acreages of Barren Land*	Acreages of Open Water*	Acreages of Deciduous Forest*	Acreages of Pasture/Hay*
Long-term access roads	21	< 1	< 1	6	0	0	0	0
Battery storage system	< 1	0	0	< 1	0	0	0	0
Additional fenced land	987	8	< 1	187	< 1	< 1	< 1	2
Solar inverter	< 1	< 1	0	< 1	0	0	0	0
Gen-tie line foundations	< 1	< 1	0	< 1	0	0	0	0
Solar Array	396	2	< 1	73	< 1	< 1	< 1	< 1
Substation	7	< 1	0	< 1	0	0	0	0

* Acreages and percentages rounded to next whole number.

Table 3.4-7. Other Action Alternative Temporary Land Use

Project Feature	Acreages of Cropland*	Acreages of Developed, Open Space*	Acreages of Developed, Low Intensity*	Acreages of Grassland*	Acreages of Pasture/Hay*
Temporary access roads	9	< 1	< 1	3	0
Underground collection lines	21	3	< 1	6	< 1

* Acreages and percentages rounded to next whole number.

Infrastructure

The Other Action Alternative does not intersect or overlap with any existing transmission lines. Therefore, no impacts to infrastructure would occur from construction, O&M, and decommissioning activities under the Other Action Alternative.

Prime and Important Farmlands

The Other Action Alternative would impact a total of 1,744 acres, of which 1,449 acres (83%) are considered Prime Farmland. Similar to the Proposed Action, impacts on Prime Farmland would include soil mixing, rutting, and soil compaction. Once construction and reclamation are complete, agricultural activities could resume under the gen-tie line, temporary access roads, and above the underground collection lines. Impacts would also be minimized to Prime Farmland by restoring agricultural lands where practicable.

Cumulative Impacts

The Proposed Action would add up to an estimated 1,692 acres of long-term, land use conversion from agricultural to energy development (through land disturbance and fencing) to future conditions under the No Action Alternative. However, this conversion represents no more than 1% of total cropland within Garfield County. Based on previous land cover trends, anticipated land use of the analysis area is projected to continue to be primarily agricultural. Although no reasonably foreseeable trends and actions are anticipated in the analysis area, if Proposed Action construction activities coincide with other reasonably foreseeable trends and actions in Garfield County, cumulatively the Proposed Action could also contribute to temporary, localized loss of land access and increases in traffic and noise. However, RUS assumes that other projects would occur where land development regulations, such as zoning and land use plan designations, allow such uses. Therefore, no significant cumulative impacts would occur.

3.4.2.4 Summary of Impacts

Potential impacts on existing land use were assessed quantitatively and qualitatively on the best available data and compared between the No Action Alternative, the Proposed Action, and the Alternative Action. Under the No Action Alternative, the Project would not be constructed, and there would be no impacts to existing land use from the Project. However, existing and reasonably foreseeable trends and actions would continue to influence land use for the Application Area. Under the Proposed and Alternative Action, there would be temporary to long-term impacts to land use due to construction, O&M, and decommissioning of the Project. The greatest impact of the Project would be the long-term conversion of cropland for use by the Project. The Proposed Action and Other Alternative Action would convert or restrict access to approximately 22% and 17% (respectively) of the cropland in the analysis area; however, the cropland use by the Project in both alternatives is less than 1% of the total cropland in Garfield County. Therefore, with the implementation of BMPs described in Chapter 2, no impact thresholds would be triggered as a result of the Project, either individually or when considered in conjunction with other present and reasonably foreseeable trends and actions.

3.4.3 Noise

3.4.3.1 Introduction

Noise is generally defined as sound but is more specifically used to describe loud, unpleasant, unexpected, undesired, or unwanted sound that interferes with or disrupts normal activities, is intense enough to result in hearing damage, or may be considered otherwise annoying. Noise may be associated with human activities (e.g., construction operations of heavy equipment, loud music, etc.) or environmental influences (e.g., barking dog, strong winds/storms, etc.). Human response to noise can vary according to the type and characteristics of the noise source, the distance between the noise source and the person/people hearing the noise (aka. receptor[s]), the sensitivity of the receptor, and the time of day. Although prolonged exposure to high noise levels has been demonstrated to cause hearing loss, the principal human response to unwanted sound is annoyance. Project actions could generate noise due to vehicle or equipment operation and human activity. Noise could also disrupt wildlife life-cycle activities of foraging, resting, migrating, and other patterns of behavior. However, wildlife-related noise impacts are discussed in Section 3.3.3.

This analysis describes the existing (also referred to as ambient) noise conditions within specific analysis areas (See Section 3.4.3.1.1 below). The effects of the No Action Alternative and the action alternatives on noise levels are subsequently described and discussed.

3.4.3.1.1 SPATIAL AND TEMPORAL SCOPE OF ANALYSIS

The spatial scale for analysis of potential effects to noise extends up to 210 feet (64 meters[m]) from the Proposed Action footprint. This spatial scale assumes a maximum noise level of 90 A-weighted decibel (dBA) generated by Project impact equipment (e.g., pile driver, jack hammer, etc.) and the furthest distance the noise could propagate across a relatively flat topography before diminishing back to existing ambient levels, estimated at 55 dBA based on the available data for the Project vicinity.[15] For context, this section also describes ambient noise conditions within the broader Application Area.

The temporal scale for analysis of noise effects considers the timeframe beginning with construction and ending after decommissioning.

3.4.3.2 Affected Environment

3.4.3.2.1 NOISE REGULATIONS AND AMBIENT CONDITIONS

Relevant state and local noise regulations are listed in Table 3.4-8. Although the Project is not located within the city limits of Enid, it is located near the city limits, therefore the city's nuisance ordinance as it pertains to noise regulations is included in Table 3.4-8 for Project consideration.

[15] This follows the Inverse Square Law that states as the distance doubles from a point source (e.g., 1 m to 2 m, 2 m to 4 m, 4 m to 8 m, and so on) the standard attenuation of sound intensity decreases at 6 dBA per doubling of distance, in a free field situation.

Table 3.4-8. Noise Regulations Applicable to the Project

Location	Noise Regulation
State of Oklahoma	A. Every vehicle shall be equipped, maintained, and operated so as to prevent excessive or unusual noise. Every motor vehicle shall at all times be equipped with a muffler or other effective noise-suppressing system in good working order and in constant operation, and no person shall use a muffler cut-out, bypass or similar device. No person shall modify the exhaust system of a motor vehicle in any manner which will amplify or increase the noise or sound emitted louder than that emitted by the muffler originally installed on the vehicle. B. The engine and power mechanism of every motor vehicle shall be so equipped and adjusted as to prevent the escape of excessive fumes or smoke, or both. Oklahoma Statute Title 47, 12-402
City of Enid, Oklahoma	Section 28-330. Sounds impacting residential life. (a)It is unlawful to carry on the following activities within any residentially zoned area of the town or within 300 feet of any residentially occupied structure in any zone of the town:(1)The operation of a solid waste collection and disposal truck for refuse collection between the hours of 9:00 p.m. and 6:00 a.m.(2)The operation of construction machinery between the hours of 9:00 p.m. and 7:00 a.m.(3)The operation of garage machinery between the hours of 9:00 p.m. and 7:00 a.m.(4)The operation of lawn mowers and other domestic tool out-of-doors between the hours of 10:00 p.m. and 7:00 a.m.(b)Any mechanical noise other than that regulated in subsection (a) of this section that registers more than 70 dB(A) at the nearest complainant's property line is a violation of this section.(c)This section shall not apply to emergency operations designed to protect the public health and safety or work by town or county crews or town or county contractors or public service companies in a right-of-way or utility easement when the department responsible for the work has determined that it is necessary to undertake the work between the hours of 9:00 p.m. and 7:00 a.m. to avoid unreasonably impacting the flow of traffic, to avoid unreasonably disrupting the provision of a utility service or due to a requirements of the state department of transportation. (Ordinance No. 307-18, 32-75, 2-12-2019)

Lands surrounding the Project are generally flat with minimal development and classified as rural and agricultural (see Section 3.4.2 Land Use). The Project is also located within 5 miles of two major airfields including the Enid Woodring Regional Airport, located approximately 1.1 miles north of the Application Area, and Vance AFB, located approximately 3.2 miles west of the Application Area (AirNav 2021a, 2021b). Existing ambient noise conditions are primarily influenced by agricultural equipment use (e.g., tractors, forage harvesters, grain dryers, chain saws, and other loud machinery), vehicle traffic along intersecting and adjacent rural roadways, and aircraft flight operations from the Enid Woodring Regional Airport and Vance AFB.

Noise emissions from agricultural equipment ranges from 74 dB up to 100 dB based on equipment type and whether it is operating at an idle speed or at full work speed (Murphy and Harshman 2012; Smith 2019). Depending on the time of year, agricultural equipment could be operating more routinely throughout the Application Area influencing ambient noise levels. Roadway traffic noise is dependent on the mix of vehicle types (i.e., cars, trucks, motorcycles, semi-trucks, etc.), the speed being traveled, and the number and frequency of vehicles traveling on the road, often measured as annual average daily traffic (AADT). Movement of agricultural equipment along adjacent roadways also contributes to roadway traffic noise in rural areas. Roadway traffic noise along regional highways generally ranges between 50 to 60 dBA whereas roadway traffic noise for rural county roads range from 40 to 50 dBA (Bureau of Transportation Statistics 2021a). Depending on the time of day, the county roads within or adjacent to the Project could have a greater influence on ambient noise levels as people travel to and from work during peak hours (i.e., morning and evening).

Flight operations from the two nearby airfields, Vance AFB and Enid Woodring Regional Airport, also influence the ambient noise levels. However, it is the aircraft flight operations from the Enid Woodring Regional Airport that have the highest influence on the existing ambient noise conditions since the primary runways are oriented north to south, focusing a bulk of the airport’s flight traffic and associated noise directly through the center of the Application Area (Bureau of Transportation Statistics 2021; Vance AFB 2018). The Enid Woodring Regional Airport averages 96 flights per day; 66% of the planes flying in/out

are military aircraft and 90% of the aircraft based at the airport are of single-engine airplanes (AirNav 2021b). Based on the airport operating hours (6:00 a.m. to 9:30 p.m., 365 days per year), the airport accommodates approximately 6.4 flights per hour, per day, which roughly equates to a plane landing or taking off every 9 to 10 minutes during operating hours and presents a constant flow of air traffic. Vance AFB operates more than 200 aircraft, flies more than 50,000 sorties, and logs more than 74,000 flying hours per year (Vance AFB 2019).

Transportation noise data from the Bureau of Transportation Statistics shows noise contours for the Enid Woodring Regional Airport extend over most of the Application Area contributing to ambient noise levels between 45 to 55 dBA in the south to southeastern areas and higher ambient noise levels of 55 to 80 dBA in the central and northern areas of the Application Area (Bureau of Transportation Statistics 2021). Based on noise contours presented in the Vance AFB JLUS, anticipated noise from flight operations attenuating from Vance AFB also contribute to ambient noise levels along the western limits of the Application Area with noise levels up to 53 dBA for the northwestern area to 45 dBA in the central-west area (Vance AFB 2018).

3.4.3.2.2 PERCEPTIONS OF NOISE LEVELS

Community sound levels are generally presented in terms of dBA to reflect the selective sensitivity of human hearing. Table 3.4-9 presents the average noise levels based on human population area descriptions (FAA 2020).

Table 3.4-9. Average Noise Levels Based on Human Population

Area Description	Noise Level (dBA)
Noisy urban area	82
Commercial area	66
Quiet urban area	58
Quiet rural area	46

Human perception of loudness is not linearly related to increases in sound levels. A 3 decibel (dB) increase in sound level is barely detectible by the human ear, while a 5 dB increase in sound level is clearly noticeable. Sound is perceived to have doubled at a 10 dB increase (Federal Highway Administration 2017; Lamancusa 2000). Table 3.4-10 presents the average sound level for everyday noises and their typical human response after routine or repeated exposure (Centers for Disease Control and Prevention 2019).

Table 3.4-10. Average Sound Level For Everyday Noises and Typical Human Response

Everyday Sounds and Noises	Average Sound Level (dB)	Typical Response (after routine or repeated exposure)
Softest sound that can be heard	0	Sounds at these dB levels typically do not cause any hearing damage
Normal breathing	10	
Ticking watch	20	
Soft whisper	30	
Refrigerator hum	40	
Normal conversation, air conditioner	60	

Everyday Sounds and Noises	Average Sound Level (dB)	Typical Response (after routine or repeated exposure)
Washing machine, dishwasher	70	You may feel annoyed by the noise
City traffic (inside the car)	80–85	You may feel very annoyed
Gas-powered lawnmowers and leaf blowers	80–85	Damage to hearing possible after 2 hours of exposure
Motorcycle	95	Damage to hearing possible after about 50 minutes of exposure
Approaching subway train, car horn at 16 feet (5 m), and sporting events (such as hockey playoffs and football games)	100	Hearing loss possible after 15 minutes
The maximum volume for personal listening devices; a very loud radio, stereo, or television; and loud entertainment venues (such as nightclubs, bars, and rock concerts)	105–110	Hearing loss possible in less than 5 minutes
Shouting or barking in the ear	110	Hearing loss possible in less than 2 minutes
Standing beside or near sirens	120	Pain and ear injury
Firecrackers	140–150	Pain and ear injury

Source: Centers for Disease Control and Prevention (2019).

3.4.3.2.3 NOISE-SENSITIVE RECEIVERS

Noise-sensitive receivers generally are defined as locations where people reside or where the presence of unwanted sound may adversely affect the existing land use. Typically, noise-sensitive land uses include residences, hospitals, places of worship, libraries, performance spaces, offices, and schools, as well as nature and wildlife preserves, recreational areas, and parks.

A total of 49 noise-sensitive receivers are located within the Application Area, all of which are residences (see Figure 3.4-6 in Section 3.4.7). No other noise-sensitive receivers, such as places of worship, recreational areas, or schools, were identified. Figure 3.4-5 shows the location for identified noise-sensitive receivers that are within 210 feet of the Project construction footprint and are at the highest risk of noise impacts.

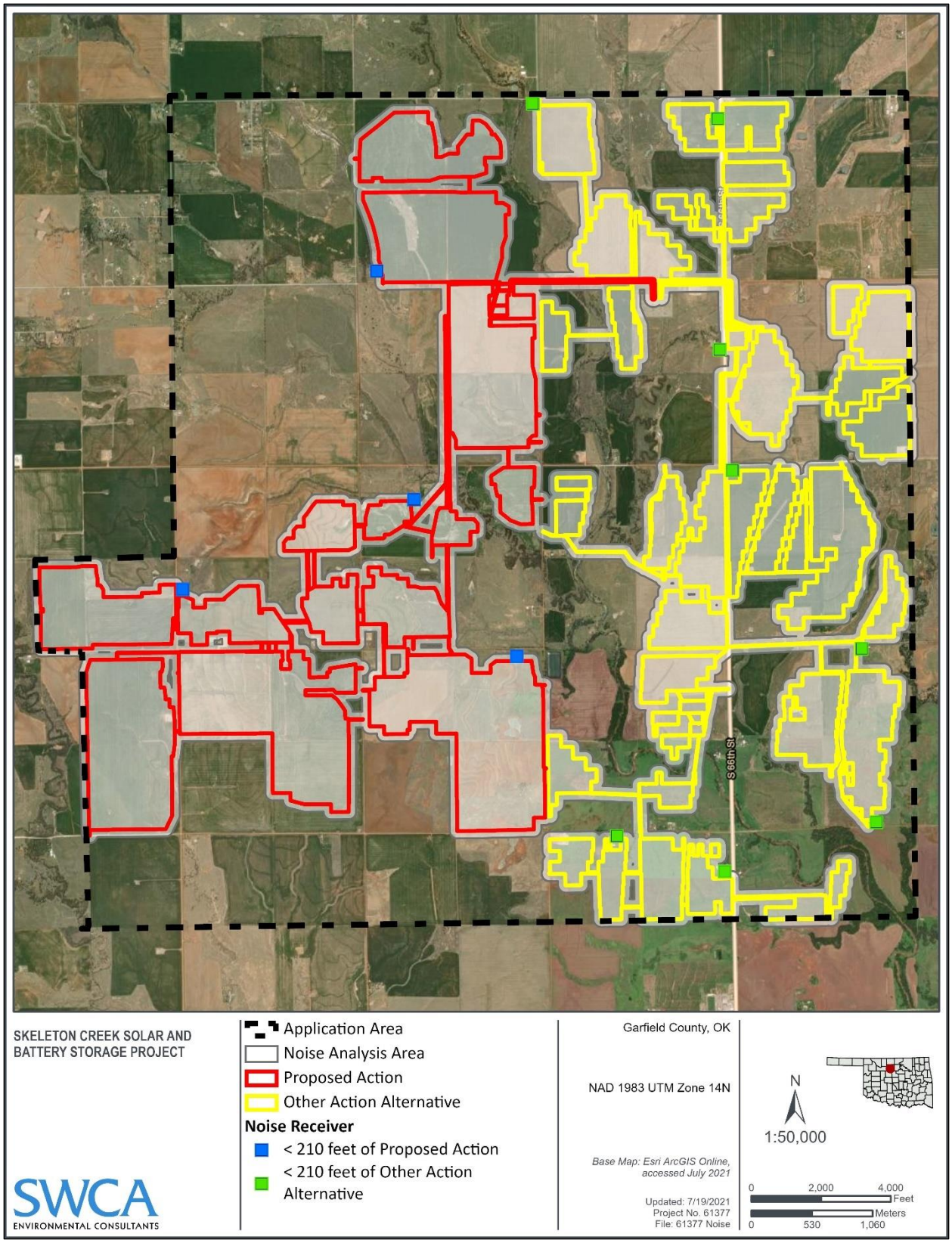

Figure 3.4-5. Sensitive noise receivers identified for the analysis area.

3.4.3.2.4 VIBRATION AND CORONA NOISE

Ground-borne vibration such as pile driving and earthmoving may be induced by construction activities. The effects of ground-borne vibration may include perceptible movement of building floors, interference with vibration-sensitive instruments, rattling of windows, shaking of items on shelves or hanging on walls, and rumbling sounds. The rumbling sound heard is the noise radiated from the motion of the room's surfaces. Annoyance from vibration often occurs when the vibration exceeds the threshold of perception by only a small margin. A vibration level that causes annoyance would be well below the damage threshold for normal buildings. Ground-borne vibration is almost never annoying to people who are outdoors; without the effects associated with the shaking of a building, the rumble noise of vibrations is not perceptible. Unlike noise, human response to vibration is not dependent on existing vibration levels. Humans respond to a new source of vibration based on the frequency of such events.

Corona noise is a sound generated by high-voltage transmission lines. Certain weather conditions can produce a tiny electric discharge, called corona activity, due to the localized electric field near a conductor. This activity is dependent on the conductor voltage, shape, and diameter, as well as elevation and weather conditions. The awareness of this noise is more likely noticed at higher elevations or during light rain or foggy conditions as water drops increase corona activity. Noise levels associated with heavy rain events tend to cover up the corona noise as the heavier rainfalls become louder than that of the corona noise. Corona noise is generally a concern for transmission lines of 345 kV and higher and require special design considerations versus power lines operating at lower voltages.

3.4.3.3 Environmental Consequences

3.4.3.3.1 METHODOLOGY

Table 3.4-11 lists the issues identified for this resource and the indicators and impact thresholds used to assess impacts for this EIS.

Although the Project is located outside the City of Enid jurisdictional boundaries, the impact thresholds used to assess potential daytime and nighttime impacts are based on the requirements of the city's nuisance ordinance (Ordinance No. 307-18).

Table 3.4-11. Noise Issues, Indicators, and Impact Thresholds

Issues	Indicators	Impact Thresholds
Increase in ambient noise levels	Change in ambient noise levels (decibels)	Exceedance of 70 dBA for sensitive receivers during daytime hours (7:00 a.m. to 9:00 p.m.) or exceedance of 55 dBA for sensitive receivers during nighttime hours (after 9:00 p.m. and before 7:00 a.m.)

This noise impact analysis evaluates potential changes to existing noise environments resulting from Project actions. These potential changes could be beneficial if they reduce the number of sensitive receptors exposed to unacceptable noise levels. Conversely, changes could be detrimental if they result in exposure to increased noise levels.

3.4.3.3.2 NO ACTION ALTERNATIVE

Under the No Action Alternative, the Project would not be constructed, and there would be no new sources of noise from the Project. Existing and reasonably foreseeable trends and actions would continue to generate ambient noise in the analysis area, however. Current and anticipated land use of the analysis area is projected to primarily remain as agricultural use. Future development could result in some

farmland conversion; however, based on land cover trends (see Section 3.4.2.2.1), this conversion would be limited in nature. Therefore, agricultural equipment use (e.g., tractors, forage harvesters, grain dryers, chain saws, and other loud machinery), vehicle traffic along intersecting and adjacent rural roadways, and aircraft flight operations from the Enid Woodring Regional Airport and Vance AFB are anticipated to remain the main sources of noise. These sources could generate 40 dBA to 100 dBA in intermittent, localized traffic and equipment activity, as well as 45 dBA to 80 dBA more long-term, continuous aircraft flight noise.

