Skeleton Creek Solar and Battery Storage Project

Alternative Evaluation Study and Site Selection Study

PREPARED FOR

Skeleton Creek Energy Center, LLC

and

USDA Rural Utilities Service

PREPARED BY

SWCA Environmental Consultants

SKELETON CREEK SOLAR AND BATTERY STORAGE PROJECT

ALTERNATIVE EVALUATION STUDY AND SITE SELECTION STUDY

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EXECUTIVE SUMMARY

This report is a joint Alternatives Evaluation Study (AES)/Site Selection Study (SSS) for the Skeleton Creek Solar and Battery Storage Project (Project). The Project will consist of a 250-megawatt (MW) solar plus 200 MW/800 megawatt-hour (MWh) storage facility that will utilize photovoltaic (PV) modules that comply with the U.S. Department of Agriculture's Buy American requirements. The Project will be located entirely on privately owned farmland, in a rural area in Garfield County, Oklahoma. The Application Area encompasses approximately 12,250 acres. Within the Application Area, construction will occur on a 4,500 to 6,000-acre Project Area.

Skeleton Creek Energy Center, LLC, a subsidiary of NextEra Energy Resources, LLC, (hereafter referred to as the Applicant) executed a 20-year Power Purchase Agreement (PPA) for the Project with Western Farmers Electric Cooperative (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 commercial operation date (COD) on or around November 30, 2023, and is expected to create approximately 300 temporary construction jobs to construct the Project and up to 10 permanent 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.

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 will 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 will provide a source of non-dispatchable power via solar panels that increase capacity, while battery storage will provide a source of dispatchable power that increases the reliability of generated power to the grid. In addition, the Project will help the Southwest Power Pool continue to comply with Oklahoma legislative declarations to facilitate the delivery of renewable energy.

As part of this study, the Applicant evaluated alternative means of meeting the stated purpose and need. However, only the Project – implemented through WFEC's PPA – was carried forward for analysis. No other load management or technology alternatives were identified as capable of meeting WFEC's dual-pronged purpose and need: meeting energy demand and expanding WFEC's portfolio to diversify their renewable resources, with a particular focus on solar and battery storage.

Based on this finding, the Applicant conducted a SSS to determine potential locations for their proposed Project. The study used a phased approach, consisting of initial constraint and opportunity analysis, followed by alternative site identification using the Applicant's proprietary software and alternative ranking.

The Applicant identified their approximately 12,250-acre Application Area as the study area for evaluation in this SSS. The Application Area contains lands in reasonable proximity to the point of interconnect (the existing Oklahoma Gas and Electric 345-kilovolt Woodring Substation), with sufficient access to necessary roads and other infrastructure, as well as sufficient land available for lease or acquisition. A total of four potential project site alternatives (Alternatives A–D) were identified for analysis based on the Applicant's optimization effort. Collectively, these four sites cover the entirety of the Application Area, with some overlap.

The Applicant developed specific site evaluation criteria to facilitate an objective, quantitative comparison of project site alternatives. These criteria emphasized resource and construction concerns that represent a significant siting constraint and that could differ across the site alternatives. After review of the site alternative findings, the Applicant decided to carry all four alternatives forward for further consideration. This decision was based on a desire to maintain flexibility in geographic coverage across the Application Area, given the early stage of Project design. The Applicant has not identified a Preferred Alternative at this time; this decision will be made as part of the future National Environmental Policy Act process.

CONTENTS

Appendices

Figures

Tables

ABBREVIATIONS

AC	Alternating current
AES	Alternatives Evaluation Study
CDC	Centers for Disease Control and Prevention
CFR	Code of Federal Regulations
COD	Commercial operation date
DC	Direct current
EIA	U.S. Energy Information Administration
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
FERC	Federal Energy Regulatory Commission
gen-tie	Transmission line
GIS	Geographic information system
GRDA	Grand River Dam Authority
MW	Megawatt
MWh	Megawatt-hour
NEE	NextEra Energy, Inc.
NEER	NextEra Energy Resources, LLC
NEPA	National Environmental Policy Act
NHD	National Hydrography Dataset
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NWI	National Wetlands Inventory
O&M	Operations and maintenance
OCC PUD	Oklahoma Corporation Commission Public Utility Division
ODWC	Oklahoma Department of Wildlife Conservation
OES	Oklahoma Energy Security
OG&E	Oklahoma Gas and Electric
ONHI	Oklahoma Natural Heritage Inventory

PCUs	Power conversion units
POI	Point of interconnect
PPA	Power Purchase Agreement
PPA	Purchase Power Agreement
PPE	Personal protective equipment
Project	Skeleton Creek Solar and Battery Storage Project
PV	Photovoltaic
REPA	Renewable energy purchase agreement
RUS	Rural Utilities Service
SPCC	Spill Prevention Control and Countermeasures
SPP	Southwest Power Pool
SPP MMU	Southwest Power Pool Market Monitoring Unit
SSS	Site Selection Study
SWPPP	Stormwater Pollution Prevention Plan
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WFEC	Western Farmers Electric Cooperative

1 FORMAT AND CONTENT OF REPORT

This report is a joint Alternatives Evaluation Study (AES)/Site Selection Study (SSS). Section 1 of this report contains the *Project Description* (Section 1.1) and *Profile of the Applicant* (Section 1.2). The Project Description provides an overview of the following components of the Project:

- Section 1.1.1 *Project Location* provides an overview of the proposed project location;
- Section 1.1.2 *Facility Location and Components* provides an overview and description of the proposed facility location and project components;
- Section 1.1.3 *Construction Process and Schedule* provides an overview of the construction process and schedule for project construction;
- Section 1.1.4 *Operations and Maintenance* provides an overview of operations and maintenance activities for the proposed project; and
- Section 1.1.5 *Decommissioning* provides an overview of the decommissioning process for the proposed project.

Section 2 of this report contains the AES and Section 3 contains the SSS. The AES documents the purpose and need for the project and identifies the various options the Applicant has considered in order to meet the projected load growth. These options considered included load management, renewable and non-renewable energy sources, distributed generation, repowering/uprating existing units, participation in other company's projects, purchased power, and new transmission capacity. The AES contains the following information outlined below:

- Section 2.1 *Introduction* provides an overview of the AES;
- Section 2.2 *Purpose and Need* provides an overview of the purpose and need for the proposed project and includes the following information: demand load forecast, planning history; existing resources, and needs summary;
- Section 2.3 *Load Management Alternatives* provides an overview of the load management alternative(s); and
- Section 2.4 *Consideration of Technical Alternatives* provides a description and evaluation of the alternatives under consideration for the proposed project, including the No Action Alternative.

The SSS is a study to identify suitable areas for siting a proposed project facility based on regulatory, environmental, engineering and economic constraints based on the purpose and need and develops potential siting locations for the new facility within that study area. The SSS contains the following information outlined below:

- Section 3.1 *Introduction* provides an overview of the SSS and includes a basis for the study, environmental review requirements and review process, utility or cooperative, purpose and need, required permits and approvals, and community outreach and public involvement process;
- Section 3.2 *Technological Alternative(s) Under Evaluation* provides an evaluation and identification of technological alternatives considered under the SSS; and

- Section 3.3 *Site Selection Process* provides an overview of the site selection process which includes the following components: scope and basic project requirements, approach and methodology, three phased site selection approach (Phase I Identification of Potential Sites/Site Areas, Phase II Identification of Candidate Sites, and Phase II Comparative Analysis and Site Evaluation), and selection of alternative sites to carry forward for consideration in National Environmental Policy Act (NEPA) document.

Section 4 of this report contains the Literature Cited for the report. Constraint and opportunity maps are provided in Appendix A.

1.1 Project Description

The Skeleton Creek Solar and Battery Storage Project (Project) consists of a 250-megawatt (MW) solar plus 200 MW/800 megawatt-hour (MWh) storage facility that will utilize photovoltaic (PV) modules that comply with the U.S. Department of Agriculture's (USDA's) Buy American requirements. The Project will be located entirely on privately owned farmland in a rural area in Garfield County, Oklahoma. The Application Area encompasses approximately 12,250 acres. Within the Application Area, construction will occur on a 4,500 to 6,000-acre Project Area. The exact siting of the Project Area has not been finalized; however, the Project will be designed to avoid or minimize resource concerns, where applicable.

The Applicant executed a 20-year Power Purchase Agreement (PPA) with Western Farmers Electric Cooperative (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 commercial operation date (COD) on or around November 30, 2023, and is expected to create approximately 300 temporary construction jobs to construct the Project and up to 10 permanent 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.

As proposed, the Project will consist of PV solar panels and a lithium ion-based (or similar battery technology) energy storage facility. The Project will provide renewable energy to WFEC through the electrical transmission grid at the Oklahoma Gas and Electric (OG&E) 345-kilovolt (kV) Woodring Substation via a 2- to 4-mile 345-kV transmission line (gen-tie). The Project will generate electricity using multiple arrays of PV panels electrically connected to associated power inverter units. The current from the power conversion units (PCUs) will be gathered by an internal electrical collection system and stepped-up to transmission voltage prior to leaving the Project Area. 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 allows for approximately 250 MW electrical production within the approximately 4,500 to 6,000-acre Project Area. The Project is expected to operate for approximately 30 years from COD.

1.1.1 *Project Location*

The Application Area is located approximately 4 miles southeast of Enid, Oklahoma, and is entirely on private land (Figure 1). The Applicant is currently reviewing site constraints and resource conditions at different locations within the Application Area to determine preferred development locations.

1.1.2 *Facility Location and Components*

Project facilities will be located entirely on privately owned land and will encompass approximately 4,500 to 6,000 acres within the Application Area in Garfield County, Oklahoma. All Project facilities will be enclosed by fences.

The Project will consist of four major components: PV solar arrays (the main Project footprint), energy storage facilities (batteries, racking, inverters), linear facilities (as further described below), and transmission interconnection facilities (a substation/switchyard that interconnects to the existing OG&E 345-kV Woodring Substation via an estimated 2- to 4-mile gen-tie). Each of these components is explained in detail in the following sections.

The Project facilities will include the following major components or systems:

- PV modules/arrays;
- solar trackers or fixed support structures;
- direct current (DC) collection cable and combiner boxes;
- solar power inverters and medium voltage transformers;
- electrical collection system (34.5-kV lines);
- substation including breakers, switches, and main step-up transformer and gen-tie to existing point of interconnect (POI); and
- an energy storage (battery) system.

A number of linear facilities will be developed as part of the Project. These linear facilities may include:

- a network of internal access roads;
- a substation to connect the gen-tie to the existing POI;
- distribution power for construction and operations control systems; and
- communications cables or lines.

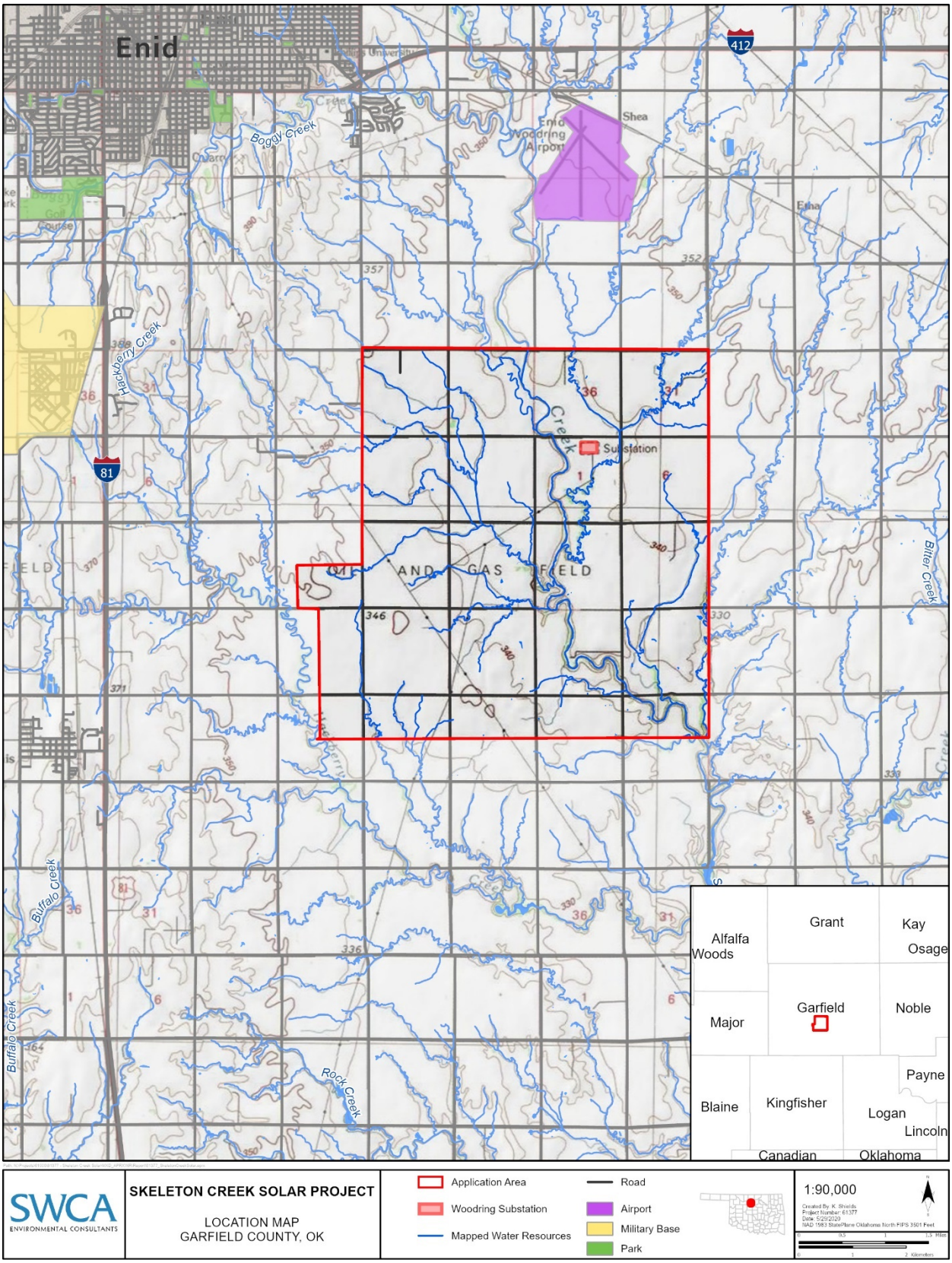

Figure 1. Location of the Project.

All road improvements will be located on private land or along county road rights-of-way within the overall Application Area. A network of internal access roads will be constructed based on the finalized Project Area footprint.

1.1.2.1 PV MODULES / ARRAYS

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

The modules are grouped together in solar arrays. 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 sufficient AC arrays 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 will be determined during the final design and appropriate updates will be made to prior to construction.

1.1.2.2 SOLAR TRACKERS AND/OR FIXED SUPPORT STRUCTURES

There are different types of mounting structures for the modules, depending on whether the modules will be fixed in one position or intended to track the sun's motion during the day. A solar tracking mechanism is used to maximize the solar energy conversion efficiency by keeping the modules perpendicular to the sun's energy rays throughout the day. This completed assembly of PV modules mounted on a framework structure is called a "tracker" as it tracks the sun from east to west. The PV module rows will typically be oriented north-to-south based on the mounting structure design; however, exact module support structure types will be determined during the final design. The single-axis tracker configuration is more complicated and is discussed in more detail below. A fixed support structure is also possible. In this application, the fixed structure will orient the panels in a permanent position towards the south at a certain angle to optimize production throughout the year without any mechanical movement or drive motors.

At this time, there are two types of tracker systems that may be selected for the Project: a ganged system or 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 modules through a series of mechanical linkages and/or gearboxes. A stand-alone system utilizes a single actuator for each row of PV modules. The exact tracker manufacturer and model will 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.

Module layout and spacing is optimized to balance energy production versus peak capacity and depends 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 will be identified in the final design.

1.1.2.3 ELECTRICAL COLLECTION SYSTEM

PV modules 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 will be designed to convert the output power from the PV modules 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 PV arrays will be transmitted to inverters through DC electrical cables. As currently configured, the Project may use up to 100 PCUs to accomplish the DC-to-AC power conversion process. The number of modules connected to each inverter is dependent on the specific model of modules, inverters, and their capacities, which will 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 inverter package is then routed to the corresponding medium-voltage step-up transformer. Based on the preliminary design, the output voltage from each inverter will be increased to the desired AC collection system voltage (34.5 kV) by these medium voltage transformers.

1.1.2.4 ENERGY STORAGE SYSTEM

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

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

A battery supplier has not been selected at this time due to changing markets; however, the final battery supplier(s) will be selected prior to Project construction and will meet the Rural Utilities Service (RUS) Buy American Provision and be subject to an industry-standard pre-qualification process.

1.1.2.5 MEDIUM VOLTAGE TRANSFORMATION/ON-SITE PROJECT SUBSTATION

The AC will leave the medium voltage transformers via 34.5-kV lateral lines which dead-end at the on-site Project substation. The Project substation will 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 will be built for 345 kV and operate at that nominal voltage. The Project substation will occupy approximately 8 acres within the Project Area.

1.1.2.6 INTERCONNECTION TO THE POI

The electrical power from the on-site Project substation will be transmitted through an estimated 2- to 4-mile overhead gen-tie line for delivery to the OG&E Woodring Substation. The gen-tie will be constructed for the nominal operating voltage of the substation, which is 345 kV. If required, the conductor wires will be supported by an intermediate structure. Final hardware design will be determined during final engineering of the gen-tie.

1.1.2.7 ADMINISTRATION / OPERATIONS AND MAINTENANCE BUILDING, CONTROL ROOM, AND WAREHOUSE LOCATIONS

The Project may include an administration / operations and maintenance (O&M) facility, housed in an approximately 3,500-square-foot building and located near the Project access road. The building will provide a small administrative area, a work area for performing minor repairs, and a storage (or

warehouse) area for housing spare parts, transformer oil, and other incidental chemicals. The administration/ O&M building, control room, and warehouse will be air-conditioned and could include offices, a break room, restrooms, and locker rooms with showers. The administration/O&M building may be a pre-engineered metal building with metal siding and roof. The building will be supported on reinforced concrete mat foundations or individual spread footings. The floor will consist of a reinforced concrete slab. The design and construction of the administration/ O&M building, control room, and warehouse will be consistent with all applicable state and local building codes.

