ENVIRONMENTAL ASSESSMENT

For

COLDWATER SOLAR FACILITY

Today's Power
Your Energy Partner

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TODAY'S POWER, INC.

ENVIRONMENTAL ASSESSMENT
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INTRODUCTION

Today's Power, Inc. (TPI) is a wholly-owned subsidiary of Arkansas Electric Cooperatives, Inc. a Little Rock-based utility service cooperative owned by 17 Arkansas electric distribution cooperatives. TPI partners with electric utilities across the Midwest in order to serve their members clean, renewable energy. TPI, in partnership with Clark, Meade, and Seward (CMS) Electric Cooperative, proposes to install a new, 12-acre solar facility, known as the Coldwater Solar Facility (Project) near the city of Coldwater, Kansas in Comanche County near the intersection of CM Road 11 and CM Ave. H, as shown on the enclosed map, which can be found in Appendix A.

Per RD Instruction 1970-C Exhibit B Section 2.3.1: "USDA, Rural Development is a mission area that includes three federal agencies – Rural Business-Cooperative Service, Rural Housing Service, and Rural Utilities Service. The agencies have in excess of 50 programs that provide financial assistance and a variety of technical and educational assistance to eligible rural and tribal populations, eligible communities, individuals, cooperatives, and other entities with a goal of improving the quality of life, sustainability, infrastructure, economic opportunity, development, and security in rural America. Financial assistance can include direct loans, guaranteed loans, and grants in order to accomplish program objectives."

Today's Power, Inc. (TPI) plans to seek financial assistance from the USDA Rural Development (RD), Rural Utilities Service (RUS) under its Electric Program for the Coldwater Solar Facility (Project).

The proposed project involves construction of a new electric generating facility of 2.8 MWDC and requires the physical disturbance of approximately 12 acres at a single site. As such, the proposed project requires an environmental assessment in accordance with 7 CFR 1794.23(c). This environmental assessment has been prepared in accordance with RD Instruction 1970-C Exhibit B, Guide to Applicants for Preparing Environmental Assessments.

1.0 PROJECT PURPOSE AND NEED

1.1 PROJECT DESCRIPTION, DETAILS, AND LOCATION

The proposed 2.8 MWDC solar facility will be located on the 12-acres rural, agricultural tracts of land that have been previously disturbed for agriculture activities and are currently owned by CMS Electric Cooperative. The current site location is an open field that would avoid any known floodplains, wetlands or streams, and will require minimal grading and no tree clearing. The disturbance of land will be limited to the approximately 12-acre owned Area of Potential Effect (APE) during construction. No current structures exist on the proposed site requiring demolition or disturbance.

The construction phase of the Project, which includes grading, will be planned and designed to minimize the use of mechanized grading and fill materials procured off site. Controls, such as silt fences and stabilization, will be used during and after construction as needed to minimize indirect adverse environmental effects.

After construction, the proposed Project would be in operation seven days per week during conditions of adequate sunlight. Anticipated activities to support and maintain operation would consist of visits to inspect, monitor, and report the system operations and site conditions, as well as to repair or replace any equipment as necessary. These visits would total less than one average daily trip over the life of the Project. The Project will be fenced prior to operation to prevent unauthorized access to protect both the Project and the public safety. The site is also located adjacent to an existing substation to allow for ease of interconnection to the existing electric grid. Any necessary fencing, connections, and roads for the Project are included in the APE for the Project and thus in the Agency evaluations of the effected environment. Interconnecting utility lines and fencing not listed as part of the project will be constructed entirely separately by the local utility after the Project is constructed and with separate funding. An exhibit showing the proposed solar facility's location in relation to the existing substation is provided in Appendix A.

1.2 PURPOSE AND NEED

The purpose of this Project is to provide a clean and renewable energy source to the existing electrical grid in the area. TPI is partnering with CMS Electric Cooperative to construct this Project and improve the reliability and capacity of the power system in the area by providing clean, renewable energy.

2.0 ALTERNATIVES EVALUATED INCLUDING THE PROPOSED ACTION

2.1 PROPOSED ACTION

The proposed project is the construction of a 12-acre, 2.8-Megawatt solar electric array located on land previously cleared and developed for agricultural use. The Project will interconnect to the CMS Electric Cooperative electric distribution system which would require little to no upgrades. The solar array is located northwest of Coldwater near the intersection of CM Road 11 and CM Ave. H.

The Project has been sited on private property currently owned by CMS Electric Cooperative to avoid floodplains, wetlands, streams, and to minimize the need for clearing, and grading. The site is also located adjacent to an existing substation to provide ease of connection to the electric grid.

The construction phase of the Project, which includes grading, will be planned and designed to minimize the use of mechanized grading and fill materials procured off site. Controls, such as silt fences and stabilization, will be used during and after construction as needed to minimize indirect adverse environmental effects.

2.2 OTHER ALTERNATIVES EVALUATED

TPI considered the potential sites in the area of need in terms of those which they own or could lease, those which would avoid floodplains, wetlands, streams, and those which would require a minimal need for clearing and grading. The site was chosen as it minimizes all potential negative social and environmental impacts and is already owned by CMS Electric Cooperative.

2.3 NO ACTION ALTERNATIVE

The purpose of this Project is to provide a clean and renewable energy source to the existing electrical grid in the area. The proposed Project will require the conversion of 12 acres of potential farmland and will have an anticipated increase in air quality due to the use of a significant renewable energy source for the existing power grid when compared to the existing use of fossil fuel.

The ‘no action alternative’ would continue to rely upon fossil fuel for power to the existing power grid. The ‘no action alternative’ would not provide additional power to the area, nor would it provide the environmental benefits of clean, renewable energy.

3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

3.1 LAND USE

3.1.1 LAND OWNERSHIP AND USE

Current land use for the Project consists of undeveloped rural and agricultural areas on privately owned land. The property is currently zoned as Agricultural Use. No known development plans are known to exist for the area and CMS Electric Cooperative currently owns the property upon which the array is to be constructed.

3.1.2 IMPORTANT FARMLAND

AFFECTED ENVIRONMENT

The site is located on land previously disturbed for agriculture activities. The proposed Project will be located on rural, agricultural tracts of land in Kansas northwest of the city of Coldwater in Comanche County, near the intersection of CM Road 11 and CM Ave. H. According to the Natural Resources Conservation Service (NRCS) website, the site is located within prime farmland.

ENVIRONMENTAL CONSEQUENCES

Proposed Project location and description as well as the applicable AD-1006 form were all forwarded to the U.S. Department of Agriculture – Natural Resources Conservation Service (NRCS) on February 23rd, 2021 regarding impact on important farmland for the Project. The completed form resulted in a score of 125; as the score for the proposed site was less than 160 per the completed AD-1006 form no alternative actions needed to be considered to reduce potential adverse impacts to the environment per NRCS. The completed form can be found in Appendix C.

3.1.3 FORMALLY CLASSIFIED LANDS

AFFECTED ENVIRONMENT

The National Map provided by the USGS was referenced for any known Formally Classified Lands. The map may be found in Appendix B. There are no known: National Parks and Monuments; National Forests and Grasslands; National Historic Landmarks; National Battlefield and Military Parks; National Historic Sites and Historical Parks; National Natural Landmarks; National Wildlife Refuges; National seashores, lake shores, and trails; Wilderness areas; Wild, scenic, and recreational rivers; State parks; State fish and wildlife management areas; Bureau of Land Management (BLM) administered lands; or Native American owned lands and leases administered by the Bureau of Indian Affairs (BIA) located in the Project APE.

ENVIRONMENTAL CONSEQUENCES

The site and APE are located on land that is owned by CMS Electric Cooperative. According to the National Map, there are no known Formally Classified Lands as defined above located in the Project APE. Therefore, no impact to any Formally Classified Lands is anticipated as a result of the Project.

3.2 FLOODPLAINS

AFFECTED ENVIRONMENT

The site is located on land outside of existing floodplains. The avoidance of floodplains was one of the initial criteria for site selection.

A project area map adapted from the Federal Emergency Management Agency's (FEMA) website (msc.fema.gov) and showing the Project location were unavailable as FEMA has not completed a study to determine flood hazard for the selected location; therefore, a flood map has not been published at this time. TPI also contacted Comanche County on February 26th, 2021 for concurrence that the proposed Project was outside of any flood plain; however, no response was received as of today's date. All correspondence can be found in Appendix D.

According to the attached NRCS web soil survey for the site, provided in Appendix D, the soils at the proposed site have a Flooding Frequency Class of "none", meaning that flooding is not probable and nearly 0% in any year.

ENVIRONMENTAL CONSEQUENCES

Based upon all available data for this Project, no floodplain is located in the area, and no environmental impact is anticipated to any floodplain as a result of this Project.

3.3 WETLANDS

AFFECTED ENVIRONMENT

The site is located on land outside of existing wetlands. The avoidance of wetlands was one of the initial criteria for site selection. The proposed Project is not in a known wetland per the USFWS National Wetlands Inventory. USFWS wetlands for the surrounding area are indicated on the attached map, which can be found in Appendix D.

ENVIRONMENTAL CONSEQUENCES

As there are no wetlands in the APE for the Project, and the construction of the project will involve controls and best management practices to control any discharge from the site, there is no anticipated impact to any wetlands as a result of this Project.

3.4 WATER RESOURCES

AFFECTED ENVIRONMENT

According to the attached map, located in Appendix E, using the EPA's Sole Source Aquifer online data-viewer, the proposed Project is not within the limits of a sole source aquifer. The proposed Project is also not within a known well-head or watershed protection area. The nearest receiving stream to the proposed Project is a tributary to Cavalry Creek located approximately 900 feet to the West of the Project APE.

ENVIRONMENTAL CONSEQUENCES

All necessary permits will be in place prior to construction. Controls, such as silt fences, stabilization, and other Best Management Practices (BMPs) will be used as a requirement of the Land Disturbance Permit and Stormwater Pollution Prevention Plan during and after construction as needed to minimize any potential indirect adverse environmental effects to water quality. During construction activities, routine inspections will also take place to ensure that these controls are implemented correctly.

As solar panels are not considered impermeable surfaces and the Project will not result in any new effluent discharge, stormwater quality is not anticipated to be significantly affected by the Project. Furthermore, the proposed Project is not within the limits of a sole source aquifer, a known well-head or watershed protection area. No effects or impacts to water resources are anticipated as a result of the proposed Project.

3.5 COASTAL RESOURCES

AFFECTED ENVIRONMENT

There are no coastal areas or protected aquatic habitats in the region.

ENVIRONMENTAL CONSEQUENCES

As there are no coastal areas or protected aquatic habitats in the region, no impact to those areas is anticipated by the Project.

3.6 BIOLOGICAL RESOURCES

3.6.1 FISH, WILDLIFE, AND VEGETATION

AFFECTED ENVIRONMENT

The site is located on land previously disturbed for agriculture activities. The proposed Project will be located on rural, agricultural tracts of land in Kansas northwest of the city of Coldwater in Comanche County, near the intersection of CM Road 11 and CM Ave. H. The construction phase of the Project, which includes grading, will be planned and designed to minimize the potential need of mechanized grading and fill materials procured off site. At present, the proposed Project site contains minimal wildlife or vegetative life.

ENVIRONMENTAL CONSEQUENCES

There are no surface waters within the Project limits providing no suitable habitat for fish and BMPs and controls will be used to prevent any offsite impacts to the environment. The cleared former farmland that will be converted to a solar facility also currently provides little suitable habitat in general for native vegetation or wildlife on the Project site. No effects upon fish, wildlife or vegetation are anticipated as a result of this Project.

3.6.2 THREATENED AND ENDANGERED SPECIES

AFFECTED ENVIRONMENT

TPI accessed the U.S. Fish and Wildlife Service (USFWS) Information for Planning and Conservation (IPaC) website on February 24th, 2021. According to the website, there are two endangered species that may be present in the APE of the proposed Project, the Whooping Crane and the Arkansas River Shiner. The official IPaC species list is provided in Appendix G. An updated IPaC species list was accessed on August 19th, 2021 which confirmed that no additional threatened or endangered species were present within the APE of the proposed Project. An additional updated updated IPaC species list was accessed on January 31st, 2022 which included a candidate species, the Monarch Butterfly, that may be present within the APE of the proposed Project.

ENVIRONMENTAL CONSEQUENCES

A Biological Assessment was prepared on February 24th, 2021 using IPAC to assess the effects of the proposed Project and determine whether the Project may affect the Whooping Crane or Arkansas River Shiner. TPI determined that the proposed Project is outside of any suitable habitat and that the Project will have no effect on the Whooping Crane or the Arkansas River Shiner, nor result in the adverse modification of any critical habitat present. This determination was submitted to the USFWS field office for review and comment. The USFWS field office responded with their concurrence on March 30th, 2021. The Monarch Butterfly's preferred habitat consists of open fields and meadows with milkweed and flowering plants while the proposed Project is proposed to be constructed within a previously cleared agricultural area. There is no suitable habitat for the Monarch Butterfly within the APE. The Project will have no effect on the Monarch Butterfly, nor result in the adverse modification of any critical habitat present.

Per the request of the USFWS, TPI also contacted the Kansas Department of Wildlife, Parks, and Tourism for their review and comment on April 26th, 2021. As of today's date, no response was received by the Kansas Department of Wildlife, Parks, and Tourism. All correspondence can be found in Appendix G. No environmental impact is anticipated to any threatened or endangered species as a result of this Project.

3.6.3 MIGRATORY BIRD TREATY ACT

AFFECTED ENVIRONMENT

TPI accessed the U.S. Fish and Wildlife Service (USFWS) Information for Planning and Conservation (IPaC) website on February 24th, 2021. According to the website, there are four birds of concern with potential ranges that overlap the Project location. These birds are: the Bald Eagle, Harris's Sparrow, the Lark Bunting, and the Red Headed Woodpecker. The official IPaC species list is provided in Appendix G. An updated IPaC species list was also accessed on August 19th, 2021 which showed that the Harris's Sparrow was no longer a bird of concern for the Project location, while the Black Tern was now added to the bird of concern list in its place. The Bald Eagle is discussed in its own section 3.6.4, below.

ENVIRONMENTAL CONSEQUENCES

The proposed Project will consist of the construction of ground-mounted solar arrays, which will pose no risk to migratory birds in flight and will take place upon fallow land, which provides little suitable wildlife habitat for any listed species and no reason to cause an impact upon their existing flight patterns. Solar panels at the site will be photovoltaic, which shall absorb sunlight, and which are the only solar panel type approved for use by the Audubon Society due to their relatively low impact upon birds (https://www.audubon.org/news/solar-power-and-birds). Furthermore, construction of the proposed solar facility is anticipated to begin in October, which is outside of the breeding season for all species listed, and outside of the timeframes of significant probability of presence for all listed species according to the USFWS IPaC website results provided in Appendix G. No impact or take of any listed species is anticipated by the Project.

3.6.4 BALD AND GOLDEN EAGLE PROTECTION ACT

AFFECTED ENVIRONMENT

TPI accessed the U.S. Fish and Wildlife Service (USFWS) Information for Planning and Conservation (IPaC) website on February 24th, 2021. According to the website, the Bald Eagle is a bird of concern in the Project area. The official IPaC species list is provided in Appendix G.

ENVIRONMENTAL CONSEQUENCES

The proposed Project will consist of the construction of ground-mounted solar arrays, which will pose no risk to migratory birds in flight and will take place upon fallow land, which provides little suitable wildlife habitat for the Bald Eagle and would not cause an impact upon their existing flight patterns. Solar panels at the site will be photovoltaic, which shall absorb sunlight, and which are the only solar panel type approved for use by the Audubon Society due to their relatively low impact upon birds (https://www.audubon.org/news/solar-power-and-birds). Furthermore, construction of the proposed solar facility is anticipated to begin in October, which is outside of the timeframe of significant probability of presence for the Bald Eagle according to the USFWS IPaC website results provided in Appendix G. No disturbance, impact or take of the Bald Eagle is anticipated by the Project.

3.6.5 INVASIVE SPECIES

AFFECTED ENVIRONMENT

Many invasive species have potential to be found throughout Kansas (https://www.kansasforests.org/forest_health/invasivespecies.html). As such, some invasive species may be present in the APE. However, in general, the proposed Project site has no known invasive species present, only native growth from former farmland.

ENVIRONMENTAL CONSEQUENCES

Due to the minimized need for earthwork and thus fill material necessary from offsite, as well as the absence of surface water near the Project location, and the maintenance of any such vegetation at the site during operation, the Project will not promote the introduction or growth of invasive species and is anticipated to have no effect upon native species in the APE.

3.7 CULTURAL RESOURCES AND HISTORIC PROPERTIES

AFFECTED ENVIRONMENT

The site is located on land previously disturbed for agriculture activities and currently owned by CMS Electric Cooperative. The proposed solar array will be located on rural, agricultural tracts of land in Kansas northwest of the city of Coldwater in Comanche County, near the intersection of CM Road 11 and CM Ave. H. According to the Kansas State Historic Preservation Office's National and State Registers of Historic Places no historic or cultural resources were located within the Project area.

ENVIRONMENTAL CONSEQUENCES

The Kansas State Historic Preservation Office (SHPO) was contacted for their review and comment on the proposed Project on February 23rd, 2021. In accordance with the online Tribal Directory Assessment Tool (TDAT), the following Indian tribes were contacted on February 23rd, 2021 regarding the proposed Project: Cheyenne and Arapaho Tribes, Oklahoma, Osage Nation, the United Keetowah Band of Cherokee Indians in Oklahoma, and the Wichita and Affiliated Tribes. A finding of "no historic properties affected," was provided to each listed Indian Tribe on March 17th, 2021.

At the request of the Cheyenne and Arapaho Tribes, Oklahoma, a cultural resource survey was conducted by Historic Preservation Associates, LLC for the proposed Project. Regarding the Project, the survey stated that "there are no historic properties that may be affected by the undertaking". The cultural resource survey was provided to the Cheyenne and Arapaho Tribes, Oklahoma on May 25th, 2021.

The Kansas SHPO provided their concurrence on March 11th, 2021 finding that "the proposed project will not affect any properties listed" and that "as far as this office is concerned, the project may proceed." The United Keetowah Band of Cherokee Indians in Oklahoma provided their concurrence on February 23rd, 2021 and the Osage Nation provided their concurrence on December 17th, 2021. As of today's date, no further response was received by the Cheyenne and Arapaho Tribes, Oklahoma, and the Wichita and Affiliated Tribes.

All tribal and SHPO correspondence as well as an Unanticipated Discovery Plan for the protection of cultural resources during construction of the Coldwater Solar Facility can be found in Appendix H. Given the above discussion, it is concluded that the proposed undertaking will have no effect on historic properties or cultural resources.

3.8 AESTHETICS

AFFECTED ENVIRONMENT

The site is located on fallow land previously disturbed for agriculture activities and currently owned by CMS Electric Cooperative. The proposed solar array will be located on rural, agricultural tracts of land outside of any aesthetically sensitive location such as a scenic area or park and adjacent to an existing substation.

ENVIRONMENTAL CONSEQUENCES

The Project will place photovoltaic panels over the 12 acres shown on the APE, outside of any scenic or otherwise aesthetically sensitive area. Due to the limited height of these structures, the existing substation of a taller height that is located adjacent to the Project, and the existing fallow land that they will be placed upon, no significant adverse impact upon the aesthetics of the area are anticipated by the Project.

3.9 AIR QUALITY

AFFECTED ENVIRONMENT

The attached report, located in Appendix I, using the EPA provided NEPAssist tool shows that the proposed Project is not within EPA-designated non-attainment or maintenance areas for air quality criteria pollutants.

ENVIRONMENTAL CONSEQUENCES

As shown in the above referenced report, the Project is outside of any EPA-designated non-attainment or maintenance areas for air quality criteria pollutants.

Short term increases to dust due to construction for the Project will be negligible due to the usage of BMPs, such as silt fences and stabilization, which will be used during and after construction as needed to minimize any indirect adverse environmental effects.

Short term increases to emissions from construction vehicles may also be expected during the construction phase of the project, but this incidental increase is not anticipated to have any noticeable effect due to the short duration of construction. Additionally, long term air quality in the area should benefit given the lower emissions anticipated due to the implementation of a significant renewable energy source for the existing power grid.

3.10 SOCIO-ECONOMIC & ENVIRONMENTAL JUSTICE

Applicants are required to determine if their proposal has or may have a disproportionately high and adverse human health or environmental effects on minority and low-income populations under E.O. 12898 *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations* and USDA Departmental Regulation DR 5600-2, *Environmental Justice*.

AFFECTED ENVIRONMENT

The U. S. Census Bureau data for Comanche County, KS was reviewed for 2010-2020 and is provided in Appendix J. It shows a population of 95.8% white, with an 11.6% poverty rate, and a reported growth trend during that time of -10.1%.

Per the attached report, also located in Appendix J, using the EPA provided EJScreen tool, the proposed Project is too small or sparsely populated to generate a report.

The proposed Project is within an undeveloped, agricultural area already owned by CMS Electric Cooperative. The development of the Project is not anticipated to impact the lives of the population. There are no known environmental issues within the APE that would be expected to pose an environmental justice risk. The surrounding area, and local services and public facilities will not be affected by the Project beyond being provided the availability of a renewable, solar source of electric energy.

ENVIRONMENTAL CONSEQUENCES

The proposed Project is being designed to meet the future power needs for growth and stability of all residents in the area by providing them clean, renewable energy. The Project is not considered an environmental risk or controversial and will not displace any current residents, nor will it adversely impact local public facilities or public services.

Based on this and the results of the attached form RD 2006-38, TPI determined that financial assistance for this Project will have no major Environmental Justice or civil rights impact.

3.11 MISCELLANEOUS ISSUES

3.11.1 NOISE

AFFECTED ENVIRONMENT

The site is located on land previously disturbed for agriculture activities and currently owned by CMS Electric Cooperative. The proposed solar array will be located on rural, agricultural tracts of land in Kansas northwest of the city of Coldwater in Comanche County, near the intersection of CM Road 11 and CM Ave. H. Current noise levels for the site are typical of a rural, agricultural area located beside a roadway. Based upon aerial images of the site, the nearest residences are located approximately 0.3 miles away.