There are no reasonably foreseeable trends and actions projected to occur within the analysis area; however, runway improvements are proposed at the Enid Woodring Regional Airport (slated for construction in 2022 and 2023) that would contribute to long-term noise emissions associated with airport operation for the analysis area and surrounding region. RUS anticipates that all reasonably foreseeable trends and actions would occur in compliance with all federal, state, and local noise regulations.

3.4.3.3.3 PROPOSED ACTION

Construction

Construction of the Proposed Action would have temporary effects on the existing ambient noise levels during the proposed 18-month construction period. Typical equipment that may be used for the Project is outlined in Table 2.3-3 and includes heavy equipment such as graders, excavators, bulldozers, backhoes, pile drivers, compaction machines, end loaders, and cutting machines. Use of heavy equipment for site preparation and development (e.g., milling, grading, and backfill) generally represent the highest potential noise source, including vibration noise, during construction operations with equipment noise ranging from 80 dBA for backhoe operations up to 100 dBA for pile driving activities (Federal Transit Administration 2018). The noise, including vibration noise, generated from these construction activities would be temporary and would generally occur between 7:00 a.m. and 7:00 p.m., Monday through Friday (Section 2.3.2.3.1). All vehicles and construction equipment would be properly muffled to reduce noise.

Construction activities would be spread out across the Project based on the construction activity occurring (i.e., site preparation/clearing, fence installation, trenching/installation of electrical underground systems, and solar array installation), as all construction activity could not occur at the same time and specific location. Each array would have an associated access road for construction traffic use. This spread of construction activities would avoid a concentration of heavy equipment operating collectively in a single area and compounding noise emission levels. Additionally, the natural attenuation of noise emissions would result in significantly diminishing noise levels as the distance from the construction equipment increased (i.e., got farther away) so a piece of equipment operating at 80 dBA would be reduced to 62 dBA at a distance of 26.2 feet (8 m) from the source and a piece of equipment operating at 100 dBA would be reduced to 64 dBA at a distance of 210 feet (64 m) from the source.

There are four noise-sensitive receivers (i.e., residences) located within 210 feet of the Proposed Action construction footprint that could be temporarily affected by construction noise. All vehicles and construction equipment would be maintained to minimize exhaust emissions and would be properly muffled to reduce noise. Construction activities following the site preparation and development phase would likely result in lower noise emissions as compared to the initial site preparation efforts since anticipated equipment use would generate lower sound levels. Based on normal installation procedures, this EIS assumes that construction activity would be staged such that equipment noise would be spread out across the Project minimizing noise concentration points and increasing distances from sensitive noise receivers and increasing the noise attenuation from construction activities. As such, noise generated by later construction activities would not exceed the 70 dBA threshold and would not result in adverse impacts to nearby sensitive receivers or have long-term impacts (i.e., potential human discomfort or hearing loss).

During the 18-month construction period, the Proposed Action would average between 200 to 300 employees per month who would commute to the Project, and up to 400 employees who would commute during peak construction times (typically lasting only a few weeks). The Proposed Action is also anticipated to average approximately 25 truck deliveries per day over the construction period.

Construction traffic volumes associated with the Proposed Action would need to equal that of the existing traffic volumes (i.e., doubling the noise sources) to achieve a perceivable (3 dBA) increase in existing traffic noise. Based on the average daily traffic volumes identified later in Section 3.4.6.3.1 Roadways, Table 3.4-19, Project-associated highway traffic would need to equal or exceed 1,800 vehicles on State Highway 74, 6,800 vehicles on U.S. Highway 81, or 8,700 vehicles on U.S. Highway 64 to achieve a minimum 3 dBA increase in traffic noise along those highways. Therefore, the expected 200 to 400 vehicles associated with Project vehicle traffic would not measurably influence existing highway traffic noise levels.

Based on available country road traffic data (Association of Central Oklahoma Governments [ACOG], 2020), county road traffic volumes range from 300 vehicles coming off from highways to 100 vehicles along primary county road arterials. The expected 200 to 400 vehicles associated with Project vehicle traffic would have a greater impact on traffic noise associated with these more local roads. However, traffic generated as part of the proposed construction activities (i.e., workers commuting and truck deliveries) would not follow a single travel path as workers and deliveries would be traveling from different areas and accessing different locations of the Project. As such, Project vehicles would not be concentrated in one area and would vary throughout the duration of construction. Therefore, construction traffic is not anticipated to increase roadway noise levels along the county roads by more than 3 dBA to 5 dBA and would still fall well below current ambient noise levels associated with flight operations at Enid Woodring Regional Airport.

Operations, Maintenance, and Decommissioning

The Project would generate O&M noise. Transformers, solar inverters, substations, and the battery storage system all emit noise, as would maintenance activities (e.g., repairs and mowing). Specific manufacturer-determined noise emission levels cannot be identified until final designs are complete and specific equipment is identified for the Proposed Action. However, in general, noise emission levels from operational components would range from 55 dBA on smaller transformers up to 70 dBA on larger transformers; less than 65 dBA for most solar inverters; 60 dBA to 80 dBA for substations, depending on size; 60 dBA to 70 dBA for cooling systems on battery storage system; and approximately 90 dBA for mowers (Csanyi 2016; Dudek 2016; Louden 2011).

Noise-generating equipment would be spaced out throughout the Project based on the final design plan. Maintenance activities (e.g., repairs and mowing) would also occur as needed or upon a routine schedule, such as for monthly equipment inspections or mowing.

There are four noise-sensitive receivers located within 210 feet of the Proposed Action operational footprint. Normal attenuation of noise levels emitted from operational equipment and maintenance activities would eliminate any potential adverse noise impacts to sensitive noise receivers. The nearest sensitive noise receiver to the proposed Project substation is located approximately 0.6 mile (3,098 feet) west of the substation site and would not be affected by Project substation operation noise due to the distance and natural noise attenuation.

Noise associated with the corona effect could also occur during the operation of the Project's transmission line. Noise associated with corona discharge is often associated with a hum, hissing, or crackling sound. Natural attenuation of noise would reduce the potential for corona noise impacts on sensitive receivers and design consideration could be applied to further reduce potential corona noise discharges associated

with the Project. Additionally, the transmission line would only extend 1 mile in length, limiting impacts to a localized area. The Proposed Action would not generate any vibrations during O&M, therefore negative impacts associated with vibrations are not anticipated.

Decommissioning (or plant re-powering) activities would result in similar noise impacts and durations as described above for construction activities.

Cumulative Effects

As noted in Section 3.4.3.3.2, agricultural equipment use (e.g., tractors, forage harvesters, grain dryers, chain saws, and other loud machinery), vehicle traffic along intersecting and adjacent rural roadways, and aircraft flight operations from the Enid Woodring Regional Airport and Vance AFB are anticipated to remain the main sources of noise. The Proposed Action would add both temporary construction noise, as well as intermittent and continuous, long-term operational and maintenance noise to these current and future noise conditions. Since these noise emissions would be minimized through BMPs and naturally attenuate over distance and vegetative screening, no significant cumulative impacts would occur.

3.4.3.3.4 OTHER ACTION ALTERNATIVE

Construction, Operations, Maintenance, and Decommissioning

Potential noise impacts from construction, O&M, and decommissioning (or plant re-powering) activities would generally be the same under the Proposed Action (Section 3.4.3.3.3) and Other Action Alternative because, in general, the Project actions and schedule would be similar in scope and duration. Impacts unique to the Other Action Alternative are described below.

There are seven noise-sensitive receivers located within 210 feet of the Other Action Alternative's footprint. All vehicles and construction equipment would be maintained to minimize exhaust emissions and would be properly muffled to reduce noise. Project noise would also be dispersed across the Other Action Alternative's footprint. For this reason, noise generated by construction activities associated with implementation of the Other Action Alternative would not exceed the 70 dBA threshold and would not result in significant impacts to nearby sensitive receivers or have long-term impacts within the Application Area.

Normal attenuation of noise levels emitted from operational equipment would eliminate most potential impacts to sensitive noise receivers. However, one noise receiver is located approximately 220 feet west of the proposed Project substation site and would potentially be affected by substation operation noise due to the proximity of the receiver and the concentrated noise sources (i.e., transformers, solar inverters) that would be present at the Project substation (see Figure 3.4-5). Use of noise shielding could be required to deflect the unwanted sound emitted from the Project substation away from the nearby sensitive receiver. A noise analysis would be required to determine the suitable size for a long-term noise barrier (i.e., height, length and location) to determine if noise shielding would be reasonable and feasible between the Project substation and the sensitive receiver.

Cumulative Effects

Potential cumulative effects on ambient noise levels would be the same as those described under the Proposed Action and could occur where other existing and reasonably foreseeable trends and actions occur within the analysis area. The Other Action Alternative would generate both temporary construction noise and intermittent and continuous, long-term operational noise. Since these noise emissions would be minimized through BMPs and naturally attenuate over distance and vegetative screening, no significant cumulative impacts would occur.

3.4.3.4 Summary of Impacts

Potential impacts on ambient noise levels were assessed qualitatively on the best available data and compared between the No Action Alternative, the Proposed Action, and the Other Action Alternative. Under the No Action Alternative, the Project would not be constructed, and there would be no impacts to existing noise quality from the Project. However, existing and reasonably foreseeable trends and actions would continue to influence ambient noise levels. No significant noise impacts would occur under either action alternative. Natural attenuation of noise emissions from associated activities under all action alternatives would diminish before having a significant effect to sensitive noise receivers. Applicant-committed BMPs would also minimize potential Project noise impacts. Therefore, with the implementation of BMPs described in Chapter 2, no impact thresholds would be triggered as a result of the Project, either individually or when considered in conjunction with other present and reasonably foreseeable trends and actions.

3.4.4 Public Health and Safety

3.4.4.1 Introduction

Project-related actions may affect human health and safety, including exposure to electromagnetic field (EMFs), risk of fire from severe weather, worker safety, and solid, hazardous, and toxic materials and waste. This analysis describes the current public health and safety conditions for Garfield County, Oklahoma (Section 3.4.4.2). The effects of the No Action Alternative and the action alternatives on public health and safety are subsequently described and discussed.

3.4.4.1.1 SPATIAL AND TEMPORAL SCOPE OF ANALYSIS

The spatial scale for analysis of potential effects to public health and safety encompasses a 10-mile radius around the Project. This area is referred to as the public health and safety analysis area or, more generally in this section, the analysis area. The major communities and public services for local residents fall within the 10-mile analysis area. Therefore, this analysis area reflects the furthest extent for potential effects to public health and safety concerns.

To allow for an assessment of public health and safety effects throughout the Project's life cycle, the temporal scale of effects ranges from the 18-month construction period to the operational life of the Project, which is assumed to be 30 years for this EIS.

3.4.4.2 Affected Environment

3.4.4.2.1 SOLID, HAZARDOUS, AND TOXIC MATERIALS AND WASTE

The Oklahoma Department of Environmental Quality regulates the state's solid and toxic waste. The City of Enid Landfill is based in Garfield County (Oklahoma Department of Environmental Quality 2021). This landfill does not take items classified as hazardous wastes, toxic wastes, liquid waste oils, polychlorinated biphenyl waste, bio-med wastes, radioactive wastes, burn barrels, Mixed Class I and Class III, or other unacceptable wastes.

Publicly available databases were searched to gather information regarding known sites of environmental concern in the analysis area. Sites of environmental concern include Superfund sites (Comprehensive Environmental Response, Compensation, and Liability Act sites), underground storage tanks, and EPA-permitted hazardous waste management facilities. A search of the publicly available data identified no Superfund sites within the analysis area (EPA 2021f). There are approximately 774 underground storage

tanks (USTs) in Garfield County, with 177 classified as open, 583 closed USTs, and 14 temporarily closed USTs (EPA 2021g). USTs store substances such as diesel fuel, leaded and unleaded gasoline, fuel oil, aviation fuel, kerosene, gas/ethanol blend, and waste/used motor oil. There are also approximately 76 EPA-permitted hazardous waste management facilities in the analysis area (EPA 2021h). All of the hazardous waste management facilities are small or very small quantity generators, meaning that they may not accumulate more than 1,000 kilograms of hazardous waste at any time.

Review of aerial photograph imagery identified at least 26 potential farm dumps (debris/solid waste disposal areas) within the Application Area. Based on experience with rural-farm related dumps, the dumps typically contain used farm equipment, scrap metal, household trash, appliances, tires, fencing, and related farm waste. These dumps can occasionally contain drums or containers used for storage of regulated/hazardous substances. Likewise, approximately 53 oil-gas wells were identified within the Application Area. In addition, it is expected that many former oil-gas wells (plugged/abandoned in the past) and dry holes exist, but are not mapped (Petric 2020).

Review of the U.S. Department of Transportation (USDOT) National Pipeline Mapping System map for Garfield County identified several natural gas and hazardous liquid (crude oil) transmission pipelines to traverse the site. No natural gas incidents or liquid accidents (i.e., releases) were identified in the site vicinity on the mapping system database (Petric 2020).

3.4.4.2.2 OTHER PUBLIC HEATH AND SAFETY RISKS

Severe Weather Risk

Lightning strikes can cause fires and transmission outages. Lightning often strikes tall objects because it provides the easiest path for the lightning to take. In a rural region, transmission towers are often the tallest objects available. Severe weather, such as hail, high winds, and tornadoes, can also cause damage to power lines and other infrastructure, potentially resulting in fires and transmission outages. The National Weather Service maintains a radar based at Vance AFB, Oklahoma, covering an area that includes the analysis area and surrounding areas with a range of 124 nautical miles. The radar coverage area includes a small portion of the Texas panhandle, as well as portions of southern Kansas and north-central Oklahoma. This coverage area experienced 28,315 severe weather events between 1980 and 2006, including 2,322 significantly severe events (National Oceanic and Atmospheric Administration [NOAA] 2007). Significantly severe events include tornadoes classified as F2 or stronger on the Fujita Scale (F Scale), wind gusts of 65 knots or stronger, and hail of 2-inch diameter or larger. Compared with the other 141 radar coverage areas in all states across the country that were studied, the area surrounding the analysis area ranked second in the number of severe weather events between 1980 and 2006, and second in the number of significantly severe events during that period (NOAA 2007).

Severe weather events common in the area include thunderstorm winds, hail, and tornadoes. According to the radar based in Norman, Oklahoma, Garfield County experienced 37 tornadoes (1980—present). Tornadoes are classified based on their wind speeds on two scales, the F Scale or the enhanced Fujita Scale (EF Scale). Table 3.4-12 differentiates the wind speeds of the classifications and the associated damage for each classification. Of the total tornadoes experienced by the county, three were classified as F2, four were classified as EF2, two were classified as F3, and one tornado in 1991 was classified as F4 (NOAA 2021). From 1950 to 2010, 5,226 other extreme weather events occurred within 50 miles of Enid (USA 2021). The top two events experienced by this area are thunderstorm winds (1,804 events), and hail (2,865 events) (The Old Farmer’s Almanac 2018).

Table 3.4-12. Severe Weather Events

F Scale	Damage	EF Scale
F0 (40–72 mph)	Light damage	EF0 (65–85 mph)
F1 (73–112 mph)	Moderate damage	EF1 (86–110 mph)
F2 (113–157 mph)	Considerable damage	EF2 (111–135 mph)
F3 (158–207 mph)	Severe damage	EF3 (136–165 mph)
F4 (208–260 mph)	Devastating damage	EF4 (166–200 mph)
F5 (261–318 mph)	Incredible damage	EF5 (over 200 mph)

Note: Adapted from The Old Farmer's Almanac (2018).

Worker and Highway Incidents

Work-related fatalities, injuries, and illnesses associated with vehicle movement and construction workers can occur in and around construction sites. The U.S. Bureau of Labor Statistics and the Bureau of Labor Statistics (BLS) Injuries, Illnesses and Fatalities Program monitor and track statistics on these injury rates. According to the BLS, "an injury or illness is considered to be work-related if an event or exposure in the work environment either caused or contributed to the resulting condition or significantly aggravated a pre-existing condition" (BLS 2016). Table 3.4-13 provides information on the number and rate of fatal and nonfatal occupational injuries and illnesses in the construction field. Incidence rates are not available for Oklahoma as the state does not participate in the BLS Survey of Occupational Injuries and Illnesses. Incidences of highway fatalities for Oklahoma are presented in Table 3.4-14.

Table 3.4-13. Construction Worker Incidents

Date Series	Number	Rate
Fatal occupational injuries		
Construction, 2017 (Oklahoma)	17	13.4*
Construction, 2018 (Oklahoma)	15	10.5*
Construction, 2019 (Oklahoma)	16	12.9*
Construction, 2017 (United States)	1,013	
Construction, 2018 (United States)	1,038	
Construction, 2019 (United States)	1,102	
Utility system construction, 2019 (United States)	70	
Nonfatal, occupational injuries and illnesses		
Construction laborers, 2018 (United States)	20,430	209.3†
Construction laborers, 2019 (United States)	19,790	231.0†
Utility system construction, 2019 (United States)	13,100	2.1‡

* Per 100,000 full-time workers.
† Per 10,000 full-time workers.
‡ Per 100 full-time workers.
Sources: Bureau of Labor Statistics (2018, 2019, 2020a, 2020b, 2020c, 2020d, 2021).

Safety and health standards for public sector workforce are regulated by the Public Employees Occupational Safety and Health Division. The private sector workforce safety and health standards are regulated by the Occupational Safety and Health Administration.

Table 3.4-14. Incidences of Highway Fatalities for Oklahoma

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Fatalities	668	696	709	678	669	645	687	657	655	640

Source: Bureau of Transportation Statistics (2021b).

Electric and Magnetic Fields

EMFs are a combination of electric and magnetic fields that occur both naturally and as a result of human activity, sometimes referred to as radiation. Naturally occurring EMFs are caused by the weather and Earth's geomagnetic field. EMFs are also created by household appliances such as hair dryers, microwave ovens, power tools, and current flowing through power lines. The strength of the fields is determined mainly by line current and distance from the line. The EMFs from power lines occur mainly within the transmission ROW but can extend for a short distance beyond. EMFs currently occur within the analysis area due to the existing transmission line and Woodring Substation.

Research on the potential influence of EMFs on organisms and human health has been conducted over many decades to understand basic interactions of EMFs with biological organisms and cells, and to investigate potential therapeutic applications. The research began in the 1970s to address the potential adverse health effects of EMFs, with the overall conclusion that low, long-term EMF exposure would not lead to any adverse health effects (National Institute of Environmental Health Sciences 2002). As a result, no standards or guidelines have been recommended to prevent this type of exposure; however, research has indicated that short-term exposure to higher intensities of EMF (above exposure levels of electrical and industrial workers) could produce adverse stimulation of nerves and muscles (World Health Organization 2007).

3.4.4.3 Environmental Consequences

3.4.4.3.1 METHODOLOGY

Table 3.4-15 lists the issues identified for this resource and the indicators and impact thresholds used to assess impacts for this EIS.

Table 3.4-15. Public Health and Safety Issues, Indicators, and Impact Thresholds

Issues	Indicators	Impact Thresholds
Introduction of hazardous materials	Estimated volume of materials generated by project	No impact thresholds established by regulations; best professional judgment
Increased road hazards	Estimated change in traffic; change in risk of road accidents	
Increased risk of exposure to EMFs	EMF exposure risk	Thresholds established by scientific literature
Severe weather risk	Qualitative assessment of potential risk due to severe weather events and fire	No impact thresholds established by regulations; best professional judgment

Data sources considered when analyzing impacts to public health and safety include studies of the potential public health concerns associated with EMF exposure; severe weather statistics from the National Weather Service; worker safety statistics from the BLS; applicable laws and regulations regarding solid, hazardous, and toxic wastes and materials; and previous EISs of similar solar farm projects.

3.4.4.3.2 NO ACTION ALTERNATIVE

Under the No Action Alternative, the Project would not be constructed and there would be no impacts on public health and safety from the Project. However, existing and reasonably foreseeable trends and actions would continue to affect public health and safety in the analysis area.

Since 1980, Garfield County has experienced 37 tornadoes, along with other severe weather events. This EIS assumes that there is likely potential for future weather events, regardless of the Project. BLM's *Oklahoma, Kansas, and Texas Final Joint EIS/Proposed BLM RMP and BIA Integrated RMP* notes that "The role of climate change in altering the frequency of the types of severe weather most typically associated with the Southern Great Plains, such as severe local storms, hailstorms, and tornadoes, remains difficult to quantify. Indirect approaches suggest a possible increase in the circumstances conducive to such severe weather, including an increase in the instances of larger hail sizes in the region by 2040, but changes are unlikely to be uniform across the region, and additional research is needed" (BLM and BIA 2019:3–21). These events could result in property damage, loss, or human injury or death. Other potential public safety risks in the analysis area likely to continue into the future are the prescribed burns conducted by Vance AFB and private landowners.