In the event that an O&M facility is not needed on-site, storage containers similar to CONEX boxes will be placed in the designated O&M facility area to store spare parts and equipment.

1.1.2.8 ROADS AND ACCESS

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

The finished width of the internal roads and roads between the sub-areas may be up to 20 feet wide and graded. The majority of the Project Area will remain unpaved with select roadways improved with road base and/or gravel. The entire site will be fenced appropriately using security fencing to restrict public access during construction and operations.

1.1.2.9 TEMPORARY CONSTRUCTION WORKSPACE, YARDS, STAGING AREAS

A temporary staging area will be established on the solar facility site, including fenced parking, covered trash disposal facilities, construction trailers, a laydown area, and sufficient portable toilets and potable water for the construction staff. Mobile trailers or similar suitable facilities (e.g., modular offices) will be used as construction offices for Project and subcontractor personnel. Construction laydown and parking areas will be located within the Project Area. Laydown yards will 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 will be provided for the construction offices, laydown area, and Project Area. Temporary construction power before the construction of permanent distribution power will either be provided via a local distribution line extended to the Project Area or come from temporary diesel generators. Temporary area lighting will be provided and strategically located for safety and security. The following site services will be provided by the Applicant or its contractors:

- 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; and
- 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 will be delivered to the site by truck. Site access will be controlled for personnel and vehicles. The fence that will protect the site after full build-out will be installed during or after site preparation/clearing (e.g., grading, mowing, etc.) is complete, but before large components are brought into the site for assembly and installation. During the initial site preparation/clearing, equipment will be stored overnight and during weekends and holidays in a secure, fenced, and gated equipment storage area within the future footprint of the solar field. This area will be moved periodically to allow for completion of grading across the site.

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

1.1.2.10 GEOTECHNICAL STUDIES

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

1.1.2.11 EROSION CONTROL AND STORMWATER DRAINAGE

Erosion will 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.

1.1.2.12 VEGETATION TREATMENT AND WEED MANAGEMENT

A Restoration and Revegetation Plan and an Invasive Species and Noxious Weed Management Plan will be developed prior to construction. The plans will include approved mitigations and best management practices. Infestations of non-native and invasive species will be treated in accordance with the Invasive Species and Noxious Weed Management Plan. If needed, only approved herbicides will be used within the Project Area. Any use of specific herbicides will be outlined in the Noxious Weed Management Plan.

1.1.3 *Construction Process and Schedule*

The following subsections describe civil/structural features of the Project. The Project will 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 location. The engineering, procurement, and construction of the Project will be performed under multiple contracts. Project construction will be undertaken in a sequential approach in accordance with a construction plan, which will be developed and finalized prior to the start of construction, in conjunction with the selected contractors.

Temporary construction laydown and parking areas will be included within the Application Area. With the exception of linear facilities, construction laydown will remain within the overall Project footprint.

During construction, temporary utilities will be provided for the construction offices, laydown area, and the Project Area. Temporary power during the construction period will be supplied primarily by diesel generators.

1.1.3.1 CONSTRUCTION SCHEDULE, PERSONNEL, AND EQUIPMENT

Construction of the entire Project in a single phase is expected to occur over approximately a period of 18 months, which includes mobilization, construction/installation, commissioning/testing, and demobilization.

The on-site workforce will consist of laborers, craftsmen, supervisory personnel, support personnel, and construction management personnel. For a single-phase project, construction typically requires a monthly average of approximately 200 to 300 employees during the construction period, with labor requirements peaking at approximately 400 workers. Multiple, smaller phases would require fewer employees. As experience has shown, special circumstances may warrant an increased number of on-site workers for a short period of time, which is typically a few weeks.

Construction will generally occur between 7:00 a.m. and 7:00 p.m., Monday through Saturday. Additional hours may be necessary to make up schedule deficiencies or to complete critical construction activities. For instance, during placement of concrete or during hot weather, it may 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) may continue 24 hours per day, 7 days per week. Construction times will comply with local permit requirements.

Typical equipment that may be used for the Project includes, but is not limited to:

- Graders
- Excavators
- Bulldozers
- Backhoes
- Cutting machines
- End loaders
- Delivery trucks
- Trenching Machines
- Pile Drivers
- Flatbed trucks
- Cranes
- Rollers
- Electrical test equipment
- Off-road buggies
- Forklifts and carry decks
- Water supply trucks
- Water spray trucks
- Concrete mixers
- Compaction machines
- Survey equipment
- Light trucks

1.1.3.2 CIVIL WORKS DESCRIPTION

1.1.3.2.1 Site Preparation / Surveying / Staking

Prior to the commencement of construction, a land surveyor will 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 will furnish data for the horizontal and vertical control points and horizontal alignments, profiles, and elevations. During construction, the surveyor will reestablish and set additional control points to maintain the horizontal and vertical control points, as needed.

1.1.3.2.2 Site Cleaning / Grading / Excavation

To prepare the Project for construction, the areas within the fenced boundary where the solar array, roads, and other site facilities will be located are typically mowed to a height no more than 3 inches. All other vegetation is typically left intact to the greatest extent possible. Grading will only occur in the areas where the elevation will need to be changed to accommodate the tracker/racking system tolerances, site drainage, roads, laydown areas, and foundations. The minimal grading approach helps preserve the underground root structure, topsoil nutrients, seed base, and pre-construction site hydrology. The organic matter that remains after mowing will remain within the construction area (except in trenches and under equipment foundations). During the site-clearing process, the site will also be cleared of refuse, as necessary. Refuse materials encountered will be recycled or disposed of, as applicable.

For roadways, access ways, and areas where concrete foundations are used for inverter equipment, substations, drainage facilities, and other structures, grading may be required. Grading consists of the excavation and compaction of earth to meet the design requirements. Grading within the solar field will match existing grades as closely as possible. Some existing contours will need to be smoothed out for access purposes, but the macro-level topography and storm water drainage will be similar to pre-construction conditions. To the extent practical, grading of an area will 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 Project Area that need to be graded are expected to result in a balanced cut-and-fill quantity of earthwork to maintain the existing conditions to the extent practical for the protection of the equipment and facilities. Fill will be compacted as necessary, and appropriate dust abatement measures implemented. These measures may include 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.

Materials suitable for compaction will be stored in stockpiles at designated locations, using proper erosion prevention methods. Materials unsuitable for compaction, such as debris and large rocks, will 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 will be disposed of in accordance with applicable laws, ordinances, regulations, and standards.

1.1.3.2.3 Major Equipment Installation

Construction of the tracker/mounting assemblies may be conducted in a single laydown area within the Project Area and then the assemblies will be transported to the proper location and placed on the pre-installed supports. Alternately, the array assembly may occur at the installation point. Final assembly typically involves tractors and forklifts to place the tracker/mounts onto the support structures. During this work, there will be multiple crews working the site with vehicles, including special vehicles for transporting the arrays.

The tracker/mount installations will be constructed using driven steel posts or possibly concrete foundations, if required. As the solar arrays are installed, the balance of the plant will be constructed concurrently. Within the solar fields, the electrical and instrumentation/control wiring will be installed in underground trenches or overhead where underground is impractical. The wiring will run to the location of the solar field controls and the circuits checked.

The construction of the substation/switchyard is planned to begin early in the construction process. Heavy foundations and equipment pads will 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 will be identified in a Dust Control Plan. Concrete foundations for the substation/switchyard structures will be placed as the construction progresses.

1.1.3.2.4 Energy Storage System Installation

For the DC-coupled system, the container sizes will be optimized per market conditions and distribution among the inverters. The containers will 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 will be packaged within the cabinets and may include fans, liquid coolants, or refrigerants. The batteries will be commissioned concurrently with the solar Project, demonstrating the charge and discharge, per the control scheme.

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

1.1.3.2.5 Testing and Commissioning

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

1.1.4 *Operations and Maintenance*

1.1.4.1 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 will 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 will be notified and will return to the facility, as required. Specialty personnel may also be located on-site during non-working hours to perform specific maintenance functions, as required.

Operation and maintenance 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 may be present on-site at various times. Heavy-haul transport equipment may be brought to the site, as needed, to facilitate any major maintenance or equipment repair or replacement.

1.1.4.2 OPERATION AND MAINTENANCE ACTIVITIES

The plant will be maintained by personnel for normal preventive maintenance. This includes inspection of field components, condition assessment of critical equipment, and routine lubrication of equipment.

Grading and drainage will be maintained for gravel and earthen roads and damage to the road repaired as soon as practical. As needed, water will be applied to limit fugitive dust when road maintenance is conducted. The Project will develop a site-specific vegetation management plan will be developed and implemented during operation.

The Project may operate as either a manned or unmanned site to be determined after final design. Under normal circumstances for an unmanned site, the Project substation will be controlled remotely, and

routine in person inspections will occur on a weekly or as needed basis. In addition, all of the Project substation structures will 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 will be inspected regularly to ensure the safe, efficient, and economical operation of the Project.

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

1.1.4.3 WATER USE

The PV technology proposed for the Project does not require water for the generation of electricity. During operations, water use will 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 will be approximately 25 acre-feet per year. This assumes no generation of wastewater on-site that will require treatment.

1.1.4.4 WASTE AND HAZARDOUS MATERIALS MANAGEMENT

Project wastes may include nonhazardous solid waste, hazardous solid waste, and hazardous liquid waste. A variety of safety-related plans and programs will be developed and implemented to ensure safe handling, storage, and use of hazardous materials. Personnel will be supplied with appropriate personal protective equipment (PPE) and will be properly trained in the use of PPE 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 will be stored on-site.

1.1.4.5 SOLID AND NON-HAZARDOUS WASTE

Operation and maintenance of the Project may generate non-hazardous solid wastes typical of power generation or other industrial facilities. The plant wastes that are 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 will be disposed by means of contracted refuse collection and recycling services. Waste collection and disposal will be conducted in accordance with applicable regulatory requirements to minimize health and safety effects.

1.1.4.6 HAZARDOUS CHEMICALS

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

The quantities stored on-site will be evaluated to identify the required usage and maintain sufficient inventories to meet use rates without stockpiling excess chemicals. Chemicals that may be present include some or all of the following:

- fuel (diesel);

- fertilizers;
- hydraulic fluid; and
- transformer oil.

1.1.4.7 HAZARDOUS SOLID AND LIQUID WASTES

Hazardous solid and liquid waste streams generated during operations typically include substances such as used hydraulic fluids, oils, greases, filters, etc., as well as spent cleaning solutions and spent batteries. A Spill Prevention Control and Countermeasures (SPCC) Plan, and Waste and Hazardous Materials Plan will be developed prior to construction.

1.1.5 *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. During improvement removal, the site will remain fenced and gated. Materials that could be reused or recycled will be hauled away from the site and sold. Materials that could neither be reused nor recycled will be dismantled and hauled to the nearest approved landfill. Hazardous materials that could not be reused or recycled will be disposed of at approved facilities. Applicant will 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, it is anticipated that fugitive dust abatement measures comparable to those applied during the Project construction will be implemented.

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

1.2 WFEC Profile

WFEC is a generation and transmission cooperative that currently provides essential electric service to 21 member-owner cooperatives, Altus Air Force Base, and other power users. WFEC is the major source of electric power supply for more than two-thirds of the geographical region of Oklahoma, as well as small portions of Texas, Kansas and a portion of southeastern New Mexico (Figure 2). These member cooperatives provide electrical service directly to approximately 326,000 consumer-members, including businesses, farms, and households. The 21 member cooperatives are listed in Table 1 (WFEC 2019).

Table 1. WFEC Member Electric Cooperatives.

Alfalfa Electric Cooperative	East Central Okla. Electric Cooperative	Northwestern Electric Cooperative
Canadian Valley Electric Cooperative	Farmers' Electric Cooperative	Oklahoma Electric Cooperative
Central Valley Electric Cooperative	Harmon Electric Association	Red River Valley Rural Electric Assoc.
Choctaw Electric Cooperative	Kay Electric Cooperative	Roosevelt County Electric Cooperative
Cimarron Electric Cooperative	Kiamichi Electric Cooperative	Rural Electric Cooperative
CKenergy Electric Cooperative	Lea County Electric Cooperative	Southeastern Electric Cooperative
Cotton Electric Cooperative	Northfork Electric Cooperative	Southwest Rural Electric Association

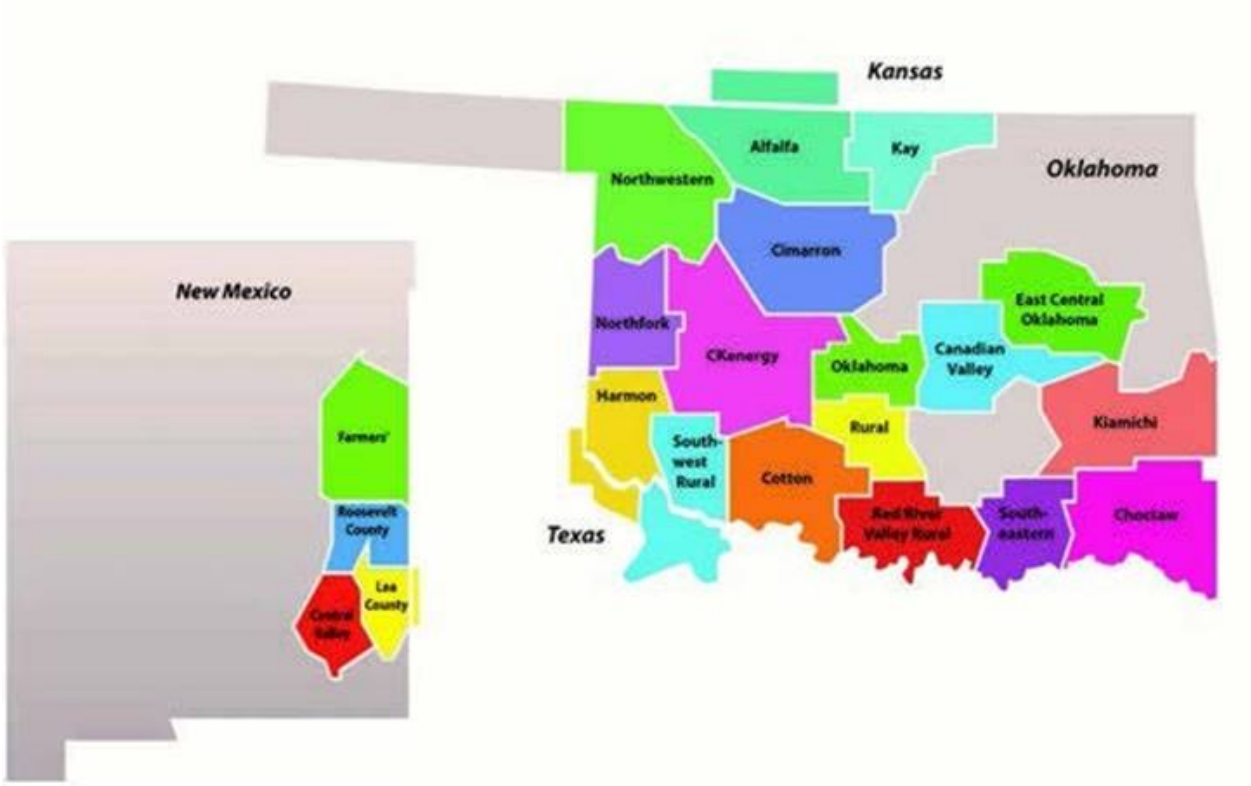

Figure 2. WFEC Member System's Service Area

1.3 Profile of Applicant

The Applicant is Skeleton Creek Energy Center, LLC a wholly owned subsidiary of NextEra Energy Resources, LLC (NEER). NextEra Energy, Inc. (NEE) is a large electric power and infrastructure company in North America and has two principle businesses: Florida Power & Light Company and NEER. NEER, with its affiliated entities, produces the majority of its electricity from renewable sources and is the world's largest generator of renewable solar and wind energy. NEER's strategic focus is centered on the development, construction, and operation of long-term contracted assets throughout the U.S. and Canada, including renewable generation facilities, natural gas pipelines, electric transmission facilities, and battery storage projects (NEER 2019).

NEER was formed in 1998 to aggregate NEE's competitive energy businesses. NEER currently owns, develops, constructs, manages and operates electric generation facilities in wholesale energy markets primarily in the U.S. and Canada. As of December 31, 2019, NEER operated facilities with a total generating capacity of 24,700 MW. The breakdown of NEER's net generating capacity by fuel type in 2019 was the following: wind (65%), nuclear (12%), solar (12%), natural gas (7%), and oil (4%) (NEER 2019).

In addition, NEER develops and constructs battery storage projects. NEER also owns and operates rate-regulated transmission facilities, primarily in Texas and California, and transmission lines that connect its electric generation facilities to the electric grid, which are comprised of approximately 190 substations and 1,865 circuit miles of transmission lines as of December 31, 2019. NEER sells products associated with its own generation facilities (energy, capacity, renewable energy credits and ancillary services) in competitive markets in regions where those facilities are located. Customer transactions may be supplied

from NEER generation facilities or from purchases in the wholesale markets, or from a combination thereof (NEER 2019).

2 ALTERNATIVE EVALUATION STUDY

2.1 Introduction

The Applicant plans to apply for a loan from the RUS, an agency that administers the USDA's Rural Utilities Programs, for the Proposed Project. RUS has determined that a loan for the Project would be a federal action and is, therefore, subject to NEPA review. 42 U.S. Code § 4321 et seq. See also 7 Code of Federal Regulations (CFR) § 1970.8(c). RUS is responsible for determining the appropriate level of environmental review and the adequacy of that review. 7 CFR § 1970.10. RUS has determined that it will complete an Environmental Impact Statement (EIS) to evaluate the Applicant's planned request for funding (7 CFR § 1970.9).