ENVIRONMENTAL CONSEQUENCES

Any noise produced by construction of the facility will be localized and temporary for the extent of the construction activity. Manual equipment installation will be utilized whenever possible to reduce the need for mechanized equipment that would increase noise during the construction phase and no specialized equipment that would generate loud noise is proposed to be used at the site. The level of noise that is anticipated to be produced by the proposed solar facility will not be greater than current ambient noise levels in the area. The proposed Project is anticipated to have no effect upon the noise pollution in the area.

3.11.2 TRANSPORTATION

3.11.2.1 FEDERAL AVIATION ADMINISTRATION

AFFECTED ENVIRONMENT

The attached map, located in Appendix L, using the EPA provided NEPAssist tool shows that the proposed Project is not within 5 linear miles of an airport.

ENVIRONMENTAL CONSEQUENCES

Section 14 CFR 77.9 states that if requested by the FAA, or if you propose those types of construction or alteration listed in Section 14 CFR 77.9 (a) - 77.9 14 CFR (e), that you must file notice with the FAA. As the Project is over 5 miles from an airport and site developments are not expected to be 200 feet above the ground surface, none of the requirements of Section 14 CFR 77.9 (a) – 14 77.9 14 CFR (e) have been met which would require the filing of notification with the FAA. Section 14 CFR 77.9 is located in Appendix L. No impact to air traffic is expected as a result of this Project.

3.11.2.2 TRAFFIC

AFFECTED ENVIRONMENT

The site is located in Kansas northwest of the city of Coldwater in Comanche County, near the intersection of CM Road 11 and CM Ave. H. along a gravel roadway.

ENVIRONMENTAL CONSEQUENCES

The construction activities for the Project do not propose to impact traffic patterns, nor have any impact upon the existing roadway. In total, project construction is anticipated to last for 2 months and no obstruction to traffic is anticipated during construction. Periodic inspection of the site and maintenance activities for the site will be required once built, but will be negligible in terms of long-term impact to current traffic patterns and amounting to less than one average daily trip. No impact upon traffic is anticipated as a result of this Project.

3.12 HUMAN HEALTH AND SAFETY

3.12.1 ELECTROMAGNETIC FIELDS AND INTERFERENCE

AFFECTED ENVIRONMENT

The proposed Project will be located on rural, agricultural tracts of land in Kansas northwest of the city of Coldwater in Comanche County, near the intersection of CM Road 11 and CM Ave. H. on land currently owned by CMS Electric Cooperative. The proposed Project location site is located approximately 2 miles outside of the city of Coldwater, beside an existing electrical substation and over 0.4 miles away from the nearest occupied residence.

As the Project will involve the construction of a solar panel array that will generate electricity, Electromagnetic Fields (EMFs) may be generated. Studies (Tell, 2015) based upon similar facilities suggest that any EMFs generated will be below permissible exposure thresholds. The abstract of this study states: “A solar facility converts direct current generated by the solar panels to three-phase 60-Hz power that is fed to the grid. This conversion involves sequential processing of the direct current through an inverter that produces low-voltage three-phase power, which is stepped up to distribution voltage (∼12 kV) through a transformer. This study characterized magnetic and electric fields between the frequencies of 0 Hz and 3 GHz at two facilities operated by the Southern California Edison Company in Porterville, CA and San Bernardino, CA. Static magnetic fields were very small compared to exposure limits established by IEEE and ICNIRP. The highest 60-Hz magnetic fields were measured adjacent to transformers and inverters, and radiofrequency fields from 5–100 kHz were associated with the inverters. The fields measured complied in every case with IEEE controlled and ICNIRP occupational exposure limits. In all cases, electric fields were negligible compared to IEEE and ICNIRP limits across the spectrum measured and when compared to the FCC limits (≥0.3 MHz).”

ENVIRONMENTAL CONSEQUENCES

Current scientific literature such as the above referenced study, as well as the attached similar studies, located in Appendix M, suggest that electromagnetic fields that are generated from similar solar facilities operate below acceptable exposure levels, with the highest EMFs present at three feet of distance from the inverter units used. The solar facility is proposed to be located over 1000 feet away from any occupied residence and will be fenced off prior to operation to prevent unauthorized access. As a result, no impact to human health and safety are anticipated as a result of exposure to EMFs due to this Project.

3.12.2 ENVIRONMENTAL RISK MANAGEMENT

AFFECTED ENVIRONMENT

The attached report, located in Appendix K, using the EPA provided NEPAssist tool shows that the proposed Project is not within EPA-designated areas for existing hazardous waste facilities, toxic release inventories, or TSCA sites.

The proposed Project will be located on agricultural tracts of land in Kansas on land without any existing facilities that is currently owned by CMS Electric Cooperative. The site is not anticipated to have any hazardous material, lead, or petroleum products within the APE.

ENVIRONMENTAL CONSEQUENCES

As shown in the above referenced report, the Project is outside of any existing RCRA facilities, toxic release inventories, or TSCA sites, and will not produce any hazardous material or waste or consist of a new RCRA hazardous materials handling facility. No effect to environmental risk management is anticipated.

3.13 CORRIDOR ANALYSIS

AFFECTED ENVIRONMENT

Connection to the existing electrical grid will be completed by CMS Electric Cooperative to the substation located adjacent to the Project and within the 12- acre area of the project. Interconnecting utility lines not listed as part of the project will be constructed entirely separately by the local utility after the Project is constructed and with separate funding.

ENVIRONMENTAL CONSEQUENCES

The interconnection point will take place toward the existing substation directly south of the site and within the project's area of potential effect. The interconnection will also be constructed entirely separately by the local utility after the Project is constructed and with separate funding. The future interconnection is anticipated to have no impact outside of those listed for the Project.

4.0 CUMULATIVE EFFECTS

4.1 SUMMARY OF ENVIRONMENTAL EFFECTS

Environmental Resource	Determination of Effect
Land Use	No known development plans for the area, CMS Electric Cooperative currently owns the property. No Effect Anticipated.
Farmland	Conversion of approximately 12 acres of farmland, USDA consultation concluded. No Effect Anticipated.
Formally Classified Land	No known Formally Classified Lands within project area. No Effect Anticipated.
Floodplains	No Floodplains within project area. No Effect Anticipated.
Wetlands	No Wetlands within project area. No Effect Anticipated.
Water Resources	No sole source aquifer, well-heads, or watershed protection areas within project area. No Effect Anticipated.
Coastal Resources	No coastal areas or aquatic habitats in region. No Effect Anticipated.

Biological Resources – Fish, Wildlife and Vegetation	Little to no suitable habitat for native vegetation currently within project area. USFWS concurrence granted. No Effect Anticipated.
Biological Resources – Threatened and Endangered Species	No suitable habitat for listed threatened and endangered species currently within project area. USFWS concurrence granted. No Effect Anticipated.
Biological Resources – Migratory Bird Treaty Act	Little suitable habitat for birds of concern within project area. Construction will occur outside of breeding season and significant probability of presence timeframe. No Effect Anticipated.
Biological Resources – Bald and Golden Eagle Protection Act	Little suitable habitat for Bald Eagle within project area. Construction will occur outside of breeding season and significant probability of presence timeframe. No Effect Anticipated.
Biological Resources – Invasive Species	Minimized fill required from offsite and no surface water at project site. Project will not promote the introduction or growth of invasive Species. No Effect Anticipated.
Cultural Resources and Historic Properties	Survey concluded. SHPO and United Keetowah Band of Cherokee Indians in Oklahoma concurrence provided. Consultation concluded for all other tribes. No Effect Anticipated.
Aesthetics	Project is outside of any aesthetically sensitive area. Project will be of limited height and is located adjacent to an existing substation of taller height upon fallow land. No Effect Anticipated.
Air Quality	Project is outside of any EPA-designated non-attainment or maintenance areas for air quality criteria pollutants. Short term increases to dust will be mitigated by BMPs and short term increases to emissions will be negligible during construction. No Adverse Effect Anticipated. Long-term Benefit Anticipated due to clean, renewable energy source.

Socio-Economic & Environmental Justice	Project is not an environmental risk nor controversial and will not displace any current residents, nor will it adversely impact local public facilities or public services. No Effect Anticipated.
Noise	Short-term noise during construction will be controlled by using manual installation methods where possible. Post-construction noise levels will be equivalent to current ambient noise levels in area. No Effect Anticipated.
Transportation	Project is over 5 miles from nearest airport. No significant short-term obstruction to traffic planned for construction. No significant long-term increase to traffic during Project life. No Effect Anticipated.
Human Health and Safety	Highest EMFs would be present at approximately three feet of distance from the inverter units used. Project location is over 1000 feet occupied residences and will be fenced off to prevent unauthorized access. No Effect Anticipated.

4.1 CUMULATIVE EFFECTS

Environmental Resource	Past	Proposed Action	Future Action	Cumulative Effect
Land Use	Agricultural, Rural Area	Convert 12-Acres To A Solar Facility	No Effect Anticipated	No Significant Effect Anticipated
Farmland	Agricultural, Rural Area	Convert 12-Acres To A Solar Facility	No Effect Anticipated	No Significant Effect Anticipated
Formally Classified Land	None Existing Near Project Area	No Effect Anticipated	No Effect Anticipated	No Significant Effect Anticipated
Floodplains	None Existing Near Project Area	No Effect Anticipated	No Effect Anticipated	No Significant Effect Anticipated
Wetlands	None Existing Near Project Area	No Effect Anticipated	No Effect Anticipated	No Significant Effect Anticipated
Water Resources	No Known Sole Source Aquifers, Wells, Or Protection Areas Near Project Area. Receiving Stream ± 900 Feet Distant	No Effect Anticipated	No Effect Anticipated	No Significant Effect Anticipated
Coastal Resources	None Existing Near Project Area	No Effect Anticipated	No Effect Anticipated	No Significant Effect Anticipated
Biological Resources – Fish, Wildlife And Vegetation	Little Suitable Habitat Within Project Area. No Indirect Effects To Surrounding Area	No Effect Anticipated	No Effect Anticipated	No Significant Effect Anticipated
Biological Resources – Threatened And Endangered Species	No Suitable Habitat Within Project Area. No Indirect Effects To Surrounding Area	No Effect Anticipated	No Effect Anticipated	No Significant Effect Anticipated

Biological Resources – Migratory Bird Treaty Act	No Suitable Habitat Within Project Area. No Indirect Effects To Surrounding Area	No Effect Anticipated	No Effect Anticipated	No Significant Effect Anticipated
Biological Resources – Bald And Golden Eagle Protection Act	No Suitable Habitat Within Project Area. No Indirect Effects To Surrounding Area	No Effect Anticipated	No Effect Anticipated	No Significant Effect Anticipated
Biological Resources – Invasive Species	None Known Within Project Area Or Surrounding Area	No Effect Anticipated	No Effect Anticipated	No Significant Effect Anticipated
Cultural Resources And Historic Properties	None Known Within Project Area Or Surrounding Area	No Effect Anticipated	No Effect Anticipated	No Significant Effect Anticipated
Aesthetics	Agricultural, Rural Area Adjacent To Existing Substation	Will Convert 12-Acres Of Potential Farmland To Solar Facility	No Effect Anticipated	No Significant Effect Anticipated
Air Quality	Outside Of EPA-Designated Non-Attainment Or Maintenance Areas For Air Quality Criteria Pollutants	Long-Term Benefit Anticipated	No Effect Anticipated	Long-Term Benefit Anticipated
Socio-Economic & Environmental Justice	No Public Facilities Or Services, Nor Residential Or Commercial Properties In Surrounding Area	No Effect Anticipated	No Effect Anticipated	No Significant Effect Anticipated
Noise	Rural, Ambient Noise Level	No Effect Anticipated	No Effect Anticipated	No Significant Effect Anticipated
Transportation	Light, Rural Traffic. No Airport In Surrounding Area	No Effect Anticipated	No Effect Anticipated	No Significant Effect Anticipated

Human Health And Safety	Vacant Farmland	EMF Potential At Project Area. Project Will Prevent Unauthorized Access. No Effect Anticipated	No Effect Anticipated	No Significant Effect Anticipated

In general, no significant effects are anticipated either individually or cumulatively as a result of the Project both within the 12-acre area of potential effect for the project and for the immediately surrounding area within the next 20 years. No future masterplans for the area are known, nor are in development and no known future developments in the area are anticipated to have a significant effect upon the environmental resources of the area.

Land Use, Aesthetics, and Farmland will change from a rural, agricultural potential farming area to a solar facility as the result of the proposed construction. The solar facility will generate potential EMFs, but the amount that will be generated by such a facility is within safety standards, and the area will also be restricted from unauthorized access. Air Quality is expected to increase in quality over the lifespan of the Project, as the Project will provide cleaner energy than the current alternatives. No other effects are anticipated to provide a significant cumulative effect upon the area.

5.0 SUMMARY OF MITIGATION

The initial criteria for site selection, the use of BMPs such as silt fences and stabilization are anticipated to effectively minimize the potential effects of the Project upon the environment. Conditional approval measures were requested by the Fish and Wildlife Service as well as the interested Tribes, such as working closely with the State Wildlife Agency to avoid impact upon any pending endangered species, and the appropriate actions to be taken in case of incidentally encountering human remains or artifacts in the Project area. All mitigation issues are discussed above as well as in the appropriate appendices, and additional mitigation measures beyond those listed do not appear warranted at this time.

6.0 COORDINATION, CONSULTATION AND CORRESPONDENCE

The following agencies or agency websites were consulted as part of the preparation of this EA, all supporting documentation and agency correspondence is provided in the Appendices:

Cheyenne and Arapaho Tribes

EPA

FAA

FEMA Floodplain Map

Kansas Historical Society

Kansas Department of Wildlife, Parks and Tourism

Comanche County Emergency Management

National Park Service

NEPAssist

Osage Nation

United Keetowah Band of Cherokee Indians in Oklahoma

US Census Data

USDA – NRCS

US Fish and Wildlife Services

Wichita and Affiliated Tribes

7.0 REFERENCES

All supporting documentation and agency correspondence is provided in the Appendices.

EPA EJScreen, last accessed August 8, 2021 https://ejscreen.epa.gov/mapper/

EPA NEPAssist tool, last accessed August 8, 2021. https://nepassisttool.epa.gov/nepassist/nepamap.aspx

EPA–Sole Source Aquifers Mapping System, last accessed August 8, 2021. https://epa.maps.arcgis.com/apps/webappviewer/

FEMA Flood Plain Map, last accessed August 8, 2021. https://msc.fema.gov/portal/home

Klinger, et al. Today's Power Coldwater Solar Facility RUS 1230 – Identification of Historic Properties Historic Preservation Associates, LLC May, 2021.

NRCS Soil Survey, last accessed August 8, 2021. https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm

Tell RA, Hooper HC, Sias GG, Mezei G, Hung P, Kavet R. Electromagnetic Fields Associated with Commercial Solar Photovoltaic Electric Power Generating Facilities. *J Occup Environ Hyg.* 2015;12(11):795-803. doi:10.1080/15459624.2015.1047021

Tribal Directory Assessment Tool (TDAT), last accessed February 23, 2021 https://egis.hud.gov/tdat/

US Census Data, last accessed August 19, 2021. https://www.census.gov/quickfacts/fact/table/comanchecountykansas/PST045219

US Fish and Wildlife Services– Information for Planning and Consultation, last accessed August 19, 2021. https://www.fws.gov/southeast/conservation-tools/information-for-planning-and-consultation/

US Fish and Wildlife Services – National Wetlands Inventory, last accessed August 9, 2021 https://www.fws.gov/wetlands/data/mapper.html

USGS National Map, last accessed August 18, 2021 https://apps.nationalmap.gov/viewer/

8.0 LIST OF PREPARERS

This EA was prepared by:

Matthew Miller, PE

Vice President, Toth & Associates

Joseph Tuey, EI

Engineer, Toth & Associates

Marcus Brundage,

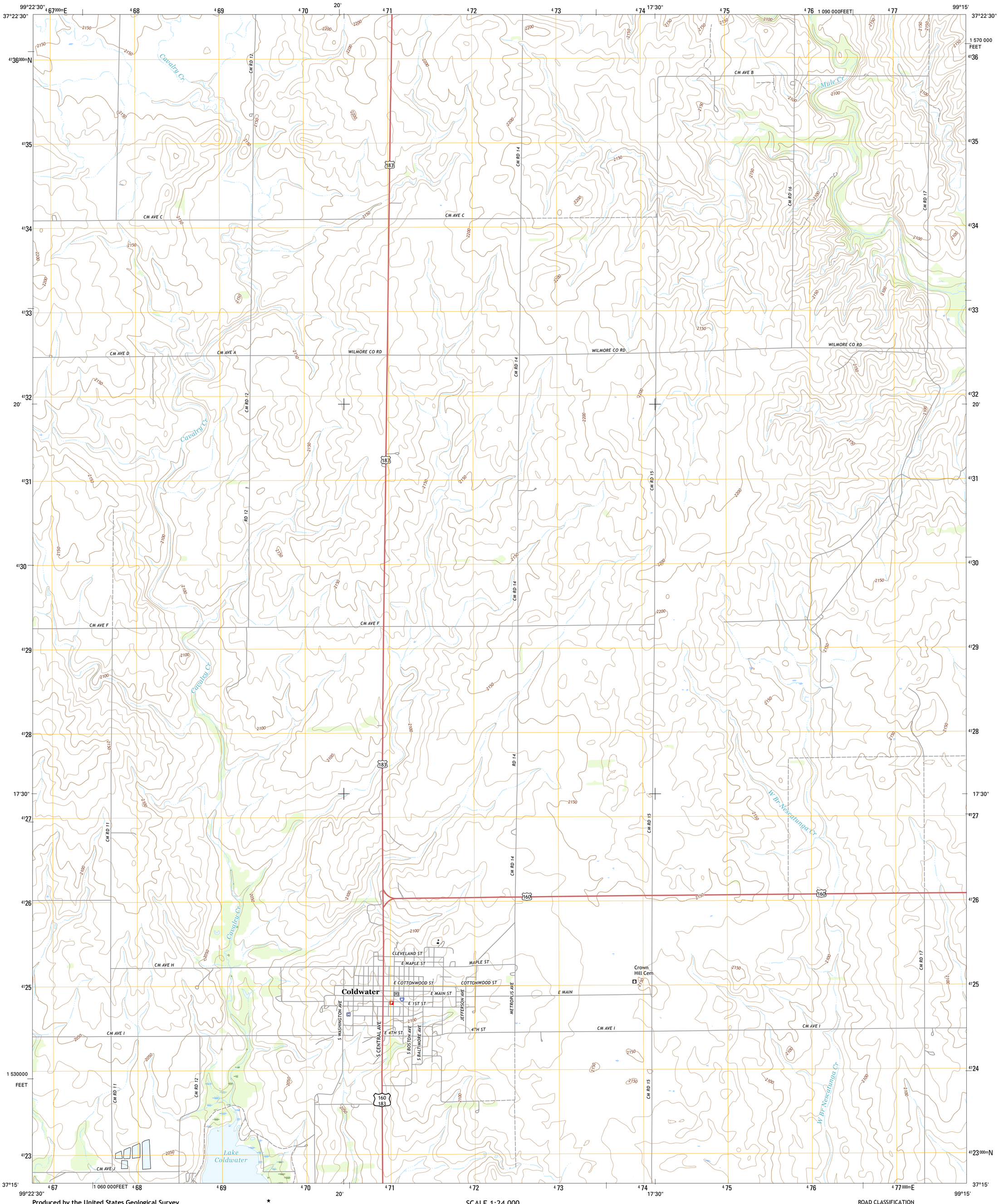
Environmental Protection Specialist, USDA RUS

Appendix A

U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

The National Map
US Topo

COLDWATER QUADRANGLE
KANSAS-COMANCHE CO.
7.5-MINUTE SERIES

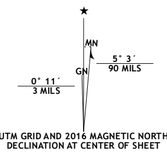


Produced by the United States Geological Survey

North American Datum of 1983 (NAD83)
World Geodetic System of 1984 (WGS84). Projection and 1 000-meter grid: Universal Transverse Mercator, Zone 14S
10 000-foot ticks: Kansas Coordinate System of 1983 (south zone)

This map is not a legal document. Boundaries may be generalized for this map scale. Private lands within government reservations may not be shown. Obtain permission before entering private lands.