Reasonably foreseeable trends and actions in the analysis area include reconstruction of the 13/31 runway at the Enid Woodring Regional Airport (2022–2023); reconstruction of the center runway at the Vance AFB (2021–2022); construction of the Kaw Lake Water Pipeline (slated to begin by 2023); construction of State Highway 74, U.S. Highway 60, and U.S. Highway 412 (2021–2028); replacement or rehabilitation of one bridge in Garfield County; and the increased production of ammonia upgrade products for Koch Fertilizer planned for 2021–2022, which includes expansion of on-site rail tracks and upgrades to ammonia truck loading facilities. No new sources of EMFs are anticipated from these projects, but these projects could have temporary and localized impacts on the public health and safety due to increased road hazards and the increased probability of worker incidents or injuries. These projects could also generate solid or hazardous materials that would need to be properly disposed. However, RUS anticipates that all reasonably foreseeable trends and actions would occur in compliance with federal, state, and local regulations regarding public health and safety.

3.4.4.3.3 PROPOSED ACTION

Construction

Solid, Hazardous, and Toxic Materials and Waste

The types of solid, hazardous, and toxic materials and waste that would be used during Project construction are described below. No contaminated materials are anticipated during construction, but if encountered, the handling, storage, and disposal of all solid, hazardous, and toxic materials and waste would be done in compliance with applicable state and federal laws and regulations such as the Resource Conservation and Recovery Act (40 USC 239–282) and Oklahoma Statute Title 27A Article VII and X.

Standard construction vehicles may contain gasoline/diesel fuel, hydraulic oil, grease, and antifreeze. Antifreeze, grease, and hydraulic oil would be contained within the vehicle, unless there is a spill or on-site vehicle maintenance.

Only specific, approved herbicides would be used within the Proposed Action footprint and would be outlined in the invasive species and noxious weed management plan. Landowner consent would be required and the person applying herbicides would have EPA certification. All herbicide applications would be conducted in accordance with federal, state, and local laws, regulations, and labels.

Solid wastes generated under Proposed Action could include paper, wood, metal, and general trash. RUS expects that solid waste generated from clearing and grading of the construction sites would go to a landfill that accepts biodegradable yard waste. Materials unsuitable for compaction, such as debris and large rocks, would be stockpiled at designated locations for subsequent disposal at an acceptable off-site location. Any solid wastes generated by construction workers such as food and beverage containers would be captured at the point of use and collected for off-site disposal at a local recycling landfill.

Through the development of the SPCC plan and the waste and hazardous materials plan, waste handling, storage, and disposal of solid, hazardous, and toxic materials would comply with federal, state, and local regulations.

The Applicant has conducted a desktop Phase I Environmental Site Assessment to identify potential existing hazardous substances or petroleum products in the Application Area. That assessment did not identify past or current uses or facilities of environmental interest that present an environmental concern or could impact siting, development, and construction of the Project (Petric 2020). However, exposure of previously undocumented sites from Project construction could still represent a risk to construction workers or the public. As noted in Section 3.4.2.3.3, less than 1% of existing pipelines would coincide with Project underground collection lines. Collection lines could be buried in a manner to avoid disruption or damage to existing pipeline infrastructure; therefore, risks to pipeline rupture and releases would be minimal.

Other Public Health and Safety Risks

Other Project-related public health and safety risks include increased risk of fires, severe weather, road worker and driver incidents, and EMF exposure. Potential fire-causing events include factors outside the Project's control (i.e., severe weather, such as thunderstorms), and Project activities, such as welding or the use of combustion engines that could occur during construction. The Applicant would implement BMPs, such as the SPCC plan and waste and hazardous materials plan, to reduce the potential for health and safety impacts that could result from fires associated with construction of the Project. Building and electric codes and the Applicant's internal standards would dictate how to design for weather conditions. The Project would also be designed in accordance with National Electrical Safety Code requirements that take into account severe weather events in this region of the country, which includes high winds. Therefore, potential impacts on public and worker health and safety from potential fire-causing activities and severe weather during construction would be minimized, as practicable.

Construction of the Proposed Action could also result in temporary risks to worker and driver health and safety due to construction activities and increased traffic volume in the analysis area. Construction activities include, but are not limited to, electrocution, exposure to extreme weather, falling, exposure to hazardous materials, and injury from equipment and materials. Construction safety requirements would meet the Occupational Safety and Health Administration standards and site-specific occupational safety measures would be developed as appropriate.

Traffic volume would increase as a result of the Project due to employee commutes and truck deliveries (see Section 3.4.6). During the 18-month construction period, the Proposed Action would average between 200 to 300 employees per month who would commute to the Application Area, and up to 400 employees would commute during peak construction time (typically lasting only a few weeks). The Proposed Action is also anticipated to average approximately 25 truck deliveries per day over the construction period. Existing traffic volumes are low and there are no major roadways or highways in the Proposed Action footprint. Therefore, potential impacts to worker safety during construction would be localized and temporary.

During the construction phase of the Project, there would not be an increase in the existing EMFs in the analysis area, as the transmission lines, power lines, solar array, and associated facilities would not yet be energized. Workers also would not typically be exposed to EMFs during construction of the Project due to precautions during construction that would keep them from working directly under or parallel to the existing facilities for extended periods of time. Therefore, the potential impacts to public and worker health and safety associated with EMFs would be negligible.

Operations, Maintenance, and Decommissioning

Solid, Hazardous, and Toxic Materials and Waste

Project wastes could include nonhazardous solid waste, hazardous solid waste, and hazardous liquid waste. A variety of safety-related plans and programs would be developed and implemented to ensure safe handling, storage, and use of hazardous materials, such as a SPCC plan and waste and hazardous materials plan. Hazardous solid and liquid waste streams generated during operations would include substances such as used hydraulic fluids, oils, greases, filters, etc., as well as spent cleaning solutions and spent batteries. Nonhazardous solid wastes would include oily rags, worn or broken metal and machine parts, defective or broken electrical materials, other scrap metal and plastic, insulation material, empty containers, paper, glass, and other miscellaneous solid wastes including the typical refuse generated by workers. These materials would be disposed by means of contracted refuse collection and recycling services. Nonhazardous solid waste, hazardous solid waste, and hazardous liquid waste collection and disposal would be conducted in accordance with applicable regulatory requirements to minimize health and safety effects.

Decommissioning (or plant re-powering) activities would have the same effects on waste and disposal as those anticipated during the 18-month construction period. Materials that could be reused or recycled would be hauled away from the site and sold. Materials that could neither be reused nor recycled would be dismantled and hauled to the nearest approved landfill. Hazardous materials that could not be reused or recycled would be disposed of at approved facilities.

Other Public Health and Safety Risks

The Applicant would implement vegetation maintenance and BMPs, such as the SPCC plan and waste and hazardous materials plan to reduce the potential for health and safety impacts that could result from fires associated with O&M of the Project. Extreme high winds, flooding, and debris associated with severe weather events could result in damage or destruction of PV panels or other infrastructure during Project operation. In the event of storm damage, the Applicant would address all repairs and clean up needed. Placement of Project infrastructure outside of floodplains and aquatic features would reduce flooding risks. Severe weather impacts could also be reduced by regular inspection/integrity checks and routine vegetation maintenance and debris clean up.

O&M impacts to worker and driver health and safety would be negligible, as there would only be 10 long-term workers for the Project.

PV panels generate lower-voltage DC electricity, which produce stationary (0 hertz [Hz]) electric and magnetic fields (Cleveland and Flowers 2017). The produced electricity needs to be distributed using transmission lines and must be converted to AC electricity by solar inverters to match the frequency of the grid. The solar inverters and the transmission lines produce a non-stationary EMF, known as extremely low frequency (ELF) EMF, 60 Hz. This frequency is at the low-energy end of the electromagnetic spectrum, with most electrical home appliances producing 50 to 60 Hz ELF-EMF. A Massachusetts study found that the magnetic fields of solar inverters had a range of 500 to 150 milligauss

at 3 to 7 feet, but at a distance of 150 feet, the levels dropped to 0.5 milligauss or even background levels (0.2 milligauss) (Massachusetts Department of Energy Resources, Massachusetts Department of Environmental Protection, and Massachusetts Clean Energy Center 2015). The ELF magnetic fields were well below the International Commission of Non-Ionizing Radiation Protection's (ICNIRP) recommended magnetic field exposure limit of 2,000 milligauss, even within the 3 to 7 feet range (Massachusetts Department of Energy Resources, Massachusetts Department of Environmental Protection, and Massachusetts Clean Energy Center 2015). The low electric frequency and magnetic fields of the solar panels, transmission lines, and solar inverters validate the conclusion that the EMF levels of solar facilities are considered negligible.

Impacts to public and worker health and safety due to increased EMF exposure during O&M would be limited to activities within 150 feet of the solar inverters and transmission lines. The potential for workers to be exposed to EMF levels during the operations phase would be low because of the intermittent nature of maintenance activities. PV panels produce stationary (0 Hz) EMFs and would not increase EMF levels. The Project's O&M and decommissioning would not be anticipated to raise EMF levels beyond the ICNIRP's recommended exposure limits.

Decommissioning (or plant re-powering) activities would have similar public health and safety effects as those anticipated during the 18-month construction period.

Cumulative Effects

In general, cumulative impacts to public and worker health and safety from the Proposed Action could occur where other existing and reasonably foreseeable trends and actions occur within the analysis area. As noted in Section 3.4.4.3.2, future trends and reasonably foreseeable trends and actions could have temporary to long-term impacts on the public health and safety within the analysis areas due to severe weather events, increased road hazards, and the increased probability of worker incidents or injuries. No new sources of EMFs are anticipated from these projects, but future projects could also generate solid or hazardous materials that would need to be properly disposed. However, RUS anticipates that all reasonably foreseeable trends and actions would occur in compliance with federal, state, and local regulations regarding public health and safety.

The Proposed Action could contribute to these health and safety risks through additional temporary traffic increases; generation of solid and hazardous waste; debris, fires, or other catastrophic damage due to severe weather events; and long-term, low levels of EMF exposure. However, the Project would be designed to would comply with federal, state, and local regulations and EMF levels would not exceed the ICNIRP's recommended exposure limits. Therefore, the Proposed Action, when combined with other present and reasonably foreseeable trends and actions, would not have a significant cumulative impact.

3.4.4.3.4 OTHER ACTION ALTERNATIVE

Construction, Operations, Maintenance, and Decommissioning

Potential impacts to public and worker health and safety from construction, O&M, and decommissioning (or plant re-powering) activities are assumed to be same under the Proposed Action (Section 3.4.4.3.3) and the Other Action Alternative because, in general, the Project actions and schedule would be similar in scope and duration. No public health and safety impacts unique to the Other Action Alternative were identified.

Cumulative Effects

Potential cumulative effects on public health and safety would be the same as those described under the Proposed Action and could occur where other existing and reasonably foreseeable trends and actions occur within the analysis area. The Other Action Alternative would generate the same types and quantities of solid and hazardous waste, vehicle trips, and EMFs to the current and future traffic conditions. Similar to the Proposed Action, the Other Action Alternative would be designed in accordance with National Electrical Safety Code requirements that take into account severe weather events in this region of the country. Placement of Project infrastructure outside of floodplains and aquatic features would reduce flooding risks. Severe weather impacts could also be reduced by regular inspection/integrity checks and routine vegetation maintenance and debris clean up. Therefore, the Proposed Action, when combined with other present and reasonably foreseeable trends and actions, would not have a significant cumulative impact.

3.4.4.4 Summary of Impacts

Potential impacts on public and worker health and safety were assessed qualitatively on the best available data and compared between the No Action Alternative, the Proposed Action, and the Other Alternative Action. Under the No Action Alternative, the Project would not be constructed, and there would be no Project-associated impacts to public health and safety. However, existing and reasonably foreseeable trends and actions would continue to affect the health and safety of the public and workers in the analysis area. Under the Proposed Action and Other Alternative Action, construction, O&M, and decommissioning of the Project would result in temporary to long-term impacts to public and worker health and safety. However, with the implementation of BMPs described in Chapter 2, no impact thresholds would be triggered as a result of the Project, either individually or when considered in conjunction with other present and reasonably foreseeable trends and actions.

3.4.5 Socioeconomics and Environmental Justice

3.4.5.1 Introduction

Development projects like the Project can affect social and economic conditions through changes to population, employment opportunities, revenue, or other factors. To ensure that these potentially long-lasting effects to local residents and their communities are adequately considered, it is important to establish a thorough understanding of both current and anticipated socioeconomic conditions for proposed Project activities. Additionally, during scoping, concerns were expressed by the EPA that the EIS include an environmental justice analysis that relies on EPA's environmental justice mapping and screening tool called EJSCREEN, and the EPA encouraged outreach to potentially affected rural communities.

This analysis describes the socioeconomic conditions and environmental justice populations within Garfield County, Oklahoma (see Section 3.4.5.2). The effects of the No Action Alternative and Other Alternative Action on socioeconomic conditions and environmental justice populations are subsequently described and discussed.

3.4.5.1.1 SPATIAL AND TEMPORAL SCOPE OF ANALYSIS

The spatial scale for analysis of potential effects to socioeconomic conditions encompasses Garfield County, Oklahoma. This area is referred to as the *socioeconomics analysis area* or, more generally in this section, the *analysis area*. Unincorporated portions of Garfield County and communities within the county are most likely to be directly impacted by the Project.

To allow for an assessment of socioeconomic effects throughout the Project's life cycle, the temporal scale of effects ranges is from the 18-month construction period to the operational life of the Project, which is assumed to be 30 years.

3.4.5.2 Affected Environment

3.4.5.2.1 COUNTY POPULATION AND DEMOGRAPHIC DATA

The estimated 2019 population of Garfield County is 61,056. The population of the county increased by approximately 1% between 2010 and 2019 (U.S. Census Bureau 2021a). Enid is the largest city in Garfield County; its estimated 2019 population is 49,688 (U.S. Census Bureau 2021a), representing approximately 80% of the total county population. The Application Area is located southeast of the City of Enid in a rural area with a low population density. Table 3.4-16 and Table 3.4-17 present summaries of Garfield County population and demographic data and include data for the State of Oklahoma for reference.

Table 3.4-16. Population Characteristics: Garfield County and State of Oklahoma

	2019 Population	2010 Population	% Change 2010–2019	% Under Age 5	% Under Age 18	% Over Age 65
Garfield County	61,056	60,580	0.8	7.2	27.5	16.5
State of Oklahoma	3,956,971	3,751,582	5.5	6.5	24.1	16.1

Table 3.4-17. Race and Hispanic Origin: Garfield County and State of Oklahoma

	White	Black or African American	American Indian or Alaskan Native	Asian	Native Hawaiian or Pacific Islander	Two or More Races	Hispanic or Latino (any race)	White (not Hispanic or Latino)
Garfield County	84.3%	3.2%	3.3%	1.3%	3.8%	4.1%	13.2%	73.1%
State of Oklahoma	74.0%	7.8%	9.4%	2.4%	0.2%	6.3%	11.1%	65.0%

3.4.5.2.2 EMPLOYMENT AND INCOME

Between 2015 and 2019, 62% of the population of Garfield County was in the civilian labor force. The estimated 2019 total employment (jobs) in Garfield County was 21,659 (U.S. Census Bureau 2021a). The *Oklahoma Employment Report – March 2021* estimated 23,700 non-farm jobs in Garfield County, of which 20,100 were private and 3,600 were in government; the unemployment rate in Garfield County was 3.5% (not seasonally adjusted) (Oklahoma Employment Security Commission 2021). The 2019 median household income was $54,006; 12.7% of Garfield County population are in poverty as defined by the U.S. Census Bureau (2021a).

3.4.5.2.3 HOUSING AND PUBLIC SERVICES

There were an estimated 26,769 housing units in Garfield County in 2019, of which 23,683 were occupied and 3,086 were vacant. Of the occupied housing units, 7,733 were rental housing and 15,950 were owner-occupied. Rental housing vacancy in 2019 was 7.7%. (U.S. Census Bureau 2021b). There are multiple hotels and recreation vehicle parks in Garfield County that provide lodging and temporary housing accommodations (VisitEnid/Enid Welcome Center 2021).

Garfield County supports 13 fire departments. The Project is located in the Pioneer Skeleton Creek Fire District. Patrol services are provided by the Garfield County Sheriff's Office, which employs 22 deputies, seven dispatchers, and two administrative staff (Garfield County 2021), and the Enid Police Department, which has 110 employees (Enid Police 2021). Additionally, two large, full-service medical centers are present in Enid: INTEGRIS Baptist Medical Center (with 183 staffed beds) and St. Mary's Regional Medical Center (with 164 staffed beds) (American Hospital Directory 2021).

There are nine school districts in Garfield County. The Enid School District is the largest with an enrollment of 7,803 students in the 2019–2020 school year (National Center for Educational Statistics 2021a). The Project is located approximately 0.5 mile north of the Pioneer-Pleasant Vale school complex, which includes kindergarten–12 facilities for the Pioneer-Pleasant Vale School District. Total enrollment of the Pioneer-Pleasant Vale School District in the 2019–2020 school year was 503 students (National Center for Educational Statistics 2021b).

3.4.5.2.4 COUNTY TAX REVENUE

Garfield County tax revenues are from collection of ad valorem (property) taxes, business personal property taxes, public service corporation taxes, distributions of state revenues from the Oklahoma Tax Commission, and various fees and other revenue sources (Garfield County Treasurer 2021). The City of Enid has a 4.25% sales tax (which is added to the state 4.5% sales tax), which provides a major revenue source for the city (City of Enid 2021a).

3.4.5.2.5 ENVIRONMENTAL JUSTICE POPULATIONS

EO 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, requires that "each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations" (Subsection 1-101)." RUS guidance further states that "[t]he Agency will incorporate environmental justice principles into Agency programs, activities, and services."

U.S. Census data and the EPA's EJSCREEN tool were used to identify low-income or minority population characteristics of the analysis area, and also to the State of Oklahoma overall as a reference to compare the relative proportion of low-income and minority populations within the analysis area. Garfield County's low-income population (defined as percentage of people below poverty) is 12.7%, which is lower than the poverty rate for the State of Oklahoma (14.2%); Garfield County's minority population (those identified in the U.S. Census as non-White and/or Hispanic or Latino) is 26.9%, compared to 35% for the State of Oklahoma (U.S. Census 2021a).

EPA's EJSCREEN is an environmental justice screening tool that provides a consistent, nationwide dataset for combining environmental and demographic indicators to support assessing affected populations and potential environmental justice issues. EJSCREEN demographic indicators for low-income and minority populations for Garfield County were very similar to corresponding indicators for the State of Oklahoma, indicating similar proportions of low-income and minority populations in Garfield County as in the state (EPA 2021c). In addition, results from an EJSCREEN search of a 5-mile radius around the Project indicates lower proportions of low-income and minority populations than Garfield County. Therefore, following the *EPA's Promising Practices for EJ Methodologies in NEPA Reviews* (EPA 2016), Garfield County does not meet the criteria for low-income or minority environmental justice populations. However, RUS continues to engage with local officials and residents through the public involvement process for the Project, and will ensure that meaningful engagement opportunities are provided during draft and final EIS review periods.

Guidance provided by the CEQ also indicates that potential impacts on the social or cultural practices of Native American Tribes as a result of impacts to the natural or physical environment should be assessed as potential environmental justice impacts (CEQ 1997). During government-to-government consultations with RUS, representatives from the Osage Nation expressed concerns about potential Project impacts to areas of importance within the analysis area.

3.4.5.3 Environmental Consequences

3.4.5.3.1 METHODOLOGY

Table 3.4-18 lists the issues identified for this resource and the indicators and impact thresholds used to assess impacts for this EIS.

Table 3.4-18. Socioeconomic and Environmental Justice Issues, Indicators, and Impact Thresholds

Issues	Indicators	Impact Thresholds
Change in population, housing, and public services	Change in population, rental housing vacancy rate, county services	Applicable federal regulations do not establish a clear threshold for identifying a "significant" socioeconomic impact. Therefore, no socioeconomic impact criteria were established for this EIS; however, all potential effects to socioeconomic conditions from proposed construction and operation actions are disclosed to the reader.
Changes to employment, income, and tax revenue	Change in population, estimated employment, and county tax revenue generated by Project	
Impacts to environmental justice populations	Qualitative assessment of impact to human health or the environment	The affected environmental justice population would experience disproportionately high and adverse effects from 1) impacts on the natural or physical environment; 2) impacts that appreciably exceed or are expected to appreciably exceed those on the general population or other appropriate comparison group; or 3) impacts that occur or would occur in a minority or low-income population, or Native American Tribe affected by cumulative or multiple adverse exposures from environmental hazards

The potential socioeconomic impacts from implementation of any alternative were determined by comparing the estimated change in employment and income, visitor spending rates, county tax revenue, and traffic that would occur from the construction and operation of these actions to the existing socioeconomic conditions described in Section 3.4.5.2.