On April 1, 2016, RUS established guidance requiring applicants to submit an AES (USDA 2016: Exhibit B) to RUS prior to EIS initiation (USDA 2016: Exhibit C). According to this guidance, the purpose of the AES is:

> *"… to provide the applicant's rationale for its proposal and why that proposal is the best means of solving the problem. Specifically, the AES will identify the applicant's purpose and need for action and the technological means to meet the purpose and need (i.e, building a new power plant, connecting a new transmission line to the grid to bring power from where it is generated to where it is needed, etc.). All of the technologies will be identified in the AES. The AES will not identify the specific locations on the ground where these technologies would be constructed" (USDA 2016: Exhibit B, § 1.1).*

Consistent with these requirements, the Applicant prepared this AES to assist RUS throughout the environmental review and decision-making process by explaining the need for the Project and by describing other alternatives that were evaluated to meet that need. Each alternative is described in sufficient detail so that the public and other stakeholders can understand and assess each alternative. This AES also explains which alternative is best for fulfilling the need for the Project and why the other alternatives considered were rejected.

2.2 Purpose and Need

The Applicant entered into a PPA with WFEC for the Project described above in Section 1.1. 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 will 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 will provide a source of non-dispatchable power via solar panels that increase capacity, while battery storage will provide a source of dispatchable power that increases the reliability of generated power to the grid.

In addition, the Project will help 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 (OES) Act was enacted which established a goal that 15 percent of all installed electric generation capacity within the state of Oklahoma be generated from renewable energy sources such as wind, solar, PV, 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. By 2019, about one third of Oklahoma's installed capacity used renewable resources (EIA 2020b). The 2018 *The State of Oklahoma's Electric System Planning Report* (Oklahoma Corporation Commission Public Utility Division [OCC PUD] 2018) also reached the following conclusions about statewide electric generation for the next ten years (2017–2026):

- 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 generation mix reflects these goals and trends, relying on a variety of technologies, fuel types and owned and contract resources, including substantial amounts of wind under PPAs. In 2016, WFEC introduced solar into this blend. WFEC announced in its 2019 annual report that solar power generation will be a greater portion of WFEC's overall fuel mix in upcoming years. WFEC owns or contracts almost 51 MW of solar generation which includes 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 is the 220 MW Tip Top solar facility with commercial operation planned for 2022 and the Applicant's Project considered in this AES, planned for 2023 (WFEC 2020a). WFEC (2020a) stated that these projects will help further diversify its generation portfolio to include 523 MW of solar generation, 957 MW of wind generation, and 268 MW of hydroelectric generation. When completed, WFEC projects that over 40% of the energy it sells to the SPP will be generated with renewables (WFEC 2020a).

2.2.1 *Demand/Load Forecast*

Table 2 presents WFEC's capacity, demand and requirements summary for the SPP 2019 Resource Adequacy Report. In 2019, WFEC had a total capacity of 2,077 MW and a forecasted peak demand of 1,582 MW and forecasted net peak demand of 1,534 MW. The SPP resource adequacy requirement was 1,718 MW and the SPP target planning reserve margin is 12%. Therefore, WFEC had a 35% planning reserve margin which exceeded the SPP target reserve margin of 12%.

Table 2. WFEC Capacity, Demand and Requirements Summary

Capacity Summary	Unit	2019
Capacity Resources	MW	1,368
Firm Capacity Purchases	MW	417
Firm Capacity Sales	MW	0
External Firm Power Purchases	MW	292

Capacity Summary	Unit	2019
External Firm Power Sales	MW	0
Confirmed Retirements	MW	0
Total Capacity	MW	2,077
Demand Summary		
Forecasted Peak Demand	MW	1,582
Internal Firm Power Sales	MW	179
Internal Firm Power Purchases	MW	200
Controllable and Dispatchable DR	MW	0
Controllable and Dispatchable BTM Gen	MW	27
Net Peak Demand	**MW**	**1,534**
Requirements Summary		
Resource Adequacy Requirement	**MW**	**1,718**
Excess Capacity	MW	359
Deficient Capacity	MW	0
LRE planning reserve margin	%	35.37
Planning Reserve Margin	%	12.00

Source: SPP 2019a

Table 3 presents WFEC's demand and reserve forecast for 2015–2026 which also indicates that their forecasted system generating capacity exceeds SPP's system reserve margin requirement of 12% during peak summer demand (OCC PUD 2018). However, the 2018 *The State of Oklahoma's Electric System Planning Report* notes that "10-year projections, for a field as ever-changing and multifaceted as the electric industry, requires making many assumptions. This includes assumptions related to evolving technologies, regulations, and changes to consumer demands" (OCC PUD 2018). Figure 3 provides a breakdown of coincident peak demand for winter and summer from 2015 to 2019.

Table 3. WFEC Demand and Reserve Forecast

Year	System Summer Peak Demand (MW)	System Generating Capacity (MW)	Annual Energy Demand (GWh)	System Reserve Margin (%)
2015	1,642	2,053	9,365	25.0
2016	1,554	2,053	8,942	32.1
2017	1,604	1,973	8,788	23.0
2018	1,623	1,973	8,969	21.6
2019	1,654	1,973	8,969	20.1
2020	1,656	1,973	8,969	19.1
2021	1,666	1,973	9,037	18.4
2022	1,659	1,994	8,992	20.2
2023	1,668	1,994	9,025	19.5
2024	1,675	1,994	9,056	19.0
2025	1,671	1,994	8,992	19.3
2026	1,640	1,994	8,932	21.6

As noted under the purpose and need introduction, while WFEC's demand and forecast reserve through 2026 shows forecast generation exceeding SPP system reserve margin, meeting demand is always a concern for energy providers. WFEC is continuously evaluating capacity needs to meet the supply demands and to provide efficient affordable energy across their service territory. Furthermore, in addition to meeting and exceeding demand and reserve forecasts, WFEC aims to utilize a well-balanced and diversified portfolio of generation resources to protect from uncontrollable forces of nature and changing or volatile market conditions and to keep rates competitive (WFEC 2020a). WFEC also aims to continue to meet demand and diversify its energy portfolio to exceed the requirements of the Oklahoma Energy Act by utilizing additional renewable energy resources. The additional generation capacity provided by the Project will help further this goal, through an additional 250 MW of solar power plus 200 MW of battery storage. Battery storage will add a dispatchable form of energy to the grid that will allow WFEC to increase reliability and address peak on-demand needs without the need for additional fossil fuel consumption.

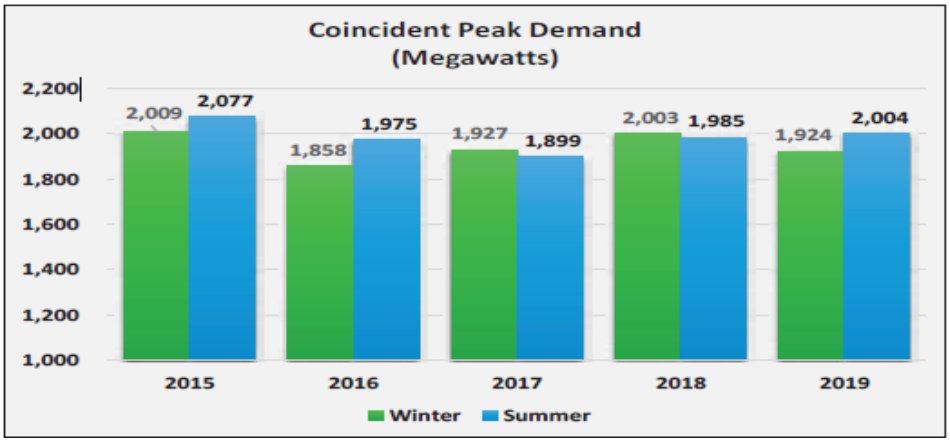

Figure 3. WFEC Seasonal Peak Demand 2015–2019 (WFEC 2020a)

2.2.2 *Planning History*

WFEC has conducted varied planning scenarios and studies related to capacity needs, focusing on present and future power requirements of its members. WFEC also coordinates with the USDA, as necessary, as part of system improvements to meet forecasted need identified in these planning studies.

2.2.3 *Existing Resources*

WFEC operates a wide variety of owned and contracted electrical generation resources to serve the energy requirements of its members. In addition, WFEC has established PPAs with other utility power generation facilities to purchase available economical electric resources. Figure 4 shows the breakdown of WFEC's annual energy sources for 2019. The total capacity of WFEC's owned and contracted generating resources are presented in Table 4 and discussed in the following sections.

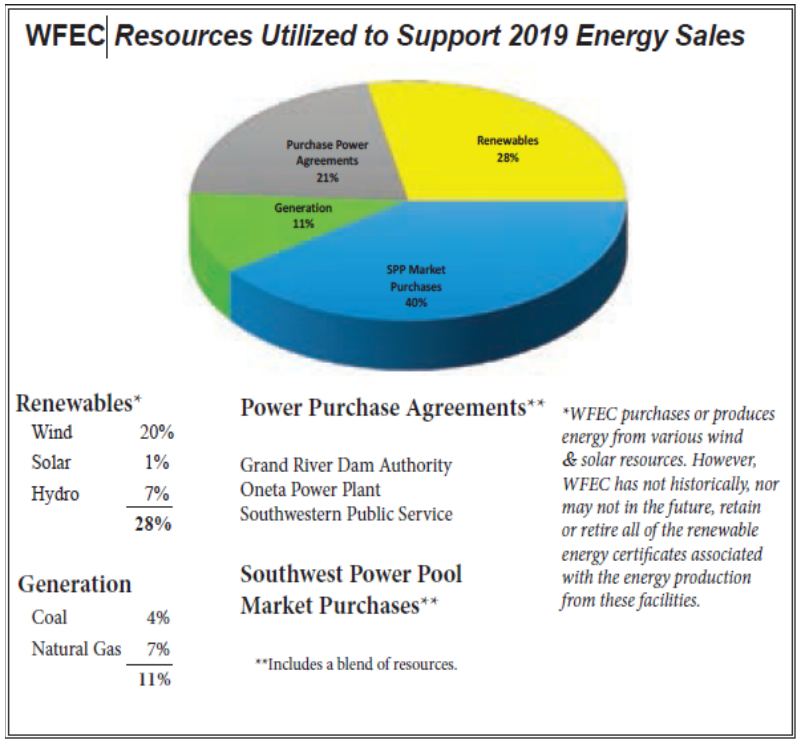

Figure 4. Breakdown of Energy Sources for 2019 (WFEC 2020a)

Table 4. WFEC 2019 Fuel Mix

Resource	Generating Capacity
Gas-Fired Oklahoma	892 MW
Gas-Fired New Mexico	43 MW
Coal-Fired Oklahoma	400 MW
Total Generating Capacity	1,335 MW
Power Purchases	
Gas-Fired	327 MW
Hydro	268 MW
Portfolio of Grand River Dam Authority (GRDA) assets	200 MW
New Mexico Contracts-Portfolio	197 MW
Total Purchase Power	992 MW
SPP Accredited Solar/Wind	133 MW
Total Combined Capacity	2,460 MW
Wind	
Oklahoma	615 MW
New Mexico	92 MW
Total Wind	707 MW
2020-planned wind Oklahoma	250
Solar	
New Mexico	30 MW
Oklahoma	21 MW
Total Solar	51 MW
2020-planned solar park - Oklahoma	2 MW
2022-planned solar- New Mexico	220 MW
2023-planned solar and 800 MWh battery storage - Oklahoma	250 MW

Source: WFEC 2020a

2.2.3.1 GENERATION RESOURCES

WFEC owns and operates a diverse power generation fleet consisting of six steam and gas turbine power generation sites, five utility-scale solar farms, and thirteen community solar farms. WFEC's claimed electric generation capacity in Oklahoma includes more than 1,300 MW combined of owned natural gas-fueled and coal-fired generation, plus a diverse renewable energy portfolio featuring owned solar capacity, as well as wind and hydroelectric generation through purchase power agreements (PPAs). The total combined capacity for owned and contracted assets is approximately 2,500 MW, all located in Oklahoma and New Mexico (WFEC 2020a).

The total generating capacity by WFEC in Oklahoma was nearly 2,100 MW in 2018 (OCC PUD 2018) as shown in Table 5.

Table 5. Western Farmers Electric Cooperative Generation Resources in Oklahoma

Transaction Type	Plant Name	Location	Energy Source	Nameplate MW Capacity	MW Generating / Claimed Capacity
WFEC-Owned	Anadarko 3	Anadarko	Natural gas	49.56	40.00
WFEC-Owned	Anadarko 4	Anadarko	Natural gas	105.12	94.00
WFEC-Owned	Anadarko 5	Anadarko	Natural gas	105.12	94.00
WFEC-Owned	Anadarko 6	Anadarko	Natural gas	105.12	94.00
WFEC-Owned	Hugo	Hugo	Coal	450.00	438.00
WFEC-Owned	Mooreland 1	Mooreland	Natural gas	50.60	50.00
WFEC-Owned	Mooreland 2	Mooreland	Natural gas	136.00	132.00
WFEC-Owned	Mooreland 3	Mooreland	Natural gas	144.00	140.00
WFEC-Owned	WFEC GenCo Anadarko 7	Anadarko	Natural gas	46.00	41.00
WFEC-Owned	WFEC GenCo Anadarko 8	Anadarko	Natural gas	45.50	45.00
WFEC-Owned	Bob Orme CT Anadarko 9	Anadarko	Natural gas	60.50	48.34
WFEC-Owned	Bob Orme CT Anadarko 10	Anadarko	Natural gas	60.50	48.33
WFEC-Owned	Bob Orme CT Anadarko 11	Anadarko	Natural gas	60.50	48.33
WFEC-Owned	Cyril Solar	Cyril	Solar Farm	5.00	0
WFEC-Owned	Hinton Solar	Hinton	Solar Farm	3.00	0
WFEC-Owned	Marietta Solar	Marietta	Solar Farm	3.00	0
WFEC-Owned	Pine Ridge Solar	Pine Ridge	Solar Farm	3.00	0
WFEC-Owned	Tuttle Solar	Tuttle	Solar Farm	4.00	0
PPA	Southwestern Power Admin.	Tulsa	Hydro	260.00	260.00
PPA	Grand River Dam Authority	Vinita	Natural gas	200.00	200.00
PPA	Oneta	Coweta	Natural gas	250.00	280.00
WFEC-Owned	Anadarko 3	Anadarko	Natural gas	49.56	40.00

Transaction Type	Plant Name	Location	Energy Source	Nameplate MW Capacity	MW Generating / Claimed Capacity
PPA	Buffalo Bear	Fort Supply	Wind Farm	18.90	– **
PPA	Blue Canyon 1	Lawton	Wind Farm	74.25	8.00
PPA	Red Hills	Elk City	Wind Farm	123.00	10.00
PPA	Rocky Ridge	Rocky	Wind Farm	148.80	45.00
PPA	Balko	Balko	Wind Farm	100.00	5.00
PPA	Grant	Medford	Wind Farm	50.00	2.50
PPA	Minco IV	Hinton	Wind Farm	100.00	15.00
Totals, including PPA capacity				**2,225.30**	**2,178.5**

2.2.3.2 EXISTING PURCHASE CONTRACTS

As shown in Table 3, WFEC had a total purchase power of 992 MW as of 2019. The breakdown of the PPAs is the following: 327 MW gas fired, 268 MW hydro, 200 MW from Grand River Dam Authority, and 197 MW from New Mexico contracts-portfolio (WFEC 2020a).

In 2003, WFEC's signed the State of Oklahoma's first PPA between a wind farm developer and a purchaser. WFEC's first renewable energy venture, a 74-MW facility (Blue Canyon Wind Farm), began commercial operation in December of 2003. Since then, WFEC has added long-term PPAs with 12 additional wind farms, located in Oklahoma and New Mexico, bringing its combined wind energy total to 705 MW, as of the end of 2018 (WFEC 2018). These are described below.

- WFEC signed a second PPA in 2008 with Edison Mission Group for the purchase of wind energy from Buffalo Bear Wind Farm, an 18.9 MW facility in Northwest Oklahoma. WFEC also signed a third PPA with Acciona Energy for the purchase of wind energy from the Red Hills Wind Farm. This facility, which began commercial operation in June 2009, is located near Elk City, with a nameplate capacity of 123 MW. Between the three purchases, WFEC had 216 MW of wind energy available, representing close to 8 percent of WFEC's fuel blend.

- A long-term renewable energy purchase agreement (REPA) signed in late September 2010 between WFEC and TradeWind Energy for wind energy. This wind energy producing facility, Rocky Ridge Wind, a 150 MW site, was completed in June 2012.

- On May 1, 2014, a milestone of the Transition Agreement with the New Mexico cooperatives was reached when third-party supplier contracts, cooperative-owned generation assets and a REPA were assigned to WFEC. This generation asset that was declared commercial in February 2012 is located near Lovington, N.M., and consists of five gas-fired reciprocating engine and generator units. Each of the generators is capable of producing 9.3 MW of electricity, for a total of 46.5 MW. Plus, the REPA added the output from an approximate 24.9 MW nameplate rated Wildcat Wind Farm, near Lovington, N.M., to WFEC's wind farm portfolio.

- WFEC's portfolio of wind energy continued to expand as a result of energy purchase agreements for 35 MW of energy contracted with four small wind farms in New Mexico, operational in 2014. These include Brahms BEP Wind I and II, near Grady, N.M. and Anderson Wind Project I and II, near Chaves County, N.M.

- The 100 MW Balko Wind Project, near Balko, OK., began commercial operation in 2015, as well as the 50 MW Grant Wind Project, in Grant County, OK. in 2016. Once these projects were completed, WFEC's wind energy PPAs totaled 575 MW, with some 19 to 21 percent of its total annual electricity production coming from wind generators in Oklahoma and New Mexico.

- Under a PPA, the 25 MW, utility-scale Caprock Solar Power Project, covering about 200 acres south of Tucumcari, NM, came online in late 2016. Solar facilities owned and maintained by WFEC also began operations at five sites in Oklahoma, each near an existing WFEC substation. According to the WFEC website, those projects, accounting for 18 MW of solar capacity, consist of 5 MW from 20,000 panels at Cyril, 4 MW from 16,000 panels at Tuttle, and 3 MW from 12,000 panels each at Hinton, Marietta and Pine Ridge (OCC PUD 2018).

- The 130 MW Minco IV Wind Project, near Hinton, OK, began commercial operation in 2018, adding 100 MW to WFEC's wind energy PPAs.