Imagery.....NAIP, June 2014
Roads..... U.S. Census Bureau, 2014 - 2015
Names.....GNIS, 2015
Hydrography.....National Hydrography Dataset, 2014
Contours.....National Elevation Dataset, 2006
Boundaries.....Multiple sources; see metadata file 1972 - 2015
Public Land Survey System.....BLM, 2015
Wetlands.....FWS National Wetlands Inventory 1977 - 2014



UTM GRID AND 2016 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

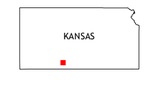
U.S. National Grid
100,000-m Square ID
MG
Grid Zone Designation
14S

SCALE 1:24 000

1 0.5 0 KILOMETERS 1 2
1000 500 0 METERS 1000 2000
1 0.5 0 1
MILES
1000 0 1000 2000 3000 4000 5000 6000 7000 8000 9000 10000
FEET

CONTOUR INTERVAL 10 FEET
NORTH AMERICAN VERTICAL DATUM OF 1988

This map was produced to conform with the National Geospatial Program US Topo Product Standard, 2011.
A metadata file associated with this product is draft version 0.6.19



QUADRANGLE LOCATION

ROAD CLASSIFICATION

Expressway
Secondary Hwy
Ramp
Local Connector
Local Road
4WD
Interstate Route
US Route
State Route

1	2	3
4		5
6	7	8

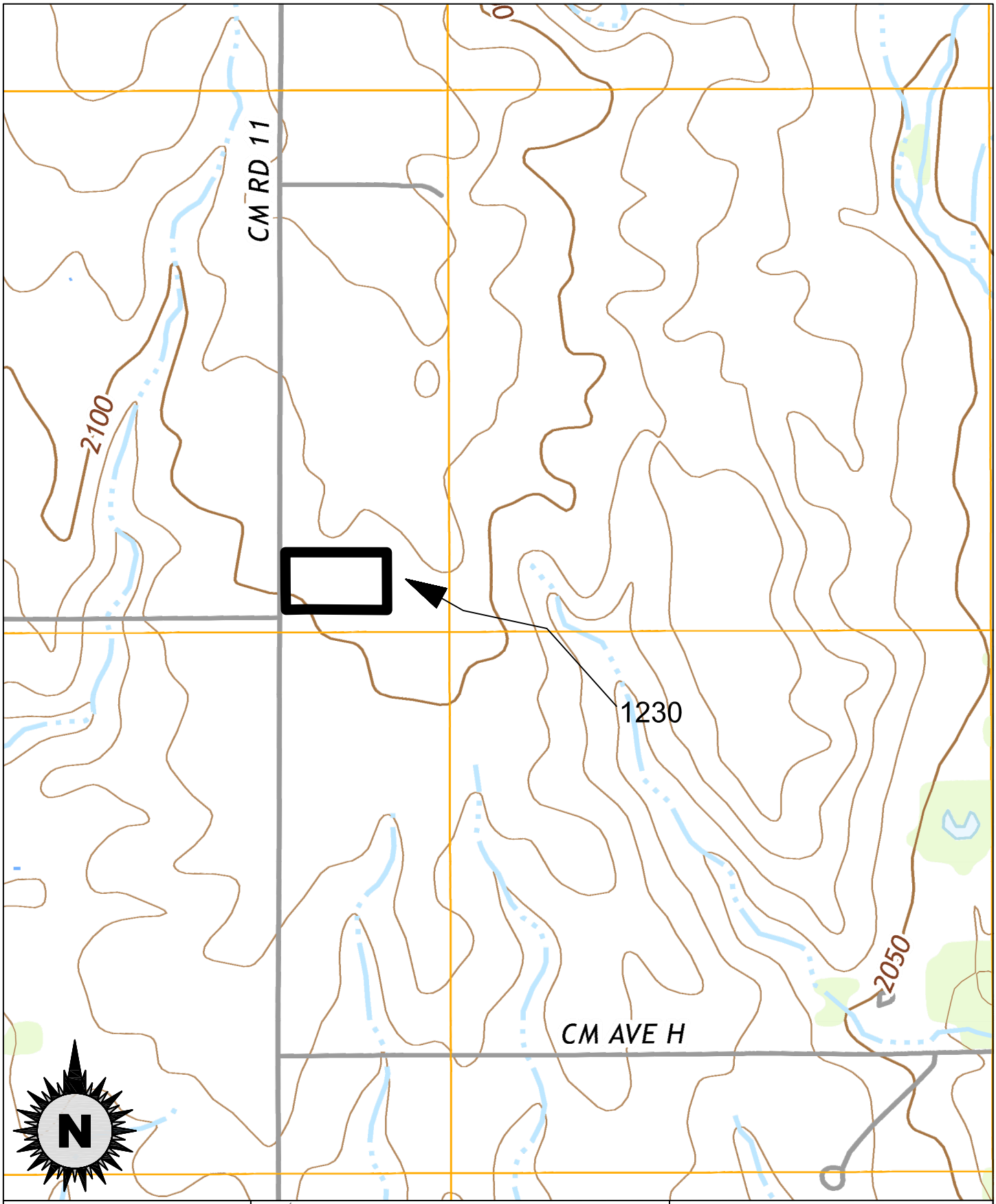
ADJOINING QUADRANGLES

1 East Kiowa Creek North
2 Coldwater NE
3 Iron Mountain
4 East Kiowa Creek South
5 Wilmore
6 Protection
7 Protection NE
8 Nescatunga Creek North

COLDWATER, KS
2016

NSN. 7643016366836
NGA REF NO. USGSX24K9516

ENCLOSURE B



LEGEND:

IMPACT AREA

COLDWATER QUADRANGLE
KANSAS-COMANCHE CO.

Today's Power
Your Energy Partner

COLDWATER SOLAR FACILITY
COLDWATER, KANSAS
COMANCHE COUNTY

DWG BY:	CHK BY:	APR BY:	SCALE:	DATE:	DRAWING:
JDM	JDM	JDM	1" = 800'	2/23/2021	RUS - 1230

RUS 1230

Aerial Image showing the Existing Substation as well as the Proposed Solar Facility.

Appendix B

Formally Classified Lands

8/19/2021, 9:12:52 PM

- Populated Places
- State Capitol Buildings
- Post Offices
- Native American Area
- Bureau of Land Management
- NASA Facility
- Military Reserve
- National Cemetery
- National Grassland
- US Fish & Wildlife Service
- National Wilderness
- National Park
- National Forest
- State or Territory Large-Scale
- County or Equivalent

1:18,056

0 0.17 0.35 0.7 mi

0 0.28 0.55 1.1 km

USGS The National Map: National Boundaries Dataset. Data Refreshed July, 2021., USGS TNM – National Structures Dataset. Data Refreshed July, 2021., USGS The National Map: Geographic Names Information System. Data Refreshed July, 2021., USGS The

USGS
2021 USGS

Appendix C

Today's Power

Your Energy Partner

www.todayspower.com

February 23, 2021

Jeff Hellerich
Natural Resources Conservation Service
760 South Broadway Boulevard
Salina, KS 67401-4604
By Email: ks.nrcs.er.fppa@usda.gov

Dear Mr. Hellerich,

Today's Power, Inc. (TPI) is in the process of preparing a loan application to the USDA Rural Development for the installation of a solar generation facility near the Kansas town of Coldwater in partnership with CMS Electric Cooperative, Inc.

The project involves the construction of the Coldwater Solar Facility. The Coldwater Solar Facility is proposed to be a 1.4 MW DC solar array and a permanent access road. Each of the proposed array will use less than 10 acres of land and will be located on rural, undeveloped tracts of land.

We are requesting the assistance of your office in identifying any areas such as important farmlands or prime forest lands that may be impacted by the project. Please find the enclosed Farmland Conversion Impact Rating Form AD-1006. A project description and USGS map are enclosed for your review. TPI's loan funding and construction progress is dependent upon approval of the project environmental review. We would appreciate your response as soon as possible.

If you need further information, please call me at 618-922-1809. Please return your reply to our office or email your response to jmccann@todayspower.com. Thank you for your assistance with this project review.

Sincerely,

Today's Power, Inc.

Justin McCann, P.E.
Vice President of Engineering

Enclosures:

Enclosure A: RUS 1230 Coldwater Solar Facility Project Description
Enclosure B: RUS 1230 Coldwater Solar Facility Project Map
Enclosure C: RUS 1230 Coldwater Solar Facility AD-1006

Justin McCann

From: SM.FPAC.NRCS.KS.ER.FPPA <KS.NRCS.ER.FPPA@usda.gov>
Sent: Friday, February 26, 2021 7:56 AM
To: Justin McCann
Cc: Hellerich, Jeffrey - NRCS, Salina, KS; Ethridge, Kris - NRCS, Hutchinson, KS; Nester, Brian - NRCS, Salina, KS
Subject: RE: Coldwater Solar Facility EA Review Request
Attachments: RUS 1230 Coldwater Solar Facility AD-1006 Form.pdf; NRCS_Response_FPPA_Letter - Coldwater Solar Facility.pdf

Hello Mr. McCann,

Attached are the Farmland Conversion Impact Rating form (AD-1006) with Parts II, IV and V completed for the Coldwater Solar Facility to be constructed near the city town of Coldwater in Comanche County, Kansas and a response letter to you from the NRCS.

Thanks,

Brian Nester
Soil Scientist
USDA-NRCS
760 S. Broadway
Salina, KS 67401
(785) 823-4581 (office)
(785) 515-8119 (cell)

From: Justin McCann <jmccann@todayspower.com>
Sent: Tuesday, February 23, 2021 6:56 PM
To: SM.FPAC.NRCS.KS.ER.FPPA <KS.NRCS.ER.FPPA@usda.gov>
Cc: Nester, Brian - NRCS, Salina, KS <brian.nester@usda.gov>
Subject: Coldwater Solar Facility EA Review Request

Mr. Hellerich,

Please find the attached letter request for a site review by the NRCS. A Google Earth kmz file is also included for your reference. If you have any questions or concerns about this request, please let us know.

Sincerely,

Justin McCann, PE
Vice President of Engineering
Today's Power, Inc.
Direct: 618-922-1809
Email: jmccann@todayspower.com

USDA
United States Department of Agriculture

February 25, 2021

Mr. Justin McCann, P.E.
Vice President of Engineering
Today's Power, Inc.
7300 Industry Drive
North Little Rock, Arkansas 72117

RE: Farmland Protection Policy Act (FPPA) Request

Dear Mr. McCann:

We received the information that you provided regarding the Coldwater Solar Facility to be constructed near the city town of Coldwater in Comanche County, Kansas.

The Agriculture and Food Act of 1981 (Public Law 97-98) includes provisions for the Farmland Protection Policy Act (FPPA) in Subtitle 1 of Title XV, Sections 1539-1549. This Act is intended to minimize the impact of Federal programs on unnecessary and irreversible conversion of prime and important farmland to nonagricultural uses.

Please find enclosed Form AD-1006, Farmland Conversion Impact Rating. Please note that parts II, IV, and V have been completed by Natural Resources Conservation Service (NRCS). Please complete Parts VI and VII, then return a completed copy by email to: KS.NRCS.ER.FPPA@usda.gov.

If you have any questions or concerns regarding FPPA or Form AD-1006, please contact Jeffrey A. Hellerich, State Soil Scientist, by phone at 785-823-4564 or email jeffrey.hellerich@usda.gov.

Sincerely,

MONTY R. BRENEMAN
Acting State Conservationist

Enclosure

ec:
Jeffrey A. Hellerich, State Soil Scientist, NRCS, Salina, Kansas
Brian K. Nester, Soil Scientist, NRCS, Salina, Kansas
Kris R. Ethridge, Assistant State Conservationist for Field Operations, NRCS, Hutchinson, Kansas

Natural Resources Conservation Service
760 South Broadway Boulevard
Salina, Kansas 67401-4604

Phone: 785-823-4500
FAX: 855-533-5070
www.ks.nrcs.usda.gov

U.S. Department of Agriculture

FARMLAND CONVERSION IMPACT RATING

PART I *(To be completed by Federal Agency)*	Date Of Land Evaluation Request 2/23/2021
Name of Project Coldwater Solar Facility RUS 1230	Federal Agency Involved USDA
Proposed Land Use Power Generation	County and State Comanche County, Kansas
PART II *(To be completed by NRCS)*	Date Request Received By NRCS 2/23/2021 / Person Completing Form: Brian Nester

Does the site contain Prime, Unique, Statewide or Local Important Farmland? *(If no, the FPPA does not apply - do not complete additional parts of this form)*	YES	NO	Acres Irrigated	Average Farm Size
	✔		5,035	2,302

Major Crop(s)	Farmable Land In Govt. Jurisdiction	Amount of Farmland As Defined in FPPA
Wheat	Acres: 505082 % 99.9	Acres: 50508 % 56.7

Name of Land Evaluation System Used	Name of State or Local Site Assessment System	Date Land Evaluation Returned by NRCS
Comanche County	None	2/25/2021

PART III *(To be completed by Federal Agency)*	Alternative Site Rating			
	Site A	Site B	Site C	Site D
A. Total Acres To Be Converted Directly	12.0			
B. Total Acres To Be Converted Indirectly				
C. Total Acres In Site	12.0			
PART IV *(To be completed by NRCS)* Land Evaluation Information				
A. Total Acres Prime And Unique Farmland	12.0			
B. Total Acres Statewide Important or Local Important Farmland	0.0			
C. Percentage Of Farmland in County Or Local Govt. Unit To Be Converted	0.00419			
D. Percentage Of Farmland in Govt. Jurisdiction With Same Or Higher Relative Value	56%			
PART V (To be completed by NRCS) Land Evaluation Criterion Relative Value of Farmland To Be Converted (Scale of 0 to 100 Points)	35			

PART VI *(To be completed by Federal Agency)* Site Assessment Criteria *(Criteria are explained in 7 CFR 658.5 b. For Corridor project use form NRCS-CPA-106)*	Maximum Points	Site A	Site B	Site C	Site D
1. Area In Non-urban Use	(15)				
2. Perimeter In Non-urban Use	(10)				
3. Percent Of Site Being Farmed	(20)				
4. Protection Provided By State and Local Government	(20)				
5. Distance From Urban Built-up Area	(15)				
6. Distance To Urban Support Services	(15)				
7. Size Of Present Farm Unit Compared To Average	(10)				
8. Creation Of Non-farmable Farmland	(10)				
9. Availability Of Farm Support Services	(5)				
10. On-Farm Investments	(20)				
11. Effects Of Conversion On Farm Support Services	(10)				
12. Compatibility With Existing Agricultural Use	(10)				
TOTAL SITE ASSESSMENT POINTS	160	0	0	0	0
PART VII ***(To be completed by Federal Agency)***					
Relative Value Of Farmland *(From Part V)*	100	35	0	0	0
Total Site Assessment *(From Part VI above or local site assessment)*	160	0	0	0	0
TOTAL POINTS ***(Total of above 2 lines)***	260	35	0	0	0

Site Selected:	Date Of Selection	Was A Local Site Assessment Used? YES ☐ NO ☐

Reason For Selection:

Name of Federal agency representative completing this form:	Date:

(See Instructions on reverse side) **Form AD-1006 (03-02)**

STEPS IN THE PROCESSING THE FARMLAND AND CONVERSION IMPACT RATING FORM

Step 1 - Federal agencies (or Federally funded projects) involved in proposed projects that may convert farmland, as defined in the Farmland Protection Policy Act (FPPA) to nonagricultural uses, will initially complete Parts I and III of the form. For Corridor type projects, the Federal agency shall use form NRCS-CPA-106 in place of form AD-1006. The Land Evaluation and Site Assessment (LESA) process may also be accessed by visiting the FPPA website, http://fppa.nrcs.usda.gov/lesa/.

Step 2 - Originator (Federal Agency) will send one original copy of the form together with appropriate scaled maps indicating location(s)of project site(s), to the Natural Resources Conservation Service (NRCS) local Field Office or USDA Service Center and retain a copy for their files. (NRCS has offices in most counties in the U.S. The USDA Office Information Locator may be found at http://offices.usda.gov/scripts/ndISAPI.dll/oip_public/USA_map**,** or the offices can usually be found in the Phone Book under U.S. Government, Department of Agriculture. A list of field offices is available from the NRCS State Conservationist and State Office in each State.)

Step 3 - NRCS will, within 10 working days after receipt of the completed form, make a determination as to whether the site(s) of the proposed project contains prime, unique, statewide or local important farmland. (When a site visit or land evaluation system design is needed, NRCS will respond within 30 working days.

Step 4 - For sites where farmland covered by the FPPA will be converted by the proposed project, NRCS will complete Parts II, IV and V of the form.

Step 5 - NRCS will return the original copy of the form to the Federal agency involved in the project, and retain a file copy for NRCS records.

Step 6 - The Federal agency involved in the proposed project will complete Parts VI and VII of the form and return the form with the final selected site to the servicing NRCS office.

Step 7 - The Federal agency providing financial or technical assistance to the proposed project will make a determination as to whether the proposed conversion is consistent with the FPPA.

INSTRUCTIONS FOR COMPLETING THE FARMLAND CONVERSION IMPACT RATING FORM

(For Federal Agency)

Part I: When completing the "County and State" questions, list all the local governments that are responsible for local land use controls where site(s) are to be evaluated.

Part III: When completing item B (Total Acres To Be Converted Indirectly), include the following:

1. Acres not being directly converted but that would no longer be capable of being farmed after the conversion, because the conversion would restrict access to them or other major change in the ability to use the land for agriculture.
2. Acres planned to receive services from an infrastructure project as indicated in the project justification (e.g. highways, utilities planned build out capacity) that will cause a direct conversion.

Part VI: Do not complete Part VI using the standard format if a State or Local site assessment is used. With local and NRCS assistance, use the local Land Evaluation and Site Assessment (LESA).

1. Assign the maximum points for each site assessment criterion as shown in § 658.5(b) of CFR. In cases of corridor-type project such as transportation, power line and flood control, criteria #5 and #6 will not apply and will, be weighted zero, however, criterion #8 will be weighed a maximum of 25 points and criterion #11 a maximum of 25 points.

2. Federal agencies may assign relative weights among the 12 site assessment criteria other than those shown on the FPPA rule after submitting individual agency FPPA policy for review and comment to NRCS. In all cases where other weights are assigned, relative adjustments must be made to maintain the maximum total points at 160. For project sites where the total points equal or exceed 160, consider alternative actions, as appropriate, that could reduce adverse impacts (e.g. Alternative Sites, Modifications or Mitigation).

Part VII: In computing the "Total Site Assessment Points" where a State or local site assessment is used and the total maximum number of points is other than 160, convert the site assessment points to a base of 160.
Example: if the Site Assessment maximum is 200 points, and the alternative Site "A" is rated 180 points:

$$\frac{\text{Total points assigned Site A}}{\text{Maximum points possible}} = \frac{180}{200} \text{ X } 160 = 144 \text{ points for Site A}$$

For assistance in completing this form or FPPA process, contact the local NRCS Field Office or USDA Service Center.

NRCS employees, consult the FPPA Manual and/or policy for additional instructions to complete the AD-1006 form.

U.S. Department of Agriculture

FARMLAND CONVERSION IMPACT RATING

PART I *(To be completed by Federal Agency)*		Date Of Land Evaluation Request 2/23/2021	
Name of Project Coldwater Solar Facility RUS 1230		Federal Agency Involved USDA	
Proposed Land Use Power Generation		County and State Comanche County, Kansas	
PART II *(To be completed by NRCS)*		Date Request Received By NRCS 2/23/2021	Person Completing Form: Brian Nester
Does the site contain Prime, Unique, Statewide or Local Important Farmland? *(If no, the FPPA does not apply - do not complete additional parts of this form)*	YES ☑ NO ☐	Acres Irrigated 5,035	Average Farm Size 2,302
Major Crop(s) Wheat	Farmable Land In Govt. Jurisdiction Acres: 505082% 99.9	Amount of Farmland As Defined in FPPA Acres: 50508% 56.7	
Name of Land Evaluation System Used Comanche County	Name of State or Local Site Assessment System None	Date Land Evaluation Returned by NRCS 2/25/2021	

PART III *(To be completed by Federal Agency)*	Alternative Site Rating			
	Site A	Site B	Site C	Site D
A. Total Acres To Be Converted Directly	12.0			
B. Total Acres To Be Converted Indirectly				
C. Total Acres In Site	12.0			
PART IV *(To be completed by NRCS)* Land Evaluation Information				
A. Total Acres Prime And Unique Farmland	12.0			
B. Total Acres Statewide Important or Local Important Farmland	0.0			
C. Percentage Of Farmland in County Or Local Govt. Unit To Be Converted	0.00419			
D. Percentage Of Farmland in Govt. Jurisdiction With Same Or Higher Relative Value	56%			
PART V (To be completed by NRCS) Land Evaluation Criterion Relative Value of Farmland To Be Converted (Scale of 0 to 100 Points)	35			

PART VI *(To be completed by Federal Agency)* Site Assessment Criteria *(Criteria are explained in 7 CFR 658.5 b. For Corridor project use form NRCS-CPA-106)*	**Maximum Points**	Site A	Site B	Site C	Site D
1. Area In Non-urban Use	(15)	15			
2. Perimeter In Non-urban Use	(10)	10			
3. Percent Of Site Being Farmed	(20)	20			
4. Protection Provided By State and Local Government	(20)	0			
5. Distance From Urban Built-up Area	(15)	15			
6. Distance To Urban Support Services	(15)	15			
7. Size Of Present Farm Unit Compared To Average	(10)	0			
8. Creation Of Non-farmable Farmland	(10)	10			
9. Availability Of Farm Support Services	(5)	5			
10. On-Farm Investments	(20)	0			
11. Effects Of Conversion On Farm Support Services	(10)	0			
12. Compatibility With Existing Agricultural Use	(10)	0			
TOTAL SITE ASSESSMENT POINTS	160	90	0	0	0
PART VII ***(To be completed by Federal Agency)***					
Relative Value Of Farmland *(From Part V)*	100	35	0	0	0
Total Site Assessment *(From Part VI above or local site assessment)*	160	90	0	0	0
TOTAL POINTS ***(Total of above 2 lines)***	260	125	0	0	0

Site Selected: A	Date Of Selection 08/08/2021	Was A Local Site Assessment Used? YES ☐ NO ☑

Reason For Selection:

Site meets necessary land requirements. All potential sites in the area would require the conversion of equivalent farm land for solar facility requirements.

Name of Federal agency representative completing this form: J. Tuey	Date: 08/08/2021

(See Instructions on reverse side)

Form AD-1006 (03-02)

STEPS IN THE PROCESSING THE FARMLAND AND CONVERSION IMPACT RATING FORM

Step 1 - Federal agencies (or Federally funded projects) involved in proposed projects that may convert farmland, as defined in the Farmland Protection Policy Act (FPPA) to nonagricultural uses, will initially complete Parts I and III of the form. For Corridor type projects, the Federal agency shall use form NRCS-CPA-106 in place of form AD-1006. The Land Evaluation and Site Assessment (LESA) process may also be accessed by visiting the FPPA website, http://fppa.nrcs.usda.gov/lesa/.

Step 2 - Originator (Federal Agency) will send one original copy of the form together with appropriate scaled maps indicating location(s)of project site(s), to the Natural Resources Conservation Service (NRCS) local Field Office or USDA Service Center and retain a copy for their files. (NRCS has offices in most counties in the U.S. The USDA Office Information Locator may be found at http://offices.usda.gov/scripts/ndISAPI.dll/oip_public/USA_map**,** or the offices can usually be found in the Phone Book under U.S. Government, Department of Agriculture. A list of field offices is available from the NRCS State Conservationist and State Office in each State.)

Step 3 - NRCS will, within 10 working days after receipt of the completed form, make a determination as to whether the site(s) of the proposed project contains prime, unique, statewide or local important farmland. (When a site visit or land evaluation system design is needed, NRCS will respond within 30 working days.

Step 4 - For sites where farmland covered by the FPPA will be converted by the proposed project, NRCS will complete Parts II, IV and V of the form.

Step 5 - NRCS will return the original copy of the form to the Federal agency involved in the project, and retain a file copy for NRCS records.

Step 6 - The Federal agency involved in the proposed project will complete Parts VI and VII of the form and return the form with the final selected site to the servicing NRCS office.

Step 7 - The Federal agency providing financial or technical assistance to the proposed project will make a determination as to whether the proposed conversion is consistent with the FPPA.

INSTRUCTIONS FOR COMPLETING THE FARMLAND CONVERSION IMPACT RATING FORM

(For Federal Agency)

Part I: When completing the "County and State" questions, list all the local governments that are responsible for local land use controls where site(s) are to be evaluated.