3.4.5.3.2 NO ACTION ALTERNATIVE

Under the No Action Alternative, the Project would not be constructed, and there would be no impacts on socioeconomics or environmental justice populations from the Project. However, existing and reasonably foreseeable trends and actions would continue to affect these resources in the analysis area. Current and future economic development opportunities, such as those described in Table 4.4-1, would continue to drive population, employment, housing growth, and public service needs. Future economic development would have long-term beneficial impacts by providing employment opportunities and economic activity. Future construction actions could also result in temporary increases in noise, traffic, and human activity, but would not disrupt normal or routine demographic characteristics, employment, or economic activity in the analysis area—or that, in the case of temporary economic activity specifically associated with construction, any such changes would generally revert to preconstruction conditions following construction completion.

Not all reasonably foreseeable trends and actions would be subject to federal or state laws or policies that require mitigation for unanticipated discoveries or consider visual impacts for historic properties. For this reason, unmitigated impacts could occur to unidentified tribal resources of concern from reasonably foreseeable trends and actions.

3.4.5.3.3 PROPOSED ACTION

Construction

Construction activities under the Proposed Action are anticipated to employ a monthly average of 200 to 300 workers over a period of 18 months, with labor requirements peaking to approximately 400 workers (NextEra Energy 2020). Workers would consist of a variety of laborers, skilled craft/tradespersons, supervisory, construction management, and support staff. Some of the jobs are likely to be filled by persons from Garfield County; however, given the specialized nature of the development and trades involved, it is likely that workers from outside Garfield County would temporarily reside in Garfield County during construction. Assuming 70% of the average monthly workforce (assumed to be 250 workers), approximately 175 workers would temporarily relocate to Garfield County during construction. Project-related spending during construction on goods and services would create additional indirect employment opportunities that could be filled by local or non-local people. The temporary increase in population from construction-related jobs filled by non-local people would not substantially change the population (more than 61,000) or workforce (approximately 23,000). Similarly, the effect of construction-related population change would not adversely impact housing availability in Garfield County because the additional population would be small in comparison to the number of vacant rental housing units in the county.

The temporary increase in population from construction would create an increase in demand for public services. The change in demand for public services would be small because the increase in population would be small in comparison to the population of Garfield County, where those services are provided. Some non-local workers could bring family members, including school-aged children who could enroll in local schools during construction. This is likely to be a small portion of the approximately 175 non-local workers and would represent a very small increase in enrollment in Garfield County school districts.

During construction, there would be an increase in spending in Garfield County due to local procurement of good and services related to construction, as well as indirect spending by construction workers on housing, food, and other goods and services. Increased construction-related spending would result in increased revenues to Garfield County and the City of Enid during construction due to increased sales taxes collected, as well as through other revenue sources.

Environmental justice impacts are based on adverse construction impacts that would occur to air quality, water quality, land use, public health and safety, transportation, and cultural resources that could be disproportionately borne by environmental justice populations. Adverse impacts to air quality during Project construction were characterized as short-term and adverse (see Section 3.3.1). Similarly, no significant adverse impacts to water quality (see Section 3.3.2), land use (see Section 3.4.2), or transportation (see Section 3.4.6) were identified for Project construction. The Proposed Action would have minimal impacts to public and worker health and safety. Likewise, as described in Section 3.4.1 (Cultural and Historical Resources), no archaeological resources or properties of traditional cultural or religious significance to Native American Tribes were identified in the APE. RUS remains in consultation with Native American tribes and other consulting parties under NHPA Section 106 on identified cultural resources, adverse effects, and the resolution of adverse effects (per 36 CFR 800). Therefore, potential adverse impacts to environmental justice populations are considered negligible.

Operations, Maintenance, and Decommissioning

Proposed Action operations would occur over a 30-year period and would involve up to 10 workers. The number of full-time operational staff would represent a negligible increase to the population of Garfield County and would similarly not affect housing, employment, or public services. Although not quantifiable at this time, Project operations would result in increased revenues (compared to the No Action Alternative) collected from ad valorem (property) taxes, business property taxes, public service corporation, and other taxes or fees paid as part of operations.

Impacts to air quality during Project O&M are characterized as long term but beneficial (see Section 3.3.1). Similarly, no significant adverse impacts to water quality (see Section 3.3.2), land use (see Section 3.4.2), or transportation (see Section 3.4.6) were identified. O&M and decommissioning would have minimal impacts to public health and safety. Likewise, as described in Section 3.4.1, O&M actions would generally not result in new ground disturbance and would not result in historic or archaeological impacts as long as 1) activities stay within previously surveyed areas and 2) any measures identified during NHPA Section 106 process and required under the NEPA decision for the Project are implemented. Therefore, potential adverse impacts to environmental justice populations are considered negligible.

Decommissioning (or plant re-powering) would involve a workforce and scope of activities similar to construction that would result in a small temporary population increase during decommissioning activities. Socioeconomic effects would be like those for construction.

Cumulative Effects

In general, cumulative socioeconomic impacts would result from reasonably foreseeable trends and actions in combination with effects of the Proposed Action. The Oklahoma Department of Commerce's most recent projection of population growth estimated that Garfield County would experience "slight population growth . . . growing at an average annual rate of 0.05%" (Oklahoma Department of Commerce 2012). Population growth and changes in socioeconomic characteristics (employment, revenue, etc.) would occur in response to reasonably foreseeable trends and actions as well as regional, national, and global economic factors and trends. RUS anticipates that the Proposed Action would result in beneficial cumulative impacts to employment due to new hiring and economic activity. The Project would provide a regional market and ongoing demand for workers skilled in the professions and trades needed for construction, installation, maintenance, and repair of solar facilities.

The Proposed Action would also increase exposure to noise, traffic, water, and air pollution for environmental justice populations beyond conditions under the No Action Alternative. However, these impacts would largely cease when construction is complete. Additionally, replacing the need for fossil fuel power generation would have a net beneficial impact on air quality. Environmental justice populations tend to be more burdened with adverse health conditions that can increase susceptibility to the harmful effects of air pollution, and they could be particularly vulnerable to the adverse economic impacts of climate change because they have fewer financial resources to cope with these effects. Therefore, the beneficial impacts of reducing air emissions, including GHG emissions, could be greater than those experienced by non-minority or non-low-income members of the general population who also reside in the region.

3.4.5.3.4 OTHER ACTION ALTERNATIVE

Construction, Operations, Maintenance, and Decommissioning

Potential socioeconomic and environmental justice impacts from construction, O&M, and decommissioning (or plant re-powering) activities are generally assumed to be the same under the Proposed Action and the Other Action Alternative because, in general, the construction actions and

schedule would be similar in scope and duration. The reader is referred to the Other Action Alternative sections in the air, water, and cultural resources sections of this chapter for additional discussion of specific natural or physical environment impacts that could impact environmental justice populations.

Cumulative Effects

In general, cumulative socioeconomic impacts would be the same as those described under the Proposed Action by contributing to population and economic changes in Garfield County during construction and operations. The Proposed Action would also increase exposure to noise, traffic, water, and air pollution by environmental justice populations beyond conditions under the No Action alternative. However, these impacts would largely cease when construction is complete. Additionally, replacing the need for fossil fuel power generation would have a net beneficial impact on air quality. Environmental justice populations tend to be more burdened with adverse health conditions that can increase susceptibility to the harmful effects of air pollution, and they could be particularly vulnerable to the adverse economic impacts of climate change because they have fewer financial resources to cope with these effects. Therefore, the beneficial impacts of reducing air emissions, including GHG emissions, could be greater than those experienced by non-minority or non-low-income members of the general population who also reside in the region.

3.4.5.4 Summary of Impacts

Potential impacts on socioeconomics and environmental justice populations were assessed qualitatively on the best available data and compared between the No Action Alternative, the Proposed Action, and the Alternative Action. Under the No Action Alternative, the Project would not be constructed, and there would be no Project associated impacts to socioeconomics and environmental justice populations. However, existing and reasonably foreseeable trends and actions would continue to provide both economic activity and environmental risks to local residents. The Proposed Action would result in temporary increases in population, employment, and demand for housing and public services, as well as increased tax revenues during construction and operations. The Proposed Action would also increase exposure to noise, traffic, water, and air pollution by environmental justice populations beyond conditions under the No Action alternative. However, replacing the need for fossil fuel power generation would have a net beneficial impact on air quality. Therefore, the Proposed Action when combined with other present and reasonably foreseeable trends and actions would not have a significant cumulative impact.

3.4.6 Transportation

3.4.6.1 Introduction

Transportation reflects the existing roadway/highway, railway, and airport use for human movements into, out of, within, and through regional areas. The transportation of people and goods is through the movement of vehicles, trains, and aircraft (i.e., planes, helicopters) through a network of roads, highways, rail lines, and designated flight space. Project actions could disrupt transportation services and networks. During scoping, one meeting participant expressed concern whether the Project could interfere with other bridge construction activities.

This section evaluates existing roadway/highway, railway, and airport use for the analysis area. The effects of the No Action Alternative and action alternatives on transportation are subsequently described and discussed.

3.4.6.1.1 SPATIAL AND TEMPORAL SCOPE OF ANALYSIS

The spatial scale for analysis of potential effects to transportation encompasses a 10-mile radius around the Proposed Action footprint. This area is referred to as the *transportation analysis area* or, more generally in this section, the *analysis area*. The major transportation resources for the town of Enid, along with several other small surrounding communities, fall within the 10-mile analysis area. Therefore, this analysis area reflects the furthest extent for potential effects to transportation concerns.

To allow for an assessment of transportation effects throughout the Project's life cycle, the temporal scale of effects ranges from the 18-month construction period to the operational life of the Project, which is assumed to be 30 years.

3.4.6.2 Affected Environment

Transportation resources in the analysis area include roadways/highways, railways, and airports. The town of Enid, Oklahoma, is the major community focal point within the county, connecting rural communities and residents by major thoroughfares (U.S. Highway 81, U.S. Highway 64, and various county roads), railroad lines (Chicago-Rock Island-Pacific Rail Line, Burlington Northern Rail Line, Atchison-Topeka-Santa Fe Rail Line), and regional/military airports (Enid Woodring Regional Airport, Vance AFB).

3.4.6.2.1 ROADWAYS

The transportation analysis area is served by a network of federal, state, county, and local roadways. Roads throughout the analysis area are managed by the USDOT, Federal Highway Administration, Oklahoma Department of Transportation (ODOT), and local agencies. Major roadways, defined as state and U.S. highways within the 10-mile analysis area, are listed in Table 3.4-19. Roadways in the analysis area that specifically cross the Application Area and could be affected by the Project are listed in Table 3.4-20.

Table 3.4-19. Roadways in the Analysis Area

Roadway	Description	Average Daily Traffic Volume
U.S. Highway 81	4-lane, 2-way highway	6,800–16,300
U.S. Highway 64	4-lane, 2-way highway	8,700–19,800
State Highway 74	2-lane, 2-way highway	1,800–2,300

Source: ODOT (2019).

Table 3.4-20. Roadways that Cross the Application Area and that Could be Impacted by the Project

Roadway	Through Road	Miles in Application Area*	No. of Bridge Crossings	No. of Culvert Crossings
South 30th Street (N2900)	Yes	4	1	7
South Covered Wagon Trail	No	< 1	0	1
South 42nd Street (N2910)	Yes	5	1	8
South 54th Street (N2920)	Partial	4	1	4
South 66th Street (N2930)	Yes	4	2	3
South 78th Street/Farmland Road (N2940)	Partial	1	0	4

Roadway	Through Road	Miles in Application Area*	No. of Bridge Crossings	No. of Culvert Crossings
East Fox Drive (E0460)	Yes	4	2	4
East Paradise Lane	No	< 1	0	1
East Wheat Capital Road (E0470)	Yes	4	2	5
East Longhorn Trail (E0480)	Yes	4	3	5
East Skeleton Road (E0490)	Partial	4	1	5
East Hayward Road (E0500)	Yes	5	3	6

Source: ODOT (2018).

There are 12 rural roads that are within the analysis area that support local transportation into and through the Application Area. The rural roads are classified as asphalt, gravel, and grade & drain roads. Seven roads serve as primary thoroughfares through the Application Area, three provide only partial passage through the Application Area due to unbridged waterways, and two are dead end residential roads (see Table 3.4-20).

Average annual daily traffic (AADT) volumes for the rural roads within or intersecting the analysis area are not available; however, based on a dataset available through the ACOG, AADT volumes on rural roads located approximately 11 miles southeast in Logan County range from 300 vehicles coming off from highways to 100 vehicles along primary county road arterials (ACOG 2020). Based on proximity, RUS anticipates a similar traffic volume of vehicles for the seven rural roads that serve as primary thoroughfares. Traffic volumes along the three rural roads are expected to have lower AADT volumes than that of the primary thoroughfares.

Within Garfield County, there are approximately 528 bridges for highways, railway, bicycle, and pedestrian use. Within the analysis area, there are approximately 16 bridges and approximately 53 box/pipe culvert crossings; there are no underpass crossings.

3.4.6.2.2 AIRPORTS

Airports, heliports, and landing strips are used for transportation of passengers, cargo, and military activities in Oklahoma. There are two airports and one helipad in the analysis area (FAA 2021a). Table 3.4-21 provides a short description of each facility.

The Enid Woodring Regional Airport is approximately 1.1 miles from the Project to the end of the nearest runway, Vance AFB is approximately 3.9 miles from the Project to the nearest runway, and the Atwood helipad is approximately 7.0 miles from the Project on the western side of Enid, Oklahoma. Only Enid Woodring Regional Airport presents a direct approach and take-off flight pattern that is directly in line with the Project (AirNav 2021a, 2021b).

Table 3.4-21. Airports within the Analysis Area

Airport Name	Type	Elevation	Description
Vance AFB (END) (FAA 2021b)	Private	1,312 feet	Three runways that run in a north–south alignment. One runway (17C/35C) has a partial concrete, asphalt, or bitumen-bound macadam surface that is 9,217 feet in length. The second runway(17L/35R) has a concrete surface that is 5,024 feet in length. The third runway (17R/35L) has a partial concrete, asphalt, or bitumen-bound macadam surface that runs 9,217 feet in length.
Enid Woodring Regional Airport (FAA 2021c)	Public	1,167 feet	One runway (13/31) runs in a northwest–southeast alignment, has an asphalt surface, and is 3,150 feet in length. The second runway (17/35) runs in a north/south alignment, has a concrete surface, and is 8,613 feet in length.
Atwoods (OK26) (FAA 2021d)	Private	1,296 feet	The helipad has a concrete surface and is 100 × 75 feet.

3.4.6.2.3 RAILWAYS

Three mainline railroads are owned and/or operating in the analysis area: Burlington Northern Rail Line, the Atchison-Topeka-Santa Fe Rail Line, and the Chicago-Rock Island-Pacific Rail Line.

Burlington Northern-Santa Fe (BNSF) is the largest freight railroad network in North America and one of seven North American Class I railroads. The Burlington Northern Rail Line and the Atchison-Topeka-Santa Fe Rail Line are a part of the BNSF Railway. BNSF has an estimated 35 to 40 miles of track within the analysis area. Both of these railways are approximately 2.6 miles and 2.9 miles east-northeast of the Project, respectively.

The Union Pacific Railroad is the second largest railroad in the United States and the oldest operating Class I railroad. Union Pacific is the primary owner of the Chicago-Rock Island-Pacific Rail Line, with an estimated 12 to 18 miles of track within the analysis area. This railway is approximately 2 miles west of the Project.

The active mainline railroads are used for freight; no passenger rail service operates in the analysis area.

3.4.6.3 Environmental Consequences

3.4.6.3.1 METHODOLOGY

Table 3.4-22 lists the issues identified for this resource and the indicators and impact thresholds used to assess impacts for this EIS.

Table 3.4-22. Transportation Issues, Indicators, and Impact Thresholds

Issues	Indicators	Impact Thresholds
Increased road traffic and safety hazards	Change in area traffic volumes and road condition	No impact thresholds established by regulations; best professional judgment
Impact to aviation use and safety	Distance from airports/heliports Change in ground elevation increase in reflective glare Compliance with FAA requirements	Project does not comply with FAA requirements.
Change in rail transportation	Encroachment on railroad ROW Compliance with Federal Railroad Administration requirements	Project does not comply with FRA requirements

Transportation resources were identified based on a review of aerial photographs, mapping, and available public data. Potential impacts to roadways, in the form of traffic, were assessed with respect to anticipated disruption or improvement of current transportation patterns and systems; deterioration or improvement of traffic conditions; and changes to existing levels of transportation safety. Beneficial or adverse impacts could arise from the physical changes to traffic patterns (e.g., closing, rerouting, or creating roads), construction activity, introduction of construction-related traffic on local roads, or changes to daily or peak-hour traffic volumes created by installation workforce or population changes.

Potential impacts to railway use were assessed with respect to anticipated disruption or improvements to rail lines or road crossings over existing railways, or the increase in rail services as a result of the Project that could result in beneficial or adverse impacts on the function of the rail system. Potential impacts to airport use were assessed with respect to anticipated disruption to flight patterns or the increase in generated flights servicing the airport as a result of the Project.

3.4.6.3.2 NO ACTION ALTERNATIVE

Under the No Action Alternative, the Project would not be constructed, and there would be no impacts on transportation from the Project. However, existing and reasonably foreseeable trends and actions would continue to affect transportation in the analysis area. Looking at future trends, anticipated land use is projected to primarily remain as agricultural use. Future development could result in some farmland conversion; however, based on land cover trends (see Section 3.4.2.2.2), this conversion would be limited in nature. Therefore, marketed increases in future traffic volume, or demand for transportation, are not anticipated.

Reasonably foreseeable trends and actions with the potential to impact transportation under the No Action Alternative include U.S. Highway 412 highway improvements from Garland Road to the U.S. Highway 64 Junction (proposed for 2023–2027), U.S. Highway pavement rehabilitation from Chestnut Avenue to the State Highway 45 Junction (proposed for 2022), reconstruction of the 13/31 runway at the Enid Woodring Regional Airport (proposed for 2022–2023), and construction of the future Kaw Lake Water Pipeline (slated to begin by 2023) (ODOT 2021). These projects would generate temporary, localized transportation disruptions during construction. However, all reasonably foreseeable trends and actions would occur in compliance with all federal, state, and local transportation regulations. Improvements to U.S. Highways 412 and 60 and increased flight activities at the Enid Woodring Regional Airport would result in long-term benefits through improved transportation services.

3.4.6.3.3 PROPOSED ACTION

Construction

Construction of the Proposed Action would have temporary effects on the existing transportation resources (i.e., roadway/highway, railway, airport) in the analysis area over the 18-month construction period.

Project traffic generated during construction, O&M, and decommissioning would mainly use the seven primary thoroughfares (i.e., South 30th Street, South 42nd Street, South 66th Street, East Fox Drive, East Wheat Capital Road, East Longhorn Trail, and East Hayward Road), with limited use along the three roads that do not provide complete passage through the analysis area (i.e., South 54th Street, South 78th Street, and East Skeleton Road). Project traffic would not occur on the two dead-end roads within the Application Area (i.e., South Covered Wagon Trail and East Paradise Lane).

The Proposed Action would average between 200 to 300 employees per month that would be commuting to the Project during the 18-month construction period, with the occasional potential for up to 400 employees commuting during peak construction times (typically lasting only a few weeks during the construction period). Multiple, smaller phases throughout the construction period would require fewer employees. The Proposed Action would also average approximately 25 truck deliveries per day over the construction period. This could increase traffic on local roads by an additional estimated 450 to 850 ADT.

Traffic generated as part of the construction activities (i.e., workers commuting, truck deliveries) would not follow a single travel path because workers and deliveries would be traveling from different areas and accessing different locations of the Project. For this reason, the anticipated construction traffic would not be concentrated in one area and would vary in occurrence throughout the day during peak and off-peak hours. The overall addition of construction traffic would be minimal along existing highways, and the use of different route approaches for construction traffic along rural roads would further reduce the level of temporary impacts during the construction period.

The Applicant would implement measures during construction for any road closures or detour routes as needed, and coordination for such needs would be conducted with the USDOT, Federal Highway Administration, and ODOT as applicable. Additionally, the Applicant would coordinate with the agencies to ensure the weight loads, width, and underpass heights of the existing facilities (i.e., roads, bridges, culvert crossings) are considered in the Project planning and delivery of materials and equipment to further avoid adverse impacts for traffic safety during construction.

The Applicant would also coordinate with the appropriate local officials, FAA, Department of Defense, the State of Oklahoma, and local airport operators to ensure safe and efficient use of the navigable airspace for public use and military airports. Because construction activities and equipment use would have to comply with FAA regulations on height limitations within active air space, adverse impacts associated with the Proposed Action are not anticipated for airports and associated flight operations during the construction period. Once the final Proposed Action footprint is selected, notice would be provided to the FAA for review and compatibility with FAA's criteria for structure heights, wire spans, markings, lighting, and glare.

Likewise, the Applicant would coordinate with the appropriate railway operators if the Project encroaches on a mainline railroad ROW, as well as for significant deliveries of large equipment and construction supplies if the delivery routes cross existing railway at-grade crossings to ensure the weight loads, widths, and scheduling would not impact existing railway facilities or transport scheduling. The Proposed Action would not require the use of a railroad ROW for staging, temporary work areas, or construction of the Project. For this reason, adverse impacts associated with the Proposed Action are not anticipated for railways and associated transportation operations during the construction period.