On July 23, 2019, WFEC also entered into a PPA with the Applicant for the largest combined wind, solar and energy storage project in the U.S. The combined wind, solar and energy storage project is the first of its kind announced in the SPP, the electric grid region that includes Oklahoma and 13 other states in the central U.S. covering 546,000 square miles. It is also the largest co-located wind, solar and energy storage project in the U.S.

2.2.3.3 EXISTING DEMAND SIDE MANAGEMENT

No strict load management programs are currently being implemented by WFEC. However, member cooperatives may choose to implement individual load management programs to reduce peak demand. This move from a one-size-fits-all approach to multiple individualized load management programs provides more effective member assistance (WFEC 2020b.).

2.2.3.4 INCREMENTAL UPGRADES

WFEC is not evaluating any project upgrades that would increase or decrease current capacity output.

2.2.3.5 POWER POOL MEMBER RESOURCES

WFEC is a member of the SPP Regional Transmission Organization. The SPP is mandated by the Federal Energy Regulatory Commission (FERC) and is a regional entity of the North American Electric Reliability Corporation. SPP has members in 14 states covering approximately 546,000 square miles. As of 2019, SPP had 66,892 miles of transmission with a coincident peak load of 50,622 MW and a generating capacity of 89,999 MW. The breakdown of the generating capacity for 2019 was: natural gas (40.3%), coal (28.6%), wind (22.9%), hydro (3.8%), nuclear (2.3%), fuel oil (1.8%), solar (0.2%), and other (0.1%) (SPP 2019b).

SPP observed the following recent trends in terms of load and energy resources in 2017–2018.

- Total system energy consumption was up 6% from 2017 to 2018, with seasonal variations in demand.

- Annual peak load declined by two percent compared to 2017.

- Over 97 percent of the 2,300 MW increase in nameplate generation capacity was from wind resources. Wind generation as a percent of total generation continued to increase as it represented 24 percent of system generation, up from 23 percent in 2017 and 18 percent in 2016.

- Conversely, coal generation continued to decline, representing around 42 percent of total generation last year, down from 46 percent in 2017 and 49 percent in 2016.

- SPP continues to have significant excess capacity at peak loads. The SPP Market Monitoring Unit (MMU) estimated that capacity at peak was 35 percent higher than the peak demand level in 2018 (SPP MMU 2019).

Table 5 shows 2018 total energy consumption and percentage of energy consumption attributable to WFEC relative to the SPP.

Table 6. System Energy Usage

	2016		2017		2018	
	Energy Consumed (GWh)	Percent of System	Energy Consumed (GWh)	Percent of System	Energy Consumed (GWh)	Percent of System
WFEC	8,448	3.4%	8,406	3.3%	8,312	2.3%
SPP System Total	248,446	-	246,009	-	259,653	-

Source: SPP MMU 2019

2.2.3.6 TRANSMISSION SYSTEM CONSTRAINTS

WFEC owns more than 3,700 miles of transmission line and more than 330 substations and switch stations that serve its members and are operated and maintained by WFEC personnel (WFEC 2020a). The 2018 OCC PUD stated "As the Southwest Power Pool Integrated Market evolves, WFEC has seen the market add more transmission line capacity and renewable energy, resulting in a continual reduction to the cost of power provided from the IM [Integrated Market]" (OCC PUD 2018).

2.2.4 *Need Summary*

WFEC provides a diversified mix of generation resources, and WFEC's demand and forecast reserve through 2026 shows forecast generation exceeding SPP system reserve margin. However, 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. The Project will allow the Applicant to provide the additional generation capacity needed by WFEC to achieve these goals and to serve electrical needs within the service territories of their member cooperatives. As previously noted, the Project will provide a source of non-dispatchable power via solar panels that increase capacity, while battery storage will provide a source of dispatchable power that increases the reliability of generated power to the grid. The pairing of battery storage with solar panels will further allow WFEC to meet peak demand needs without adding additional fossil fuel consumption to the system.

Furthermore, in addition to meeting and exceeding demand and reserve forecasts, WFEC aims to utilize a well-balanced and diversified portfolio of generation resources to protect from uncontrollable forces of nature and changing or volatile market conditions and keep rates competitive (WFEC 2020b). WFEC also aims to continue to meet demand and diversify its energy portfolio to exceed the requirements of the Oklahoma Energy Act by utilizing additional renewable energy resources. The additional generation capacity provided by the Project will help further this goal, through an additional 250 MW of solar power plus 200 MW of battery storage.

2.3 Load Management Alternatives

As noted under Section 2.2.3.3, 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 evaluated in this AES.

2.4 Consideration of Technological Alternatives

This section evaluates alternative means of meeting the stated purpose and need, considering the strengths and weaknesses of alternative technologies, availability or abundance within WFEC's service area, and any technological, environmental, operational (including permitting), or economic constraints/benefits.

2.4.1 *No Action Alternative*

Under the No Action Alternative, the Project would not be constructed and environmental and socioeconomic 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, this alternative would not meet the purpose and need.

2.4.2 *Action Alternatives Carried Forward for Analysis*

Based upon their purpose and need, WFEC entered into a PPA with the Applicant for the addition of solar and battery storage based upon the economic evaluation of the proposal. WFEC selected the Project as the best means to meet capacity and portfolio diversification needs.

2.4.3 *Action Alternatives Dismissed from Further Analysis*

Several alternative technologies were considered but dismissed from further analysis due to their inability to fully meet WFEC's purpose and need. These are described below in more detail.

2.4.3.1 DISTRIBUTED GENERATION

Battery storage is included as part of the Project, so was not evaluated as a separate technology alternative.

WFEC has previously considered fuel cells, micro-turbines, and internal combustion engines as alternatives to meet WFEC's needs (RUS 2013). WFEC's findings indicated that these alternatives are not currently economical on a commercial scale as a primary source of meeting demand, and could result in additional associated fuel costs or air emissions. Additionally, economies-of-scale are lost when installing distributed generation as opposed to utility-scale generation (The Brattle Group 2015). Distributed generation would also fail to provide reliability benefits and congestion relief because it is typically installed on a piecemeal basis by a variety of owners. Therefore, distributed generation would not meet WFEC's purpose and need to ensure the adequacy and reliability of capacity resources. This alternative would also not expand WFEC's renewable energy portfolio.

2.4.3.2 REPOWERING/UPRATING OF EXISTING UNITS

Repowering and uprating of existing generation units owned or operated by WFEC is not practical or feasible to satisfy the purpose and need. WFEC will be evaluating each operating unit for uprating or repowering for potential additional capacity. However, there are no known repowering or uprating opportunities on the WFEC system that have the potential to both satisfy the current need and provide a more diverse energy portfolio (RUS 2013).

2.4.3.3 PARTICIPATION IN ANOTHER COMPANY'S GENERATION PROJECT (OR JOINT OWNED PROJECTS)

There are no known WFEC projects where participation is an option to meet the purpose and need (RUS 2013).

2.4.3.4 NON-RENEWABLE FUEL SOURCES

Non-renewable fuel sources such as natural gas, nuclear, and coal are available in Oklahoma and could be capable of meeting WFEC's energy needs. However, these sources may not achieve WFEC's objective to provide safe, adequate, and reliable power to its members at the lowest reasonable cost, or assist WFEC in expanding their portfolio to increase renewable energy sources, as briefly summarized below.

- Coal is an abundant fuel resource in the United States. While coal presents a generating resource that has a predictable production cost, the capital cost for coal generation facilities and the level of environmental regulation has increased over time. WFEC notes, in a previous evaluation (RUS 2013), "As such, the rate impact of adding a capital-intensive unit could significantly increase WFEC's rate base. In addition, it is becoming increasingly difficult to finance new coal units through traditional means, since RUS has not been permitted to fund baseload facilities which has included new coal units. This position is a reflection of the political and environmental issues that any new coal unit would face. There has also been mounting concern over greenhouse gas emissions and climate change resulting in a strong political move away from coal." Coal-fueled generation decreased from more than half to less than one-tenth of in-state net generation between 2005 and 2019 (EIA 2020b). Therefore, this alternative was not carried forward for analysis.

- Nuclear power is a highly capital intensive and complex technology that carries significant risks associated with investment and political support. Oklahoma does not have any nuclear power plants (EIA 2020b). Therefore, this alternative was not carried forward for analysis.

- Natural gas-fired generation can be developed by using internal combustion, such as either simple-cycle or combined-cycle combustion turbine technology, or by using external combustion such as direct firing in a boiler. Because of the high efficiency and relatively low capital cost of this type of resource, it is fully capable of supplying WFEC's energy needs. However, it does not address WFEC's desire to diversify its energy portfolio by utilizing additional renewable energy resources. Therefore, this alternative was not carried forward for analysis.

2.4.3.5 OTHER RENEWABLE ENERGY SOURCES

Other renewable energy sources include non-combustible resources (e.g., wind, hydropower, geothermal) and combustible resources (e.g., biomass). Biomass is available within the WFEC service area. However, 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. Currently biomass resources provide a small amount of power generation in Oklahoma (EIA 2020b).

There are several hydroelectric generating sources in Oklahoma operated by the GRDA, the U.S. Army Corps of Engineers, and the Oklahoma Municipal Power Authority. According to the EIA, hydroelectric power contributions to the State's electric grid vary depending on river levels, precipitation, and drought. Hydroelectric power typically provides approximately 3 percent of the state's annual utility-scale net generation, but its contributions range from less than 1 percent to more than 6 percent (EIA 2020b). However, suitable locations for new hydroelectric facilities are limited and not anticipated to be available within WFEC's Service Area. Geothermal sources have similar location-based restrictions.

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 is coincident with that demand. Pairing solar with battery storage allows for WFEC to better balance peak demand needs across its service area.

2.4.3.6 OTHER PURCHASED POWER/POWER PURCHASE AGREEMENTS

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. WFEC selected the Project as the best means to meet their needs via a PPA. Therefore, no other PPAs or proposals are carried forward for analysis.

2.4.3.7 NEW TRANSMISSION CAPACITY

Based on current transmission system characteristics, described in Section 2.2.3.6, transmission capacity is not expected to be a significant constraint to the transfer of available and economical generation capacity from the Project. Therefore, development of additional bulk transmission to enable the Project is not expected. The Applicant is currently in the queue for the SPP Generation Interconnection study process and will fund any necessary upgrades needed to bring the project online, according to the SPP Open Access Transmission Tariff.

2.4.4 *Technological Alternatives Summary*

Based on the above evaluation, only the Project – implemented through WFEC's PPA – was carried forward for analysis. No other technology alternatives were identified capable of meeting WFEC's dual-pronged purpose and need: meeting energy demand and expanding WFEC's portfolio to diversify their renewable resources, with a particular focus on solar and battery storage.

3 SITE SELECTION STUDY

3.1 Introduction

Per USDA Guidance (1970-O), "The purpose of a SSS is to identify areas that appear to be suitable for siting a new electric generation facility based on regulatory, environmental, engineering, and economic constraints. Such a study is conducted to determine what potential power plant siting locations are available for a particular facility and how to identify those locations to avoid or minimize potential environmental, social, cultural, and economic impacts. Using an overview approach, the study includes the development of siting criteria to identify siting opportunities (suitable areas) and eliminate potentially

unacceptable areas (i.e., constraints) from consideration early in the process to avoid or minimize problems, delays, and unnecessary expense in the more advanced phases of the project."

Therefore, this SSS describes the process by which the Applicant determined potential locations for their proposed Project. The purpose and need for the Project is described above in Section 2.2.

3.2 Technological Alternative(s) Under Evaluation

Identification and evaluation of technology alternatives considered as part the SSS are described in Section 2.4, above. This SSS only evaluates sites capable of supporting solar and battery storage.

3.3 Site Selection Process

3.3.1 *Scope and Basic Project Requirements*

The Project will consist of a 250-MW solar plus 200 MW/800-MWh storage facility located entirely on privately owned parcels in a rural area of Garfield County, Oklahoma. The Project facility will consist of PV modules and a lithium ion-based (or similar battery technology) energy storage facility. This facility will provide renewable energy to WFEC through the electrical transmission grid at the OG&E 345-kV Woodring Substation via a 2- to 4-mile 345-kV generation tie-line. The specific Project facilities are described in detail in Section 1.1 (Project Description).

The Project will occur on an estimated 4,500 to 6,000 acres within a 12,250-acre Application Area. Key evaluation criteria and site requirements used to define the Application Area, as well as to identify potential Project site alternatives, are described in Sections 3.3.3 to 3.3.5, below.

3.3.2 *Approach and Methodology - Overview*

The Applicant used a phased approach for the site selection process, consisting of initial constraint and opportunity analysis to generate a buildable land layer. Potential Project site alternatives were selected from this layer using the Applicant's proprietary software. These sites were then ranked using a set of environmental, social, and engineering criteria, using GIS analysis, to identify which alternative sites to carry forward for analysis in a future NEPA process. These steps and findings are discussed in more detail below.

3.3.3 *Phase I: Identification of Potential Sites/Site Areas*

3.3.3.1 STUDY AREA DEFINITION

The Applicant identified their approximately 12,250-acre Application Area as the study area for evaluation in this SSS (Figure 4). The Application Area contains lands in reasonable proximity to the POI (the existing OG&E 345-kV Woodring Substation), with sufficient access to necessary roads and other infrastructure, as well as sufficient land available for lease or acquisition.

Identification of this Application Area occurred in a multi-step process. The Applicant initially considered the entire service area covered by WFEC member cooperatives - located primarily in Oklahoma and New Mexico, with some service areas extending into parts of Texas and Kansas. The Applicant focused on WFEC's primary service area (Oklahoma), as well as Kansas, and evaluated potential locations for

- existing points of interconnect,
- low load congestion, and
- locations with high solar irradiance

These factors led to the establishment of the Application Area and elimination of other locations within or outside of the state of Oklahoma.

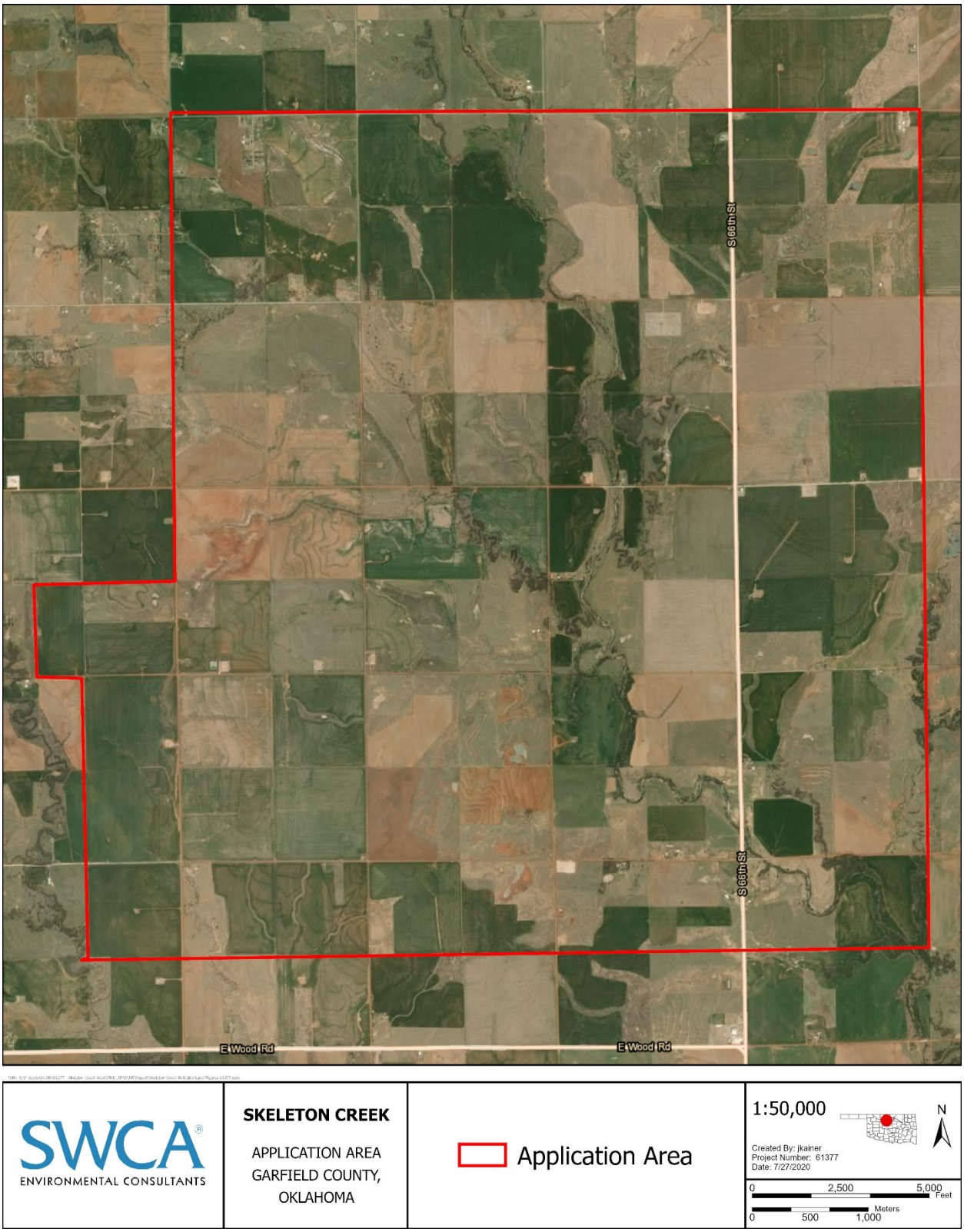

Figure 5. Application Area.

3.3.3.2 OPPORTUNITY AND CONSTRAINT MAPPING

USDA guidance states that the first step of the site selection process is to identify 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 due to regulatory restrictions or significant adverse impacts, or 2) generally avoided due to conflicts with existing land use, development, or land features.

Examples of exclusion areas include federal 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 listing on the National Register of Historic Places (NRHP). Constraints that should be avoided where practicable include environmental resources such as wetlands, streams, or important farmland and forestland. Additional constraints include areas containing public features such as airports or federally regulated facilities.