Part III: When completing item B (Total Acres To Be Converted Indirectly), include the following:

1. Acres not being directly converted but that would no longer be capable of being farmed after the conversion, because the conversion would restrict access to them or other major change in the ability to use the land for agriculture.
2. Acres planned to receive services from an infrastructure project as indicated in the project justification (e.g. highways, utilities planned build out capacity) that will cause a direct conversion.

Part VI: Do not complete Part VI using the standard format if a State or Local site assessment is used. With local and NRCS assistance, use the local Land Evaluation and Site Assessment (LESA).

1. Assign the maximum points for each site assessment criterion as shown in § 658.5(b) of CFR. In cases of corridor-type project such as transportation, power line and flood control, criteria #5 and #6 will not apply and will, be weighted zero, however, criterion #8 will be weighed a maximum of 25 points and criterion #11 a maximum of 25 points.

2. Federal agencies may assign relative weights among the 12 site assessment criteria other than those shown on the FPPA rule after submitting individual agency FPPA policy for review and comment to NRCS. In all cases where other weights are assigned, relative adjustments must be made to maintain the maximum total points at 160. For project sites where the total points equal or exceed 160, consider alternative actions, as appropriate, that could reduce adverse impacts (e.g. Alternative Sites, Modifications or Mitigation).

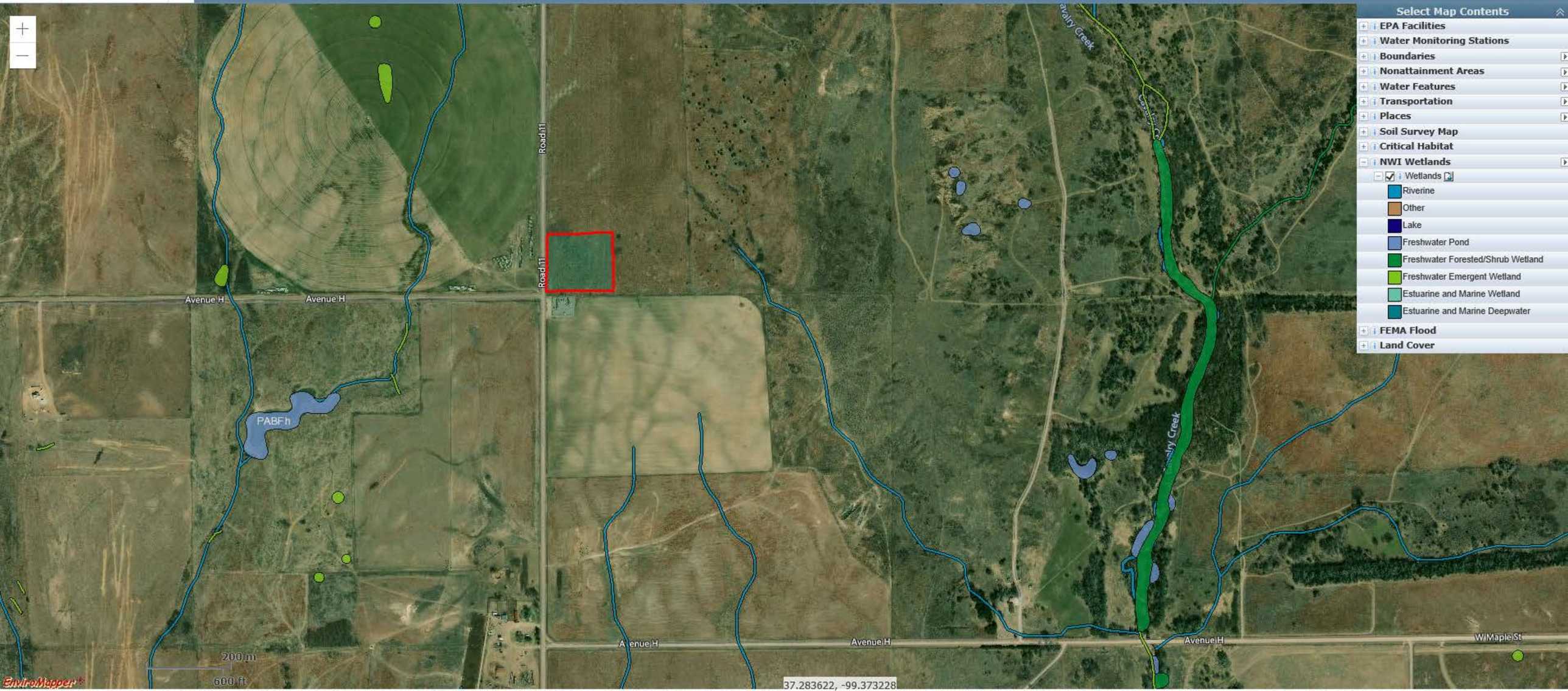
Part VII: In computing the "Total Site Assessment Points" where a State or local site assessment is used and the total maximum number of points is other than 160, convert the site assessment points to a base of 160.
Example: if the Site Assessment maximum is 200 points, and the alternative Site "A" is rated 180 points:

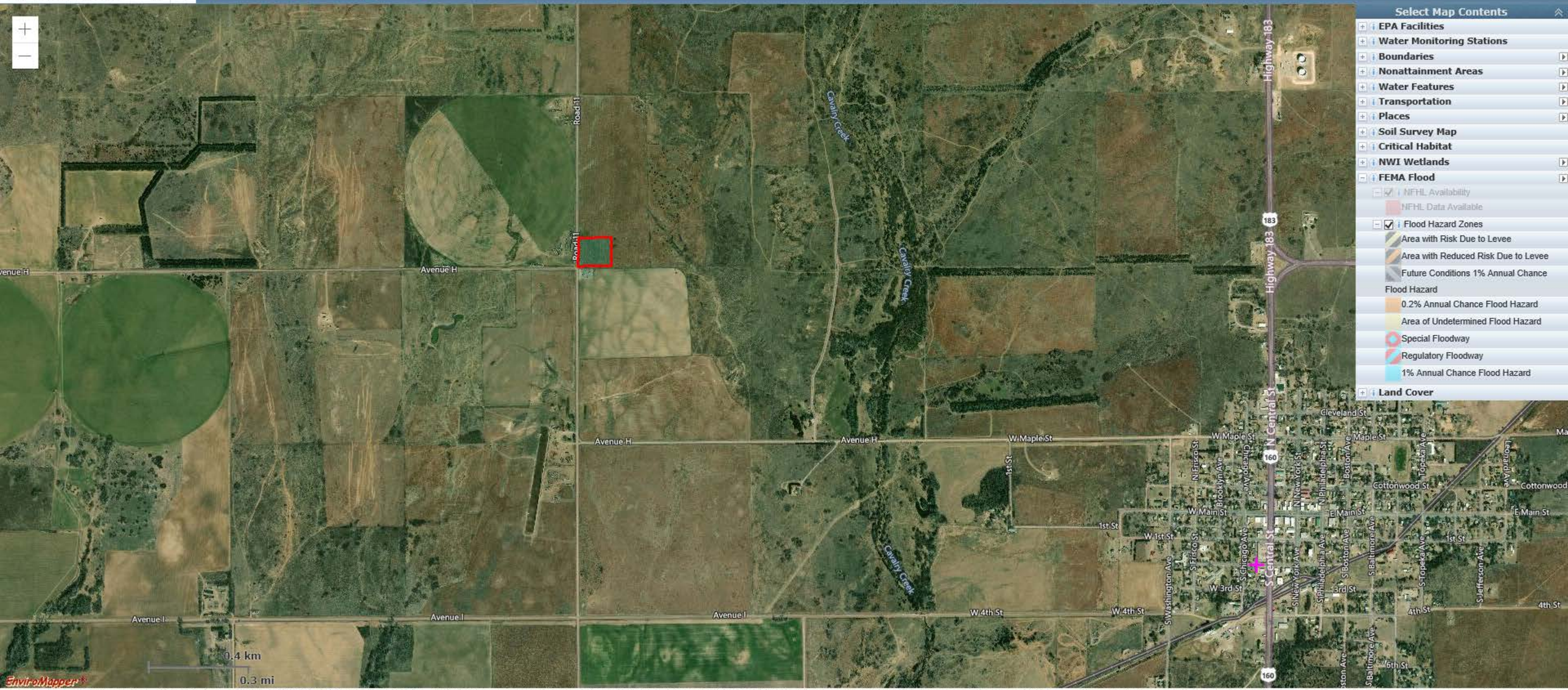
$$\frac{\text{Total points assigned Site A}}{\text{Maximum points possible}} = \frac{180}{200} \text{ X } 160 = 144 \text{ points for Site A}$$

For assistance in completing this form or FPPA process, contact the local NRCS Field Office or USDA Service Center.

NRCS employees, consult the FPPA Manual and/or policy for additional instructions to complete the AD-1006 form.

Appendix D





Today's Power
Your Energy Partner

www.todayspower.com

February 26, 2021

Britt Lenertz
Comanche County Emergency Management
401 South Philadelphia
Coldwater, KS 67029
By Email: brittlenertz@yahoo.com

Dear Ms. Lenertz,

Today's Power, Inc. (TPI) is in the process of preparing a loan application to the USDA Rural Development for the installation of a solar generation facility near the Kansas town of Coldwater in partnership with CMS Electric Cooperative, Inc.

The project involves the construction of the Coldwater Solar Facility. The Coldwater Solar Facility is proposed to be a 2.8 MW DC solar array and a permanent access road. The proposed array will use approximately 12 acres of land and will be located on rural, undeveloped tracts of land.

We are requesting the assistance of your office in identifying any areas of impact such as floodplains by the project. A project description and USGS map are enclosed for your review. TPI's loan funding and construction progress is dependent upon approval of the project environmental review. We would appreciate your response as soon as possible.

If you need further information, please call me at 618-922-1809. Please return your reply to our office or email your response to jmccann@todayspower.com. Thank you for your assistance with this project review.

Sincerely,

Today's Power, Inc.

Justin McCann, P.E.
Vice President of Engineering

Enclosures:

Enclosure A: RUS 1230 Coldwater Solar Facility Project Description
Enclosure B: RUS 1230 Coldwater Solar Facility Project Map

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United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Comanche County, Kansas

August 8, 2021

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require

alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

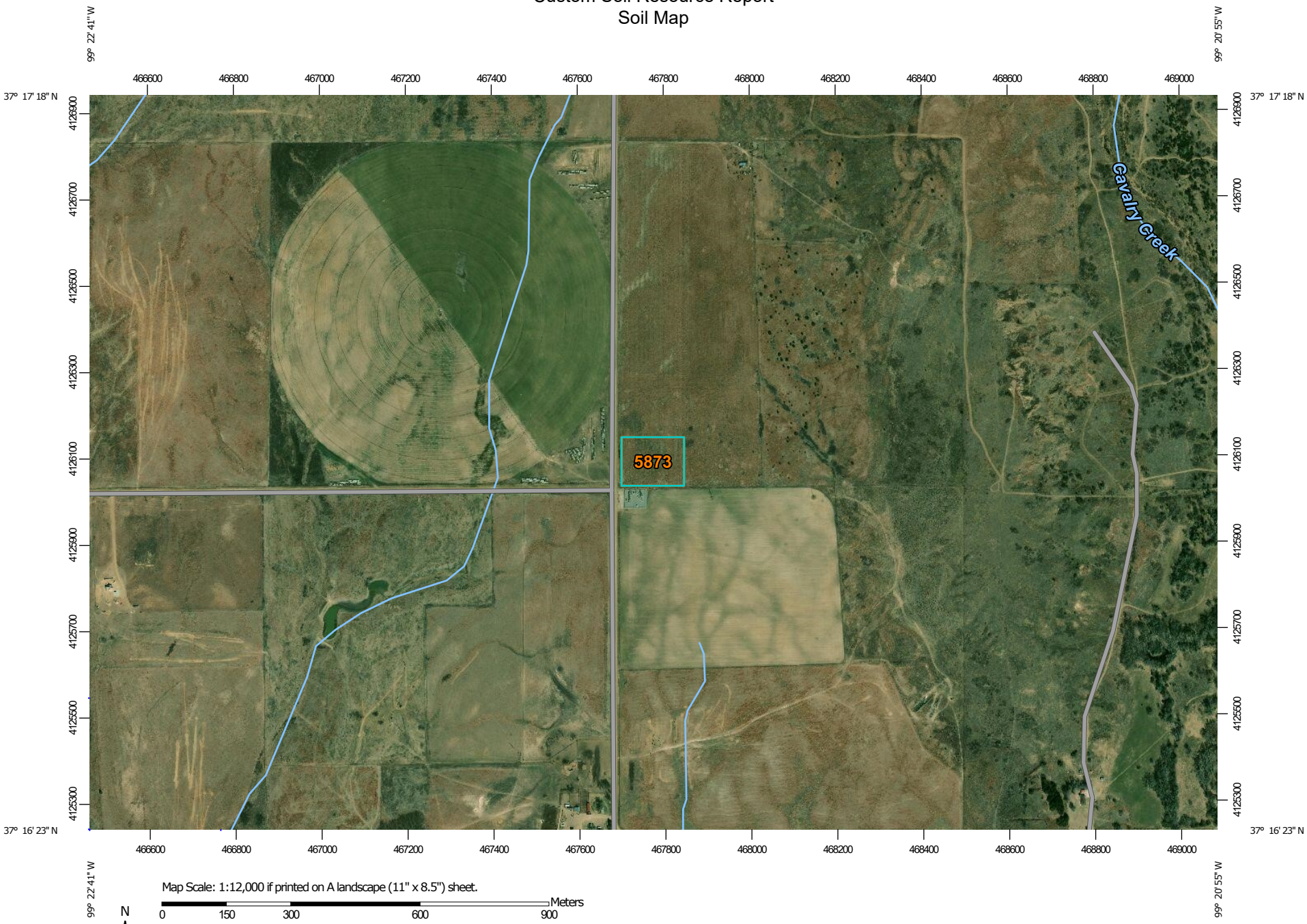
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map



MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Comanche County, Kansas
Survey Area Data: Version 19, Jun 10, 2020

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Aug 5, 2015—Nov 20, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
5873	Clark clay loam, 1 to 3 percent slopes	4.1	100.0%
Totals for Area of Interest		**4.1**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Comanche County, Kansas

5873—Clark clay loam, 1 to 3 percent slopes

Map Unit Setting

National map unit symbol: 1hc9j
Elevation: 1,500 to 2,200 feet
Mean annual precipitation: 24 to 28 inches
Mean annual air temperature: 45 to 72 degrees F
Frost-free period: 200 to 260 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Clark and similar soils: 99 percent
Minor components: 1 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Clark

Setting

Landform: Paleoterraces
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium

Typical profile

A - 0 to 10 inches: clay loam
C - 10 to 60 inches: clay loam

Properties and qualities

Slope: 1 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 45 percent
Available water capacity: High (about 10.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Ecological site: R079XY112KS - Limy Plains
Hydric soil rating: No

Minor Components

Aquolls

Percent of map unit: 1 percent
Landform: Depressions, drainageways, hillslopes
Down-slope shape: Concave
Across-slope shape: Concave

Hydric soil rating: Yes

Soil Information for All Uses

Soil Properties and Qualities

The Soil Properties and Qualities section includes various soil properties and qualities displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each property or quality.

Water Features

Water Features include ponding frequency, flooding frequency, and depth to water table.

Flooding Frequency Class (Coldwater Solar Facility)

Flooding is the temporary inundation of an area caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt is not considered flooding, and water standing in swamps and marshes is considered ponding rather than flooding.

Frequency is expressed as none, very rare, rare, occasional, frequent, and very frequent.

"None" means that flooding is not probable. The chance of flooding is nearly 0 percent in any year. Flooding occurs less than once in 500 years.

"Very rare" means that flooding is very unlikely but possible under extremely unusual weather conditions. The chance of flooding is less than 1 percent in any year.

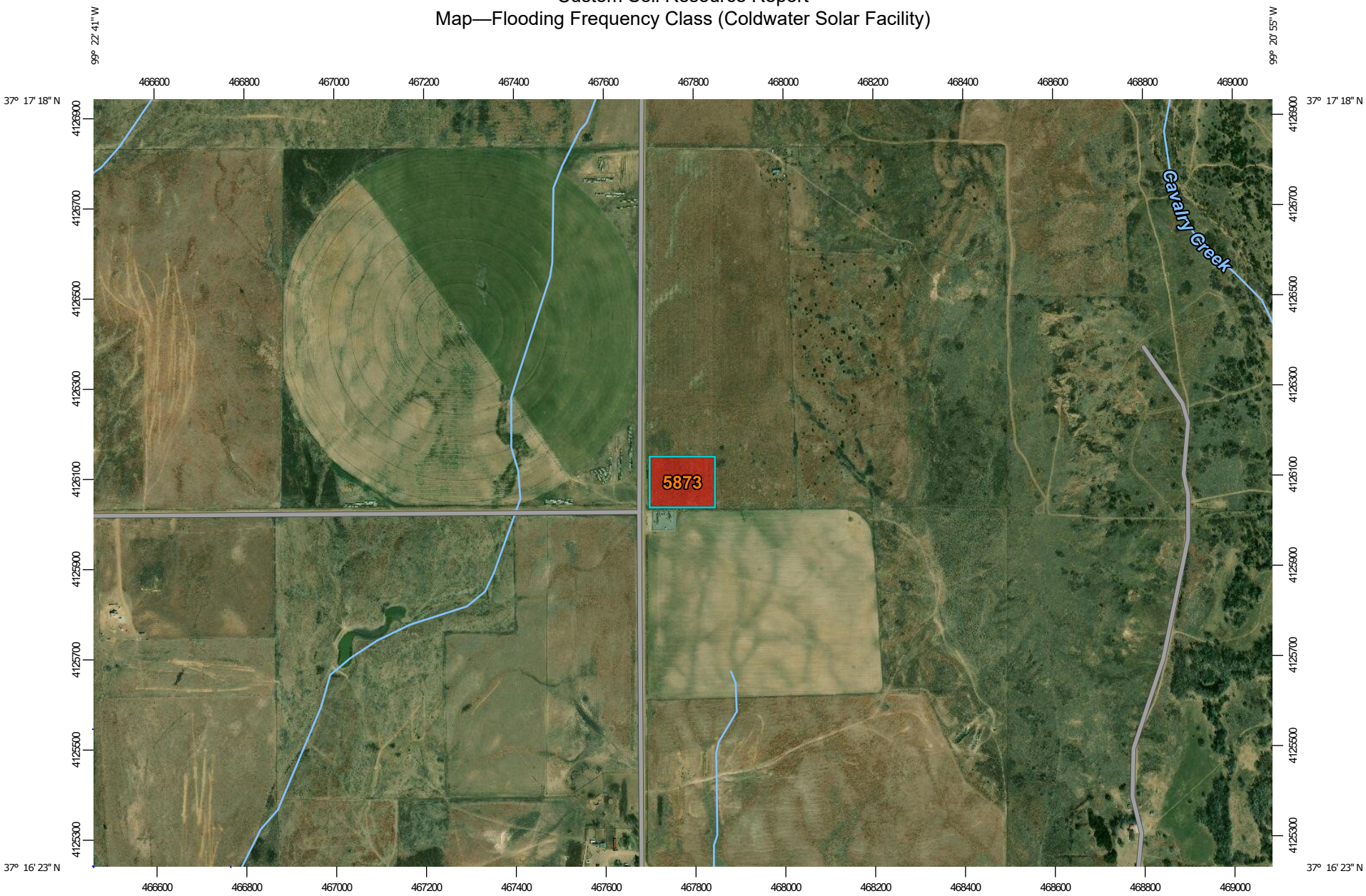
"Rare" means that flooding is unlikely but possible under unusual weather conditions. The chance of flooding is 1 to 5 percent in any year.

"Occasional" means that flooding occurs infrequently under normal weather conditions. The chance of flooding is 5 to 50 percent in any year.

"Frequent" means that flooding is likely to occur often under normal weather conditions. The chance of flooding is more than 50 percent in any year but is less than 50 percent in all months in any year.

"Very frequent" means that flooding is likely to occur very often under normal weather conditions. The chance of flooding is more than 50 percent in all months of any year.