Operations, Maintenance, and Decommissioning

O&M under the Proposed Action over its anticipated 30-year life would involve the use of up to 10 on-site workers with associated vehicle travel. This traffic volume would have no measurable impact on existing transportation resources (i.e., roadway/highways, railways, airports) during the life of the Project.

Long-term operational impacts to air transportation could result if Project structures or equipment encroach into existing flight airspace or if Project structures, such as the PV panels, introduce reflective glare and impede visual abilities for pilots on approach or take-off from nearby airports. Coordination for permitting with the appropriate local officials, FAA, Department of Defense, the State of Oklahoma, and local airport operators would be required for the Proposed Action to ensure safe and efficient use of the navigable airspace for public use airports/heliports and military airfields. Project design for structure heights, solar PV panel selection, and panel location and angle positioning would have to comply with FAA regulations

to reduce potential impacts for nearby airports, airfields, and heliports within the analysis area. A glint and glare analysis was conducted using the Solar Glare Hazard Analysis Tool to assess potential glare impacts resulting from the Project. Specifically, this analysis focused on potential glare on aircraft approaching the Vance AFB and Enid Woodring Regional Airport. This analysis identified there are no predicted glare occurrences for approaches for any runways associated with the air force base or regional airport (Capitol Airspace Group 2020). For this reason, adverse impacts associated with the Proposed Action are not anticipated for these resources or their associated flight operations for the life of the Project.

Decommissioning (or plant re-powering) activities would include concentrated activities with increased vehicle and construction equipment movement in the Proposed Action footprint similar to construction phase of the project.

Cumulative Effects

As noted in Section 3.4.6.3, the analysis area contains a diverse mix of transportation resources, including airport and railroad activity, as well as a local road network supporting an average ADT of 100 to 300 vehicles. The Proposed Action would generate up to an additional 450 to 850 ADT during peak traffic, as well as 10 vehicles during O&M to the current and future traffic conditions. Because this traffic would not be concentrated in one area and would vary in occurrence over the life of the Project, however, cumulative traffic levels would be similar to the No Action Alternative. Project impacts to railroad and aviation traffic would not be measurable, as the Applicant would coordinate with the appropriate local officials and agencies to ensure activities are conducted in compliance with all local, state, and federal regulations.

3.4.6.3.4 OTHER ACTION ALTERNATIVE

Construction, Operations, Maintenance, and Decommissioning

Potential transportation impacts from construction, O&M, and decommissioning (or plant re-powering) activities are generally assumed to be the same under the Proposed Action and the Other Action Alternative because, in general, the construction actions and schedule would be similar in scope and duration. No transportation impacts unique to the Other Action Alternative were identified.

Cumulative Effects

Potential cumulative effects on transportation resources would be the same as those described under the Proposed Action and could occur where other existing and reasonably foreseeable trends and actions occur within the analysis area. The Other Action Alternative would generate the same maximum number of vehicles during peak traffic (i.e., 450 to 850 ADT) as well as similar vehicle quantities during O&M (i.e., 10 vehicles) to the current and future traffic conditions. Similar to the Proposed Action, traffic would not be concentrated in one area and would vary in occurrence over the life of the Project. Cumulative traffic levels would be similar to the No Action Alternative. Project impacts to railroad and aviation traffic would be the same as those described under the Proposed Action and would not be measurable because the Applicant would coordinate with the appropriate local officials and agencies to ensure activities are conducted in compliance with all local, state, and federal regulations.

3.4.6.4 Summary of Impacts

Potential impacts on transportation resources (i.e., roadways/highways, railways, and airports/heliports) were assessed qualitatively on the best available data and compared between the No Action Alternative, the Proposed Action, and the Other Action Alternative. Under the No Action Alternative, the Project would not be constructed, and there would be no impacts to existing transportation resources from the Project. However, existing and reasonably foreseeable trends and actions would continue to affect transportation for the analysis area.

Under both action alternatives, construction would average between 200 to 300 employees per month that would be commuting to the Project during the 18-month construction period, with the occasional potential for up to 400 employees commuting during peak construction times. The overall addition of construction traffic would be minimal along existing highways under both alternatives, and traffic generated along rural roads near the application area would use different route approaches to avoid an increased concentration of traffic volumes focused into a few selected roads. Anticipated traffic generated during the operation of the Project under both alternatives would result in a far less increase of vehicles to local roads because only 10 vehicles are expected daily for the staff required to operate and maintain the facility. Coordination for permitting with the appropriate local officials, ODOT, FAA, Department of Defense, the State of Oklahoma, local airport operators, and local railway operators would also be required for all action alternatives to ensure safe and efficient use of transportation resources within the analysis area. Therefore, with the implementation of BMPs described in Chapter 2, no impact thresholds would be triggered as a result of the Project, either individually or when considered in conjunction with other present and reasonably foreseeable trends and actions.

3.4.7 Visual Quality and Aesthetics

3.4.7.1 Introduction

Visual resources are the physical features that make up the visible landscape (features such as land, water, vegetation, topography, and human-made features such as buildings, roads, utilities, and structures) as well as the response of viewers to those features. This EIS evaluates these topics to consider whether changes to scenery due to the Project are compatible with human activities on and expectations of the landscape.

This analysis describes the current conditions of the visual and aesthetic resources for the visual resource analysis area. The effects of the No Action Alternative and action alternatives on these resources are subsequently described and discussed.

3.4.7.1.1 SPATIAL AND TEMPORAL SCOPE OF ANALYSIS

The spatial scale for analysis of potential effects to visual resources encompasses a 0.5-mile buffer around the Proposed Action footprint, wherein it is assumed the Project would be visible from adjacent residences, travel routes, public use areas, and where impacts to scenery would mostly likely occur. This area is referred to as the *visual resource analysis area* or, more generally in this section, the *analysis area*.

The temporal scale for analysis of visual effects considers the timeframe beginning with construction and ending when revegetation is complete.

3.4.7.2 Affected Environment

RUS developed Section 1971.707 (Visual Impact Assessments) within the Rural Development Instruction 1970 Environmental (USDA 2016b) to outline methods for conducting project-associated visual analyses. Specifically, this document identifies the process to inventory intrinsic visual and aesthetic characteristics and assess impacts on these characteristics, including from the viewer's perspective. This project-specific visual analysis focuses on two elements associated with visual resources: scenery and viewers.

3.4.7.2.1 SCENERY

Scenery is defined as a continuous unit of land comprising harmonizing features that result in and exhibit a particular visual character. The Project is located approximately 5 miles southeast of Enid, Oklahoma, within the Central Great Plains EPA Level III ecoregion (EPA 2013). The analysis area is primarily characterized by panoramic landscapes defined by rolling to level grasslands that have been largely converted to agricultural lands. Vegetation color in agricultural areas ranges from green, tan, to brown depending on the season and the crop being grown. There are scattered trees along property lines, but the primary vegetation communities in the analysis area are agricultural lands and remnant grasslands. The scattered trees introduce darker and brighter greens into the setting especially in in the spring and summer. There are also residences dispersed across this agricultural landscape, introducing geometric structures and additional vegetation in the setting associated with wind breaks and ornamental landscaping. The juxtaposition of residences and agricultural lands, including barns and other structures, create an agrarian landscape character common to the region. Many of the farms in the area were built by German and Czech immigrants and are included under the state's Centennial Farm and Ranch Program to recognize these historic structures and associated landscapes.

The meandering Skeleton Creek, and its tributaries, includes a defined riparian corridor with taller trees and flowing water. Both the additional vegetation adjacent to residences and riparian vegetation along Skeleton Creek introduce the potential for vegetation to screen views resulting in more enclosed settings than the open panoramic views common in this ecoregion. In addition to existing residences, other existing development in the analysis area includes several electric transmission lines, the Woodring Substation in the northern portion of the analysis area, and scattered oil and gas development. The vertical protrusions associated with transmission line structures and oil and gas infrastructure are noticeable as they rise above the mostly flat, panoramic landscapes in the analysis area. A series of paved, gravel, and natural surface roads provide access to private property along section lines. No federal or state highways are located within the analysis area. Two airport facilities are near the Project: Vance AFB (approximately 3.5 miles west) and Enid Woodring Regional Airport (approximately 1.5 miles north).

3.4.7.2.2 VIEWERS

Viewing locations represent places where the public could view the Project. These are commonly referred to as key observation points, or KOPs, and establish the platforms where impacts on views are assessed. The identification of KOP locations included a review of residences, travel routes, and public use areas within the analysis area to represent critical viewpoints, typical views in representative landscapes, and any special project features. The level of concern for changes in the landscape, as viewed from KOPs, varies based on duration of view, volume of use, visual sensitivity, and if the viewing location has scenic or historic status. In general, views from residences, scenic roads, and public use areas would be more visually sensitive and include longer duration views compared to views from low-use roads and industrial areas. Through review of the analysis area, views from residences and two public use areas were identified as the critical viewpoints for this analysis because there are no scenic roads, federal or state highways, trails, or other recreation/public use areas within the analysis area. Nine KOP locations were identified to assess impacts on views (Table 3.4-23; see Figure 3.4-6). Additionally, residence locations and Centennial Farm and Ranch properties were identified within the analysis area and are shown on Figure 3.4-6.

Table 3.4-23. Key Observation Points

KOP Number	KOP Name	Viewer Type	Location Rationale	Proposed Action	Other Action Alternative
1	Residence on 66th Street (at E0470 Road)	Residences	View from residence toward existing Woodring Substation, proposed 345-kV gen-tie, and PV panels in an existing agricultural setting	X	X
2	Residences on Fox Drive	Residences	View from multiple residences toward PV panels in an existing agricultural setting	X	
3	Residence on E0470 Road	Residences	View from residences adjacent to PV panels in an existing agricultural setting	X	
4	Residence on E0480 Road	Residences	View from residence toward PV panels and a series of underground collector lines in an existing agricultural setting	X	
5	Residences on N2920 Road	Residences	View from multiple residences toward PV panels in an existing agricultural setting	X	
6	Residence on 66th Street (at Fox Drive)	Residences	View from residence toward PV panels in an existing agricultural setting		X
7	Bethlehem Baptist Church	Public use area	View from public use area toward PV panels in an existing agricultural setting		X
8	Residences on N2930 Road	Residences	View from multiple residences toward PV panels in an existing agricultural setting		X
9	Pioneer High School and Community Park	Recreation/ public use area	View from high school and public use area toward PV panels approximately 0.5 mile away		X

A visual contrast rating worksheet was developed for each KOP with the findings of the visual contrast rating process in Appendix B.

3.4.7.3 Environmental Consequences

3.4.7.3.1 METHODOLOGY

The visual resource analysis was developed using guidance and methods derived from RUS's Rural Development Instruction 1970 Environmental (USDA 2016b) and BLM Handbook H 8431, Visual Resource Contrast Rating (BLM 1986). In accordance with these guidance and methods, the existing visual characteristics and landscape character as well as the viewer response to those elements provide the framework for assessing the changes in visual character that would be caused by the Project. The results of this analysis provide the foundation for the development of visual mitigation measures.

Table 3.4-24 lists the issues identified for this resource and the indicators and impact thresholds used to assess impacts for this EIS.

Table 3.4-24. Visual Quality and Aesthetics Issues, Indicators, and Impact Thresholds

Issues	Indicators	Impact Thresholds
Change in existing landscape character	Scenery: Magnitude of change in landscape character Viewers: Degree of contrast perceived by viewers; number of residences within 0.5 mile of the project	No impact thresholds established by regulations; best professional judgment
Glint or glare from solar panels	Identified receptors with ocular impact/ glare occurrences	Red or yellow predicted glare occurrences in the cockpit

Project contrast is a measure of the overall visual changes to existing features of the landscape (including landform/water, vegetation, and structures) resulting from the construction and operation of that project. The assessment of contrast was done by comparing the visual elements of the existing landscape, in terms of form, line, color, and texture, to the visual elements associated with the construction, O&M, and decommissioning of the Project. This assessment also includes elements described in Rural Development Instruction 1970 Environmental related to visual impact assessments, including the intactness of the setting, unity of natural and built elements, and the vividness or memorability of the setting.

Project contrast was used as the baseline for assessing impacts to landscape character and viewers. Table 3.4-25 provides descriptions for each impact level associated with the contrast level perceived by viewers and the magnitude of change to landscape character. Contrast rating worksheets were developed from each KOP to identify the level of visual contrast introduced by the project (see Appendix B). Additionally, the number of residences within 0.5 mile of the Project are described for each alternative and shown in context with the KOPs on Figure 3.4-6.

Table 3.4-25. Criteria for Assessing Level of Impacts to Visual Resources

Level of Change	Contrast Perceived by Viewers	Magnitude of Change to Landscape Character
None/ negligible	Project components would repeat elements or patterns common in the landscape. Project components would not be visually evident.	Landscape would appear to be intact, and Project components would not attract attention. Project components would repeat form, line, color, texture, or scale common in the landscape and would not be visually evident (no contrast).
Weak	Project components would introduce elements or patterns common in the landscape that would be visually subordinate. Project components would create weak contrast compared with other features in the landscape.	Landscape would be noticeably altered, and Project components would begin to attract attention. Project components would introduce form, line, color, texture, or scale common in the landscape and would be visually subordinate (weak contrast).
Moderate	Project components would introduce elements or patterns not common in the landscape. Project components would be visually prominent in the landscape and would create moderate contrast compared with other features in the landscape.	Landscape would appear to be substantially altered and project components would begin to dominate the visual setting. Project components would introduce form, line, color, texture, or scale not common in the landscape and would be visually prominent in the landscape (moderate contrast).
Strong	Project components would introduce elements or patterns that would be visually dominant and create strong contrast compared with other features in the landscape.	Landscape would appear to be severely altered and Project components would dominate the visual setting. Project components would introduce form, line, color, texture, or scale not common in the landscape and would be visually dominant in the landscape (strong contrast).

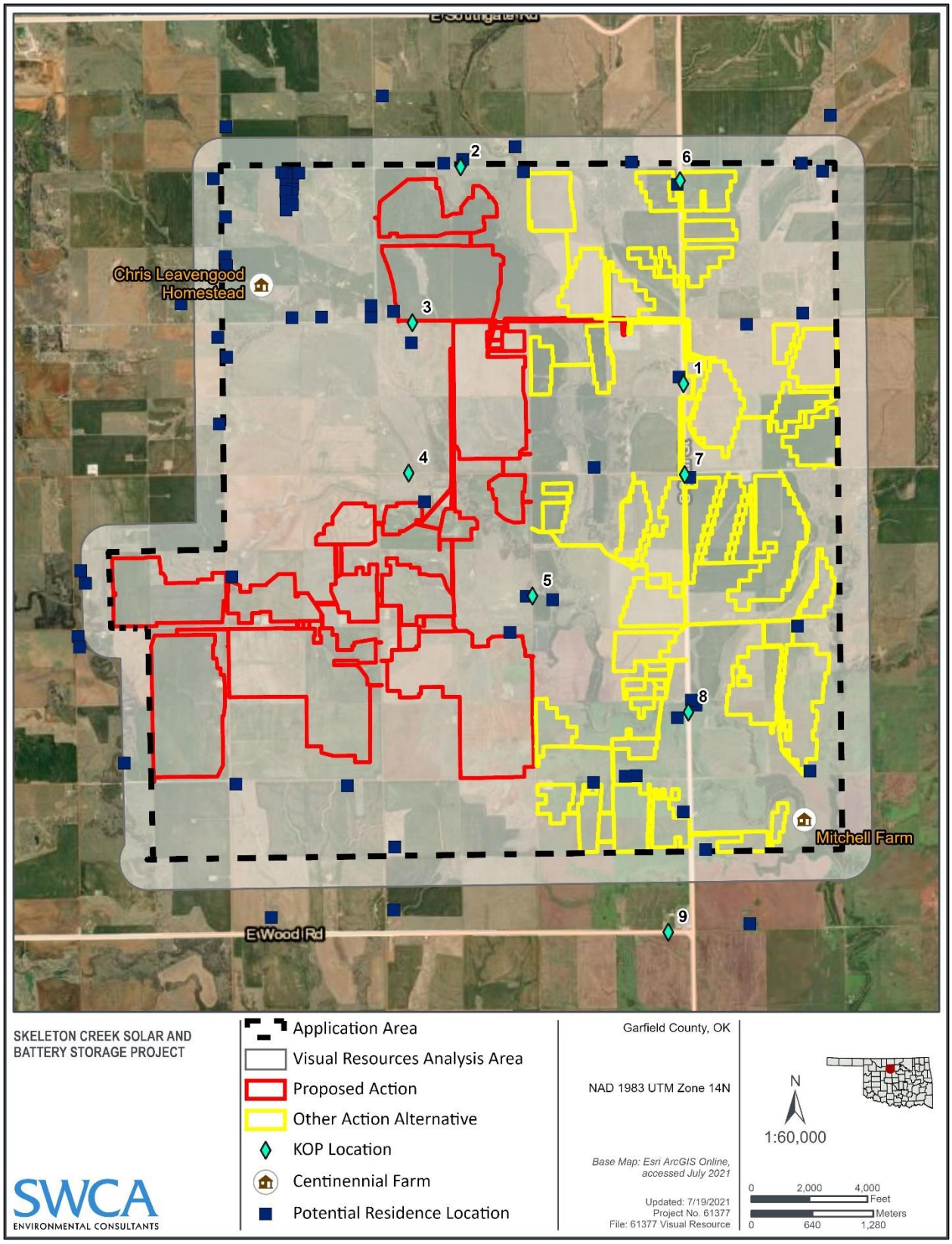

Figure 3.4-6. Key observation points in the visual resources analysis area.

3.4.7.3.2 NO ACTION ALTERNATIVE

Under the No Action Alternative, the Project would not be constructed, and there would be no impacts on visual or aesthetic resources from the Project. However, existing and reasonably foreseeable trends and actions would continue to affect these resources in the analysis area. Anticipated land use in the analysis area is projected to continue to be primarily agricultural with limited future development resulting in additional farmland conversion. The vertical protrusions associated with the existing transmission lines are evident throughout the analysis area and would continue to influence viewers as they rise above vegetation, which screens views. Wind turbines associated with the currently in-construction or operational wind farms could also be visible above the trees and further modify the viewshed.

No reasonably foreseeable trends and actions occur within the analysis area. However, transportation and airport expansion projects projected within adjacent lands in Garfield County could contribute to changes in the viewshed during construction due to movement of vehicles and equipment that could attract attention. No long-term visual changes are anticipated because these projects would be consistent with current land uses.

3.4.7.3.3 PROPOSED ACTION

Construction

Scenery

Impacts on visual resources during construction of the PV panels, solar trackers, fencing, distributed battery storage system, and the administration-O&M building would primarily be associated with dust and with increased activity (e.g., the movement of vehicles and equipment) that could attract attention. Construction of the Project would occur over 18 months. During construction, the removal of vegetation and earthwork would introduce areas of exposed soil, which would contrast with the existing setting until vegetation has been restored. Because the 34.5-kV collection system would be buried, there would be no long-term visual effects if successful revegetation occurs. Similarity, the construction of access roads in the level to rolling terrain in the analysis area would require minimal modification of the existing terrain resulting in negligible long-term visual impacts.

Viewers

The assessment of impacts on views was based on an assessment from five KOP locations representing residences in the analysis area. There are 23 residences located within 0.5 mile of the proposed PV panels and 1 residence within 0.5 mile of the proposed gen-tie and Project substation as shown on Figure 3.4-6, along with this alternative's five KOP locations (see Table 3.4-23).

Impacts common to all KOPs during construction including views of additional vehicular traffic, and associated dust, and areas of exposed soil after the removal of vegetation and during earthwork activities. These impacts would occur over an 18-month schedule and would cease after construction is complete and vegetation has been restored. Views from KOPs 3 and 4 would be most affected as they are located directly adjacent to the proposed PV panels and access roads with unobstructed views of construction activities. KOP 4 would also include views of ground disturbance associated with trenching the buried 34.5-kV collection system. Because the collection system would cross through an area of riparian vegetation northeast of the residence, there would be a weak geometric form generated by the removal of these trees. This would initially introduce visual contrast and would be noticeable in the setting; however, over time, as vegetation regrows in the area, it would begin to repeat vegetation patterns common in the area.

Operations, Maintenance, and Decommissioning

Scenery

The Project would introduce form, line, color, and textures associated with the PV panels, solar trackers, and battery storage system that are inconsistent with the existing landscape character. The conversion of approximately 528 acres of existing agricultural lands to PV panels would generate visual contrast through their flat, geometric form and dark, slightly reflective surfaces, which are not common in the setting. The addition of the repetitive, vertical upright features associated with the solar trackers, additional fenced land, and distributed battery storage system would be noticeable in this flat, panoramic landscape and be visually prominent in the landscape. However, the level of visual contrast would be reduced due to the presence of existing transmission lines and oil and gas development, which have visually influenced the landscape setting throughout the analysis area. Therefore, Project elements would attract attention but would not dominate the setting.