3.3.3.2.1 Site Evaluation Methodology and Data

Opportunities and constraints in the Application Area were evaluated according to their presence, anticipated level of regulatory permitting, agency coordination, and potential for impacts associated with construction and/or operation of the Project.

Information on siting constraints and opportunities in the Application Area was derived from use of publicly available online resources and mapping of data and information using a geographic information system (GIS) to evaluate potential risk. SWCA considered resources not present or at negligible risk within the Application Area the lowest level of risk. Resources present within the Application Area for which there is a potential that Project impacts could lead to permit or authorization denial were considered the highest level of risk. SWCA categorized resources that may contain increasing levels of potential impacts, regulatory permitting restrictions, agency coordination, and mitigation as moderate and high levels of risk. A list of resources considered in this evaluation include the following:

- Threatened and Endangered Species
- Other Biological Resources
- Wetlands
- Water Quality and Supply, Sole Source Aquifer
- Floodplains
- Geology and Soils
- Historic Resources
- Tribal/First Nation Lands
- Land Use
- Formally Classified Lands
- Recreational Resources
- Socioeconomics
- Environmental Justice
- Hazardous Substances
- Air Quality
- Noise
- Transportation

Marine and coastal resources were not evaluated due to lack of relevance for the Project.

3.3.3.2.2 Findings

Based on the below findings, the Application Area does not contain any areas that should be excluded per USDA guidance, or any resources assigned the highest risk. However, the Application Area does contain

a wide range of low to moderate risks where avoidance may be desirable, where practicable. A summary of findings by resource topic is described below.

Biological Resources

General Wildlife – The Application Area contains a variety of land covers including agriculture and pasture, grassland/herbaceous, mixed forest, riparian, wetland and freshwater that may be used as habitat by non-regulated wildlife (see Figures 4 and A-1). Taxonomic groups that may potentially occur in these habitats include small and large mammals, migratory waterfowl, songbirds, reptiles, amphibians, and fish. The risk of impacts and regulatory restrictions with regards to general wildlife is anticipated to be low and not a significant siting criterion constraint.

Migratory Birds and Bald Eagles – The Application Area is located within the Central Flyway – a major migratory route for birds (U.S. Fish and Wildlife Service [USFWS] 2020a). Based on the types of land covers present (see Figures 4 and A-1) (i.e., herbaceous grasslands, cultivated crops, streams and patches of deciduous and coniferous trees) there is potential for migratory birds to use the Application Area for foraging, breeding, nesting, or as stopover roosting during migration (USFWS 2004). According to SWCA's review of publicly available records of bald eagle sightings (eBird 2020), bald eagles (*Haliaeetus leucocephalus*) have been sighted within the last few years along perennial rivers and waterbodies in Garfield County and surrounding counties. The risk of potential impacts and regulatory restrictions with regards to migratory birds and to bald eagles is anticipated to be moderate and suitable forested/riparian nesting habitat is a siting criterion constraint to be avoided where practicable.

Other Sensitive Wildlife and Species of Special Concern – The mixed forest and freshwater habitats present within the Application Area may serve as potential foraging habitat for seven non-listed bat species with potential to occur in the Application Area (Oklahoma Department of Wildlife Conservation [ODWC] 2013). Four species, the big brown bat (*Eptesicus fuscus*), eastern red bat (*Lasiurus borealis*), hoary bat (*Lasiurus cinereus*), and tri-colored bat (*Perimyotis subflavus*) may use trees for roosting. Three species, the big-free-tailed bat (*Nyctinomops macrotis*), cave myotis (*Myotis velifer*), and Mexican free-tailed bat (*Tadarida brasiliensis*) use caves, cracks or crevasses or abandoned structures for roosting. The risk of potential impacts and regulatory restrictions with regards to bats is anticipated to be moderate and suitable forested/riparian habitat is a siting criterion constraint to be avoided where practicable. Other land covers present in the Application Area may serve as habitat for species identified by the ODWC (2016) as species of greatest conservation need. These species are not protected under state or federal regulations. Therefore, the risk of impacts and regulatory restrictions for species of greatest conservation need are anticipated to be low.

Federal and State Listed Wildlife Species and Federally Designated Critical Habitat – According to USFWS (2020b) there are five federally listed species with potential to occur in Garfield County including the Arkansas river shiner (*Notropis girardi*), red knot (*Calidris canutus rufa*), least tern (*Sterna antillarum*), whooping crane (*Grus americana*), and piping plover (*Charadrius melodus*). However, the Oklahoma Natural Heritage Inventory [ONHI] (2020a) indicates that only the whooping crane may occur in Garfield County. There are no documented populations or reported sightings of these species in the Application Area (eBird 2020; iNaturalist 2020; ONHI 2020b; USFWS 2020b). The Arkansas river shiner may be found in broad shallow main channels and side channels of streams and backwater areas (USFWS 2011). According to eBird (2020), recent sightings of whooping cranes in Garfield County have occurred at the Drummond Flats Wildlife Management Area (approximately 11 miles west of the Application Area) where there is extensive palustrine wetland habitat to accommodate foraging activities during stopovers (eBird 2020; Pearse et al. 2015). The Aransas-Wood Buffalo population of whooping cranes also has a migratory route through the Great Plains that bisects the Application Area (Figure A-2) (Pearse et al. 2018). The Application Area falls within the eastern portion of the 95% core migration

corridor, meaning that it is not in the central pathway of migrating whooping cranes but is within the outer bounds of the migration corridor (Pearse et al. 2018). There is no federally designated critical habitat, and no state-listed species with potential to occur in the Application Area (ONHI 2020a, 2020b; USFWS 2020a). The presence of potentially suitable aquatic and riparian habitat for some of the federally listed species creates moderate level of risk of potential impacts and is a siting criterion constraint to be avoided where practicable.

Invasive Species and Pests – Species that may pose a threat to health, agriculture, natural lands, or well-being of humans in Oklahoma (i.e., invasive species and pests) include several species of aquatic and terrestrial plants, fungi, and wildlife (Oklahoma Invasives 2019; Natural Resources Conservation Service [NRCS] 2020b). There are 67 invasive species of insects, plants, or animals documented in Garfield County (University of Georgia 2018). Within the Application Area, plants associated with agriculture and herbaceous land covers, as well as invasive or nuisance wildlife such as fire ants (*Solenopsis invicta*) and Canada geese (*Branta canadensis*) are anticipated to be most common. Project activities are not anticipated to significantly increase the introduction of invasive species. Thus, the risk associated with invasive species is anticipated to be low and not a significant siting criteria constraint.

Game Species – Oklahoma contains a variety of large and small species of wildlife and fish classified as game species permitted to be hunted or fished with permits or licenses (ODWC 2020). Although there is a potential for some of these species to occur in the Application Area, there are no areas specifically designated for public recreation or fishing that could attract large concentrations of these species. Most of the Application Area is sparsely populated with private lands used for agricultural purposes (see Figures 4 and A-1). Though these species may be present in the Application Area, the risk of impact and regulatory restrictions for game species is anticipated to be low and not a significant siting criteria constraint.

Plants – The land cover within the Application Area is dominated by cultivated crops and grasslands (see Figure 4). There are no federally listed or state-listed plants with potential to occur in the Application Area (USFWS 2020a). Though native prairie or riparian areas may be present in the Application Area the risk of impact and regulatory restrictions with regards to plants is anticipated to be low and not a significant siting criteria constraint.

Wetlands, Water Quality and Supply, Sole Source Aquifer, Floodplains

The Application Area contains Skeleton Creek, 27 unnamed intermittent tributaries, and an estimated 160 acres of freshwater emergent, freshwater forested wetlands, freshwater ponds, and riverine wetlands (Figure A-3, USFWS 2020c). Project construction within or adjacent to these surface waters represents a moderate risk of potential environmental impacts and regulatory restrictions and is a siting criterion constraint to be avoided where practicable. Skeleton Creek and some of the intermittent tributaries are prone to flooding (Figure A-4). Construction within the 100-year floodplain of Skeleton Creek and these tributaries represents a potential engineering risk due to damage to facilities from flooding (Federal Emergency Management Agency 2020). These potential impacts create a moderate risk to be avoided where practicable.

In Garfield County much of the drinking water supply comes from groundwater sources (U.S. Environmental Protection Agency [EPA] 2020a). Although there is no aquifer exempt from serving as a source of drinking water for the surrounding communities, there are also no areas designated by the EPA or Oklahoma Water Resources Board specifically for water protection (e.g., hot spot basin, vulnerable groundwater area, Class I-Special Source Groundwater, sole source aquifer, aquifer recharge zone) within the Application Area (EPA 2020a; Oklahoma Water Resources Board 2020). Regulatory restrictions may occur for water withdrawal or purchase of water from public water sources, private permitted sources or groundwater sources. Therefore, the risk of impact and regulatory restrictions with regards to groundwater sources is anticipated to be low to moderate, but not a significant siting criteria constraint.

Geology and Soils

The topography of the Application Area is generally flat or with gentle rolling hills. Although low risk, areas of steeper (>5%) topography may increase construction needs and should be avoided where possible. The Application Area is dominated by two geological units, the Kingman Formation or Kingman Siltstone and the Salt Plains Formation (Figure A-5) (U.S. Geological Survey [USGS] 2020a). Minor geologic units include the alluvium deposits in the vicinity of Skeleton Creek and the Fairmont Shale (Figure A-5). There are no mapped karst features in the Application Area (USGS 2014). The risk of impacts and regulatory restrictions with regard to karst features is anticipated to be low and not a significant siting criteria constraint.

According to the NRCS (2020a) Web Soil Survey, the Application Area contains hydric soils that are prone to flooding or ponding (Figure A-6). These soils may pose an engineering constraint and are to be avoided to the extent practicable.

Historic Resources

The Application Area and the surrounding area within 1 square mile does not contain previously documented archaeological sites, Oklahoma Landmarks Inventory sites, NRHP nor Oklahoma State Register of Historic Places-listed properties, or cemeteries (Oklahoma State Historic Preservation Office 2020). Presence of previously unidentified cultural or archaeological resources is possible but considered to be of low probability throughout most of the Application Area. Thus the Application Area is considered to have a low to moderate risk of impacts and regulatory restrictions and does not currently represent a significant siting criteria constraint.

Tribal/First Nation Lands

There are no tribal-owned lands within the Application Area but some tribes may have interest in the region, which could trigger additional agency and tribal coordination. Consequently, there is a low to moderate risk associated with regulatory restrictions, but this is not a significant siting criteria constraint.

Land Use, Formally Classified Lands, Recreational Resources

A significant portion of the Application Area is designated as Prime Farmland (NRCS 2020a) which represents a moderate risk of potential impacts and regulatory restrictions and is a siting criterion constraint to be avoided where practicable (Figure A-6). No known parcels are enrolled in the Natural Resources Conservation Service Wetland Reserve Program (NRCS 2020c).

The Application Area is predominantly a rural, sparsely populated area dominated by farmland and rural residences with little topographic change (see Figure 4). There are no public recreation sites, parks, wildlife management areas, or major scenic viewpoints or byways (USGS 2020b; USFWS 2020b). There are also no formally classified lands within the Application Area (National Park Service 2020; National Wild and Scenic Rivers System 2020; USFWS 2020b; USGS 2020b; Wilderness Connect 2020). Small municipalities are located between 3 and 10 miles from the Application Area, including Enid approximately 4 miles to the northwest, Fairmont approximately 3 miles to the northeast, and Waukomis approximately 3 miles to the southwest (Google Earth 2020). Solar glare may be produced from the Project and be potentially visible by surrounding residents, motorists, or pilots. The potential impacts and regulatory restrictions associated with these visual and aesthetic constraints is anticipated to be moderate and siting the Project to minimize or avoid these constraints is suggested where practicable.

The Application Area does not contain any land owned or managed by the Department of Defense (Google Earth 2020) cite. A preliminary analysis of potential impacts to military operations (e.g., military

airspace), long range radar, and weather radar systems indicated that no weather radar interference is anticipated (Federal Aviation Agency 2020). The screening tool indicates that the Project falls within the Vance Jackson military airspace and is within the range of long-range radar. This tool is preliminary, and the Applicant would coordinate with the Department of Defense prior to construction to resolve any potential for impact or interference. Therefore, this resource represents a moderate risk, but is not a significant siting criteria constraint.

Socioeconomics, Environmental Justice, Hazardous Substances, Air Quality, Noise, Transportation

The Application Area has minimal socioeconomic constraints. Energy development projects do not appear to be controversial for the community of Enid, the closest municipality to the Application Area, and solar energy and wind energy projects have been successfully completed in Garfield County. The EIA's U.S. Energy Mapping System shows the Covington Solar Farm and three wind power projects, Armadillo Flats, Breckinridge, and Chisolm View, in operation within the county (EIA 2020a). These projects are located approximately 10 to 20 miles outside of the Application Area. Census information on the populations of both Enid City and more broadly of Garfield County, indicate that populations are predominantly white with an even sex ratio, educated, and not significantly higher or lower in percentage of residents that live below the poverty line (15.9%) relative to the entire state (15.6%) (U.S. Census Bureau 2020; Centers for Disease Control and Prevention [CDC] 2020). The anticipated risk of disproportionately affecting minority or low-income populations relative to surrounding communities is low and not a significant siting criteria constraint.

The Application Area does not contain any hazardous waste facilities, superfund sites, or other facilities designed to mitigate, manage, and contain hazardous wastes (Figure A-7; EPA 2020b). Nor are there any areas mapped as a hazardous materials or waste-contaminated sites or brownfield sites (EPA 2020c; NEER 2020). Approximately 53 oil-gas wells are present across the Application Area, as well as several natural gas and hazardous liquid (crude oil) transmission pipelines. However, no incidents or accidental releases for these features were identified (NEER 2020). According to the CDC (2020) Garfield County is in attainment for all National Ambient Air Quality Standards, indicating that the Application Area is not particularly vulnerable to temporary presence of fugitive dust from construction activities. The State of Oklahoma's Air Quality Implementation Plan identifies reasonable precautions for management of fugitive dust, but these actions only pertain to areas in maintenance or non-attainment (EPA 2020d). The Project would generate noise and increase traffic within the Application Area during construction. However, traffic volumes are low and there are no major metropolitan areas, highways, navigable waterways, or railroads that would constrain siting within the Application Area. Thus, the risk of impacts and regulatory restrictions associated with transportation, noise, and air quality is anticipated to be low to moderate and not a significant siting criteria constraint.

3.3.3.2.3 Summary

Appendix A provides a visual summary of the constraints analysis findings.

3.3.3.3 IDENTIFICATION OF POTENTIAL AREAS

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 (Figure 5). The availability of land for construction was determined by presence of existing structures (e.g., pipelines, residences) and the presence of avoided land features, as described below:

- Mapped wetlands
- Transmission corridors

- Pipelines
- Slope and depth to restrictive layer
- Formally classified lands
- Private residences
- Mapped surface waters
- Mapped hydric soils
- 100-year floodplain
- Prime farmlands

This buildable layer provided the foundation for identification of potential project site alternatives, as described below in Section 3.3.4. However, this layer represents a preliminary analysis that is subject to refinement or revision as the Project design progresses.

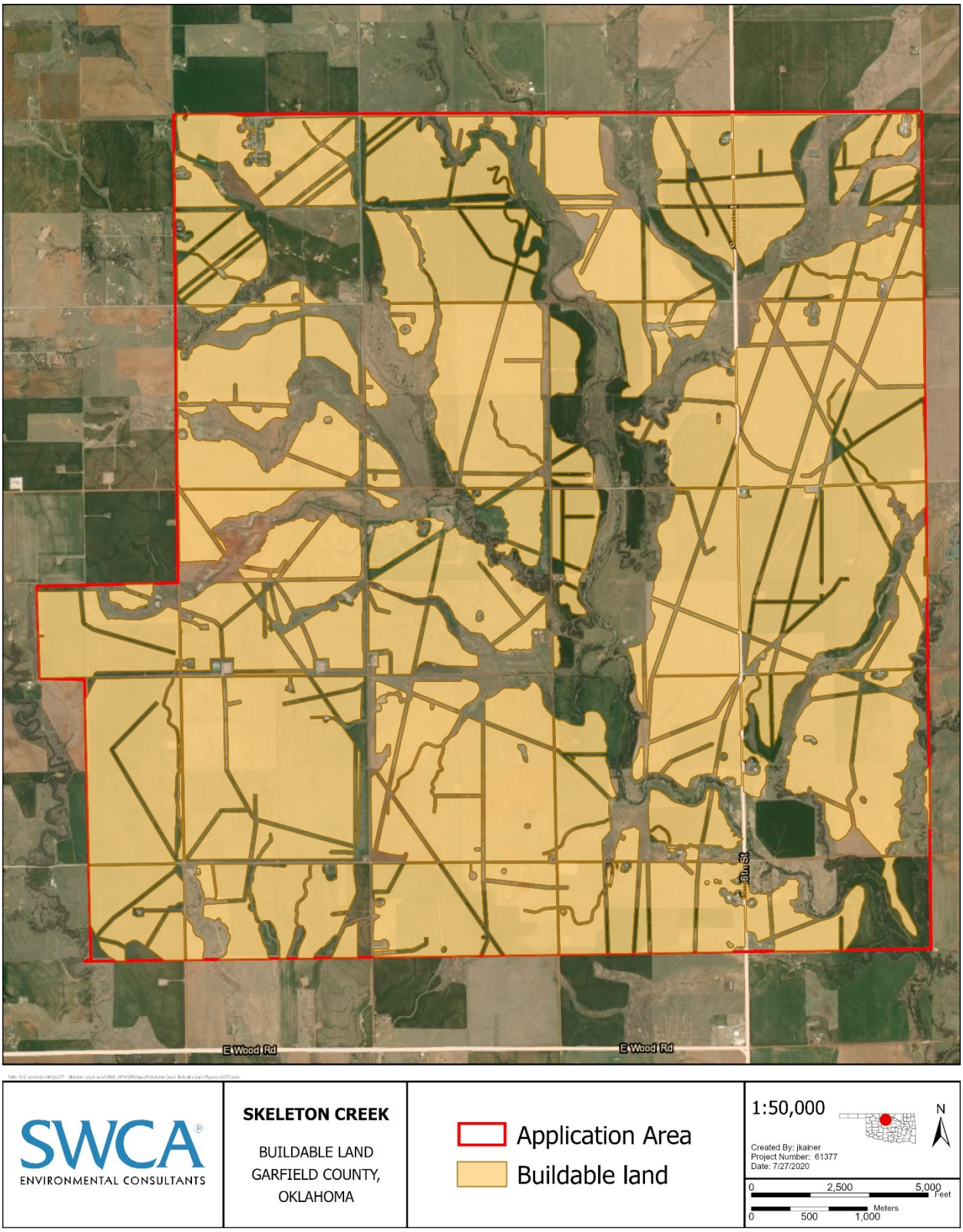

Figure 6. Buildable land layer.