Custom Soil Resource Report
Map—Flooding Frequency Class (Coldwater Solar Facility)



Map Scale: 1:12,000 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 150 300 600 900

Feet: 0 500 1000 2000 3000

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 14N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

None
Very Rare
Rare
Occasional
Frequent
Very Frequent
Not rated or not available

Soil Rating Lines

None
Very Rare
Rare
Occasional
Frequent
Very Frequent
Not rated or not available

Soil Rating Points

None
Very Rare
Rare
Occasional
Frequent
Very Frequent
Not rated or not available

Water Features

Streams and Canals

Transportation

Rails
Interstate Highways
US Routes
Major Roads
Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

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Soil Survey Area: Comanche County, Kansas
Survey Area Data: Version 19, Jun 10, 2020

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Date(s) aerial images were photographed: Aug 5, 2015—Nov 20, 2017

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Table—Flooding Frequency Class (Coldwater Solar Facility)

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
5873	Clark clay loam, 1 to 3 percent slopes	None	4.1	100.0%
Totals for Area of Interest			**4.1**	**100.0%**

Rating Options—Flooding Frequency Class (Coldwater Solar Facility)

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: More Frequent

Beginning Month: January

Ending Month: December

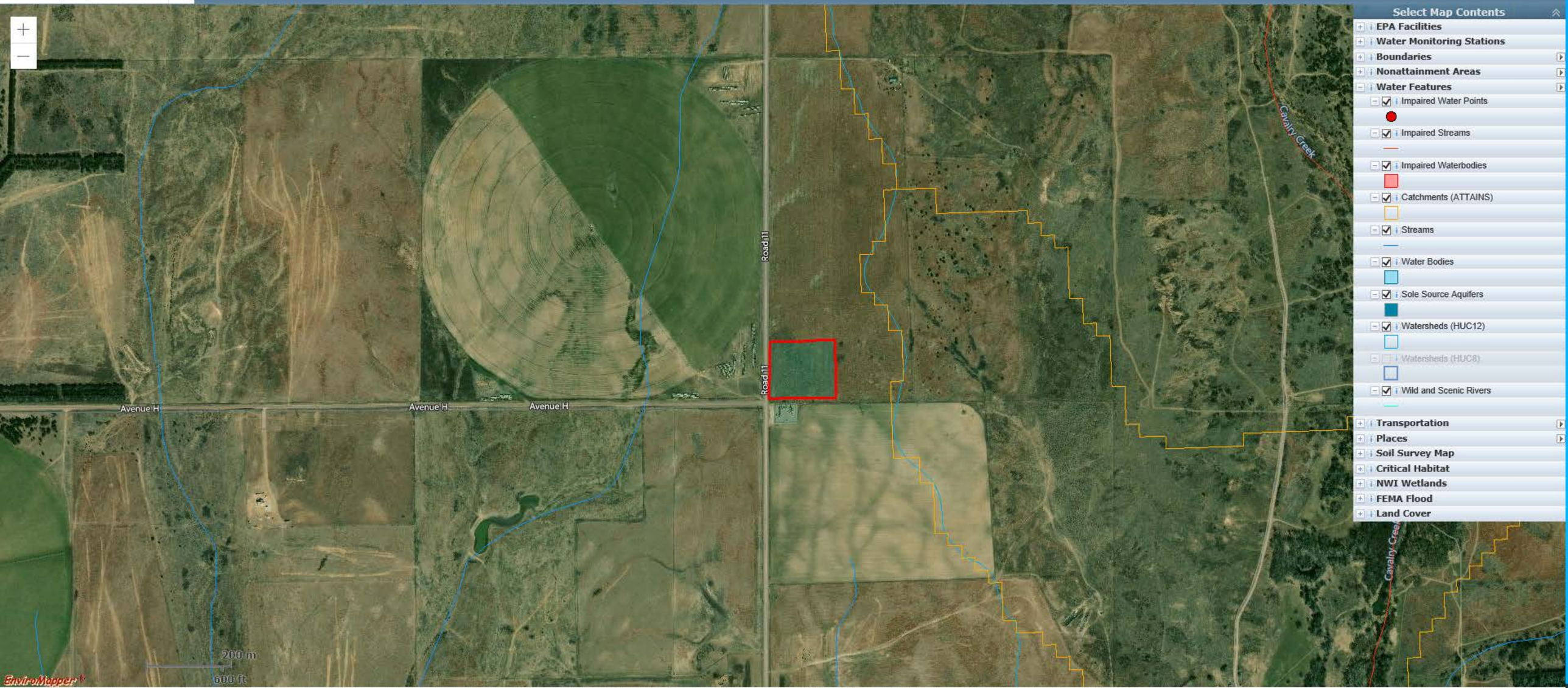
Appendix E

NEPAssist

EPA United States Environmental Protection Agency

Coldwater, KS, USA

Basemap | Imagery | Draw | Erase | Save Session | Tools | More Data



Select Map Contents

- EPA Facilities
- Water Monitoring Stations
- Boundaries
- Nonattainment Areas
- Water Features
  - Impaired Water Points
  - Impaired Streams
  - Impaired Waterbodies
  - Catchments (ATTAINS)
  - Streams
  - Water Bodies
  - Sole Source Aquifers
  - Watersheds (HUC12)
  - Watersheds (HUC8)
  - Wild and Scenic Rivers
- Transportation
- Places
- Soil Survey Map
- Critical Habitat
- NWI Wetlands
- FEMA Flood
- Land Cover

Appendix F

- Coastal Resources and Aquatic Habitats

There are no coastal resources or protected aquatic habitats in the region

Appendix G

Today's Power
Your Energy Partner

www.todayspower.com

February 24, 2021

Jason Luginbill
U.S. Fish and Wildlife Service
2609 Anderson Avenue
Manhattan, KS 66502
By Email: jason_luginbill@fws.gov

Dear Mr. Luginbill,

Today's Power, Inc. (TPI) is in the process of preparing a loan application to the USDA Rural Development for the installation of a solar generation facility near the Kansas town of Coldwater in partnership with CMS Electric Cooperative.

The project involves the construction of the Coldwater Solar Facility. The Coldwater Solar Facility is proposed to be a 2.8 MW DC solar array and a permanent access road. The proposed arrays will use approximately 12 acres of land and will be located on rural, previously disturbed, undeveloped tracts of land.

We are requesting the assistance of your office in identifying threatened or endangered species that may be impacted by the projects. Please find the enclosed IPaC species lists, biological assessment, and determination summary. If your office concurs with our determination, please respond accordingly. A project description and USGS maps are enclosed for your reference. TPI's loan funding and construction progress is dependent upon approval of the project environmental review. We would appreciate your response as soon as possible.

If you need further information, please call me at 618-922-1809. Please return your reply to our office or email your response to jmccann@todayspower.com. Thank you for your assistance with this project review.

Sincerely,

Today's Power, Inc.

Justin McCann, P.E.
Vice President of Engineering

Enclosure A: RUS 1230 Coldwater Solar Facility Project Description
Enclosure B: RUS 1230 Coldwater Solar Facility Project Map
Enclosure C: RUS 1230 Coldwater Solar Facility Species List
Enclosure D: RUS 1230 Coldwater Facility Biological Assessment
Enclosure E: RUS 1230 Coldwater Solar Facility IPaC Summary

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Kansas Ecological Services Field Office
2609 Anderson Avenue
Manhattan, KS 66502-2801
Phone: (785) 539-3474 Fax: (785) 539-8567

In Reply Refer To:
Consultation Code: 06E21000-2021-SLI-0542
Event Code: 06E21000-2021-E-01176
Project Name: Coldwater Solar Facility

February 24, 2021

Subject: List of threatened and endangered species that may occur in your proposed project location or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)

(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

https://www.fws.gov/endangered/esa-library/pdf/esa_section7_handbook.pdf

Please be aware that bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 *et seq.*)(https://www.fws.gov/birds/management/managed-species/eagle-management.php), and wind projects affecting these species may require development of an eagle conservation plan (https://www.fws.gov/migratorybirds/pdf/management/eagleconservationplanguidance.pdf). Additionally, wind energy projects should follow the wind energy guidelines (https://www.fws.gov/ecological-services/energy-development/wind.html) for minimizing impacts to migratory birds and bats.

Guidance for minimizing impacts to migratory birds for projects including communications towers (e.g., cellular, digital television, radio, and emergency broadcast) can be found at: https://www.fws.gov/birds/management/project-assessment-tools-and-guidance.php

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List
- USFWS National Wildlife Refuges and Fish Hatcheries
- Migratory Birds
- Wetlands

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

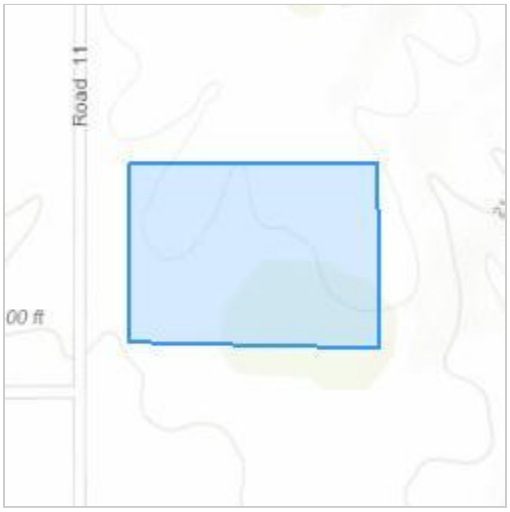
Kansas Ecological Services Field Office
2609 Anderson Avenue
Manhattan, KS 66502-2801
(785) 539-3474

Project Summary

Consultation Code: 06E21000-2021-SLI-0542
Event Code: 06E21000-2021-E-01176
Project Name: Coldwater Solar Facility
Project Type: POWER GENERATION
Project Description: Coldwater Solar Facility – 2.8 MWDC solar array located near Coldwater, Kansas. This project is located on land previously disturbed for agriculture activities.

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@37.2815483,-99.36249202650212,14z



Counties: Comanche County, Kansas

Endangered Species Act Species

There is a total of 2 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

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1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Birds

NAME	STATUS
Whooping Crane *Grus americana* Population: Wherever found, except where listed as an experimental population There is **final** critical habitat for this species. The location of the critical habitat is not available. Species profile: https://ecos.fws.gov/ecp/species/758	Endangered

Fishes

NAME	STATUS
Arkansas River Shiner *Notropis girardi* Population: Arkansas River Basin (AR, KS, NM, OK, TX) There is **final** critical habitat for this species. The location of the critical habitat is not available. Species profile: https://ecos.fws.gov/ecp/species/4364	Threatened

Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

USFWS National Wildlife Refuge Lands And Fish Hatcheries

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS OR FISH HATCHERIES WITHIN YOUR PROJECT AREA.

Migratory Birds

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described below.

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1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.
3. 50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)

The birds listed below are birds of particular concern either because they occur on the USFWS Birds of Conservation Concern (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ below. This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the E-bird data mapping tool (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found below.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON
Bald Eagle *Haliaeetus leucocephalus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Oct 15 to Jul 31
Harris's Sparrow *Zonotrichia querula* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds elsewhere

NAME	BREEDING SEASON
Lark Bunting *Calamospiza melanocorys* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA	Breeds May 10 to Aug 15
Red-headed Woodpecker *Melanerpes erythrocephalus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 10 to Sep 10

Probability Of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

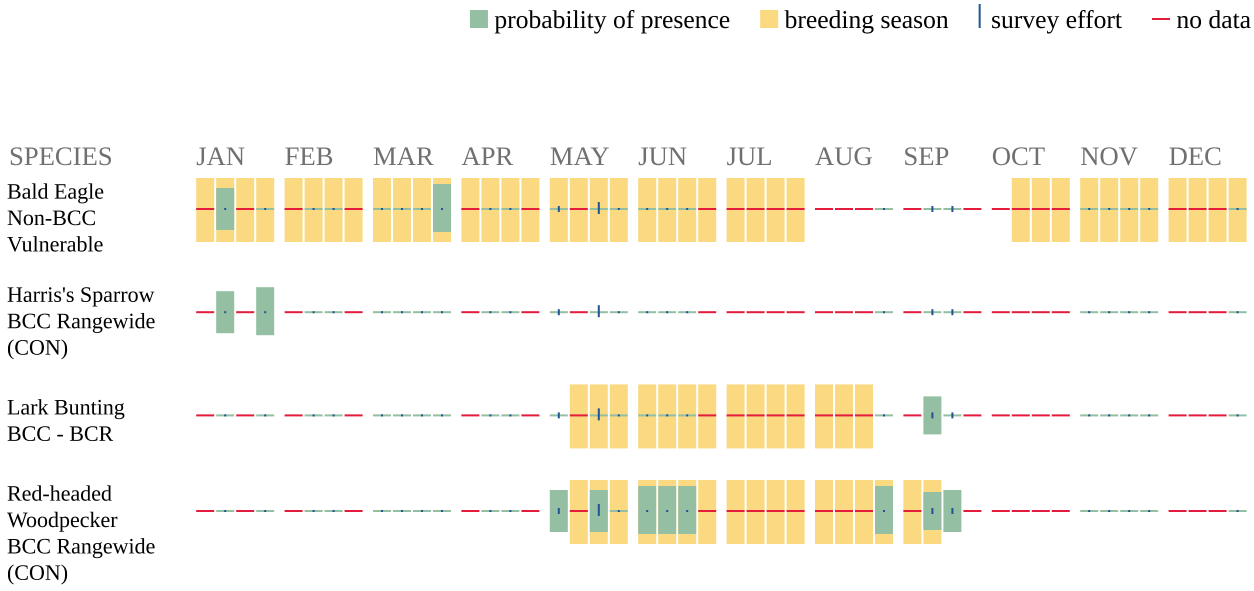
Breeding Season (■)

Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (|)
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

No Data (–)
A week is marked as having no data if there were no survey events for that week.

Survey Timeframe
Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.



Additional information can be found using the following links:

- Birds of Conservation Concern http://www.fws.gov/birds/management/managed-species/birds-of-conservation-concern.php
- Measures for avoiding and minimizing impacts to birds http://www.fws.gov/birds/management/project-assessment-tools-and-guidance/conservation-measures.php
- Nationwide conservation measures for birds http://www.fws.gov/migratorybirds/pdf/management/nationwidestandardconservationmeasures.pdf

Migratory Birds FAQ

Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Conservation Measures describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. Additional measures or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the migratory birds potentially occurring in my specified location?
The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the AKN Phenology Tool.

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?
The probability of presence graphs associated with your migratory bird list are based on data provided by the Avian Knowledge Network (AKN). This data is derived from a growing collection of survey, banding, and citizen science datasets .

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering, migrating or present year-round in my project area?
To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may refer to the following resources: The Cornell Lab of Ornithology All About Birds Bird Guide, or (if you are unsuccessful in locating the bird of interest there), the Cornell Lab of Ornithology Neotropical Birds guide. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?

Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are Birds of Conservation Concern (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Eagle Act requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects
For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the Diving Bird Study and the nanotag studies or contact Caleb Spiegel or Pam Loring.

What if I have eagles on my list?
If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report
The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of

certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

Wetlands

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

THERE ARE NO WETLANDS WITHIN YOUR PROJECT AREA.

Coldwater Solar Facility

Biological Assessment

Prepared using IPaC
February 24, 2021

The purpose of this Biological Assessment (BA) is to assess the effects of the proposed project and determine whether the project may affect any Federally threatened, endangered, proposed or candidate species. This BA is prepared in accordance with legal requirements set forth under Section 7 of the Endangered Species Act (16 U.S.C. 1536 (c)).

In this document, any data provided by U.S. Fish and Wildlife Service is based on data as of February 24, 2021.

Prepared using IPaC version 5.56.0

Coldwater Solar Facility Biological Assessment

Table Of Contents

1 Description Of The Action

1.1 Project Name

Coldwater Solar Facility

1.2 Executive Summary

The Project proposes to construct a 12-acre, 2.8 Megawatt solar electric array located on land previously cleared and developed for agricultural use. The Project is located northwest of Coldwater near the intersection of Cm Road 11 and CM Ave. H.

The construction phase of the project, which includes grading, will be planned and designed to minimize the use of mechanized grading and fill materials procured off-site. Controls, such as silt fences and stabilization, will be used during and after construction as needed to minimize indirect adverse environmental effects.

Since the project was previously cleared and disturbed for agricultural use and no natural trees or vegetation or waterways exist on the site that may be used as habitats for the IPaC listed species, the proposed project is determined to not impact listed endangered or threaten species.

Effect determination summary

1.3 Project Description

1.3.1 Location

LOCATION
Comanche County, Kansas

1.3.2 Description of project habitat

There are no natural habitats on the project site.

1.3.3 Project proponent information

Provide information regarding who is proposing to conduct the project, and their contact information. Please provide details on whether there is a Federal nexus.

Requesting Agency

Today's Power, Inc.

FULL NAME
Justin McCann

STREET ADDRESS
7300 Industry Dr.

CITY	STATE	ZIP
North Little Rock	AR	72217

PHONE NUMBER	E-MAIL ADDRESS
(618) 922-1809	jmccann@todayspower.com

Lead agency

Lead agency is the same as requesting agency

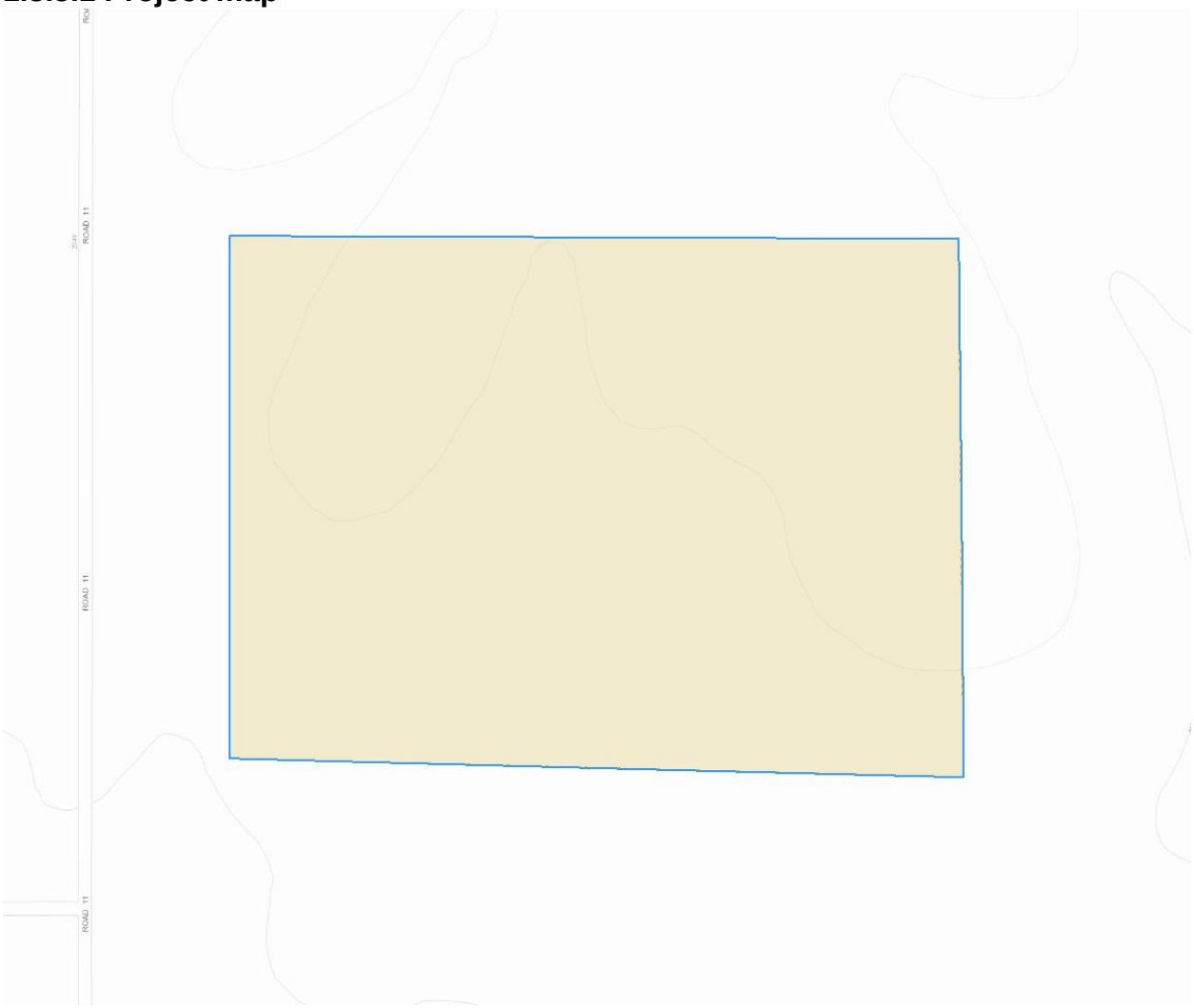
1.3.4 Project purpose

The purpose of the project is to provide a renewable energy resource for the CMS Electric Cooperative. The project is proposed to be a 2MW solar generation facility which is estimated to offset 3,540 metric tons of carbon dioxide annually.

1.3.5 Project type and deconstruction

This project is a solar power plant construction project.

1.3.5.1 Project map



LEGEND

Project footprint

Array Footprint: Install inverters, install photovoltaic panels, rough grading, photovoltaic solar power plant (structure)

1.3.5.2 photovoltaic solar power plant

Structure completion date
November 28, 2021

Removal/decommission date (if applicable)
November 28, 2046

Stressors

ENVIRONMENTAL QUALITY FEATURES

- Increase in air temperature

Description
The project site was selected to minimize land disturbance during the project construction and operation over time. The area of disturbance is expected to be less than one acre.

1.3.5.3 install inverters

Activity start date
September 28, 2021

Activity end date
October 29, 2021

Stressors

CHEMICALS / CONTAMINANTS

- Increase in contaminants

Description
The inverters will be mounted on open-air racks which will minimize the area of disturbance and other indirect effects.

1.3.5.4 install photovoltaic panels

Activity start date
September 28, 2021

Activity end date
October 29, 2021

Stressors

HUMAN ACTIVITIES

- Increase in noise

Description
The modules are installed by hand which minimizes construction noise.

1.3.5.5 rough grading

Activity start date
September 07, 2021

Activity end date
September 27, 2021

Stressors

CHEMICALS / CONTAMINANTS

- Increase in contaminants

Description
The project will be designed to localize grading to the site entrance and equipment rack areas. Silt fences and other erosion control best management practices will be used to minimize sentiment from leaving the project site.

1.3.6 Anticipated environmental stressors

Describe the anticipated effects of your proposed project on the aspects of the land, air and water that will occur due to the activities above. These should be based on the activity deconstructions done in the previous section and will be used to inform the action area.

1.3.6.1 Chemicals / Contaminants

Substances that pollute, spoil, or poison the environment (e.g., herbicides, heavy metals, oil, etc.).

1.3.6.1.1 Increase in contaminants

ANTICIPATED MAGNITUDE

This stressor is not expected to occur; the following explanation has been provided:

Silt fences and other similar erosion control best management practices are industry-accepted means to mitigate erosion impacts and site contaminants that may result from construction activities.