Landscapes adjacent to properties on the state's Centennial Farm and Ranch Program would be minimally impacted by the Project. The closest property, the Chris Leavengood Homestead, is approximately 1 mile away from the Project with a vegetated stream corridor between the property and the Project.

The introduction of the administration-O&M building would be noticeable and begin to attract attention in the setting. However, the existing residential and agricultural buildings in the landscape, as well as other structures associated with oil and gas development, have introduced form, line, color, and texture similar to the Project. In the northern part of the Proposed Action footprint, the proposed gen-tie line and Project substation would also introduce tall, vertical and horizontal transmission line and substation elements into a flat, panoramic landscape. Although these elements would be noticeable and visually prominent, there is the existing Woodring Substation located less than 1 mile away and several existing transmission lines, totaling 18.8 miles, which have altered the existing landscape.

The intactness, unity, and vividness of the agrarian landscapes in the analysis area would be impacted because the change from agricultural lands to PV panels would encroach on and begin to diminish the overall visual composition of the landscape's existing character. The application of herbicides to control weeds during O&M could also increase visual contrast through changes in vegetation color after their application. However, this type of vegetation management would be consistent with adjacent agricultural and oil and gas extraction uses; therefore, this O&M component would generally not be visually evident.

A glint and glare analysis was conducted using the Solar Glare Hazard Analysis Tool to assess potential glare impacts resulting from the Project. Specifically, this analysis focused on potential glare on aircraft approaching the Vance AFB and Enid Woodring Regional Airport. This analysis identified no predicted glare occurrences for approaches for any runways associated with the AFB or regional airport (Capitol Airspace Group 2020).

Viewers

KOP 1 Residence on 66th Street (at E0470 Road): The Project would be visible from this location, in particular the gen-tie line, which is viewed in context with the existing Woodring Substation and multiple existing transmission lines approximately 0.5 mile away. The tall, vertical form of the proposed structures would repeat those found in the existing utility development visible from this location, generating weak visual contrast in this viewshed. The construction of PV panels, approximately 1 mile away, would not be visually evident from this location because they would be screened by vegetation and the subtle rolling terrain.

KOP 2 Residences on Fox Drive: Views from these residences on Fox Drive toward the Project would be partially screened by riparian vegetation along a tributary of Skeleton Creek. The taller gen-tie line would be visible above the riparian vegetation approximately 1 mile away; however, because it repeats the form, line, and color texture of the adjacent existing transmission lines, negligible contrast would be introduced by the gen-tie line. The PV panels, solar trackers, and battery storage system would be visible approximately 0.25 mile away where not screened by the riparian vegetation. The low-profile geometric rows associated with the PV panels would create a set of converging lines due to the orientation of the panels from this location. Views of these converging lines of PV panels, color change associated with the PV panels compared to the existing agricultural field, and the vertical form of the battery storage system would begin to attract attention from this location and introduce patterns not common in the landscape.

KOP 3 Residence on E0470 Road: Views of the Project from this location would be unobstructed and include views of the PV panels, solar trackers, battery storage system, and site fencing, which would be constructed in an existing agricultural field. An existing oil and gas pad with cylindrical tanks is located between this residence and the Project. The introduction of the geometric rows of PV panels and vertical geometric battery storage system would be visually prominent and begin to dominate views from the KOP. The existing oil and gas tanks have introduced form, line, color, and textures that have modified the existing setting; however, because of the scale of the Project and relative level of proposed change, the Project would be visually prominent looking north and northeast. The taller gen-tie line would be visible above the riparian vegetation approximately 0.5 mile away; however, because it repeats the form, line, and color texture of the adjacent existing transmission lines, the gen-tie line would introduce weak visual contrast.

KOP 4 Residence on E0480 Road: Views from this residence, located closer to the Project than the KOP location, would include views of the proposed PV panels, solar trackers, battery storage system, and site fencing. Existing vegetation around the residence could provide some screening of the Project; however, because of the proximity of the Project, the Project would be prominent and begin to dominate views from this residence especially views toward the west. An existing transmission line is located approximately 0.25 mile east of the residence and rises above the riparian vegetation, along a tributary of Skeleton Creek. Because of the height of the existing transmission line, the Project would be prominent in views to the east but would not dominate these views.

KOP 5 Residences on N2920 Road: Views of the Project from this location would occur from approximately 0.25 mile away and would be partially screened by a row of trees along E0490 Road. Where visible, the series of low-profile geometric PV panels would generate a series of parallel lines and introduce a color change compared to the existing agricultural field. The addition of the PV panels, solar trackers, battery storage system, and fencing would be visually prominent and begin to dominate the setting because there are limited existing modifications in the viewshed.

Decommissioning (or plant re-powering) would include concentrated activities with increased vehicle and construction equipment movement similar to the construction phase of the Project. Ground disturbance associated with these activities and the vehicular traffic on-site would increase short-term visual contrast and would attract attention from KOPs especially from KOP 3 and 4 where these activities would occur directly adjacent to residential areas. After the Project has been decommissioned, there would be increased visual contrast between the color of the exposed soil and adjacent vegetated areas until site reclamation is successful.

Cumulative Effects

The Project would convert 528 acres of agricultural lands to PV panels, which would generate visual contrast in the analysis area, including landscapes adjacent to Centennial Farm and Ranch properties. Project construction and components would be noticeable and begin to attract attention in the setting. However, the existing residential and agricultural buildings in the landscape, as well as other structures associated with oil and gas development, have introduced form, line, color, and texture similar to the Project. Therefore, no significant cumulative impacts are anticipated.

3.4.7.3.4 OTHER ACTION ALTERNATIVE

Construction

Potential visual impacts from construction, O&M, and decommissioning (or plant re-powering) activities are generally assumed to be the same under the Proposed Action and the Other Action Alternative because, in general, the construction actions and schedule would be similar in scope and duration, and the alternative footprints would be located in landscapes with comparable character. Visual impacts unique to the Other Action Alternative are identified below.

Viewers

Similar to the Proposed Action, the assessment of impacts on views was based on five KOP locations with one KOP common between the alternatives. The KOP locations represent views from residences and two public use areas in the analysis area (see Table 3.4-23).

Impacts on views from the KOPs during construction would be similar to the Proposed Action because similar activities are proposed in comparable viewsheds. Because of the different location for this alternative, views from KOPs 6, 7, and 8 would be those most affected by construction activities because they are located directly adjacent to the PV panels and access roads with unobstructed views of construction activities.

Operations, Maintenance, and Decommissioning

Scenery

The Other Action Alternative would convert 472 acres of agricultural lands to PV panels (56 less acres than the Proposed Action). Landscapes adjacent to properties on the state's Centennial Farm and Ranch would be modified by the introduction of PV panels, which would begin to attract attention in the setting. The closest property, the Mitchell Farm, is located adjacent to the Proposed Action footprint with a stream corridor crossing through the middle of the property. The eastern portion of the property would not be directly impacted but would be visually influenced by the presence of PV panels on the agricultural lands to the north. The western portion of the property would be partially converted to PV panels, which would introduce form, line, color, and texture not common in the visual setting. Similarly, the intactness, unity, and vividness of the agrarian landscapes in the analysis area would be impacted because the change from agricultural lands to PV panels would encroach on and begin to diminish the overall visual composition of the landscape's existing character.

The gen-tie line, similar to the Proposed Action, would be noticeable and visually prominent, but it would be located near the existing Woodring Substation and several existing transmission lines, which have altered the existing landscape.

Viewers

KOP 1 Residence on 66th Street (at E0470 Road): Compared to the Proposed Action, views of the tall, vertical form of the proposed gen-tie line and Project substation would be visually prominent and introduce these elements within 0.25 mile of this residence. As described under the Proposed Action, existing transmission lines in the viewshed have introduced similar elements; however, because they are located further away, their level of dominance on these views is lower. In addition to the views of the proposed gen-tie line, the installation of PV panels, solar trackers, and battery storage system would attract attention on views to the east and southeast where constructed in an existing agricultural field.

KOP 6 Residence on 66th Street (at Fox Drive): Views of the Project from this location would be unobstructed and include views of the PV panels, solar trackers, battery storage system, and site fencing, which would be constructed in an existing agricultural field. The introduction of the geometric rows of PV panels and vertical geometric battery storage system would be visually prominent and begin to dominate views from KOP location. The existing transmission lines have modified the existing setting; however, because of the scale of the Project and relative level of proposed change, the Project would be visually prominent in views looking southwest, south, and southeast. The taller gen-tie line would be visible approximately 1 mile away; however, because it repeats the form, line, and color texture of the adjacent existing transmission lines, the gen-tie line would introduce weak visual contrast.

KOP 7 Bethlehem Baptist Church: Impacts on views from this location would be similar to KOP 6 because views toward the south would begin to be dominated by the Project. Compared to views from residences, which are typically long in duration, these impacts would generally be shorter in duration and would occur less frequently, only when people gather for services or other events.

KOP 8 Residences on N2930 Road: Views from these residences toward the Project would be partially screened by riparian vegetation along a tributary of Skeleton Creek. The proposed PV panels, solar trackers, and battery storage system would be visible approximately 0.25 mile away where not screened by the riparian vegetation. The low-profile geometric rows associated with the PV panels would begin to blend to create a geometric form on the low hill beyond the riparian vegetation. Views of PV panels, including the color change compared to the existing agricultural field, and the vertical form of the battery storage system would begin to attract attention from this location and introduce patterns not common in the landscape.

KOP 9 Pioneer High School and Community Park: The Project would be visible approximately 0.5 mile away from this public use-recreation area. Because of the partial screening of the Project and the extent of existing modifications in the viewshed, a weak level of visual contrast would be introduced by the Project. Where visible, the PV panels, solar trackers, and battery storage system would blend with the existing fencing, tall sports lighting, and structures associated with the high school and athletic fields.

Cumulative Effects

Cumulative effects associated with the addition of the Project under this alternative would be similar to the Proposed Action because the same landscapes would be impacted and the same past, present, and reasonably foreseeable trends and actions would occur.

3.4.7.4 Summary of Impacts

Impacts on visual resources were assessed and compared for the No Action Alternative, Proposed Action, and the Other Action Alternative. Under the No Action Alternative, the Project would not be constructed and there would be no impacts on visual or aesthetic resources. However, existing and reasonably

foreseeable trends and actions would continue to affect these resources in the analysis area. The action alternatives would convert approximately 472 acres of agricultural lands to 528 acres PV panels, generating visual contrast with the existing landscape character. Both the Proposed Action and the Other Action Alternative would begin to visually dominate views from some residences in the analysis area (KOPs 3, 4, 6, 7, and 8) through the construction and O&M of PV panels, solar trackers, and the distributed battery storage system. However, with the implementation of BMPs described in Chapter 2, no impact thresholds would be triggered as a result of the Project, either individually or when combined with other present and reasonably foreseeable trends and actions.

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CHAPTER 4. OTHER REQUIRED CONSIDERATIONS

4.1 UNAVOIDABLE ADVERSE IMPACTS

Table 4.1-1 summarizes unavoidable adverse impacts for each analyzed resource, subject to applicable Applicant-committed measures. Table 4.1-1 does not include potential additional mitigation measures that could avoid or further minimize or mitigate Project impacts. Please see the individual resource discussions in Chapter 3 for detailed analyses.

4.1.1 Potential Unavoidable Adverse Impacts of the Action Alternatives

Table 4.1-1. Potential Unavoidable Adverse Impacts of the Action Alternatives

Resource Area	Potential, Unavoidable Adverse Impact of the Action Alternatives
Air quality	Impacts from emissions from engines associated with traffic, construction activities, and equipment operation
Geology and soils	Increase in soil erosion, loss of mixing of organic matter, and inadvertent spills during construction and installation, O&M, and decommissioning
Water resources and floodplains	Increase in erosion, turbidity and sediment resuspension, and inadvertent spills during construction and installation, O&M, and decommissioning
Vegetation (including invasive species, noxious weeds, and special-status plants	Short- to long-term habitat alteration and increased invasive species risk
Wetlands	Increase in soil erosion, sedimentation, and discharges and releases from land disturbance during construction and installation, O&M, and decommissioning
Wildlife, including special-status species	Displacement and avoidance behavior from habitat loss and alteration and from equipment noise Individual mortality from collisions with vehicles or construction equipment
Cultural resources	In the event that cultural or historical resources are identified during the construction of the proposed Project, then the construction phase of the Project could create unavoidable impacts to the resource encountered due to the unintended disturbance and potential destruction of that resource
Land use	Land use disturbance due to construction, as well as effects due to noise, vibration, and travel delays
Noise	Temporary increase in noise levels associated with traffic, construction activities, and equipment operation
Public health and safety	Increase in risk of human exposure to hazardous materials, fire and severe weather events, worker and road incidents, and EMF
Socioeconomics and environmental justice	No unavoidable adverse socioeconomic impacts Changes to air quality, water quality, land use, and cultural resources that could be disproportionately borne by minority or low-income populations or tribes from Project construction, O&M, and decommissioning
Transportation	Changes in transit patterns
Visual resources	Change in scenic quality of landscape and seascape

4.2 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

Irreversible commitments of resources are those that cannot be regained, such as the extinction of a species or the removal of mined ore. Irretrievable commitments are those that are lost for a period of time, such as the short-term loss of timber productivity in forested areas that are kept clear for a power line or a road. Table 4.2-1 summarizes irreversible or irretrievable effects for each analyzed resource, subject to applicable Applicant-committed measures. Table 4.2-1 does not include potential additional mitigation measures that could avoid or further minimize or mitigate Project impacts. Chapter 3 provides a detailed discussion of effects associated with the Project.

4.2.1 Irreversible and Irretrievable Commitment of Resources by Resource Area

Table 4.2-1. Irreversible and Irretrievable Commitment of Resources by Resource Area

Resource Area	Irreversible Impacts	Irretrievable Impacts	Explanation
Air quality	No	No	RUS expects air emissions to be in compliance with permits regulating air quality standards, and emissions would be temporary during construction activities. If the Proposed Action displaces fossil-fuel energy generation, overall improvement of air quality would be expected.
Geology and soils	No	No	RUS does not expect activities to cause significant impacts on existing soils and geology. Soil erosion and other resource impacts would be short term, with the rare exception of a major spill.
Water resources and floodplains	No	No	RUS does not expect activities to cause significant impacts on floodplains. Turbidity and other water quality impacts would be short term, with the rare exception of a major spill.
Vegetation (including invasive species, noxious weeds, and special-status plants	No	Yes	Project activities could result in an irretrievable impact due to the loss or alteration of habitat, but these habitats could be restored after decommissioning.
Wetlands	No	Yes	Project activities could result in an irretrievable impact due to the loss or fill of wetlands, but these habitats could be restored after decommissioning.
Wildlife, including special-status species	No	Yes	Based on the healthy populations of species most likely to be impacted, most Project impacts are not expected to be irreversible or irretrievable. Irreversible and irretrievable impacts could occur if one or more individuals of species listed under the ESA were injured or killed. However, ongoing consultation with the USFWS would identify mitigation measures that would reduce or eliminate the potential for such impacts on listed species.
Cultural resources	Yes	Yes	Although unlikely, unanticipated removal or disturbance of previously unidentified cultural resources could result in irreversible or irretrievable impacts.
Land use	No	Yes	Project activities could result in an irretrievable impact due to the loss of use of the land for otherwise typical activities, but these uses could be restored after decommissioning.
Noise	No	Yes	Based on the anticipated duration of construction and installation and O&M, RUS does not anticipate impacts to result in irreversible impacts. Irretrievable impacts could occur due to changes in ambient noise levels during Project construction.
Public health and safety	No	No	RUS does not anticipate that Project actions would lead to an irretrievable or irreversible risk to public health and safety due to Applicant-committed minimization measures.

Resource Area	Irreversible Impacts	Irretrievable Impacts	Explanation
Socioeconomics and environmental justice	No	No	Based on the anticipated duration of construction and installation and O&M, RUS does not anticipate that contractor needs, housing needs, and supply requirements would lead to an irretrievable loss of workers for other projects or increase housing and supply costs. Potential environmental justice adverse impacts would be short term and localized.
Transportation	No	No	Based on the anticipated duration of construction and installation and O&M, RUS does not anticipate impacts on traffic to result in irreversible or irretrievable impacts.
Visual resources	No	Yes	Viewshed changes would persist for the life of the Project until decommissioning is complete.

4.3 RELATIONSHIP BETWEEN SHORT-TERM USE OF THE ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

The CEQ's NEPA implementing regulations (40 CFR 1502.16) require that an EIS address the relationship between short-term use of the environment and the potential impacts of such use on the maintenance and enhancement of long-term productivity. Such impacts could occur as a result of a reduction in the flexibility to pursue other options in the future, or assignment of a specific area (land or marine) or resource to a certain use that would not allow other uses, particularly beneficial uses, to occur at a later date. An important consideration when analyzing such effects is whether the short-term environmental effects of the action would result in detrimental effects to long-term productivity of the affected areas or resources.

As assessed in Chapter 3, RUS anticipates that most of the potential adverse effects associated with the Proposed Action would occur during construction activities, and would be temporary to short-term and localized in nature. Table 4.1-1 and Table 4.2-1 identify unavoidable, irretrievable, or irreversible impacts that could be associated with the Project. However, RUS expects natural environments to return to normal long-term productivity levels after Project decommissioning. Based on these findings, RUS also anticipates that the Proposed Action would not result in impacts that would significantly narrow the range of future uses of the environment.

Additionally, the Project would provide several long-term benefits:

- Promotion of renewable energy to help ensure geopolitical security; combat climate change; and provide a domestic energy source that is affordable, reliable, safe, secure, and clean.
- Delivery of power to WFEC members to contribute to Oklahoma legislative declarations to facilitate the delivery of renewable energy.

4.4 CUMULATIVE EFFECTS ANALYSIS

The CEQ's NEPA implementing regulations (40 CFR 1502.15) states that "The environmental impact statement shall succinctly describe the environment of the area(s) to be affected or created by the alternatives under consideration, including the reasonably foreseeable environmental trends and planned actions in the area(s). The term *reasonably foreseeable* is subsequently defined in 40 CFR 1508.1 as "sufficiently likely to occur such that a person of ordinary prudence would take it into account in reaching a decision."

The cumulative impacts analysis done for this EIS is consistent with CEQ regulations and considers the environmental impacts of the alternatives when added to impacts of past, present, and reasonably foreseeable trends and actions for each resource in Chapter 3. These steps were followed to analyze cumulative impacts in this EIS:

- Identify resources affected and summarize the types of impacts to each resource from the Project, as described in Chapter 3.
- Establish resource-specific spatial and temporal boundaries for analyzing impacts. Spatial boundaries delineate the area where past, present, and reasonably foreseeable trends and actions have taken place, are taking place, or could take place and result in cumulative impacts on the affected resource when combined with the impacts of the alternatives being considered. These boundaries are described by resource in Chapter 3.
- Identify the cumulative action scenario (presented in Section 4.4.1), which identifies the present and reasonably foreseeable trends and actions to be included in the impact analysis for each specific resource identified.
- Identify the types of cumulative impacts (Project + impacts from the projects listed in the cumulative action scenario) that could result for each resource.

4.4.1 Cumulative Action Scenario

The cumulative action scenario in Table 4.4-1 describes the present and reasonably foreseeable trends and actions that were identified for consideration in the EIS. The cumulative effects of past actions are accounted for in the description of the affected environment presented for each resource in Chapter 3; therefore, no past projects are included in the cumulative action scenario. For the purpose of this analysis, reasonably foreseeable actions are considered where there is an existing decision (e.g., record of decision or issued permit), a commitment of resources or funding, or a formal proposal (e.g., a permit request). Actions that are highly probable based on known opportunities or trends (e.g., residential development in urban areas) are also considered. Speculative future developments (such as those that are not formally proposed or do not have enough project details to inform analysis) are not considered.