3.3.4 *Phase II: Identification of Candidate Sites*

3.3.4.1 SITE EVALUATION METHODOLOGY

The Applicant used a proprietary optimization software tool to identify potential Project site alternatives 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 areas excluded from the buildable layer.

3.3.4.2 SUMMARY

A total of four potential Project site alternatives were identified for analysis based on the Applicant's optimization effort (Figures 6–10). Collectively, these four sites cover the entirety of the Application Area, with some overlap.

- Alternative A: located in the northwest corner of the Application Area, encompassing 6,042 acres.
- Alternative B: located in the northeast corner of the Application Area, encompassing 5,774 acres.
- Alternative C: located in the southwest corner of the Application Area, encompassing 4,728 acres.
- Alternative D: located in the southeast corner of the Application Area, encompassing 4,489 acres.

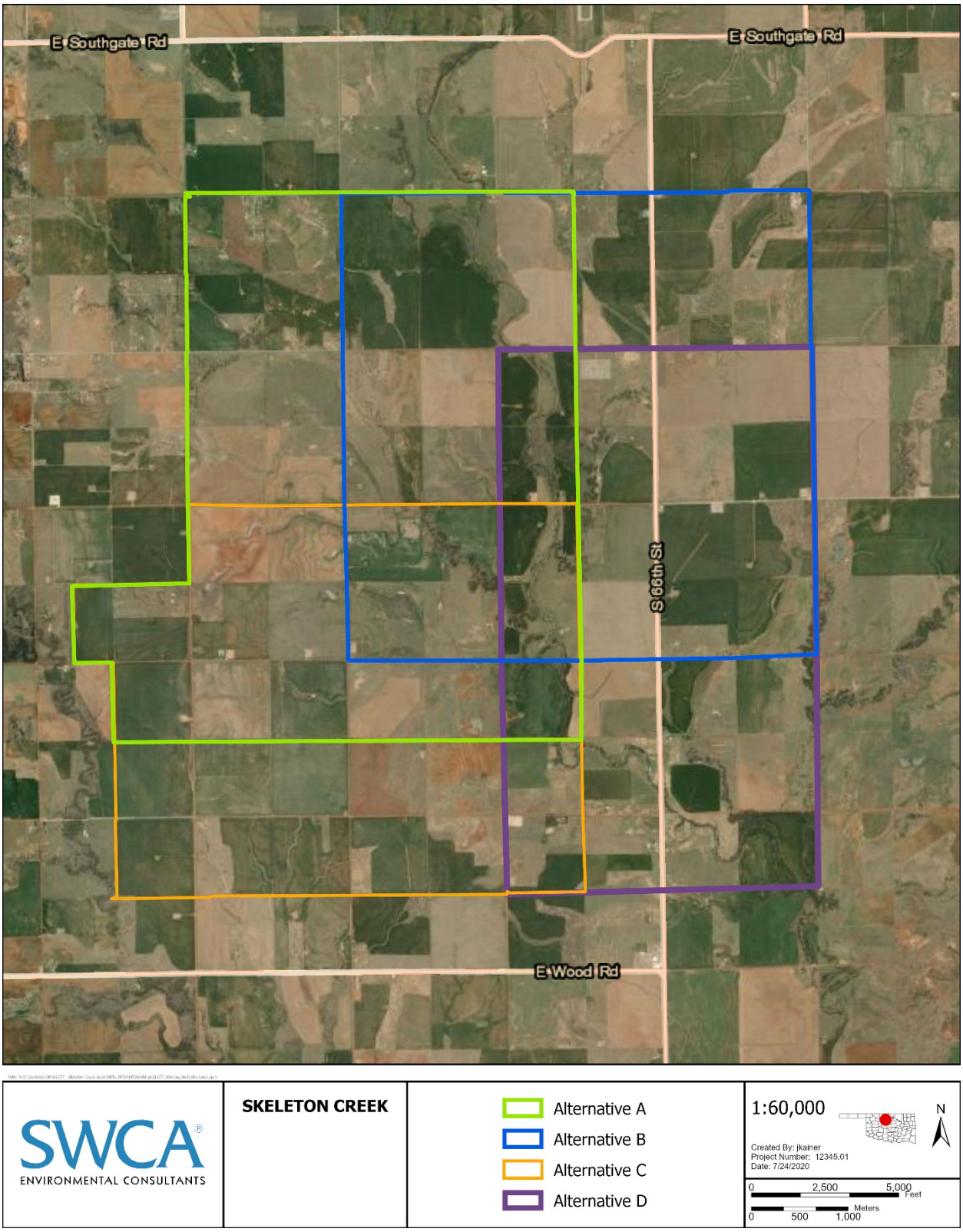

Figure 7. Overview of Project site alternatives.

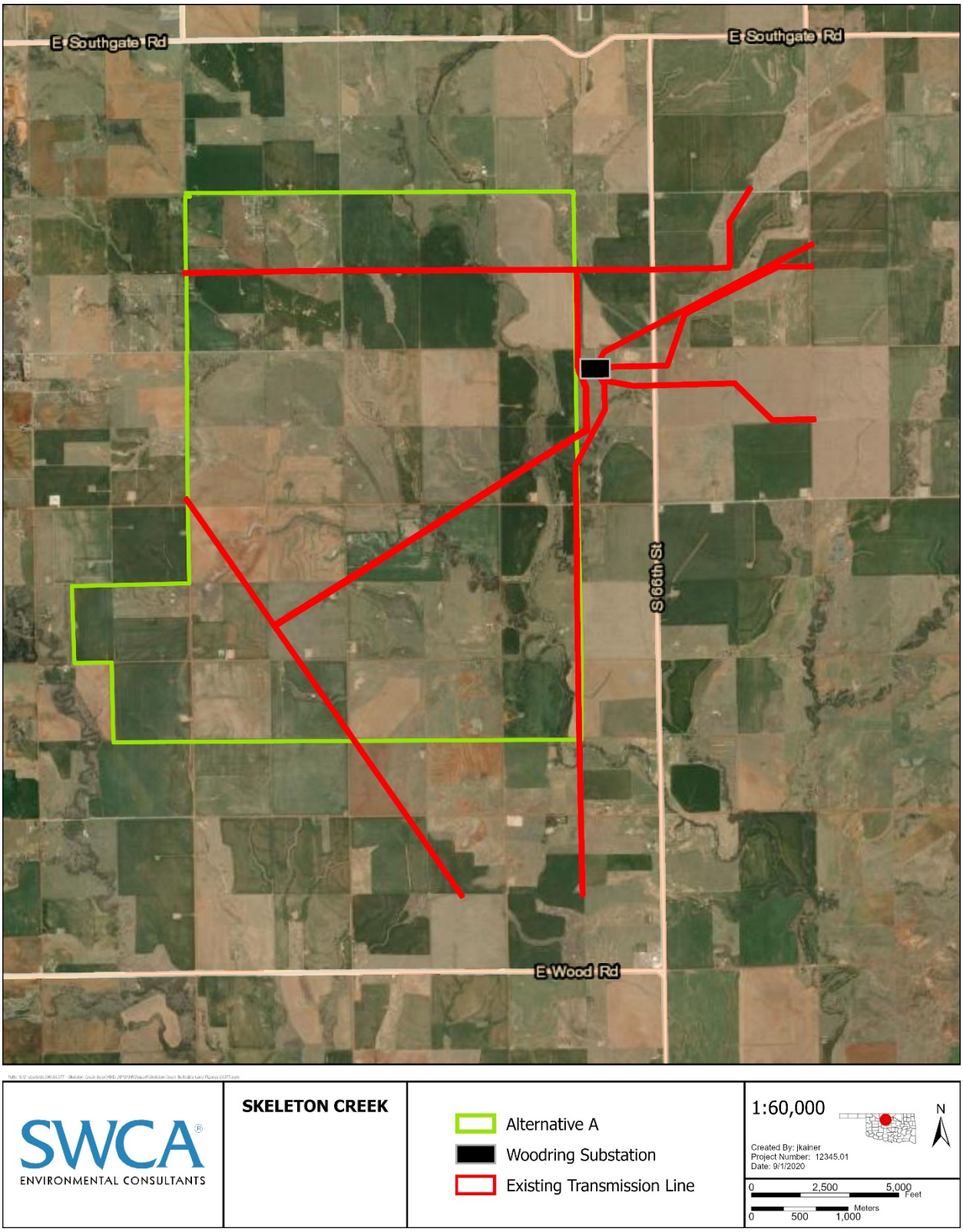

Figure 7. Alternative A overview.

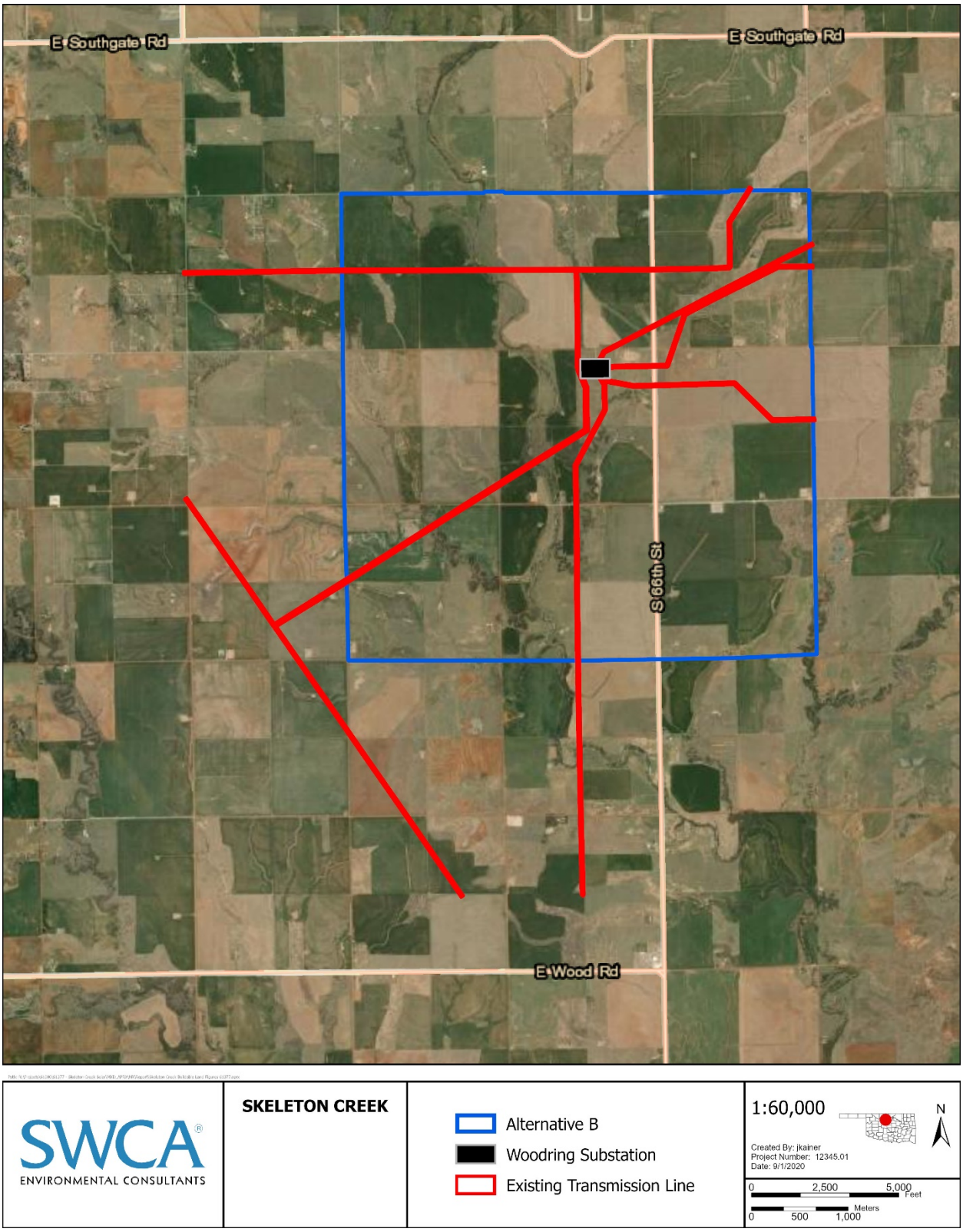

Figure 8. Alternative B overview.

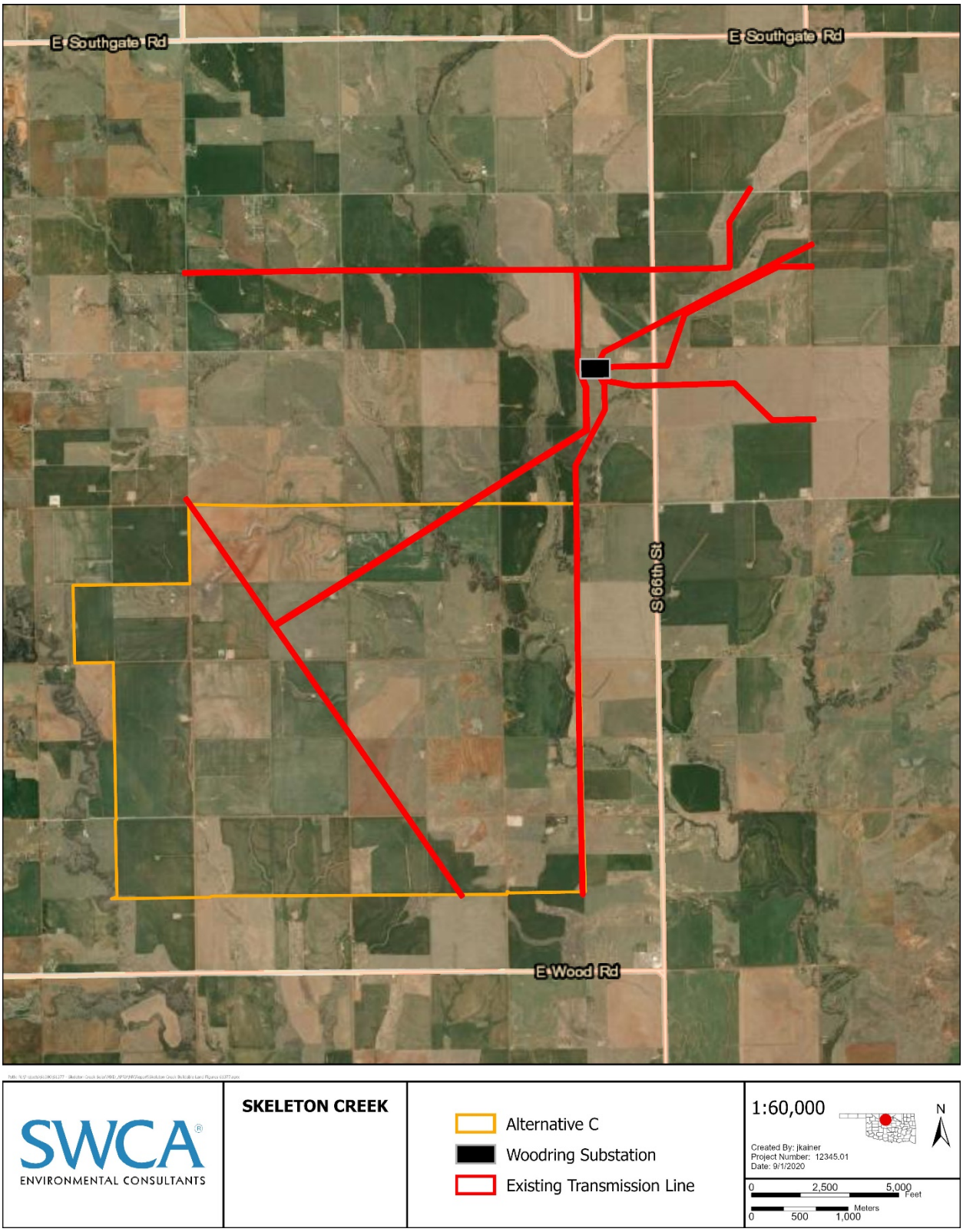

Figure 9. Alternative C overview.