CONSERVATION MEASURES

- Silt fence

STRUCTURES AND ACTIVITIES

- Rough grading
- Install inverters

1.3.6.2 Environmental Quality Features

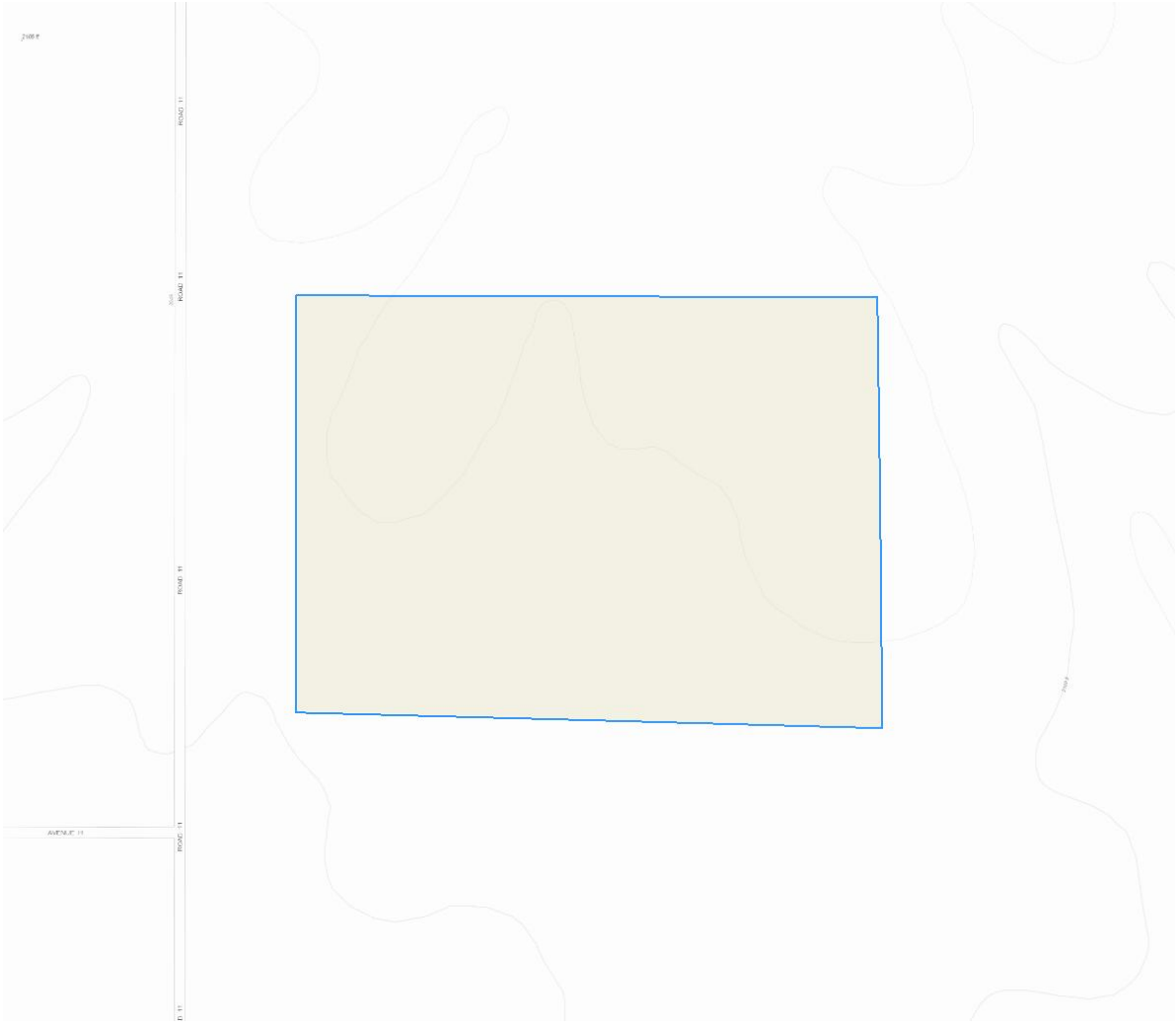
Abiotic attributes of the landscape (e.g., temperature, moisture, slope, aspect, etc.).

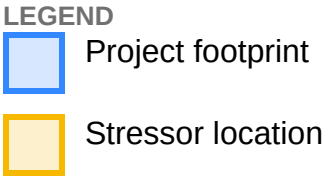
1.3.6.2.1 Increase in air temperature

ANTICIPATED MAGNITUDE

No change in air temperature is expected to occur as a result of completed the proposed project.

STRESSOR LOCATION




LEGEND
Project footprint
Stressor location

CONSERVATION MEASURES

No conservation measures for this stressor

STRUCTURES AND ACTIVITIES

- Photovoltaic solar power plant

1.3.6.3 Human Activities

Human actions in the environment (e.g., fishing, hunting, farming, walking, etc.).

1.3.6.3.1 Increase in noise

ANTICIPATED MAGNITUDE

This stressor is not expected to occur; the following explanation has been provided:

Any increase in noise will be localized and temporary during construction activity. Manual equipment installation will be utilized whenever possible to reduce the need for mechanized equipment that would increase noise during the construction phase.

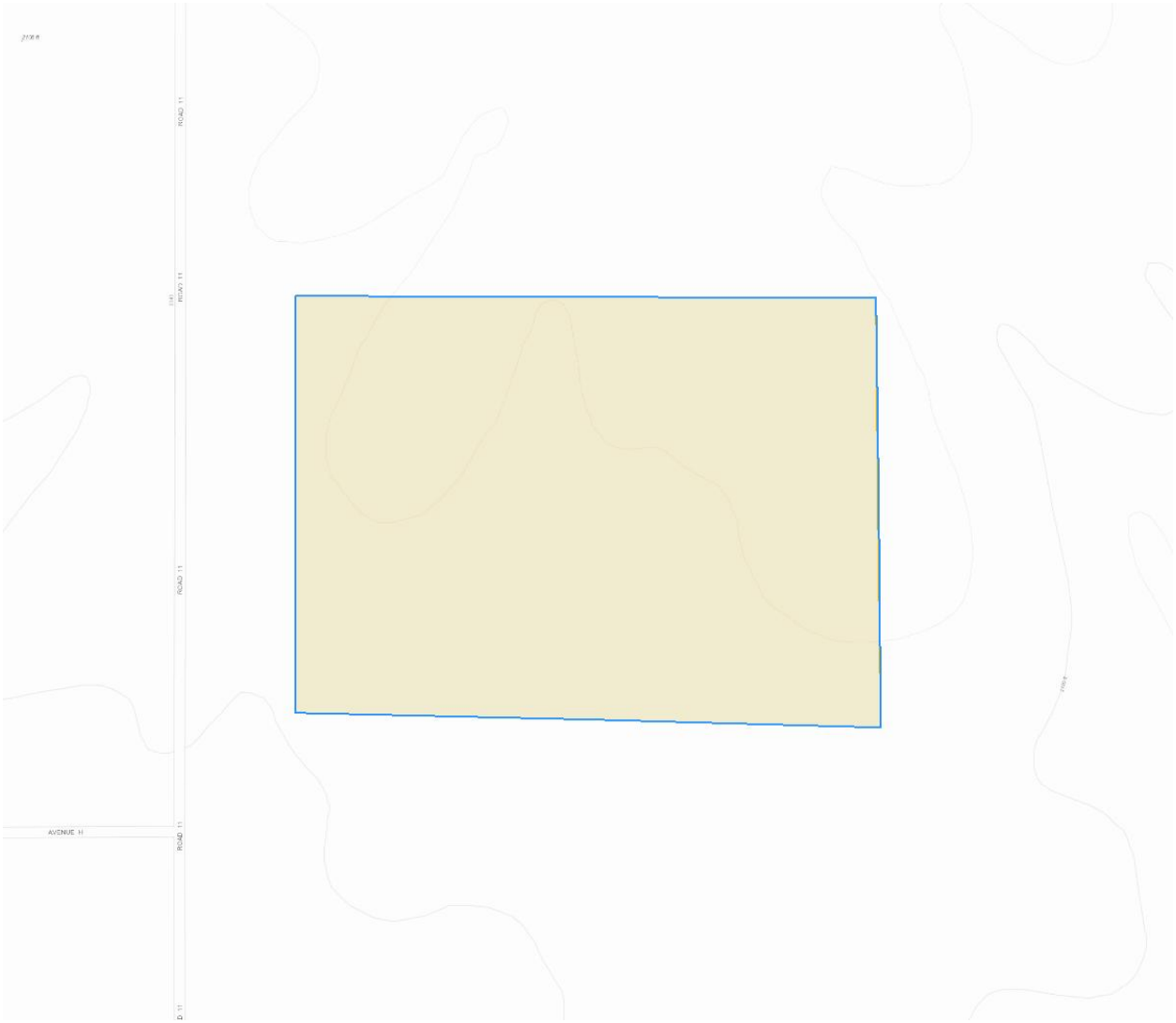
CONSERVATION MEASURES

- Manual installation

STRUCTURES AND ACTIVITIES

- Install photovoltaic panels

1.4 Action Area



1.5 Conservation Measures

1.5.1 manual installation

Description
Manual installation of materials and equipment significantly reduce the use of mechanized equipment and tools that in turn reduce noise during project construction.

Stressors
- Increase in noise

1.5.2 silt fence

Description
The use of silt fences and other similar best management practices mitigate impacts of erosion during project construction and ongoing facility operations. The mitigated erosion leads to mitigated soil contaminants from entering bodies of water.

Stressors
- Increase in contaminants

1.6 Prior Consultation History
This IPaC consultation is the initiating consultation. The Kansas Field Office will be contacted as well for consultation.

1.7 Other Agency Partners And Interested Parties
United States Department of Agriculture - Rural Development, Rural Utilities Service

1.8 Other Reports And Helpful Information
A USGS topographical drawing of the Project.

Relevant documentation
- RUS 1230 Coldwater Solar Facility Project Map

2 Species Effects Analysis

This section describes, species by species, the effects of the proposed action on listed, proposed, and candidate species, and the habitat on which they depend. In this document, effects are broken down as direct interactions (something happening directly to the species) or indirect interactions (something happening to the environment on which a species depends that could then result in effects to the species).

These interactions encompass effects that occur both during project construction and those which could be ongoing after the project is finished. All effects, however, should be considered, including effects from direct and indirect interactions and cumulative effects.

2.1 Arkansas River Shiner

This species has been excluded from analysis in this environmental review document.

Justification for exclusion

The project site is comprised of approximately 12 acres of land previously cleared and cultivated for agricultural use. The site does not contain any natural waterways or similar areas that may be used as a habitat.

2.2 Whooping Crane

This species has been excluded from analysis in this environmental review document.

Justification for exclusion

The project site is comprised of approximately 12 acres of land previously cleared and cultivated for agricultural use. The site does not contain any waterway or wetlands areas that may be used as a natural habitat.

3 Critical Habitat Effects Analysis

No critical habitats intersect with the project action area.

4 Summary Discussion, Conclusion, And Effect Determinations

4.1 Effect Determination Summary

SPECIES (COMMON NAME)	SCIENTIFIC NAME	LISTING STATUS	PRESENT IN ACTION AREA	EFFECT DETERMINATION
Arkansas River Shiner	Notropis girardi	Threatened	No	NE
Whooping Crane	Grus americana	Endangered	No	NE

4.2 Summary Discussion

The project site is a tract of land previously cleared for agricultural use. There are no natural habitats on the project site.

4.3 Conclusion

Since the project was previously cleared and disturbed for agricultural use and no natural trees or vegetation or waterways exist on the site that may be used as habitats for the IPaC listed species, the proposed project is determined to not impact listed endangered or threaten species.

Today's Power, Inc.
Coldwater Solar Facility
Rural Utilities Service Project Summary

IPaC Species Review	Review Description	Determination	Notes
Threatened Species	Mammals – None Birds – None Fishes – Arkansas River Shiner	No Impact	The site is currently utilized for row crop agricultural purposes. The 12 acre site does not contain any natural waterways or similar areas that may be used as a habitat.
Endangered Species	Mammals – None Birds – Whooping Crane Fishes – None	No Impact	The project site is comprised of approximately 12 acres of land previously cleared and cultivated for agricultural use. The site does not contain any waterway or wetlands areas that may be used as a natural habitat.
Critical Habitats	No critical habitats present	No Impact	None

United States Department of the Interior

FISH AND WILDLIFE SERVICE
2609 Anderson Ave
Manhattan, Kansas 66502

In Reply Refer to:
FWS/IR05/IR07

March 30, 2021

Justin McCann
Vice President of Engineering
7300 Industry Drive
North Little Rock, Arkansas 72117

RE: 7 solar projects in Comanche, Sumner, Pottawatomie, Kiowa, Pratt, and McPherson Counties, Kansas; FWS Tracking #: 2021-CPA-0242

Mr. McCann:

This is in response to your February 24, 2021 letters requesting review of 7 proposed solar projects across 6 counties in Kansas. USFWS received a March 5, 2021 letter from USDA confirming your designation as a non-federal representative. The 7 proposed projects range in size from 4.6 acres to 12 acres. The proposed projects would feature solar arrays of PV panels and permanent access roads to be located on rural, previously disturbed, undeveloped tracts of land.

The project locations include:

Coldwater Solar Facility – Comanche County, Kansas
Miller Solar Facility – Sumner County, Kansas
Peddicord Solar Facility – Pottawatomie County, Kansas
St. George Solar Facility – Pottawatomie County, Kansas
Greensburg Solar Facility – Kiowa County, Kansas
Kanza Solar Facility – Pratt County, Kansas
Medora Solar Facility – McPherson County, Kansas

We have no comments related to species you have indicated may occur in the project areas.

Given the current status of the lesser prairie-chicken (*Tympanuchus pallidicinctus*) as under the management authority of the State Wildlife Agency, and a pending Endangered Species Act finding due May 26, 2021 to the Federal Register, we advise that you work closely with the State Wildlife Agency to avoid effects to this species.

I am providing a link to the Service's Workplan because there are several species with Kansas occurrences, and possible occurrence in or near the proposed project area, that have been petitioned to be listed under the Endangered Species Act with scheduled process decisions that occur within your stated project timeline, or thereafter. These petitioned species are not currently included in the Service's IPaC trust resource lists. National Listing Workplan (Workplan; January 2021 version): https://www.fws.gov/endangered/esa-library/pdf/National-Listing-Workplan-FY21-FY25.pdf

Studies on wildlife and solar energy facilities are scarce; however, information collected at solar facilities by U.S. Fish and Wildlife Service (USFWS) personnel indicates that wildlife, particularly birds, can be negatively affected by solar energy development. Direct impacts could include birds or bats colliding with solar panels and mirrors or becoming exposed to elevated levels of solar flux. Indirect impacts could include wildlife species displaced due to alteration of key components of their habitat. Such impacts likely can be avoided or effects minimized by strategic design and placement of solar panels, mirrors, towers, and other associated infrastructure (e.g., access roads and distribution and transmission lines), as well as other management practices. Given the limited amount of information on impacts of solar developments, following construction of solar developments, it is recommended to implement a program of monitoring to assess the relationship of pre-construction risk assessments to actual outcomes post-construction.

The U.S. Geological Survey and USFWS collaborated to produce a guidance document for designing mortality monitoring at solar facilities, *Mortality monitoring design for utility-scale solar power facilities*, https://pubs.er.usgs.gov/publication/ofr20161087. Information gathered through monitoring efforts will support efforts in informing risk at individual developments, as well as to develop guidance for avoiding or minimizing potential impacts of solar energy development.

General Recommendations

- USFWS recommends not developing solar sites in any native vegetation due to their importance in providing habitat for wildlife, and recommends use of sites with existing disturbances (e.g., cropland, introduced pasture).
- USFWS recommends avoiding impacts to wetlands in the siting and design of these projects.
- USFWS has concerns about potential for collision injuries and mortalities of birds that mistake sunlight reflected off of the PV panels as water and subsequently fly into PV panels. Data on this issue is limited, with none reported from Kansas. Data collected through monitoring (pre- and post-construction) would support an increased understanding of the potential for this issue, and approaches to avoid or minimize it.
- Minimize grading and earthwork at sites, and ensure implementation of appropriate measures to reduce erosion.

No further coordination with the Service is required pursuant to the Endangered Species Act of 1973 (ESA) (87 Stat. 884, as amended; 16 U.S.C. 1531 et seq.) for this project.

Should project plans change, or if additional information on listed or proposed species or critical habitat becomes available, this determination may be reconsidered. Until the ongoing project is complete, we recommend that you contact this office every 90 days from the date of this letter to ensure that listed species presence/absence information for the proposed project is current. Thank you for this opportunity to comment this proposed project. If we can be of any further assistance, please contact Laura Mendenhall, of this office, at laura_mendenhall@fws.gov.

Sincerely,

FOR:
Jason Luginbill
Project Leader

CC: KDWPT, Pratt Office (Ecological Services Section)

Justin McCann

From: Justin McCann
Sent: Monday, April 26, 2021 4:51 PM
To: KDWPT.ess@ks.gov
Cc: zac.eddy@ks.gov
Subject: Today's Power CMS Coldwater Solar Facility (4 of 7)
Attachments: Enclosure A - RUS 1230 Coldwater Solar Facility Project Description.pdf; Enclosure B - RUS 1230 Coldwater Solar Facility Project Map.pdf; Enclosure C - RUS 1230 Coldwater Solar Facility Species List.pdf; Enclosure D - RUS 1230 Coldwater Solar Facility Biological Assessment.pdf; Enclosure E - RUS 1230 Coldwater Solar Facility IPaC Summary.pdf; RUS 1230 Coldwater Solar Facility.kmz; USFWS_response_letter_TodaysPower_7_projects_2021 (3-30-21).pdf

Mr. Eddy,

Per the direction of the U.S. FWS and our conversation this afternoon, please find the attached environmental review request for the Coldwater Solar Facility proposed by Today's Power in partnership with CMS Electric Cooperative.

The Coldwater Solar Facility is proposed to be a 2.8 MW DC solar array and a permanent access road. The proposed arrays will use approximately 12 acres of land and will be located on rural, previously disturbed, undeveloped tracts of land.

We are requesting the assistance of your office in identifying threatened or endangered species that may be impacted by the projects. Please find the enclosed IPaC species lists, biological assessment, and determination summary. If your office concurs with our determination, please respond accordingly. A project description and USGS maps are enclosed for your reference. TPI's loan funding and construction progress are dependent upon approval of the project environmental review. We would appreciate your response as soon as possible.

If you need further information, please call me at 618-922-1809. Please return your reply to our office or email your response to jmccann@todayspower.com. Thank you for your assistance with this project review.

Sincerely,

Justin McCann, PE
Vice President of Engineering
Today's Power, Inc.
Direct: 618-922-1809
Email: jmccann@todayspower.com

Today's Power
Your Energy Partner

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Kansas Ecological Services Field Office
2609 Anderson Avenue
Manhattan, KS 66502-2801
Phone: (785) 539-3474 Fax: (785) 539-8567

In Reply Refer To:
Consultation Code: 06E21000-2021-SLI-1276
Event Code: 06E21000-2021-E-02890
Project Name: Coldwater Solar Facility

August 19, 2021

Subject: List of threatened and endangered species that may occur in your proposed project location or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)

(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

https://www.fws.gov/endangered/esa-library/pdf/esa_section7_handbook.pdf

Please be aware that bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 *et seq.*)(https://www.fws.gov/birds/management/managed-species/eagle-management.php), and wind projects affecting these species may require development of an eagle conservation plan (https://www.fws.gov/migratorybirds/pdf/management/eagleconservationplanguidance.pdf). Additionally, wind energy projects should follow the wind energy guidelines (https://www.fws.gov/ecological-services/energy-development/wind.html) for minimizing impacts to migratory birds and bats.

Guidance for minimizing impacts to migratory birds for projects including communications towers (e.g., cellular, digital television, radio, and emergency broadcast) can be found at: https://www.fws.gov/birds/management/project-assessment-tools-and-guidance.php

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List
- USFWS National Wildlife Refuges and Fish Hatcheries
- Migratory Birds
- Wetlands

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Kansas Ecological Services Field Office
2609 Anderson Avenue
Manhattan, KS 66502-2801
(785) 539-3474

Project Summary

Consultation Code: 06E21000-2021-SLI-1276
Event Code: 06E21000-2021-E-02890
Project Name: Coldwater Solar Facility
Project Type: POWER GENERATION
Project Description: 2.8 MWDC solar array located near Coldwater, Kansas. Project is located on land previously disturbed for agricultural activities.

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@37.281194049999996,-99.36316251833136,14z

Counties: Comanche County, Kansas

Endangered Species Act Species

There is a total of 2 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

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1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Birds

NAME	STATUS
Whooping Crane *Grus americana*	Endangered

Population: Wherever found, except where listed as an experimental population
There is **final** critical habitat for this species. The location of the critical habitat is not available.
Species profile: https://ecos.fws.gov/ecp/species/758

Fishes

NAME	STATUS
Arkansas River Shiner *Notropis girardi*	Threatened

Population: Arkansas River Basin (AR, KS, NM, OK, TX)
There is **final** critical habitat for this species. The location of the critical habitat is not available.
Species profile: https://ecos.fws.gov/ecp/species/4364

Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

USFWS National Wildlife Refuge Lands And Fish Hatcheries

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS OR FISH HATCHERIES WITHIN YOUR PROJECT AREA.

Migratory Birds

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described below.

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1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.
3. 50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)

The birds listed below are birds of particular concern either because they occur on the USFWS Birds of Conservation Concern (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ below. This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the E-bird data mapping tool (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found below.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON
Bald Eagle *Haliaeetus leucocephalus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Oct 15 to Jul 31
Black Tern *Chlidonias niger* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/3093	Breeds May 15 to Aug 20

NAME	BREEDING SEASON
Lark Bunting *Calamospiza melanocorys* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA	Breeds May 10 to Aug 15
Red-headed Woodpecker *Melanerpes erythrocephalus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 10 to Sep 10

Probability Of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

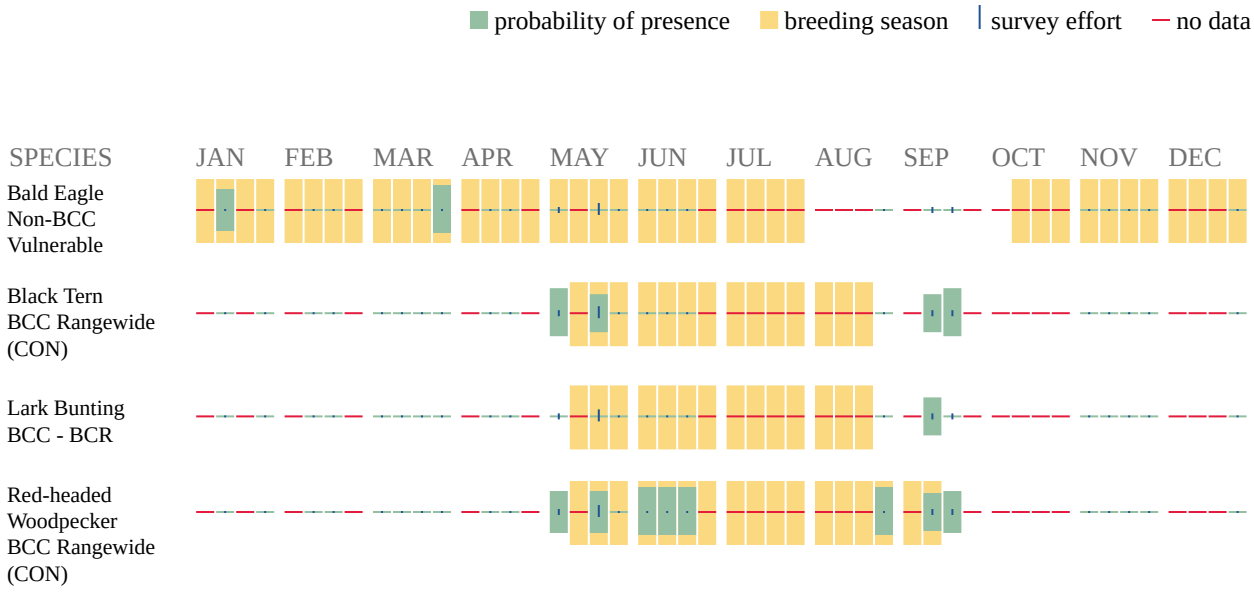
Breeding Season (■)

Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (|)
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

No Data (–)
A week is marked as having no data if there were no survey events for that week.