Table 4.4-1. Present and Reasonably Foreseeable Trends and Actions

Project Category	Present	Reasonably Foreseeable Trends and Actions	Project Name	Project Location	Project Description	Anticipated Project Schedule
Renewable energy projects	X		Breckinridge Wind Project LLC	Enid, Oklahoma	NextEra owns the Breckinridge Wind Project situated outside of North Enid with a 20-year purchase agreement. This farm has a 98.80 MW capacity and began operations in 2015. Project size 10,000 acres.	N/A
	X		Chisholm View Wind Project	Hunter, Oklahoma	The Chisholm View Wind Project, owned by Enel Green Power North America, has a 20-year purchase agreement. It began operations in 2012 and was expanded in 2016 to a capacity of 300 MW. Project size 45,000 acres.	N/A
	X		Armadillo Flats Wind Project, LLC	Covington, Oklahoma	NextEra owns the Armadillo Flats Wind Project outside of Covington. This farm has a capacity of 247.30 MW.	N/A
	X		King Plains Wind Farm	Garber, Oklahoma	Mortenson's Wind Energy began operations on its King Plains Wind Farm in 2020. This farm is expected to be operational for 30 years with a capacity of 248.2 MW. Project size 15,000+ acres.	N/A
	X	X	Maverick Wind Farm	Garfield, Major, and Kingfisher Counties	Invenergy's Maverick Wind Farm is due to complete construction in late 2021 and have a capacity of 287 MW. Project size 55,000 acres.	Operational in December 2021
	X		Moss Solar Farm	Covington, Oklahoma	This solar farm, which is owned by Oklahoma Gas & Electric Company, has a capacity of 10 MW. Project size 80 acres.	N/A
	X		Skeleton Creek Wind Farm	Major, Alfalfa, and Garfield Counties, Oklahoma	NextEra owns the Skeleton Creek Wind Project outside of Enid. This farm has a capacity of 150 MW and was operational starting December 2020.	N/A
Other generation projects	X		Rodman natural gas processing plant	Waukomis, Oklahoma	The plant, which is owned by owned by Mustang Gas Products, LLC, produces 80 million cubic feet per day of natural gas.	N/A

Project Category	Present	Reasonably Foreseeable Trends and Actions	Project Name	Project Location	Project Description	Anticipated Project Schedule
Transportation		X	Enid Woodring Airport Reconstruction	Enid, Oklahoma	The airport has budgeted reconstruction for runway 13/31 in the fiscal years of 2022–2023 and rehabilitation of taxiway A, installation of LED lights, and installation of guidance signs in fiscal years 2024–2025.	2022–2025
		X	ODOT 8-Year Construction Work Plan; District 4	Garfield County, Oklahoma	Three projects are planned: State Highway 74: From U.S. Highway 412 north 3.5 miles through Garber; includes grading, updates to ROW, and utilities U.S. Highway 60: From Chestnut Avenue in Enid, north approximately 4.4 miles to the State Highway 45 junction; pavement rehabilitation U.S. Highway 412: From Garland, extend east 6.0 miles to the U.S. Highway 64 junction; includes grading, updates to ROW, and utilities	2021–2028
	X		Union Pacific Railroad	Garfield County, Oklahoma	No reported major track renewal projects (Union Pacific 2021). Freight traffic runs on the east side of Vance AFB adjacent to family housing. The rail line also runs through the City of Enid on the east side of U.S. Highway 81 and just to the west of a residential area in Enid. The regular freight rail traffic creates noise and impacts the quality of life of nearby residents.	N/A
		X	ODOT Bridges and Highway Update	Garfield County, Oklahoma	The plan identifies three structurally deficient and functional obsolete state highway bridges in or adjacent to Enid. One bridge within Garfield County was identified for replacement/major rehabilitation.	2019–2026
Transmission infrastructure	X		OG&E Enhancements	Garfield County, Oklahoma	There are a series of 345-kV transmission lines that run through Garfield County and the Application Area owned by OG&E. OG&E has recently completed enhancements to the electricity grid in the Application Area; no further enhancements or construction is planned.	N/A
Utility infrastructure		X	Kaw Lake Water Pipeline	Enid, Oklahoma	The program consists of four primary infrastructure construction projects: 1) a micro-tunnel intake to withdraw water from Kaw Lake; 2) 70 miles of raw water conveyance pipeline; 3) a new, 10.5-million-gallons-per-day water treatment plant; and 4) distribution system improvements. The pipeline is presently in the bidding, land acquisition, and permitting phase of the process.	2020–2022

Project Category	Present	Reasonably Foreseeable Trends and Actions	Project Name	Project Location	Project Description	Anticipated Project Schedule
City, county, or other regional plans (City of Enid 2021b)	X	X	City of Enid Comprehensive Plan	Enid, Oklahoma	The plan provides future land use and zoning updates.	N/A
	X		Water System Master Plan	Enid, Oklahoma	The plan noted that the current water supply to the City of Enid is insufficient to meet future demand through 2050. The plan identified possible water supply options; however, no information indicating proposed options are being implemented (aside from Kaw Lake pipeline), so otherwise considered speculative and not analyzed.	N/A
	X	X	March 2020 Bureau of Land Management Land Use Plan/Resource Management Plan for the Oklahoma, Kansas, and Texas planning/decisions area		The plan provides overall management guidance for 15,100 acres of BLM-administered lands and 4,810,900 acres of federal mineral estate 1) underlying BLM-administered lands; 2) underlying split-estate tracts (federal minerals underlying private or state surface lands); and 3) underlying lands managed by other federal surface management agencies for the Oklahoma, Kansas, and Texas planning/decisions area.	N/A
	X	X	USGS-developed Rapid Ecoregional Assessment for the Southern Great Plains		The project falls within Southern Great Plains REA. Provides terrestrial development index (TDI) for all development (agricultural, urban, roads, railroads, energy, and minerals) for the Southern Great Plains REA project area. TDI scores represent the percentage of the surface disturbance footprint from development within a 2.5-kilometer radius moving window. TDI scores range from 0% to 100% and can be used to spatially quantify explicit cumulative effects.	N/A
	X	X	Vance Jackson AFB Joint Land Use Study		The study provides the following findings: City of Enid population is projected to increase by 22.5% between 2016 and 2030. Garfield County is projected to decrease by 0.2% during the same timeframe. The center runway replacement for Vance AFB is projected to result in potential changes to noise contours and use of flight routes.	2021–2023 (airport)

Project Category	Present	Reasonably Foreseeable Trends and Actions	Project Name	Project Location	Project Description	Anticipated Project Schedule
Conservation/ land restoration	X	X	Drummond Flats Wetland Restoration Project		Project reconnects Elm Creek to the basin and would restore the gradient of Dry Salt Creek and its ability to provide out-of-bank floodwater to the basin, thereby restoring historic flooding frequencies. Additionally, the relict lakes would be restored to their assumed original grade and hydrologic features would be created and restored by plugging field ditches, removing earthen berms, and installing dikes that would create 896 acres of seasonal water. Semi-long-term water to the basin would be increased from the current 132 acres to 386 acres.	EA and finding of no significant impact issued in April 2020
Agriculture	X	X	Private agriculture activities	Garfield County, Oklahoma	Predominant land use is agriculture, which would continue in the future.	N/A
Other	X	X	Koch Fertilizer; nitrogen production facility upgrades	Enid, Oklahoma	The project will increase production of ammonia upgrade products. Once complete, Koch Fertilizer will be able to supply up to 1.8 million tons of ammonia upgrade products annually. As part of the improvements, KF Enid will expand its on-site rail tracks and shipping capability. Additionally, the company is upgrading its ammonia truck loading facilities, including relocating them within the facility.	2021–2022

Note: N/A = not applicable.

APPENDIX A

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APPENDIX B

Visual Contrast Rating Worksheets

Form 8400-4
(September 1985)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

VISUAL CONTRAST RATING WORKSHEET (revised)

SECTION A. PROJECT INFORMATION

Project Name: Skeleton Creek EIS Key Observation Point: #1 – Residence on 66th Street (at E0470 Road) (Proposed Action)	Date 5/28/21

SECTION B. CHARACTERISTIC LANDSCAPE DESCRIPTION

	1. LANDWATER	2. VEGETATION	3. STRUCTURES
FORM	Flat to rolling, indistinct terrain; distant domed hill	Rounded deciduous trees; low grasses and agricultural crops; geometric farm fields	Tall, vertical, ordered transmission line structures
LINE	Straight to curving shallow ridges	Band of riparian vegetation; straight, butt edge between farm fields	Geometric, horizontal and vertical lines
COLOR	Tans and browns in exposed soil and along roadways	Dark greens in deciduous trees; vibrant greens in agricultural lands; tan grasses	Gray and brown transmission line structures
TEXTURE	Smooth, fine textured landforms; medium textured domed hill	Medium textured deciduous trees; fine textured grasses and agricultural crops	Coarse textured transmission line structures

SECTION C. PROPOSED ACTIVITY DESCRIPTION

	1. LANDWATER	2. VEGETATION	3. STRUCTURES
FORM	No perceived changed	No perceived changed	Tall, vertical, ordered transmission line structures
LINE	No perceived changed	No perceived changed	Geometric, horizontal and vertical lines
COLOR	No perceived changed	No perceived changed	Gray transmission line structures
TEXTURE	No perceived changed	No perceived changed	Coarse textured transmission line structures

SECTION D. CONTRAST RATING ☐ SHORT TERM ☒ LONG TERM

1. DEGREE OF CONSTRAST		FEATURES											
		LANDWATER BODY (1)				VEGETATION (2)				STRUCTURES (3)			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X				X			X	
	Line				X				X			X	
	Color				X				X			X	
	Texture				X				X			X	

2. Does project design meet visual resource management objectives? ☐ Yes ☐ No ☒ N/A (Explain on reverse side)

3. Additional mitigating measures recommended? ☐ Yes ☐ No (Explain on reverse side)

Evaluator's Names	Date
Kevin Rauhe	5/28/2021

SECTION D. (Continued)

Comments from item 2.

Additional Mitigating Measures (See item 3)

U.S. GOVERNMENT PRINTING OFFICE: 1985-461-988/33094

View facing northwest adjacent to a residence on 66th Street

Form 8400-4
(September 1985)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

VISUAL CONTRAST RATING WORKSHEET (revised)

SECTION A. PROJECT INFORMATION

Project Name: Skeleton Creek EIS Key Observation Point: #1 – Residence on 66th Street (at E0470 Road) (Other Action Alternative 1)	Date 5/28/21

SECTION B. CHARACTERISTIC LANDSCAPE DESCRIPTION

	1. LANDWATER	2. VEGETATION	3. STRUCTURES
FORM	Flat to rolling, indistinct terrain	Rounded deciduous trees; low grasses and agricultural crops; geometric farm fields	Tall, vertical, ordered transmission line structures
LINE	Straight to curving shallow ridges	Straight, butt edge between farm fields	Geometric, horizontal and vertical lines
COLOR	Tans and browns in exposed soil and along roadways	Dark greens in deciduous trees; vibrant greens in agricultural lands; tan grasses	Gray and brown transmission line structures
TEXTURE	Smooth, fine textured landforms	Medium textured deciduous trees; fine textured grasses and agricultural crops	Coarse textured transmission line structures

SECTION C. PROPOSED ACTIVITY DESCRIPTION

	1. LANDWATER	2. VEGETATION	3. STRUCTURES
FORM	No perceived changed	Geometric clearing for substation yard	Tall, vertical, ordered transmission line structures and substation equipment
LINE	No perceived changed	Butt edge between substation yard and adjacent farm field	Geometric, horizontal and vertical lines
COLOR	No perceived changed	Gray rock	Gray transmission line structures
TEXTURE	No perceived changed	Medium textured substation yard	Coarse textured transmission line structures and substation equipment

SECTION D. CONTRAST RATING ☐ SHORT TERM ☒ LONG TERM

1. DEGREE OF CONSTRAST		FEATURES											
		LANDWATER BODY (1)				VEGETATION (2)				STRUCTURES (3)			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X		X				X		
	Line				X		X				X		
	Color				X			X			X		
	Texture				X			X			X		

2. Does project design meet visual resource management objectives? ☐ Yes ☐ No ☒ N/A (Explain on reverse side)

3. Additional mitigating measures recommended? ☐ Yes ☐ No (Explain on reverse side)

Evaluator's Names	Date
Kevin Rauhe	5/28/2021

SECTION D. (Continued)

Comments from item 2.

Additional Mitigating Measures (See item 3)

U.S. GOVERNMENT PRINTING OFFICE: 1985-461-988/33094

View facing north adjacent to a residence on 66th Street

Form 8400-4
(September 1985)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

VISUAL CONTRAST RATING WORKSHEET (revised)

SECTION A. PROJECT INFORMATION

Project Name: Skeleton Creek EIS Key Observation Point: #2 – Residences on Fox Drive	Date 5/28/21

SECTION B. CHARACTERISTIC LANDSCAPE DESCRIPTION

	1. LANDWATER	2. VEGETATION	3. STRUCTURES
FORM	Subtle, rolling to level terrain	Rounded deciduous trees; low grasses and agricultural crops	Geometric barn
LINE	Curving shallow ridges; horizon line	Band of riparian vegetation; straight, butt edge between farm fields	Angular rooflines, vertical lines of barn
COLOR	Tans and browns in exposed soil and roadways	Dark greens in deciduous trees; changing colors in agricultural lands from vibrant greens to tan fallow fields; tan grasses	Gray and tans
TEX-TURE	Smooth, fine textured landforms	Medium textured deciduous trees; fine textured grasses and agricultural crops	Sparse, medium textured barn

SECTION C. PROPOSED ACTIVITY DESCRIPTION

	1. LANDWATER	2. VEGETATION	3. STRUCTURES
FORM	No perceived change	No perceived change	Low profile, geometric row (PV array); vertical, ordered transmission line (gen-tie)
LINE	No perceived change	No perceived change	Regular, straight converging lines (PV array); vertical lines (gen-tie)
COLOR	No perceived change	No perceived change	Blue-gray solar panels (PV array); gray transmission line structures (gen-tie)
TEX-TURE	No perceived change	No perceived change	Fine textured, surface of panels, medium textured solar tracker (PV array); medium textured transmission line structures (gen-tie)

SECTION D. CONTRAST RATING ☐ SHORT TERM ☒ LONG TERM

1. DEGREE OF CONSTRAST		FEATURES											
		LANDWATER BODY (1)				VEGETATION (2)				STRUCTURES (3)			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X				X			X	
	Line				X				X			X	
	Color				X				X		X		
	Texture				X				X			X	

2. Does project design meet visual resource management objectives? ☐ Yes ☐ No ☒ N/A (Explain on reverse side)

3. Additional mitigating measures recommended? ☐ Yes ☐ No (Explain on reverse side)

Evaluator's Names	Date
Kevin Rauhe	5/28/2021

SECTION D. (Continued)

Comments from item 2.

Additional Mitigating Measures (See item 3)

U.S. GOVERNMENT PRINTING OFFICE: 1985-461-988/33094

View facing southeast adjacent to a residences on Fox Drive

Form 8400-4
(September 1985)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

VISUAL CONTRAST RATING WORKSHEET (revised)

SECTION A. PROJECT INFORMATION

Project Name: Skeleton Creek EIS Key Observation Point: #3 – Residence on E0470 Road	Date 5/28/21

SECTION B. CHARACTERISTIC LANDSCAPE DESCRIPTION

	1. LANDWATER	2. VEGETATION	3. STRUCTURES
FORM	Subtle, rolling to level terrain	Rounded deciduous trees; low grasses and agricultural crops	Vertical, ordered transmission line structures. Cylindrical tanks between viewpoint and residence.
LINE	Curving shallow ridges; horizon line	Band of trees around residence; straight, butt edge between farm fields	Geometric, horizontal and vertical lines. Vertical form in existing oil and gas tanks.
COLOR	Tans and browns in exposed soil and roadways	Dark greens in deciduous trees; changing colors in agricultural lands from vibrant greens to tan fallow fields; tan grasses	Gray and brown transmission line structures. Brown tanks.
TEX-TURE	Smooth, fine textured landforms	Medium textured deciduous trees; fine textured grasses and agricultural crops	Medium textured transmission line and oil and gas structures

SECTION C. PROPOSED ACTIVITY DESCRIPTION

	1. LANDWATER	2. VEGETATION	3. STRUCTURES
FORM	No perceived change	Low grasses	Low profile, geometric row of arrays on elevated solar trackers. Geometric energy storage facility.
LINE	No perceived change	Butt edges between gravel areas under PV arrays and vegetated areas between arrays	Regular, straight converging lines. Vertical lines in solar tracker and energy storage facility.
COLOR	Gray, brown gravel	Greens and tans in grasses, darker brown dying vegetation after herbicide use	Blue-gray solar panels; grey metal solar trackers and energy storage facility.
TEX-TURE	No perceived change	Fine textured grasses	Fine textured, surface of panels, medium textured solar tracker and energy storage facility.

SECTION D. CONTRAST RATING ☐ SHORT TERM ☒ LONG TERM

1. DEGREE OF CONSTRAST

ELEMENTS	FEATURES: LANDWATER BODY (1)				VEGETATION (2)				STRUCTURES (3)			
	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
Form				X			X			X		
Line				X		X			X			
Color			X				X		X			
Texture				X			X			X		

2. **Does project design meet visual resource management objectives? ☐ Yes ☐ No ☒ N/A (Explain on reverse side)**

3. **Additional mitigating measures recommended? ☐ Yes ☐ No (Explain on reverse side)**

Evaluator's Names	Date
Kevin Rauhe	5/28/2021

SECTION D. (Continued)

Comments from item 2.

Additional Mitigating Measures (See item 3)

U.S. GOVERNMENT PRINTING OFFICE: 1985-461-988/33094

View facing north adjacent to a residence on E070 Road

Form 8400-4
(September 1985)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

VISUAL CONTRAST RATING WORKSHEET (revised)

SECTION A. PROJECT INFORMATION

Project Name: Skeleton Creek EIS Key Observation Point: #4 – Residence on E0480 Road	Date 5/28/21

SECTION B. CHARACTERISTIC LANDSCAPE DESCRIPTION

	1. LANDWATER	2. VEGETATION	3. STRUCTURES
FORM	Subtle, rolling to level terrain; cut bank associated with tributary of Skeleton Creek	Rounded deciduous trees; low grasses and agricultural crops	Tall, vertical, ordered transmission line structures; geometric barn
LINE	Curving shallow ridges; horizon line; curvilinear tributary	Band of riparian vegetation; straight, butt edge between farm fields	Geometric, horizontal and vertical transmission line; angular rooflines, vertical lines of barn
COLOR	Tans and browns in exposed soil, roadways, and cut bank	Dark greens in deciduous trees; changing colors in agricultural lands from vibrant greens to tan fallow fields; tan grasses	Gray and brown transmission line structures; gray barn
TEX-TURE	Smooth, fine textured landforms; medium textured tributary	Medium textured deciduous trees; fine textured grasses and agricultural crops	Coarse textured transmission line structures; sparse medium textured barn

SECTION C. PROPOSED ACTIVITY DESCRIPTION

	1. LANDWATER	2. VEGETATION	3. STRUCTURES
FORM	No perceived change	Removal of rounded deciduous trees from 34.5 kV collector lines	Low profile, geometric row of arrays on elevated solar trackers. Geometric energy storage facility.
LINE	No perceived change	Butt edges between gravel areas under PV arrays and vegetated areas between arrays	Regular, straight lines. Vertical lines in solar tracker and energy storage facility.
COLOR	Gray, brown gravel	Removal of dark green trees for 34.5 kV collector lines; greens and tans in grasses, darker brown dying vegetation after herbicide use	Blue-gray solar panels; grey metal solar trackers and energy storage facility.
TEX-TURE	No perceived change	Existing row of trees would be coarser textured as trees are removed and individual trees would be more visible	Fine textured, surface of panels, medium textured solar tracker and energy storage facility.

SECTION D. CONTRAST RATING ☐ SHORT TERM ☒ LONG TERM

1. DEGREE OF CONSTRAST		FEATURES: LANDWATER BODY (1)				VEGETATION (2)				STRUCTURES (3)			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X			X			X		
	Line				X		X			X			
	Color			X				X		X			
	Texture				X			X			X		

2. Does project design meet visual resource management objectives? ☐ Yes ☐ No ☒ N/A (Explain on reverse side)

3. Additional mitigating measures recommended? ☐ Yes ☐ No (Explain on reverse side)

Evaluator's Names	Date
Kevin Rauhe	5/28/2021

SECTION D. (Continued)

Comments from item 2.

Additional Mitigating Measures (See item 3)

U.S. GOVERNMENT PRINTING OFFICE: 1985-461-988/33094

View facing southeast adjacent to a residence on E080 Road

Form 8400-4
(September 1985)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

VISUAL CONTRAST RATING WORKSHEET (revised)

SECTION A. PROJECT INFORMATION

Project Name: Skeleton Creek EIS Key Observation Point: #5 – Residences on N2920 Road	Date 5/28/21

SECTION B. CHARACTERISTIC LANDSCAPE DESCRIPTION

	1. LANDWATER	2. VEGETATION	3. STRUCTURES
FORM	Subtle, rolling to level terrain	Rounded deciduous trees; low grasses and agricultural crops	Vertical, ordered distribution line
LINE	Curving shallow ridges; horizon line	Band of trees along roadway; straight, butt edge between farm fields	Vertical distribution line
COLOR	Tans and browns in exposed soil and roadways	Dark greens in deciduous trees; changing colors in agricultural lands from vibrant greens to tan fallow fields; tan grasses	Brown
TEXTURE	Smooth, fine textured landforms	Medium textured deciduous trees; fine textured grasses and agricultural crops	Medium textured distribution line

SECTION C. PROPOSED ACTIVITY DESCRIPTION

	1. LANDWATER	2. VEGETATION	3. STRUCTURES
FORM	No perceived change	No perceived change	Low profile, geometric rows of arrays on elevated solar trackers. Geometric energy storage facility.
LINE	No perceived change	No perceived change	Regular, straight lines. Vertical lines in solar tracker and energy storage facility.
COLOR	No perceived change	No perceived change	Blue-gray solar panels; grey metal solar trackers and energy storage facility.
TEXTURE	No perceived change	No perceived change	Fine textured, surface of panels, medium textured solar tracker and energy storage facility.