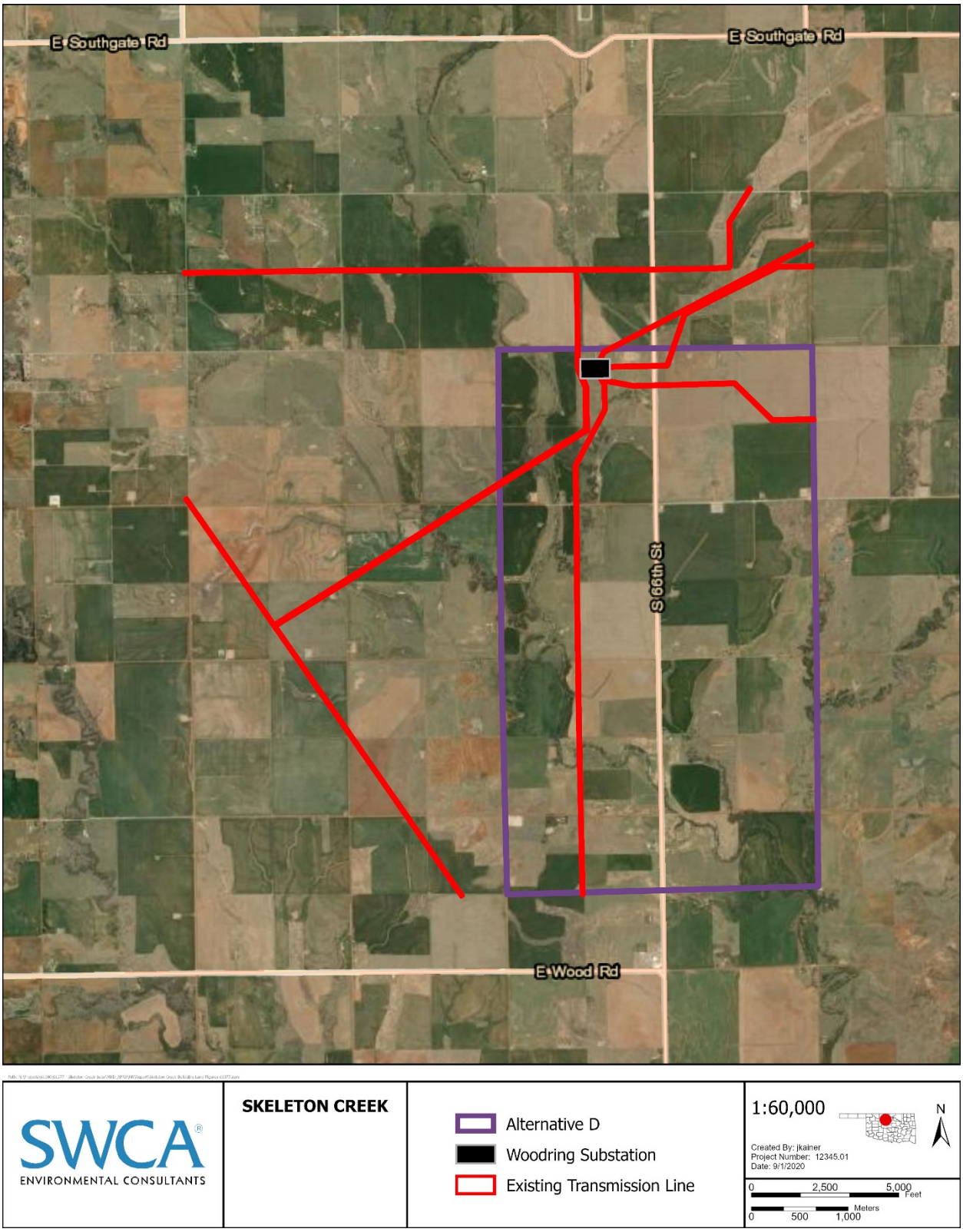

Figure 10. Alternative D overview.

3.3.5 *Phase III: Comparative Analysis and Site Evaluation*

3.3.5.1 SITE EVALUATION METHODOLOGY (CRITERIA DEVELOPMENT)

The Applicant developed specific site evaluation criteria to facilitate an objective, quantitative comparison of Project site alternatives. These criteria were identified based on previous site selection steps – emphasizing resource and construction concerns that represent a significant siting constraint and that could differ across the site alternatives. Selected evaluation criteria and their metrics are provided in Table 6, as well as briefly described below.

Table 7. Siting Criteria Information

Siting Criteria	Analysis Metric
Total Land Area	Acres
Buildable Land	Percent of Total
Availability of Property	# of Lease or Pending Parcels
Closest Distance to Point of Interconnect	Miles
Habitable Residences	Number
Land Cover (riparian or forested)	Acres
Topography (areas > 5% slope)	Acres
Hydric Soil (occasionally/frequently flooded)	Acres
Surface Water Features – NHD	Miles
Surface Water Features – NWI	Acres
Floodplains	Acres
Prime Farmland	Acres
Project within foreground visual zone (0.5 mi) of roads	Miles of public (county, state, federal) road

Total Land Area. The selected site must provide sufficient land to support the Project. Because significant portions of land within the Application Area contain environmental, engineering, and/or land use constraints, the total land area needed within each site will vary. The preference is for the total land area of the site to be as small as possible, while still achieving the desired MW target.

Contiguous Buildable Land. A site containing a high percentage of contiguous buildable land is preferred, as it will facilitate more efficient construction of the Project.

Availability of Property. Most of the land within the Application Area is privately owned and will need to be leased or purchased from private landowners. The selected site must contain sufficient parcels of land that are available for lease or purchase. Therefore, the site with the largest number of available or pending parcels is preferred.

Distance Point to the Interconnect. The Project will require the construction of a generation-tie-line to the existing OG&E 345-kV Woodring Substation. The site with the closest proximity to the POI is preferred to minimize possible environmental impacts and to reduce costs.

Habitable Residences. Siting near residences should be minimized to reduce adverse effects related to landscape alterations, visual degradation and solar glare, increased traffic, and noise. A site that contains the fewest habitable residences is preferred.

Land Cover (Riparian or Forested). Because forested or riparian habitat can provide suitable nesting or foraging habitat for a wide variety of species, the preference is to avoid these land cover types to the extent practicable.

Topography. A relatively level site is preferred over one with variable topography to minimize the cost of grading. A site comprised of land with less than 5% slopes is preferred to keep site preparation work to a minimum.

Hydric Soil. The Application Area is comprised of a variety of soils, categorized according to NRCS soil map units. Some soils are characterized as "occasionally flooded" and "frequently flooded." Project siting to avoid these areas will reduce construction engineering issues and potential damage to the facility from flooding. Therefore, a site that contains the fewest acres of hydric soils is preferred.

Surface Water Features. Construction near surface water features (wetlands, ponds, streams) should be minimized to the extent practicable to avoid impacts to these resources and preclude potential delays associated with the need to obtain permits under Section 404/401 of the Clean Water Act. Therefore, a site that contains the fewest acres/miles of surface water features is preferred.

Floodplains. Minimizing or avoiding construction in floodplains can help prevent potential flooding damage to the facility and avoid impeding water flow. Therefore, a site that contains the fewest acres of floodplains is preferred.

Prime Farmland. Nearly all the Application Area is comprised of grasslands and cultivated cropland (farmland). Because farmland is important for the production of food and other resources, construction on Prime Farmland should be minimized to the extent practicable. Prime farmland, a designation assigned by the USDA, is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, and fiber. A site that contains the fewest acres of Prime Farmland is preferred.

Visual Effects. Siting near public roads should be minimized, as practicable, to reduce effects related to landscape alterations, visual degradation, and solar glare. A site that contains the least amount of road miles within 0.5 mile of the Proposed Project is preferred.

3.3.5.2 SITE EVALUATION METHODOLOGY (RANKING)

This report relied on GIS and aerial photography as data sources for each criterion. Once all data were collected, site alternatives were ranked by assigning a score for how well each alternative met criteria: with 1 being most effective and 4 being least effective. An average ranking score was assigned for alternatives containing identical findings. All criteria were assigned the same weight during scoring. The lowest total score is considered best.

3.3.5.3 EVALUATION OF SITES AND COMPARATIVE ANALYSIS

Table 7 summarizes findings by alternatives, while Table 8 ranks the effectiveness of how each alternative site meets the siting criteria.

Table 8. Alternative Site Findings and Ranking

Siting Criteria	Alternative A	Alternative B	Alternative C	Alternative D
Total Land Area (Acres)	6,042	5,774	4,728	4,489
Buildable Land (Percent of Total)	59%	61%	69%	60%
Availability of Property (# of Leased or Pending Parcels)	11	6	7	2
Closest Distance to Point of Interconnect (Miles)	0.03	0	0.8	0
Habitable Residences (Number)	33	13	7	21
Land Cover (riparian or forested; acres)	41	93	23	93
Topography (areas > 5% slope; acres)	326	354	239	390
Hydric Soil (occasionally/frequently flooded; acres)	1,193	1,263	1,310	1,279
Surface Water Features – NHD (miles)	30	30	18	20
Surface Water Features – NWI (acres)	83	86	53	63
Floodplains (acres)	1,717	1,523	735	1,273
Prime Farmland (acres)	4,844	4,496	3,414	3,181
Project within foreground visual zone (0.5 mi) of roads (miles)	3.0	3.0	2.5	3.5

Table 9. Comparative Ranking of Sites

Siting Criteria	Alternative A	Alternative B	Alternative C	Alternative D
Total Land Area (Acres)	4	3	2	1
Buildable Land (Percent of Total)	4	2	1	3
Availability of Property (# of Leased or Pending Parcels)	1	3	2	4
Closest Distance to Point of Interconnect (Miles)	3	1.5	4	1.5
Habitable Residences (Number)	4	2	1	3
Land Cover (riparian or forested; acres)	2	3.5	1	3.5
Topography (areas > 5% slope; acres)	2	3	1	4
Hydric Soil (occasionally/frequently flooded; acres)	1	2	4	3
Surface Water Features – NHD (miles)	3.5	3.5	1	2
Surface Water Features – NWI (acres)	3	4	1	2
Floodplains (acres)	4	3	1	2
Prime Farmland (acres)	4	3	2	1
Project within foreground visual zone (0.5 mi) of roads (miles)	2.5	2.5	1	4
Total Score	**38**	**36**	**22**	**34**

3.3.6 *Selection of Alternative Sites to Carry Forward for Consideration in NEPA Document*

After review of the site alternative findings, the Applicant decided to carry all alternatives forward for further consideration. This decision was based on a desire to maintain flexibility in geographic coverage across the Application Area, given the early stage of Project design.

Although USDA guidance (1970-O) encourages applicants to identify a Preferred Alternative as part of the SSS, the ranking process reflects a single, static assessment that is subject to change as land availability status and Project design progress. Additionally, there are insufficient data points to demonstrate a statistically significant difference between compared alternatives. Therefore, the Applicant has not identified a Preferred Alternative at this time; this decision will be made as part of the future NEPA process.

All considered alternatives will be developed as described in Section 1.1, Project Description.