Survey Timeframe
Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.



Additional information can be found using the following links:

- Birds of Conservation Concern http://www.fws.gov/birds/management/managed-species/birds-of-conservation-concern.php
- Measures for avoiding and minimizing impacts to birds http://www.fws.gov/birds/management/project-assessment-tools-and-guidance/conservation-measures.php
- Nationwide conservation measures for birds http://www.fws.gov/migratorybirds/pdf/management/nationwidestandardconservationmeasures.pdf

Migratory Birds FAQ

Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Conservation Measures describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. Additional measures or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the migratory birds potentially occurring in my specified location?
The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the AKN Phenology Tool.

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?
The probability of presence graphs associated with your migratory bird list are based on data provided by the Avian Knowledge Network (AKN). This data is derived from a growing collection of survey, banding, and citizen science datasets .

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering, migrating or present year-round in my project area?
To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may refer to the following resources: The Cornell Lab of Ornithology All About Birds Bird Guide, or (if you are unsuccessful in locating the bird of interest there), the Cornell Lab of Ornithology Neotropical Birds guide. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?

Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are Birds of Conservation Concern (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Eagle Act requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects
For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the Diving Bird Study and the nanotag studies or contact Caleb Spiegel or Pam Loring.

What if I have eagles on my list?
If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report
The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of

certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

Wetlands

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

THERE ARE NO WETLANDS WITHIN YOUR PROJECT AREA.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Kansas Ecological Services Field Office
2609 Anderson Avenue
Manhattan, KS 66502-2801
Phone: (785) 539-3474 Fax: (785) 539-8567

In Reply Refer To:
Project Code: 2022-0000463
Project Name: Coldwater Solar Facility

January 31, 2022

Subject: List of threatened and endangered species that may occur in your proposed project location or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological

evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

https://www.fws.gov/endangered/esa-library/pdf/esa_section7_handbook.pdf

Please be aware that bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 *et seq.*)(https://www.fws.gov/birds/management/managed-species/eagle-management.php), and wind projects affecting these species may require development of an eagle conservation plan &nbs

Attachment(s):

- Official Species List
- USFWS National Wildlife Refuges and Fish Hatcheries
- Migratory Birds
- Wetlands

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Kansas Ecological Services Field Office
2609 Anderson Avenue
Manhattan, KS 66502-2801
(785) 539-3474

Project Summary

Project Code: 2022-0000463
Event Code: None
Project Name: Coldwater Solar Facility
Project Type: Power Gen - Solar
Project Description: 2.8 MWDC solar array located near Coldwater, Kansas. Project is located on land previously disturbed for agricultural activities.
Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@37.2811962,-99.36316253114788,14z

Counties: Comanche County, Kansas

Endangered Species Act Species

There is a total of 3 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

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1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Birds

NAME	STATUS
Whooping Crane *Grus americana* Population: Wherever found, except where listed as an experimental population There is **final** critical habitat for this species. The location of the critical habitat is not available. Species profile: https://ecos.fws.gov/ecp/species/758	Endangered

Fishes

NAME	STATUS
Arkansas River Shiner *Notropis girardi* Population: Arkansas River Basin (AR, KS, NM, OK, TX) There is **final** critical habitat for this species. The location of the critical habitat is not available. Species profile: https://ecos.fws.gov/ecp/species/4364	Threatened

Insects

NAME	STATUS
Monarch Butterfly *Danaus plexippus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9743	Candidate

Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

USFWS National Wildlife Refuge Lands And Fish Hatcheries

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS OR FISH HATCHERIES WITHIN YOUR PROJECT AREA.

Migratory Birds

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described below.

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1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.
3. 50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)

The birds listed below are birds of particular concern either because they occur on the USFWS Birds of Conservation Concern (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ below. This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the E-bird data mapping tool (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found below.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON
Bald Eagle *Haliaeetus leucocephalus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Oct 15 to Jul 31
Black Tern *Chlidonias niger* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/3093	Breeds May 15 to Aug 20

NAME	BREEDING SEASON
Lark Bunting *Calamospiza melanocorys* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA	Breeds May 10 to Aug 15
Red-headed Woodpecker *Melanerpes erythrocephalus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 10 to Sep 10

Probability Of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

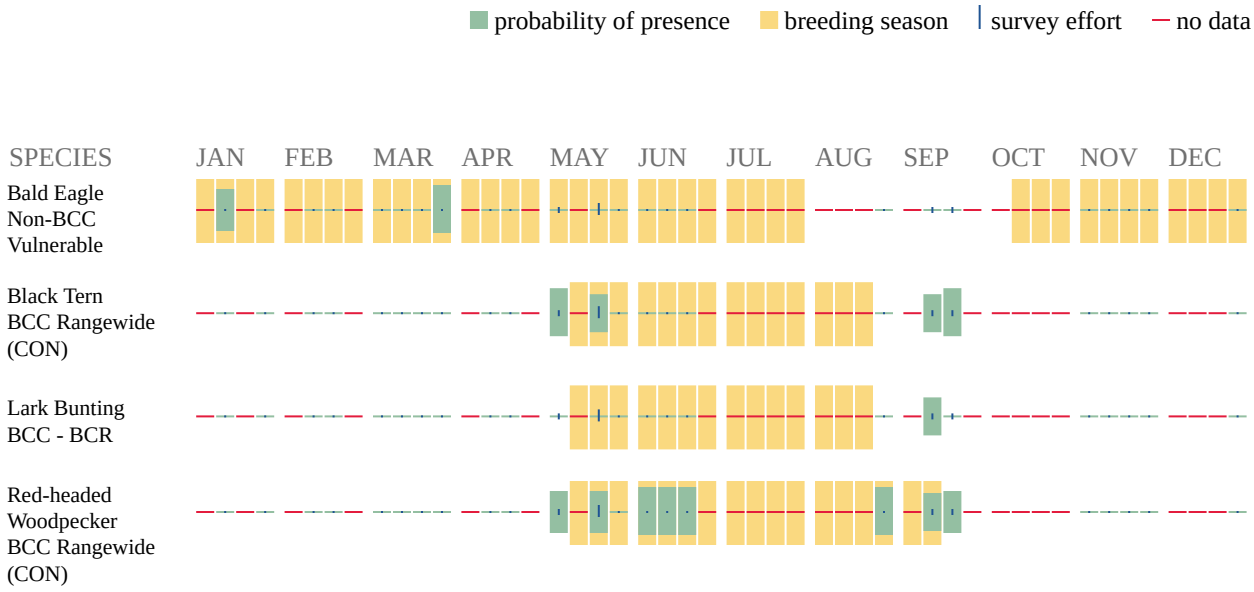
Breeding Season (■)

Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (|)
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

No Data (–)
A week is marked as having no data if there were no survey events for that week.

Survey Timeframe
Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.



Additional information can be found using the following links:

- Birds of Conservation Concern http://www.fws.gov/birds/management/managed-species/birds-of-conservation-concern.php
- Measures for avoiding and minimizing impacts to birds http://www.fws.gov/birds/management/project-assessment-tools-and-guidance/conservation-measures.php
- Nationwide conservation measures for birds http://www.fws.gov/migratorybirds/pdf/management/nationwidestandardconservationmeasures.pdf

Migratory Birds FAQ

Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Conservation Measures describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. Additional measures or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the migratory birds potentially occurring in my specified location?
The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the AKN Phenology Tool.

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?
The probability of presence graphs associated with your migratory bird list are based on data provided by the Avian Knowledge Network (AKN). This data is derived from a growing collection of survey, banding, and citizen science datasets .

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering, migrating or present year-round in my project area?
To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may refer to the following resources: The Cornell Lab of Ornithology All About Birds Bird Guide, or (if you are unsuccessful in locating the bird of interest there), the Cornell Lab of Ornithology Neotropical Birds guide. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?

Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are Birds of Conservation Concern (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Eagle Act requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects
For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the Diving Bird Study and the nanotag studies or contact Caleb Spiegel or Pam Loring.

What if I have eagles on my list?
If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report
The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of

certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

Wetlands

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

THERE ARE NO WETLANDS WITHIN YOUR PROJECT AREA.

Appendix H

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February 23, 2021

Lauren Jones
Kansas Historical Society
6425 SW 6th Avenue
Topeka, KS 66615-1099
By Email: lauren.jones@ks.gov

RE: United States Department of Agriculture (USDA) - Rural Development (RD)
Rural Utilities Service (RUS) Applicant SHPO Section 106 Initiation
Coldwater Solar Facility
Comanche County, Kansas

Dear Ms. Jones,

Today's Power, Inc. (TPI) plans to seek financial assistance from the USDA Rural Development (RD), Rural Utilities Service (RUS) under its Electric Program for the Coldwater Solar Facility (Project). This Project will not be using the Nationwide Programmatic Agreement.

The Project proposes to construct a 12-acre, 2.8-Megawatt solar electric array located on land previously cleared and developed for agricultural use. The Project will interconnect to the CMS Electric Cooperative electric distribution system which would require little to no upgrades. The solar array is located northwest of Coldwater near the intersection of Cm Road 11 and CM Ave. H. A summary project description and United States Geological Survey topographical map of location is included as Enclosures A and B, respectively.

The construction phase of the project, which includes grading, will be planned and designed to minimize the use of mechanized grading and fill materials procured off site. Controls, such as silt fences and stabilization, will be used during and after construction as needed to minimize indirect adverse environmental effects.

If RUS elects to fund the Project, it will become an undertaking subject to review under Section 106 of the National Historic Preservation Act, 54 U.S.C. 306108, and its implementing regulations, 36 CFR Part 800.

RUS defines the area of potential effect (APE), as an area that includes all Project construction and excavation activity required to construct, modify, improve, or maintain any facilities; any right-of-way or easement areas necessary for the construction, operation, and maintenance of the Project; all areas used for excavation of borrow material and habitat creation; all construction staging areas, access routes, utilities, spoil areas, and stockpiling areas. Impacts that come from the undertaking

at the same time and place with no intervening causes, are considered “direct” regardless of its specific type (e.g., whether it is visual, physical, auditory, etc.). “Indirect” effects to historic properties are those caused by the undertaking that are later in time or farther removed in distance but are still reasonably foreseeable.

Based on this definition, TPI proposes that the APE for the referenced project consists of a rural area of approximately 12 acres previously cleared for agricultural use as shown on the enclosed map. The Project will include a facility entrance for site access. The entrance will be constructed from the existing road right-of-way and easement to minimize disturbance in the APE. The geographic scope of the APE will not be final until a determination is made by RUS pursuant to 36 CFR § 800.4(a)(1). Additionally, the APE does not include any tribal lands as defined pursuant to 36 CFR § 800.16(x).

Pursuant to 36 CFR § 800.2(c)(4), and 7 CFR § 1970.5(b)(2) of the regulations, “Environmental Policies and Procedures” (7 CFR Part 1970), RUS has issued a blanket delegation for its applicants to initiate and proceed through Section 106 review if there is agreement.

In accordance with this blanket delegation, TPI is initiating Section 106 review on behalf of RUS. In delegating this authority, RUS is advocating for the direct interaction between its borrowers and the State Historic Preservation Office (SHPO). RUS believes this interaction, prior to direct agency involvement, will support and encourage the consideration of impacts to historic properties earlier in project planning.

At the direction of RUS, on 2/23/2021 TPI notified the following Indian tribes about the Project: Cheyenne and Arapaho Tribes, Osage Nation, United Keetoowah Band of Cherokee Indians, and the Wichita and Affiliated Tribes.

Please review the Project(s) and enclosed maps. After completing your review, please provide TPI with your recommendation(s) about whether or not a study of the APE is needed to identify potentially affected historic properties. If you recommend a study, please explain the nature and scope of the proposed investigation, specifically in reference to those factors identified in 36 CFR § 800.4(b)(1). If you do not recommend a study or require additional information, please provide a proposed finding of no historic properties affected or no adverse effect.

Please submit your recommendations, request for additional information, or a proposed finding, electronically within 30 days of your receipt of this request to:

Justin McCann, PE
Vice President of Engineering
Today’s Power, Inc.
7300 Industry Dr.
North Little Rock, AR 72117
Email: jmccann@todayspower.com

If no timely response is received, TPI will notify RUS so the federal agency may determine how to proceed with Section 106 review in accordance with 36 CFR § 800.3(b)(4). Should you have any questions, please contact Justin McCann or Barbara R. Britton at the following:

Barbara R. Britton
Director, Environmental and Engineering Staff
Water and Environmental Programs
Rural Utilities Service, Rural Development
United States Department of Agriculture
1400 Independence Ave., S.W.
Washington, DC 20250
Phone: (202) 720-2567
Email: Barbara.britton@usda.gov

Sincerely,

Today's Power, Inc.

Justin McCann, P.E.
Vice President of Engineering

Enclosures:

Enclosure A: RUS 1230 Coldwater Solar Facility Project Description
Enclosure B: RUS 1230 Coldwater Solar Facility Project Map

Cultural Resources Division
State Historic Preservation Office
6425 SW 6th Avenue
Topeka KS 66615-1099

Kansas Historical Society

785-272-8681, ext. 240
kshs.shpo@ks.gov
kshs.org

Jennie Chinn, Executive Director

Laura Kelly, Governor

KSR&C # 21-02-145
March 11, 2021

Justin McCann
Today's Power, Inc.
Via email

Re: Coldwater Solar Facility
CM Road 11, Coldwater
Comanche County

Staff of the State Historic Preservation Office (SHPO) has reviewed the information received February 23, 2021, regarding the above-referenced project in accordance with 36 CFR Part 800. In reviews of this nature, the SHPO determines whether a federally funded, licensed, or permitted project will adversely affect properties that are listed or determined eligible for listing in the National Register of Historic Places. The SHPO has determined that the proposed project will not affect any property listed or determined eligible for listing in the National Register. As far as this office is concerned, the project may proceed.

Thank you for giving us the opportunity to comment on this proposal. Please refer to the Kansas State Review & Compliance number (KSR&C#) listed above on any future correspondence. Please submit any comments or questions regarding this review to Tim Weston at 785-272-8681 ext. 214 or Tim.Weston@ks.gov.

Sincerely,

Jennie Chinn
State Historic Preservation Officer

Patrick Zollner
Director, Cultural Resources Division
Deputy State Historic Preservation Officer

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www.todayspower.com

February 23, 2021

Max Bear
Cheyenne and Arapaho Tribes, Oklahoma
P.O. Box 167
Concho, OK 73022
By Email: mbear@c-a-tribes.org

RE: United States Department of Agriculture (USDA) - Rural Development (RD)
Rural Utilities Service (RUS) Applicant THPO Section 106 Initiation
Coldwater Solar Facility
Comanche County, Kansas

Dear Mr. Bear,

Today's Power, Inc. (TPI) plans to seek financial assistance from the USDA Rural Development (RD), Rural Utilities Service (RUS) under its Electric Program for the Coldwater Solar Facility (Project). This Project will not be using the Nationwide Programmatic Agreement.

The Project proposes to construct a 12-acre, 2.8-Megawatt solar electric array located on land previously cleared and developed for agricultural use. The Project will interconnect to the CMS Electric Cooperative electric distribution system which would require little to no upgrades. The solar array is located northwest of Coldwater near the intersection of Cm Road 11 and CM Ave. H. A summary project description and United States Geological Survey topographical map of location is included as Enclosures A and B, respectively.

The construction phase of the project, which includes grading, will be planned and designed to minimize the use of mechanized grading and fill materials procured off site. Controls, such as silt fences and stabilization, will be used during and after construction as needed to minimize indirect adverse environmental effects.

If RUS elects to fund the Project, it will become an undertaking subject to review under Section 106 of the National Historic Preservation Act, 54 U.S.C. 306108, and its implementing regulations, 36 CFR Part 800.

RUS defines the area of potential effect (APE), as an area that includes all Project construction and excavation activity required to construct, modify, improve, or maintain any facilities; any right-of-way or easement areas necessary for the construction, operation, and maintenance of the Project; all areas used for excavation of borrow material and habitat creation; all construction staging areas, access routes, utilities, spoil areas, and stockpiling areas. Impacts that come from the undertaking at the same time and place with no intervening causes, are considered "direct" regardless of its specific type (e.g., whether it is visual, physical, auditory, etc.). "Indirect" effects to historic properties are those caused by the undertaking that are later in time or farther removed in distance but are still reasonably foreseeable.

Based on this definition, TPI proposes that the APE for the referenced project consists of a rural area of approximately 12 acres previously cleared for agricultural use as shown on the enclosed map. The Project will include a facility entrance for site access. The entrance will be constructed from the existing road right-of-way and easement to minimize disturbance in the APE. The geographic scope of the APE will not be final until a determination is made by RUS pursuant to 36 CFR § 800.4(a)(1). Additionally, the APE does not include any tribal lands as defined pursuant to 36 CFR § 800.16(x).

Pursuant to 36 CFR § 800.2(c)(4), and 7 CFR § 1970.5(b)(2) of the regulations, "Environmental Policies and Procedures" (7 CFR Part 1970), RUS has issued a blanket delegation for its applicants to initiate and proceed through Section 106 review if there is agreement.

In delegating this authority, RUS is advocating for the direct interaction between its Electric Program applicants and Indian tribes. RUS believes this interaction, prior to direct agency involvement, will support and encourage the consideration of impacts to historic properties of importance to Indian tribes earlier in project planning.

TPI is notifying you about the referenced project because of the possible interest of the Cheyenne and Arapaho Tribes in Comanche County. Should the Cheyenne and Arapaho Tribes elect to participate in Section 106 review of the referenced project, please notify me in writing via letter or preferably email as soon as possible at the following addresses:

Justin McCann, PE
Vice President of Engineering
Today's Power, Inc.
7300 Industry Dr.
North Little Rock, AR 72117
Email: jmccann@todayspower.com

Please include with your affirmative response, a description of any specific historic properties or important tribal resources in the APE and your recommendations about the level of effort needed to identify additional historic properties which might be affected by the referenced project. TPI will respect the confidentiality of the information which you provide to the fullest extent possible.

If at any time you wish to share your interests, recommendations and concerns directly with RUS, as the agency responsible for conducting Section 106 review, or to request that RUS participate directly in Section 106 review, please notify me at once, preferably via email. However, you may contact RUS directly. If you wish to do so, please submit your request to:

Alexandria Anderson
Anthropologist
Engineering and Environmental Staff
Rural Utilities Service, Rural Development
United States Department of Agriculture
1400 Independence Ave., S.W.
Washington, DC 20250
Phone: (202) 401-9141
Email: alexandria.anderson@usda.gov

Please submit your response **electronically** by March 23, 2021. RUS will proceed to the next step in Section 106 review if you fail to provide a timely response. Should you have any questions or require additional information you may contact me at the mailing address and email provided above.

Sincerely,

Today's Power, Inc.

Justin McCann, P.E.
Vice President of Engineering

Enclosures:

Enclosure A: RUS 1230 Coldwater Solar Facility Project Description
Enclosure B: RUS 1230 Coldwater Solar Facility Project Map

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www.todayspower.com

March 17, 2021

Max Bear
Cheyenne and Arapaho Tribes, Oklahoma
P.O. Box 167
Concho, OK 73022
By Email: mbear@c-a-tribes.org

RE: United States Department of Agriculture (USDA) - Rural Development (RD)
Rural Utilities Service (RUS) Applicant THPO Section 106 Recommended Finding of No Historic Properties Affected
Coldwater Solar Facility
Comanche County, Kansas

Dear Mr. Bear,

Today's Power, Inc. (TPI) plans to seek financial assistance from the USDA Rural Development (RD), Rural Utilities Service (RUS) under its Electric Program for the Coldwater Solar Facility (Project). This Project will not be using the Nationwide Programmatic Agreement.

The Project proposes to construct a 12-acre, 2.8-Megawatt solar electric array located on land previously cleared and developed for agricultural use. The Project will interconnect to the CMS Electric Cooperative electric distribution system which would require little to no upgrades. The solar array is located northwest of Coldwater near the intersection of Cm Road 11 and CM Ave. H. A summary project description and United States Geological Survey topographical map of location is included as Enclosures A and B, respectively.

The construction phase of the project, which includes grading, will be planned and designed to minimize the use of mechanized grading and fill materials procured off site. Controls, such as silt fences and stabilization, will be used during and after construction as needed to minimize indirect adverse environmental effects.

If RUS elects to fund the Project, it will become an undertaking subject to review under Section 106 of the National Historic Preservation Act, 54 U.S.C. 306108, and its implementing regulations, 36 CFR Part 800.

RUS defines the area of potential effect (APE), as an area that includes all Project construction and excavation activity required to construct, modify, improve, or maintain any facilities; any right-of-way or easement areas necessary for the construction, operation, and maintenance of the Project; all areas used for excavation of borrow material and habitat creation; all construction staging areas, access routes, utilities, spoil areas, and stockpiling areas. Impacts that come from the undertaking at the same time and place with no intervening causes, are considered "direct" regardless of its specific

type (e.g., whether it is visual, physical, auditory, etc.). “Indirect” effects to historic properties are those caused by the undertaking that are later in time or farther removed in distance but are still reasonably foreseeable.

At the direction of RUS, on 2/23/2021 TPI notified the following Indian tribes about the Coldwater Solar Facility: Cheyenne and Arapaho Tribes, Osage Nation, United Keetoowah Band, and Wichita and Affiliated Tribes. As of the date of this letter only the United Keetoowah Band has responded to the Section 106 initiation letter. The United Keetoowah Band has concurred with the project, stating that the project development may proceed. No response to the 2/23/2021 initiation letter has been received from the Cheyenne and Arapaho Tribes, Osage Nation, or Wichita and Affiliated Tribes.