SECTION D. CONTRAST RATING ☐ SHORT TERM ☒ LONG TERM

1. DEGREE OF CONSTRAST		FEATURES											
		LANDWATER BODY (1)				VEGETATION (2)				STRUCTURES (3)			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X				X		X		
	Line				X				X		X		
	Color				X				X		X		
	Texture				X				X			X	

2. Does project design meet visual resource management objectives? ☐ Yes ☐ No ☒ N/A (Explain on reverse side)

3. Additional mitigating measures recommended? ☐ Yes ☐ No (Explain on reverse side)

Evaluator's Names	Date
Kevin Rauhe	5/28/2021

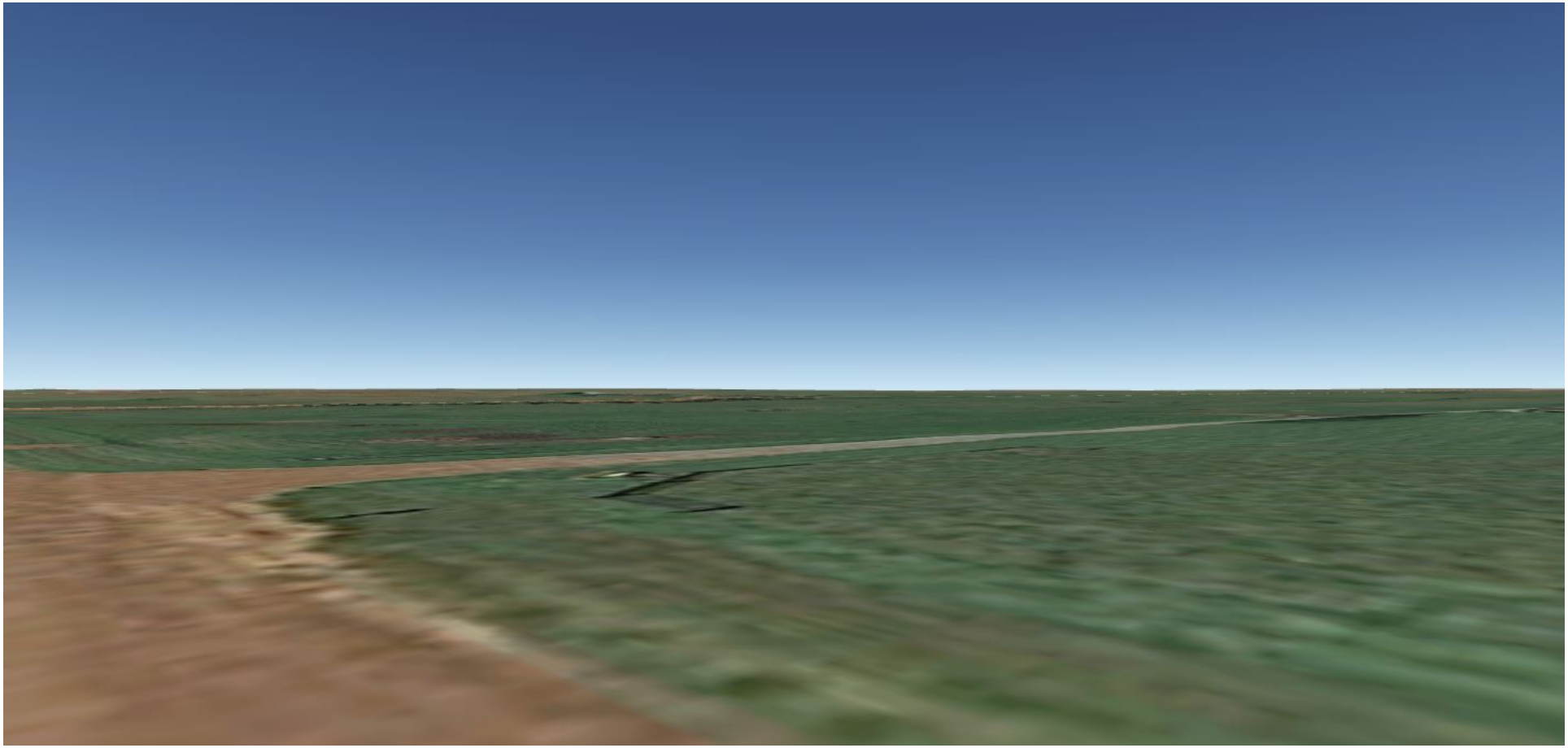
SECTION D. (Continued)

Comments from item 2.

Due to angle of view and greater distance from this KOP to the project, compared to KOP 3, the butt edges between the vegetation between the rows of solar arrays and the gravel under the arrays would not be as noticeable.

Additional Mitigating Measures (See item 3)

U.S. GOVERNMENT PRINTING OFFICE: 1985-461-988/33094



View facing southwest adjacent to a residences on N2920 Road

Form 8400-4
(September 1985)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

VISUAL CONTRAST RATING WORKSHEET (revised)

SECTION A. PROJECT INFORMATION

Project Name: Skeleton Creek EIS Key Observation Point: #6 – Residence on 66th Street (at Fox Drive)	Date 5/28/21

SECTION B. CHARACTERISTIC LANDSCAPE DESCRIPTION

	1. LANDWATER	2. VEGETATION	3. STRUCTURES
FORM	Subtle, rolling to level terrain	Rounded deciduous trees; low grasses and agricultural crops	Vertical, ordered transmission line structures
LINE	Curving shallow ridges; horizon line	Band of trees around residence; straight, butt edge between farm fields	Geometric, horizontal and vertical lines
COLOR	Tans and browns in exposed soil and along roadways	Dark greens in deciduous trees; changing colors in agricultural lands from vibrant greens to tan fallow fields; tan grasses	Gray and brown transmission line structures
TEXTURE	Smooth, fine textured landforms	Medium textured deciduous trees; fine textured grasses and agricultural crops	Medium textured transmission line

SECTION C. PROPOSED ACTIVITY DESCRIPTION

	1. LANDWATER	2. VEGETATION	3. STRUCTURES
FORM	No perceived change	Low grasses	Low profile, geometric row (PV array); geometric solar energy storage facility; vertical, ordered transmission line (gen-tie)
LINE	No perceived change	Butt edges between gravel areas under PV arrays and vegetated areas between arrays	Regular, straight converging lines (PV array); vertical lines (gen-tie and energy storage)
COLOR	Gray, brown gravel	Greens and tans in grasses, darker brown dying vegetation after herbicide use	Blue-gray solar panels (PV array); gray transmission line structures and energy storage
TEXTURE	No perceived change	Fine textured grasses	Fine textured, surface of panels, medium textured solar tracker (PV array); medium textured transmission line structures and energy storage

SECTION D. CONTRAST RATING ☐ SHORT TERM ☒ LONG TERM

1. DEGREE OF CONSTRAST

ELEMENTS	FEATURES: LANDWATER BODY (1)				VEGETATION (2)				STRUCTURES (3)			
	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
Form				X			X			X		
Line				X		X			X			
Color			X				X		X			
Texture				X			X			X		

2. Does project design meet visual resource management objectives? ☐ Yes ☐ No ☒ N/A (Explain on reverse side)

3. Additional mitigating measures recommended? ☐ Yes ☐ No (Explain on reverse side)

Evaluator's Names	Date
Kevin Rauhe	5/28/2021

SECTION D. (Continued)

Comments from item 2.

Additional Mitigating Measures (See item 3)

U.S. GOVERNMENT PRINTING OFFICE: 1985-461-988/33094

View facing south adjacent to a residence on 66th Street

Form 8400-4
(September 1985)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

VISUAL CONTRAST RATING WORKSHEET (revised)

SECTION A. PROJECT INFORMATION

Project Name: Skeleton Creek EIS Key Observation Point: #7 – Bethlehem Baptist Church	Date 5/28/21

SECTION B. CHARACTERISTIC LANDSCAPE DESCRIPTION

	1. LANDWATER	2. VEGETATION	3. STRUCTURES
FORM	Subtle, rolling to level terrain	Low grasses and agricultural crops, band of trees on horizon	Vertical, ordered transmission line structures in views to the north and west
LINE	Curving shallow ridges; horizon line	Straight, butt edge between farm fields and row of distant trees	Geometric, horizontal and vertical lines in views to the north and west
COLOR	Tans and browns in exposed soil and roadways	Dark greens in deciduous trees; changing colors in agricultural lands from vibrant greens to tan fallow fields; tan grasses	Gray and brown transmission line structures in views to the north and west
TEXTURE	Smooth, fine textured landforms	Medium textured deciduous trees; fine textured grasses and agricultural crops	Medium textured transmission line in views to the north and west

SECTION C. PROPOSED ACTIVITY DESCRIPTION

	1. LANDWATER	2. VEGETATION	3. STRUCTURES
FORM	No perceived change	Low grasses	Low profile, geometric row of arrays on elevated solar trackers. Geometric energy storage facility.
LINE	No perceived change	Butt edges between gravel areas under PV arrays and vegetated areas between arrays	Regular, straight converging lines. Vertical lines in solar tracker and energy storage facility.
COLOR	Gray, brown gravel	Greens and tans in grasses, darker brown dying vegetation after herbicide use	Blue-gray solar panels; grey metal solar trackers and energy storage facility.
TEXTURE	No perceived change	Fine textured grasses	Fine textured, surface of panels, medium textured solar tracker and energy storage facility.

SECTION D. CONTRAST RATING ☐ SHORT TERM ☒ LONG TERM

1. DEGREE OF CONSTRAST

ELEMENTS	FEATURES: LANDWATER BODY (1)				VEGETATION (2)				STRUCTURES (3)			
	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
Form				X			X			X		
Line				X		X			X			
Color			X				X		X			
Texture				X			X			X		

2. Does project design meet visual resource management objectives? ☐ Yes ☐ No ☒ N/A (Explain on reverse side)

3. Additional mitigating measures recommended? ☐ Yes ☐ No (Explain on reverse side)

Evaluator's Names	Date
Kevin Rauhe	5/28/2021

SECTION D. (Continued)

Comments from item 2.

Additional Mitigating Measures (See item 3)

U.S. GOVERNMENT PRINTING OFFICE: 1985-461-988/33094

View facing south adjacent to the Bethlehem Baptist Church on N2930 Road

Form 8400-4
(September 1985)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

VISUAL CONTRAST RATING WORKSHEET (revised)

SECTION A. PROJECT INFORMATION

Project Name: Skeleton Creek EIS Key Observation Point: #8 – Residences on N2930 Road	Date 5/28/21

SECTION B. CHARACTERISTIC LANDSCAPE DESCRIPTION

	1. LANDWATER	2. VEGETATION	3. STRUCTURES
FORM	Subtle, rolling to level terrain	Rounded deciduous trees; low grasses and agricultural crops	Geometric residence and barn
LINE	Curving shallow ridges; horizon line	Band of riparian vegetation; straight, butt edge between farm fields	Angular rooflines, vertical lines of residence and barn
COLOR	Tans and browns in exposed soil and along roadways	Dark greens in deciduous trees; changing colors in agricultural lands from vibrant greens to tan fallow fields; tan grasses	Gray and tans
TEXTURE	Smooth, fine textured landforms	Medium textured deciduous trees; fine textured grasses and agricultural crops	Sparse, medium textured structures

SECTION C. PROPOSED ACTIVITY DESCRIPTION

	1. LANDWATER	2. VEGETATION	3. STRUCTURES
FORM	No perceived change	Low grasses	Low profile, geometric rows of arrays on elevated solar trackers. Geometric energy storage facility.
LINE	No perceived change	Butt edges between PV arrays and farm fields	Regular, straight lines. Vertical lines in solar tracker and energy storage facility.
COLOR	No perceived change	Greens and tans in grasses	Blue-gray solar panels; grey metal solar trackers and energy storage facility.
TEXTURE	No perceived change	Fine textured grasses	Fine textured, surface of panels, medium textured solar tracker and energy storage facility.

SECTION D. CONTRAST RATING ☐ SHORT TERM ☒ LONG TERM

1. DEGREE OF CONSTRAST		FEATURES											
		LANDWATER BODY (1)				VEGETATION (2)				STRUCTURES (3)			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X			X			X		
	Line				X			X				X	
	Color				X			X			X		
	Texture				X			X				X	

2. Does project design meet visual resource management objectives? ☐ Yes ☐ No ☒ N/A (Explain on reverse side)

3. Additional mitigating measures recommended? ☐ Yes ☐ No (Explain on reverse side)

Evaluator's Names	Date
Kevin Rauhe	5/28/2021

SECTION D. (Continued)

Comments from item 2.

Additional Mitigating Measures (See item 3)

U.S. GOVERNMENT PRINTING OFFICE: 1985-461-988/33094

View facing northeast adjacent to a residences on N2930 Road

Form 8400-4
(September 1985)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

VISUAL CONTRAST RATING WORKSHEET (revised)

SECTION A. PROJECT INFORMATION

Project Name: Skeleton Creek EIS **Key Observation Point:** #9 – Pioneer High School and Community Park	**Date** 5/28/21

SECTION B. CHARACTERISTIC LANDSCAPE DESCRIPTION

	1. LANDWATER	2. VEGETATION	3. STRUCTURES
FORM	Subtle, rolling to level terrain	Rounded deciduous trees; low turfgrasses and agricultural crops	Tall, vertical, ordered transmission line structures and sports field lighting
LINE	Curving shallow ridges; horizon line	Band of trees along horizon; straight, butt edge between park and adjacent farm fields	Geometric, horizontal and vertical lines
COLOR	Tans and browns in exposed soil and along roadways	Dark greens in deciduous trees; green turfgrasses; changing colors in agricultural lands from vibrant greens to tan fallow fields	Brown, gray, and white structures
TEXTURE	Smooth, fine textured landforms	Medium textured deciduous trees; fine textured turfgrasses and agricultural crops	Coarse textured transmission line structures and sports field lighting

SECTION C. PROPOSED ACTIVITY DESCRIPTION

	1. LANDWATER	2. VEGETATION	3. STRUCTURES
FORM	No perceived change	No perceived change	Low profile, geometric rows of arrays on elevated solar trackers
LINE	No perceived change	No perceived change	Distant, regular, straight lines
COLOR	No perceived change	No perceived change	Blue-gray solar panels; grey metal solar trackers and energy storage facility.
TEXTURE	No perceived change	No perceived change	Fine textured, surface of panels, medium textured solar tracker and energy storage facility.

SECTION D. CONTRAST RATING ☐ SHORT TERM ☒ LONG TERM

1. DEGREE OF CONSTRAST		FEATURES											
		LANDWATER BODY (1)				VEGETATION (2)				STRUCTURES (3)			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form				X				X			X	
	Line				X				X			X	
	Color				X				X			X	
	Texture				X				X			X	

2. Does project design meet visual resource management objectives? ☐ Yes ☐ No ☒ N/A (Explain on reverse side)

3. Additional mitigating measures recommended? ☐ Yes ☒ No (Explain on reverse side)

Evaluator's Names	Date
Kevin Rauhe	5/28/2021

SECTION D. (Continued)

Comments from item 2.

Additional Mitigating Measures (See item 3)

U.S. GOVERNMENT PRINTING OFFICE: 1985-461-988/33094

View facing north adjacent to Pioneer High School and Community Park on Wood Road

APPENDIX C

Lists of Preparers and Reviewers and Notification Lists

LISTS OF PREPARERS AND REVIEWERS

Table C-1. Rural Utilities Service Contributors

Name	Role/Resource Area
National Environmental Policy Act (NEPA) Coordinator	
Bastis, Kristen	NEPA compliance
Resource Scientists and Contributors	
Britton, Barbara	Director, environmental and engineering staff; NEPA compliance
Seibert, Erika	Cultural resources

Table C-2. Cooperating Agency Reviewers

Name	Title	Agency
Anderson, David	Regional environmental scientist	Bureau of Indian Affairs
Autio, Alisha	Fish and wildlife biologist	U.S. Fish and Wildlife Service
Hayden, Keith	Environmental scientist/NEPA specialist	U.S. Environmental Protecting Agency
Moore, Kate	Regional Archeologist	Bureau of Indian Affairs
Noblitt, Bryan	Regulatory project manager	U.S. Army Corps of Engineers, Tulsa District
Rich, Patrick	Planning and environmental coordinator	Bureau of Land Management, Oklahoma Field Office

Table C-3. Consultants

Name	Role/Resource Area
Project Management/Coordinators	
Diais, Madeline; SWCA	Administrative record
Snipes, Katie; SWCA	Deputy project manager; all sections
Stein, Jeff; SWCA	Geographic information systems
Wilmot, Susan; SWCA	Project manager; all sections; NEPA lead
Subject Matter Experts	
Allgood, Crystal; SWCA	Noise; transportation
Cook, Fiona; SWCA	Vegetation
Diais, Madeline; SWCA	Land use; public health and safety; cumulative scenario
Elric, Caitlin; SWCA	Wetlands
Gregory, James; SWCA	Environmental justice; socioeconomics
Irle, Britany; SWCA	Wildlife
Linehan, Kerri; SWCA	Editor
Pearce, Phil; SWCA	Soils and geology
Phillips, Scott; SWCA	Cultural resources
Rauhe, Kevin; SWCA	Visual

Name	Role/Resource Area
Smith, Debbi; SWCA	Formatter and 508 specialist
Sohm, Brad; SWCA	Air quality
Tucker Burfitt, Linda; SWCA	Lead editor
Wielenga, Erin; SWCA	Air quality
Woodruff, Nick; SWCA	Water resources
Yelacic, David, SWCA	Cultural resources

NOTIFICATION LISTS

Table C-4. Federal Agencies

Agency	Contact
Cooperating Federal Agencies	
Bureau of Indian Affairs	Anderson, David
Bureau of Land Management, Oklahoma Field Office	Rich, Patrick
U.S. Army Corps of Engineers	Noblitt, Bryan
Participating or Other Federal Agencies	
National Weather Service	Smith, Richard
U.S. Environmental Protecting Agency	Hayden, Keith
U.S. Fish and Wildlife Service	Autio, Alisha
Vance Air Force Base	Schaefer, Terri

Table C-5. State and Local Agencies or Other Interested Parties

Agency	Contact
City of Enid	Bauer, Chris
Garfield County Commissioners	Bolz, Mark
Oklahoma Archeological Survey	Stackelbeck, Kary
Oklahoma Department of Environmental Quality	Jigoulina, Elena
Oklahoma Department of Transportation	Sundaram, P.E., Siv
Oklahoma Department of Transportation	Davis, Melissa
Oklahoma Department of Wildlife Conservation	Dinkines, Bill
State Historic Preservation Office	Ozan, Lynda
Woodring Regional Airport	Cook, Keston

Table C-6. Tribes and Native Organizations

Tribes and Native Organizations	Leader
Cheyenne and Arapaho Tribes	Governor Eddie Hamilton
Absentee Shawnee Tribe	Governor Edwina Butler-Wolfe
Alabama Quassarte Tribal Town	Chief Tarpie Yargee
Apache Tribe of Oklahoma	Chairperson Bobby Komardly
Caddo Nation	Chairperson Tamara Francis
Cherokee Nation	Principal Chief Chuck Hoskin, Jr.
Chickasaw Nation	Governor Bill Bill Anoatubby
Citizen Potawatomi Nation	Chairperson John A. Barret
Comanche Nation	Chairman William Nelson
Delaware Nation	President Kerry Holton
Delaware Tribe of Indians	Chief Chester Brooks
Eastern Shawnee Tribe of Oklahoma	Chief Glenna J. Wallace
Fort Sill Apache Tribe	Chairperson Jeff Haozous
Iowa Tribe of Oklahoma	Chairman Bobby Walkup
Kialegee Tribal Town	Mekko Jeremiah Hobia
Kickapoo Tribe of Oklahoma	Chairperson David Pacheco, Jr.
Kiowa Tribe	Chairperson Matthew Komalty
Little Traverse Bay Bands of Odawa Indians	Chairperson Regina Gasco-Bentley
Miami Tribe of Oklahoma	Chief Douglas Lankford
Modoc Tribe of Oklahoma	Chief Bill Follis
Muscogee (Creek) Nation	Principal Chief David (James) Hill (Floyd)
Osage Nation	Chief Geoffrey Standing Bear
Otoe-Missouria Tribe	Chairperson John R. Shotton
Ottawa Tribe	Chief Ethel Cook
Pawnee Nation of Oklahoma	President W. Bruce Pratt
Peoria Tribe of Indians of Oklahoma	Chief Craig Harper
Ponca Tribe of Indians of Oklahoma	Chairperson Earl Howe III
Quapaw Tribe of Oklahoma	Chairman Joseph Byrd
Sac and Fox Nation	Principal Chief Justin F. Wood
Seminole Nation of Oklahoma	Chief Leonard Harjo
Seneca-Cayuga Nation	Chief William Fisher
Shawnee Tribe	Chairperson Ron Sparkman
Thlopthlocco Tribal Town	Mekko Ryan Morrow
Tonkawa Tribe of Oklahoma	Chairperson Russel Martin
United Keetoowah Band of Cherokee	Chief Joe Bunch
Wichita and Affiliated Tribes	President Terri Parton
Wyandotte Nation	Chief Billy Friend

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