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APPENDIX A

Constraints and Opportunity Maps

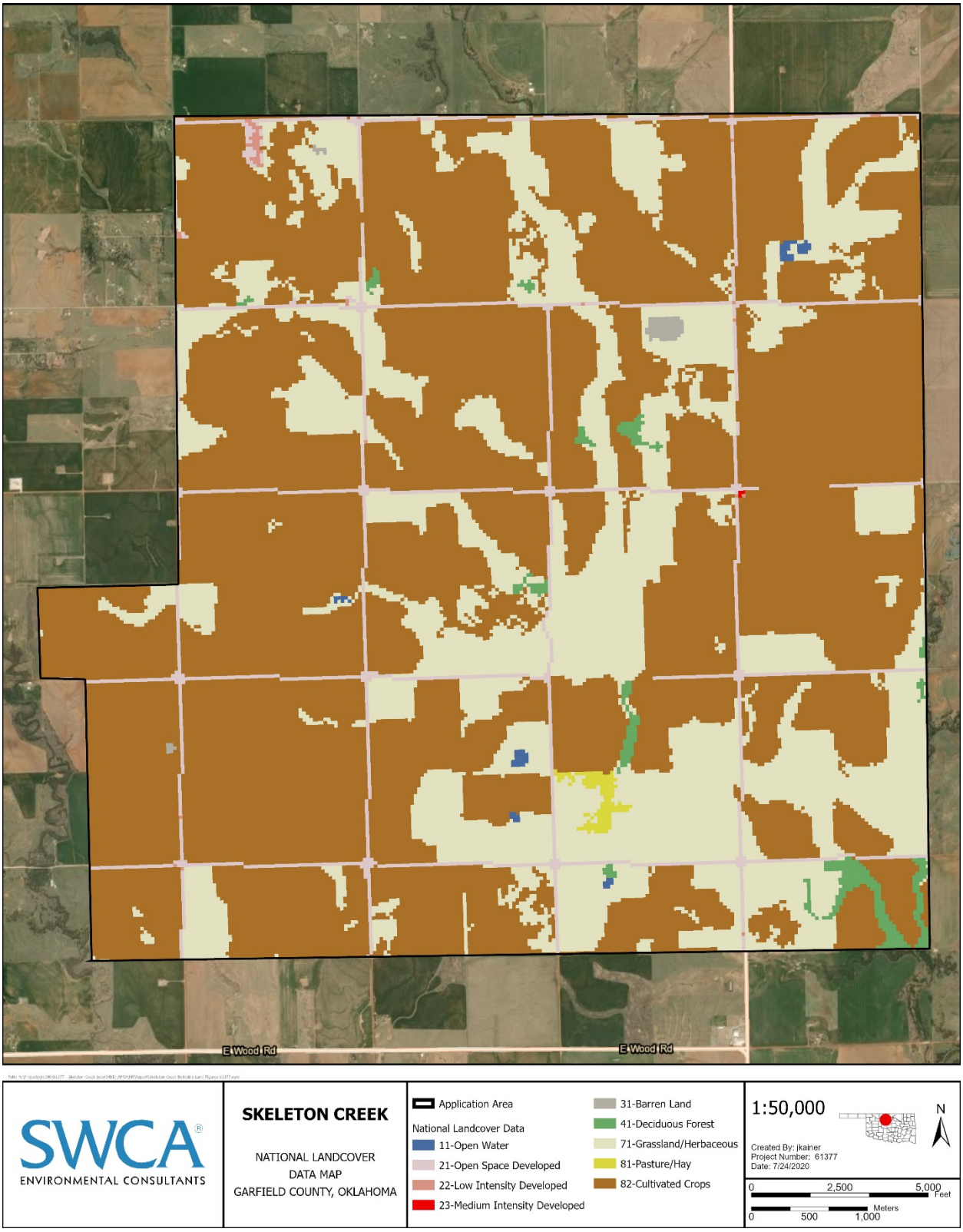

Figure A-1. Land Cover within the Application Area

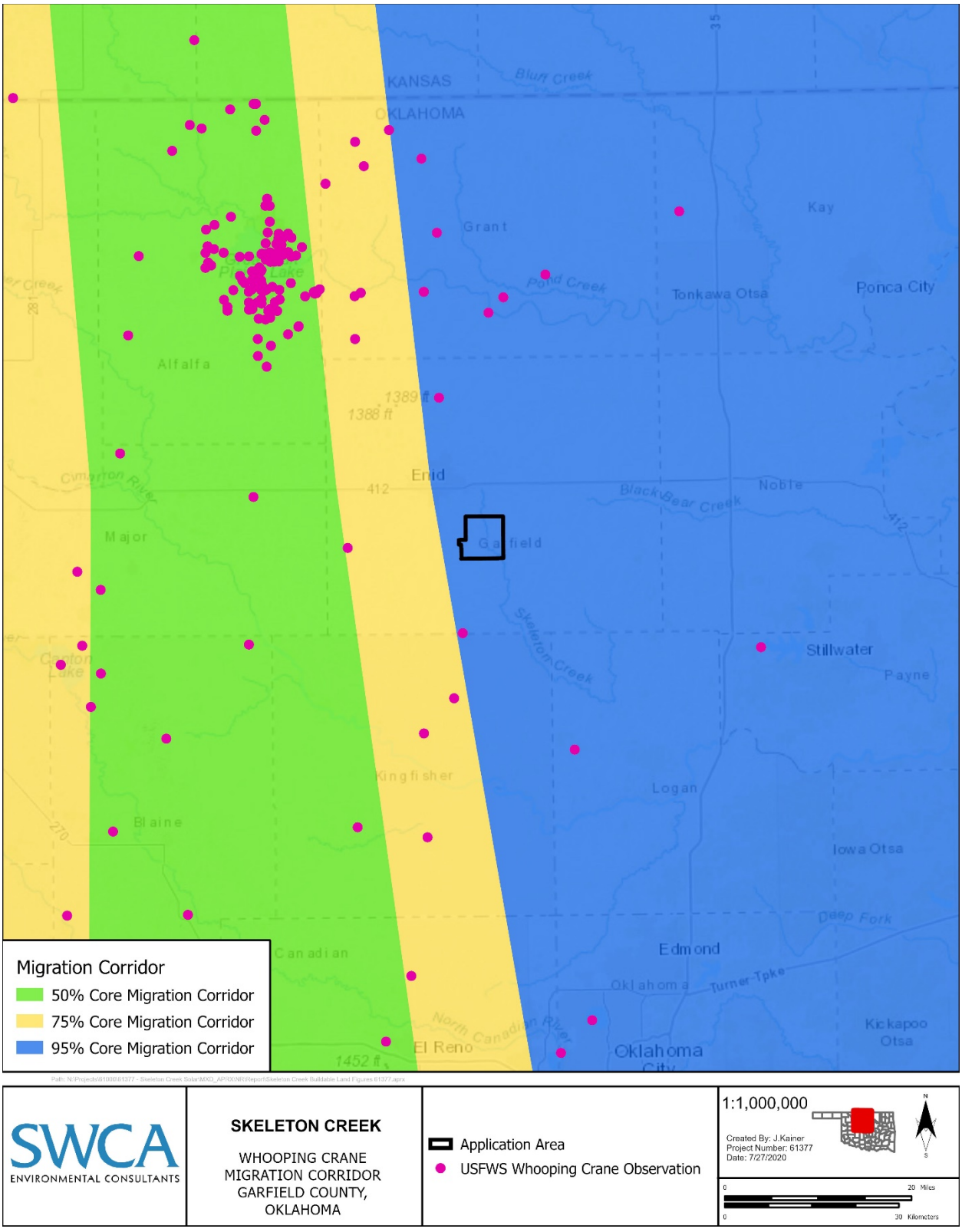

Figure A-2. Location of the Application Area within the Whooping Crane Corridor

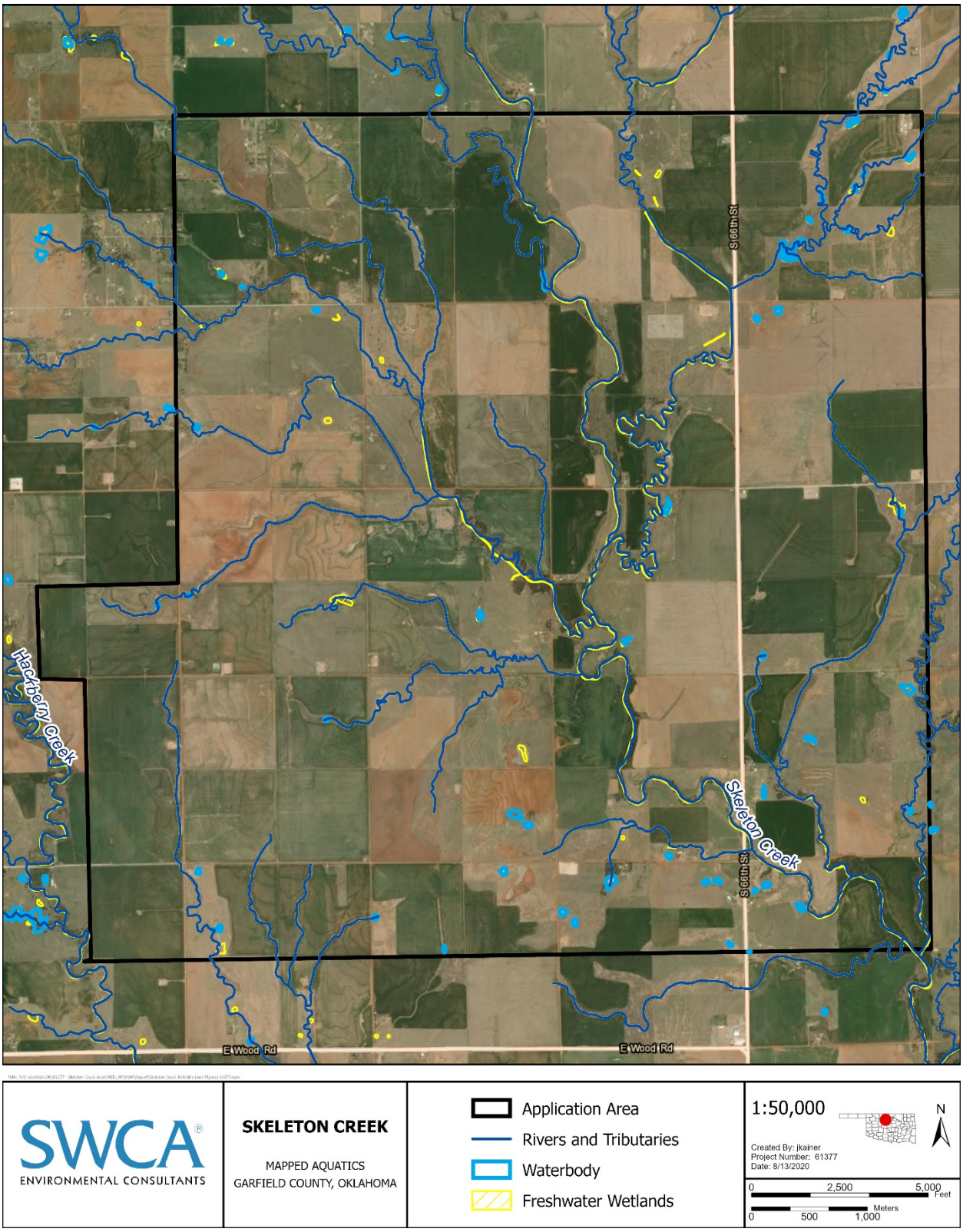

Figure A-3. Mapped aquatics in the Application Area

Figure A-4. Mapped floodplain of Skeleton Creek and associated tributaries within the Application Area

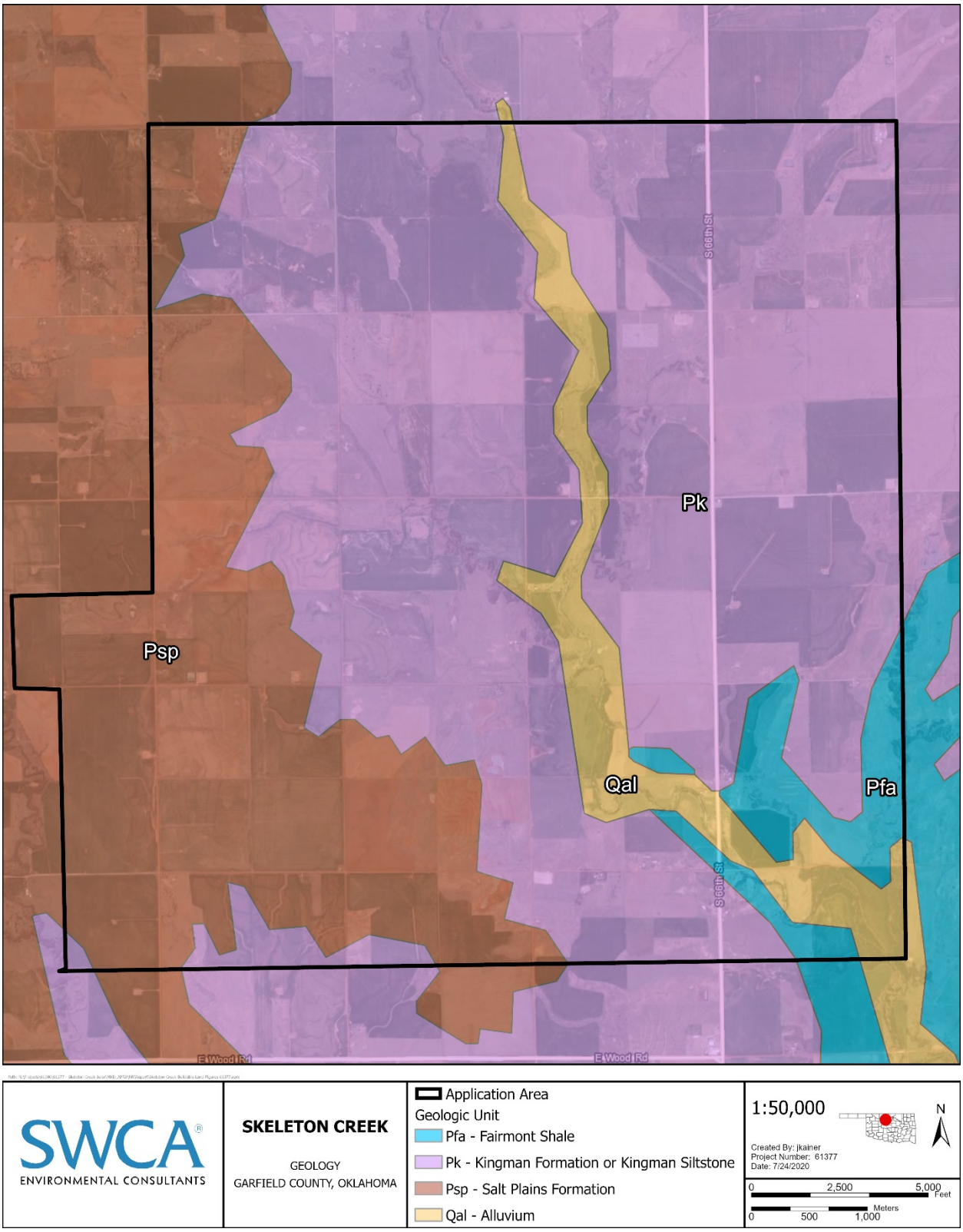

Figure A-5. Geology within the Application Area

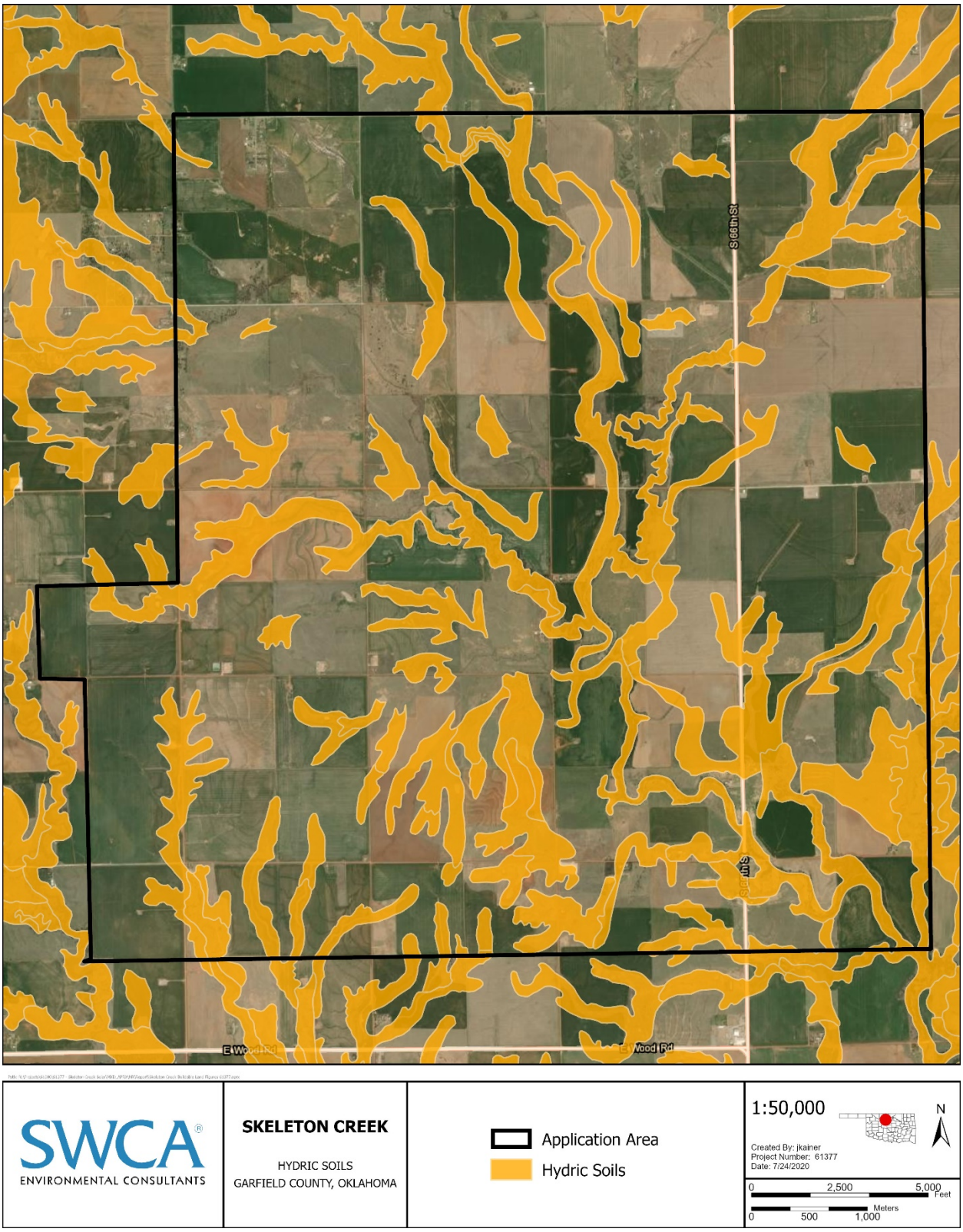

Figure A-6. Hydric soils within the Application Area

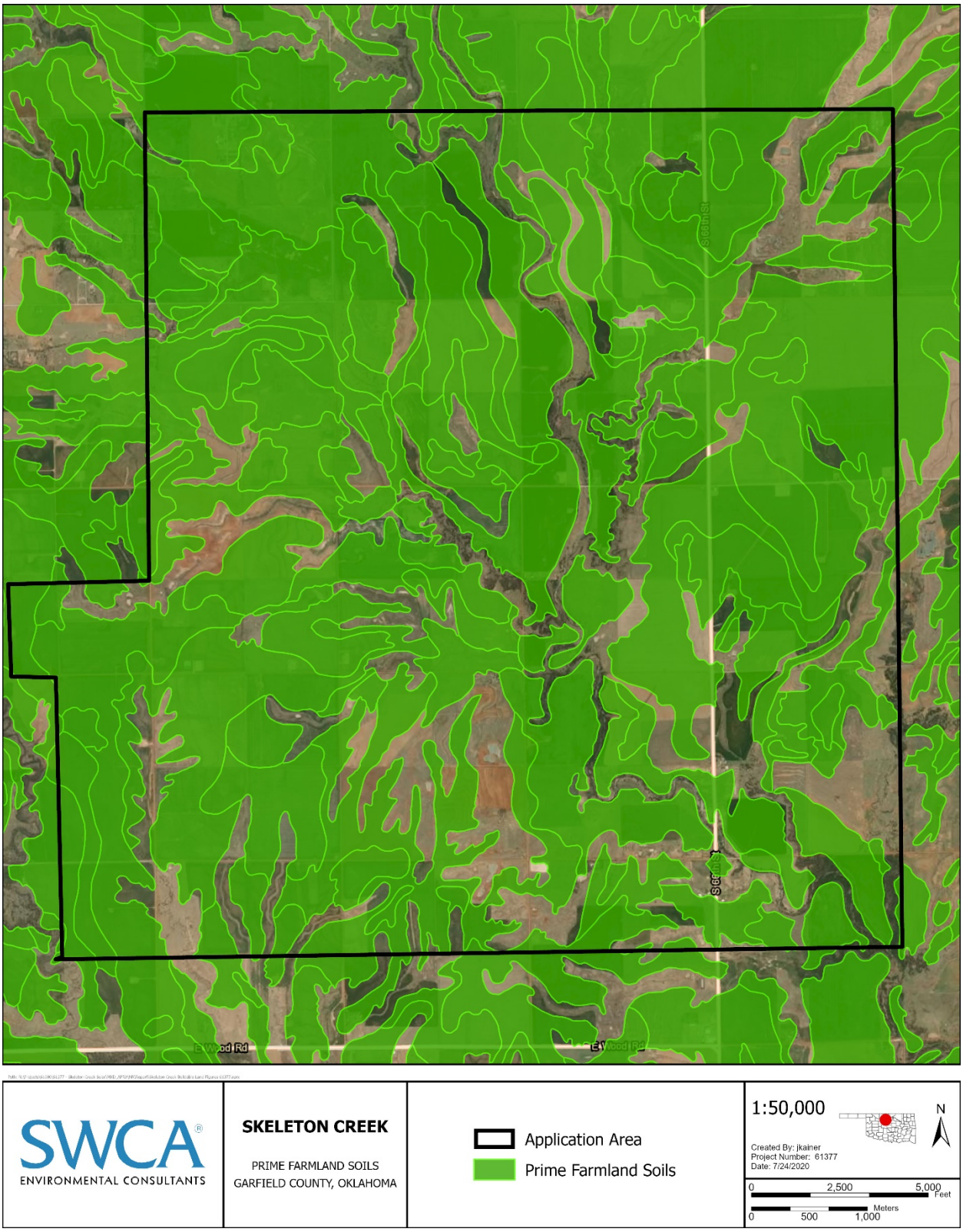

Figure A-7. Prime Farmland soils within the Application Area

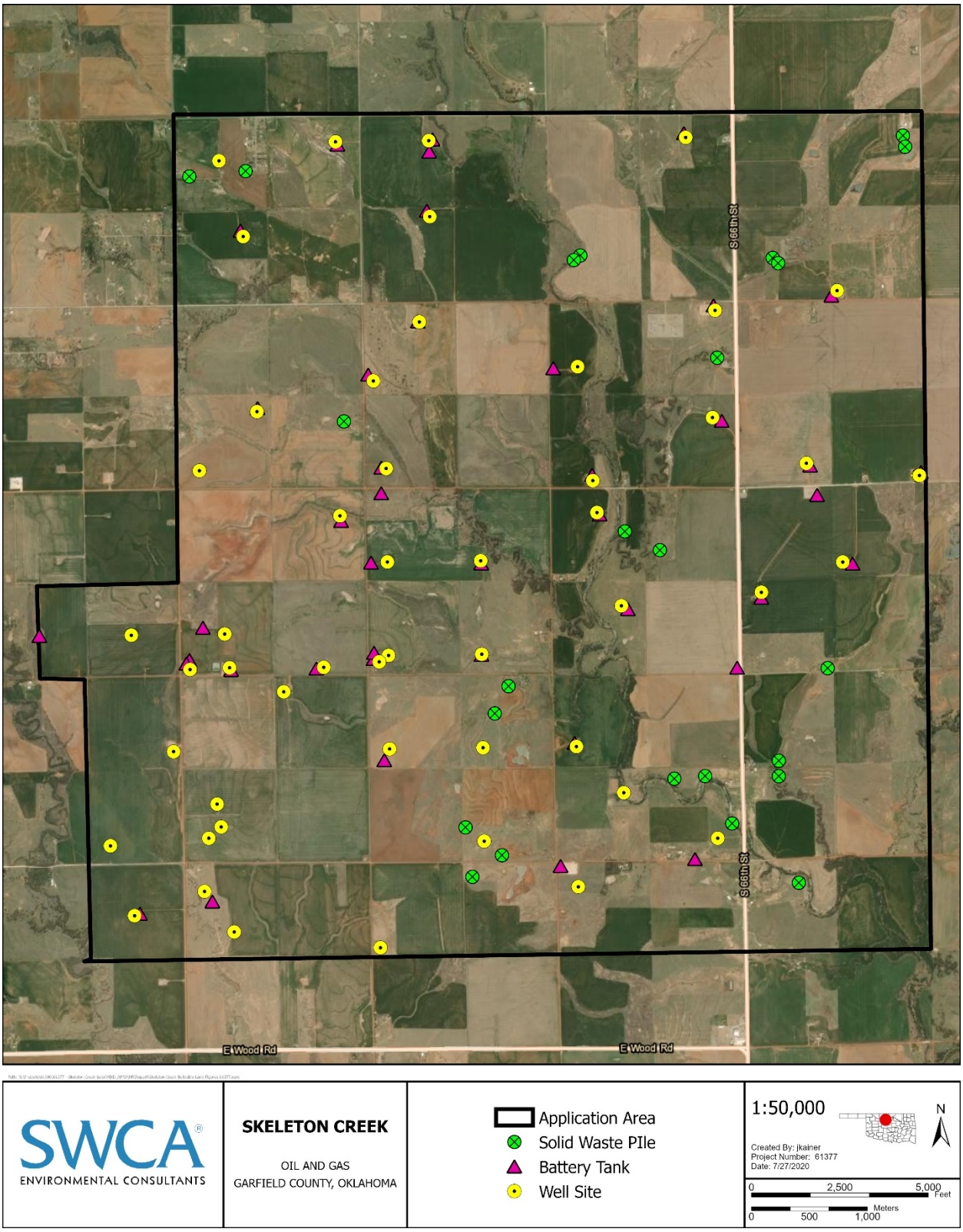

Figure A-8. Mapped hazardous materials within the Application Area