The enclosed letter titled, KHS Coldwater Response Letter dated 3/11/2021 describes the results of the review of the APE. The review was conducted by the Kansas SHPO, Kansas Historical Society, to determine whether the project will adversely affect properties that are listed or determined to eligible for listing in the National Register of Historic Places. The SHPO has determined that the proposed project will not affect any property listed or determined eligible for listing in the National Register and that the project may proceed. Today’s Power agrees with the Kansas SHPO determination that the Coldwater Solar Facility will not affect historic properties. Based on the findings of the KHS Coldwater Response Letter dated 3/11/2021, a finding of no historic properties affected in accordance with 36 CFR § 800.4(d)(1) is appropriate for the referenced project.

Accordingly, TPI is submitting a recommended finding of no historic properties affected in accordance with 36 CFR § 800.4(d)(1) and supporting documentation for review and consideration by the Cheyenne and Arapaho Tribes.

Pursuant to 36 CFR § 800.2(c)(4), and 7 CFR § 1970.5(b)(2) of the regulations, “Environmental Policies and Procedures” (7 CFR Part 1970), RUS has issued a blanket delegation for its applicants to initiate and proceed through Section 106 review if there is agreement.

In delegating this authority, RUS is advocating for the direct interaction between its Electric Program applicants and Indian tribes. RUS believes this interaction, prior to direct agency involvement, will support and encourage the consideration of impacts to historic properties of importance to Indian tribes earlier in project planning.

Please provide your concurrence or objection, electronically within 30 days of your receipt of this recommended finding. In accordance with 36 CFR § 800.3(c)(4), RUS will proceed to the next step in review if we do not receive a response from you within thirty days. Please direct any questions you may have to the following addresses:

Justin McCann, PE
Vice President of Engineering
Today’s Power, Inc.
7300 Industry Dr.
North Little Rock, AR 72117
Email: jmccann@todayspower.com

Please include with your affirmative response, a description of any specific historic properties or important tribal resources in the APE and your recommendations about the level of effort needed to identify additional historic properties which might be affected by the referenced project. TPI will respect the confidentiality of the information which you provide to the fullest extent possible.

If at any time you wish to share your interests, recommendations and concerns directly with RUS, as the agency responsible for conducting Section 106 review, or to request that RUS participate directly in Section 106 review, please notify me at once, preferably via email. However, you may contact RUS directly. If you wish to do so, please submit your request to:

Alexandria Anderson
Anthropologist
Engineering and Environmental Staff
Rural Utilities Service, Rural Development
United States Department of Agriculture
1400 Independence Ave., S.W.
Washington, DC 20250
Phone: (202) 401-9141
Email: alexandria.anderson@usda.gov

Please submit your response **electronically** by April 16, 2021. RUS will proceed to the next step in Section 106 review if you fail to provide a timely response. Should you have any questions or require additional information you may contact me at the mailing address and email provided above.

Sincerely,

Today's Power, Inc.

Justin McCann, P.E.
Vice President of Engineering

Enclosures:

Enclosure A: RUS 1230 Coldwater Solar Facility Project Description
Enclosure B: RUS 1230 Coldwater Solar Facility Project Map
Enclosure C: KHS Coldwater Response Letter

Joe Tuey

From: Justin McCann <jmccann@todayspower.com>
Sent: Thursday, August 26, 2021 3:34 PM
To: Chris Bell
Subject: Fw: Section 106 Project Review Status for USDA via Today's Power

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From: Max Bear <mbear@cheyenneandarapaho-nsn.gov>
Sent: Thursday, April 29, 2021 9:44 AM
To: Justin McCann <jmccann@todayspower.com>
Cc: alexandria.anderson@usda.gov <alexandria.anderson@usda.gov>
Subject: RE: Section 106 Project Review Status for USDA via Today's Power

Good morning sir,

I appreciate your help in completing the necessary work for these projects. I cannot make a determination before a cultural survey is to be completed on properties where the projects are located. This will help to alleviate delay in the consultation process. Please advise if I can be of any assistance.

Respectfully,
Max Bear
Tribal Historic Preservation Officer
(405)422-7714 office
(405)443-9304 cell
Working hours M-F 9am-4pm

From: Justin McCann [mailto:jmccann@todayspower.com]
Sent: Wednesday, April 28, 2021 4:04 PM
To: Max Bear <mbear@cheyenneandarapaho-nsn.gov>
Cc: Chris Rednose <chrednose@cheyenneandarapaho-nsn.gov>; alexandria.anderson@usda.gov
Subject: Section 106 Project Review Status for USDA via Today's Power

Max,

I hope this email finds you well. Could you please provide a status update of Cheyenne Section 106 reviews for the third round of solar facilities being developed by Today's Power in partnership with some of Kansas's rural electric cooperatives? A summary table below of the Section 106 consultation requests from Today's Power is below. You are welcome to respond to this email noting the results of your review and consultation. Please let us know if you have any questions or concerns.

Cooperative	Ark Valley	Bluestem	Bluestem	CMS	Ninnescah	Ninnescah	Su
Project	Medora	Peddicord	St. Goerge	Coldwater	Greensburg	Kanza	Mi
RUS Code	1227	1228	1229	1230	1231	1232	12
County	McPherson	Pottawatomie	Pottawatomie	Comanche	Kiowa	Pratt	Su
Acreage	6.3	9.4	9	12	7.8	6.3	4.6
Cultural Survey	No	Yes	No	No	No	Yes	No
Cheyenne and Arapaho Tribes Request Response	No Response	No Response	No Response	No Response	No Response	No Response	No
Letters Sent							
Cultural-SHPO Initiation	2/18/2021	2/23/2021	2/23/2021	2/23/2021	2/23/2021	2/23/2021	2/2
Cultural-SHPO Response	3/5/2021	3/11/2021	3/11/2021	3/11/2021	3/11/2021	3/11/2021	3/1
Cultural-THPO Initiation	2/18/2021	2/23/2021	2/23/2021	2/23/2021	2/23/2021	2/23/2021	2/2
Cheyenne -THPO Initiation - Email Read Receipt	2/19/2021	2/22/2021	2/24/2021	2/24/2021	2/24/2021	2/24/2021	2/2
Cheyenne -THPO Finding - Email Read Receipt	3/17/2021	3/31/21	3/17/21	3/17/2021	3/17/2021	3/31/2021	3/1

Sincerely,

Justin McCann, PE
Vice President of Engineering
Today's Power, Inc.
Direct: 618-922-1809
Email: jmccann@todayspower.com

Today's Power
Your Energy Partner

From: Chris Bell <cbell@todayspower.com>
Sent: Thursday, July 22, 2021 4:18 AM
To: Matt Miller; Joe Tuey
Subject: FW: Coldwater Solar Facility Cultural Survey
Attachments: RUS 1230 Coldwater Solar - Identification Survey.pdf

EXTERNAL EMAIL

From: Justin McCann <jmccann@todayspower.com>
Sent: Wednesday, July 21, 2021 9:38 PM
To: Chris Bell <cbell@todayspower.com>
Subject: Fwd: Coldwater Solar Facility Cultural Survey

Justin McCann, PE
Vice President of Engineering
Today's Power, Inc.
Direct: 618-922-1809
Email: jmccann@todayspower.com

From: Justin McCann
Sent: Tuesday, May 25, 2021 10:11:27 AM
To: Max Bear <mbear@cheyenneandarapaho-nsn.gov>
Cc: Chris Rednose <chrednose@cheyenneandarapaho-nsn.gov>; Anderson, Alexandria - RD, Washington, DC <alexandria.anderson@usda.gov>; Chris Bell <cbell@todayspower.com>
Subject: Coldwater Solar Facility Cultural Survey

Mr. Bear,

Per your request, please find the attached cultural resource survey completed for Today's Power's proposed Coldwater Solar Facility. Please let us know if you have any questions or concerns.

Sincerely,

Justin McCann, PE
Vice President of Engineering
Today's Power, Inc.
Direct: 618-922-1809
Email: jmccann@todayspower.com

Today's Power
Your Energy Partner

Today's Power
Your Energy Partner

www.todayspower.com

February 23, 2021

Andrea Hunter
Osage Nation
627 Grandview Ave.
Pawhuska, OK 74056
By Email: ahunter@osagenation-nsn.gov

RE: United States Department of Agriculture (USDA) - Rural Development (RD)
Rural Utilities Service (RUS) Applicant THPO Section 106 Initiation
Coldwater Solar Facility
Comanche County, Kansas

Dear Ms. Hunter,

Today's Power, Inc. (TPI) plans to seek financial assistance from the USDA Rural Development (RD), Rural Utilities Service (RUS) under its Electric Program for the Coldwater Solar Facility (Project). This Project will not be using the Nationwide Programmatic Agreement.

The Project proposes to construct a 12-acre, 2.8-Megawatt solar electric array located on land previously cleared and developed for agricultural use. The Project will interconnect to the CMS Electric Cooperative electric distribution system which would require little to no upgrades. The solar array is located northwest of Coldwater near the intersection of Cm 11 Rd. and Cm Ave. 11. A summary project description and United States Geological Survey topographical map of location is included as Enclosures A and B, respectively.

The construction phase of the project, which includes grading, will be planned and designed to minimize the use of mechanized grading and fill materials procured off site. Controls, such as silt fences and stabilization, will be used during and after construction as needed to minimize indirect adverse environmental effects.

If RUS elects to fund the Project, it will become an undertaking subject to review under Section 106 of the National Historic Preservation Act, 54 U.S.C. 306108, and its implementing regulations, 36 CFR Part 800.

RUS defines the area of potential effect (APE), as an area that includes all Project construction and excavation activity required to construct, modify, improve, or maintain any facilities; any right-of-way or easement areas necessary for the construction, operation, and maintenance of the Project; all areas used for excavation of borrow material and habitat creation; all construction staging areas, access routes, utilities, spoil areas, and stockpiling areas. Impacts that come from the undertaking at the same time and place with no intervening causes, are considered "direct" regardless of its specific type (e.g., whether it is visual, physical, auditory, etc.). "Indirect" effects to historic properties are those caused by the undertaking that are later in time or farther removed in distance but are still reasonably foreseeable.

Based on this definition, TPI proposes that the APE for the referenced project consists of a rural area of approximately 12 acres previously cleared for agricultural use as shown on the enclosed map. The Project will include a facility entrance for site access. The entrance will be constructed from the existing road right-of-way and easement to minimize disturbance in the APE. The geographic scope of the APE will not be final until a determination is made by RUS pursuant to 36 CFR § 800.4(a)(1). Additionally, the APE does not include any tribal lands as defined pursuant to 36 CFR § 800.16(x).

Pursuant to 36 CFR § 800.2(c)(4), and 7 CFR § 1970.5(b)(2) of the regulations, "Environmental Policies and Procedures" (7 CFR Part 1970), RUS has issued a blanket delegation for its applicants to initiate and proceed through Section 106 review if there is agreement.

In delegating this authority, RUS is advocating for the direct interaction between its Electric Program applicants and Indian tribes. RUS believes this interaction, prior to direct agency involvement, will support and encourage the consideration of impacts to historic properties of importance to Indian tribes earlier in project planning.

TPI is notifying you about the referenced project because of the possible interest of the Osage Nation in Comanche County. Should the Osage Nation elect to participate in Section 106 review of the referenced project, please notify me in writing via letter or preferably email as soon as possible at the following addresses:

Justin McCann, PE
Vice President of Engineering
Today's Power, Inc.
7300 Industry Dr.
North Little Rock, AR 72117
Email: jmccann@todayspower.com

Please include with your affirmative response, a description of any specific historic properties or important tribal resources in the APE and your recommendations about the level of effort needed to identify additional historic properties which might be affected by the referenced project. TPI will respect the confidentiality of the information which you provide to the fullest extent possible.

If at any time you wish to share your interests, recommendations and concerns directly with RUS, as the agency responsible for conducting Section 106 review, or to request that RUS participate directly in Section 106 review, please notify me at once, preferably via email. However, you may contact RUS directly. If you wish to do so, please submit your request to:

Alexandria Anderson
Anthropologist
Engineering and Environmental Staff
Rural Utilities Service, Rural Development
United States Department of Agriculture
1400 Independence Ave., S.W.
Washington, DC 20250
Phone: (202) 401-9141
Email: alexandria.anderson@usda.gov

Please submit your response **electronically** by March 23, 2021. RUS will proceed to the next step in Section 106 review if you fail to provide a timely response. Should you have any questions or require additional information you may contact me at the mailing address and email provided above.

Sincerely,

Today's Power, Inc.

Justin McCann, P.E.
Vice President of Engineering

Enclosures:

Enclosure A: RUS 1230 Coldwater Solar Facility Project Description
Enclosure B: RUS 1230 Coldwater Solar Facility Project Map

Today's Power
Your Energy Partner

www.todayspower.com

March 17, 2021

Andrea Hunter
Osage Nation
627 Grandview Ave.
Pawhuska, OK 74056
By Email: ahunter@osagenation-nsn.gov

RE: United States Department of Agriculture (USDA) - Rural Development (RD)
Rural Utilities Service (RUS) Applicant THPO Section 106 Recommended Finding of No Historic Properties Affected
Coldwater Solar Facility
Comanche County, Kansas

Dear Ms. Hunter,

Today's Power, Inc. (TPI) plans to seek financial assistance from the USDA Rural Development (RD), Rural Utilities Service (RUS) under its Electric Program for the Coldwater Solar Facility (Project). This Project will not be using the Nationwide Programmatic Agreement.

The Project proposes to construct a 12-acre, 2.8-Megawatt solar electric array located on land previously cleared and developed for agricultural use. The Project will interconnect to the CMS Electric Cooperative electric distribution system which would require little to no upgrades. The solar array is located northwest of Coldwater near the intersection of Cm Road 11 and CM Ave. H. A summary project description and United States Geological Survey topographical map of location is included as Enclosures A and B, respectively.

The construction phase of the project, which includes grading, will be planned and designed to minimize the use of mechanized grading and fill materials procured off site. Controls, such as silt fences and stabilization, will be used during and after construction as needed to minimize indirect adverse environmental effects.

If RUS elects to fund the Project, it will become an undertaking subject to review under Section 106 of the National Historic Preservation Act, 54 U.S.C. 306108, and its implementing regulations, 36 CFR Part 800.

RUS defines the area of potential effect (APE), as an area that includes all Project construction and excavation activity required to construct, modify, improve, or maintain any facilities; any right-of-way or easement areas necessary for the construction, operation, and maintenance of the Project; all areas used for excavation of borrow material and habitat creation; all construction staging areas, access routes, utilities, spoil areas, and stockpiling areas. Impacts that come from the undertaking at the same time and place with no intervening causes, are considered "direct" regardless of its specific

type (e.g., whether it is visual, physical, auditory, etc.). “Indirect” effects to historic properties are those caused by the undertaking that are later in time or farther removed in distance but are still reasonably foreseeable.

At the direction of RUS, on 2/23/2021 TPI notified the following Indian tribes about the Coldwater Solar Facility: Cheyenne and Arapaho Tribes, Osage Nation, United Keetoowah Band, and Wichita and Affiliated Tribes. As of the date of this letter only the United Keetoowah Band has responded to the Section 106 initiation letter. The United Keetoowah Band has concurred with the project, stating that the project development may proceed. No response to the 2/23/2021 initiation letter has been received from the Cheyenne and Arapaho Tribes, Osage Nation, or Wichita and Affiliated Tribes.

The enclosed letter titled, KHS Coldwater Response Letter dated 3/11/2021 describes the results of the review of the APE. The review was conducted by the Kansas SHPO, Kansas Historical Society, to determine whether the project will adversely affect properties that are listed or determined to eligible for listing in the National Register of Historic Places. The SHPO has determined that the proposed project will not affect any property listed or determined eligible for listing in the National Register and that the project may proceed. Today’s Power agrees with the Kansas SHPO determination that the Coldwater Solar Facility will not affect historic properties. Based on the findings of the KHS Coldwater Response Letter dated 3/11/2021, a finding of no historic properties affected in accordance with 36 CFR § 800.4(d)(1) is appropriate for the referenced project.

Accordingly, TPI is submitting a recommended finding of no historic properties affected in accordance with 36 CFR § 800.4(d)(1) and supporting documentation for review and consideration by the Osage Nation.

Pursuant to 36 CFR § 800.2(c)(4), and 7 CFR § 1970.5(b)(2) of the regulations, “Environmental Policies and Procedures” (7 CFR Part 1970), RUS has issued a blanket delegation for its applicants to initiate and proceed through Section 106 review if there is agreement.

In delegating this authority, RUS is advocating for the direct interaction between its Electric Program applicants and Indian tribes. RUS believes this interaction, prior to direct agency involvement, will support and encourage the consideration of impacts to historic properties of importance to Indian tribes earlier in project planning.

Please provide your concurrence or objection, electronically within 30 days of your receipt of this recommended finding. In accordance with 36 CFR § 800.3(c)(4), RUS will proceed to the next step in review if we do not receive a response from you within thirty days. Please direct any questions you may have to the following addresses:

Justin McCann, PE
Vice President of Engineering
Today’s Power, Inc.
7300 Industry Dr.
North Little Rock, AR 72117
Email: jmccann@todayspower.com

Please include with your affirmative response, a description of any specific historic properties or important tribal resources in the APE and your recommendations about the level of effort needed to identify additional historic properties which might be affected by the referenced project. TPI will respect the confidentiality of the information which you provide to the fullest extent possible.

If at any time you wish to share your interests, recommendations and concerns directly with RUS, as the agency responsible for conducting Section 106 review, or to request that RUS participate directly in Section 106 review, please notify me at once, preferably via email. However, you may contact RUS directly. If you wish to do so, please submit your request to:

Alexandria Anderson
Anthropologist
Engineering and Environmental Staff
Rural Utilities Service, Rural Development
United States Department of Agriculture
1400 Independence Ave., S.W.
Washington, DC 20250
Phone: (202) 401-9141
Email: alexandria.anderson@usda.gov

Please submit your response **electronically** by April 16, 2021. RUS will proceed to the next step in Section 106 review if you fail to provide a timely response. Should you have any questions or require additional information you may contact me at the mailing address and email provided above.

Sincerely,

Today's Power, Inc.

Justin McCann, P.E.
Vice President of Engineering

Enclosures:

Enclosure A: RUS 1230 Coldwater Solar Facility Project Description
Enclosure B: RUS 1230 Coldwater Solar Facility Project Map
Enclosure C: KHS Coldwater Response Letter

Osage Nation Historic Preservation Office

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Date: December 17, 2021 **File: 2122-2288KS-10**

RE: USDA, RUS, TPI, Coldwater Solar Facility, Comanche County, Kansas

Today's Power, Inc.
Justin McCann
7300 Industry Drive
North Little Rock, AR 72117

Dear Mr. McCann,

The Osage Nation Historic Preservation Office has evaluated your submission regarding the proposed USDA, RUS, TPI, Coldwater Solar Facility, Comanche County, Kansas and determined that the proposed project **most likely will not adversely affect any sacred properties and/or properties of cultural significance to the Osage Nation.** For direct effect, the finding of this NHPA Section 106 review is a determination of **"No Properties"** eligible or potentially eligible for the National Register of Historic Places. However, we request that site 14CM0410 is avoided, and that no off-site project activities such as staging, borrow/disposal sites occur in the NWSW Section 13, T32S, R19W.

In accordance with the National Historic Preservation Act, (NHPA) [54 U.S.C. § 300101 et seq.] 1966, undertakings subject to the review process are referred to in 54 U.S.C. § 302706 (a), which clarifies that historic properties may have religious and cultural significance to Indian tribes. Additionally, Section 106 of NHPA requires Federal agencies to consider the effects of their actions on historic properties (36 CFR Part 800) as does the National Environmental Policy Act (43 U.S.C. 4321 and 4331-35 and 40 CFR 1501.7(a) of 1969). **The Osage Nation concurs that the Today's Power, Inc.fulfilled NHPA compliance by consulting with the Osage Nation Historic Preservation Office in regard to the proposed project referenced as USDA, RUS, TPI, Coldwater Solar Facility, Comanche County, Kansas.**

The Osage Nation has vital interests in protecting its historic and ancestral cultural resources. We do not anticipate that this project will adversely impact any cultural resources or human remains protected under the NHPA, NEPA, the Native American Graves Protection and Repatriation Act, or Osage law. **If, however, artifacts or human remains are discovered during project construction, we ask that work cease immediately and the Osage Nation Historic Preservation Office be contacted.**

Should you have any questions or need any additional information please feel free to contact me at the number listed below. Thank you for consulting with the Osage Nation on this matter.

Andrea A. Hunter, Ph.D.
Director, Tribal Historic Preservation Officer

Johnnie Jacobs
Archaeologist

627 Grandview Ave. * Pawhuska, OK 74056 Telephone 918-287-5328 * Fax 918-287-5376
HistoricPreservation@osagenation-nsn.gov

Today's Power
Your Energy Partner

www.todayspower.com

February 23, 2021

Erica Gorsuch
United Keetoowah Band of Cherokee Indians in Oklahoma
P.O. Box 1425
Tahlequah, OK 74465
By Email: egorsuch@ukb-nsn.gov

RE: United States Department of Agriculture (USDA) - Rural Development (RD)
Rural Utilities Service (RUS) Applicant THPO Section 106 Initiation
Coldwater Solar Facility
Comanche County, Kansas

Dear Ms. Gorsuch,

Today's Power, Inc. (TPI) plans to seek financial assistance from the USDA Rural Development (RD), Rural Utilities Service (RUS) under its Electric Program for the Coldwater Solar Facility (Project). This Project will not be using the Nationwide Programmatic Agreement.

The Project proposes to construct a 12-acre, 2.8-Megawatt solar electric array located on land previously cleared and developed for agricultural use. The Project will interconnect to the CMS Electric Cooperative electric distribution system which would require little to no upgrades. The solar array is located northwest of Coldwater near the intersection of Cm 11 Rd. and Cm Ave. 11. A summary project description and United States Geological Survey topographical map of location is included as Enclosures A and B, respectively.

The construction phase of the project, which includes grading, will be planned and designed to minimize the use of mechanized grading and fill materials procured off site. Controls, such as silt fences and stabilization, will be used during and after construction as needed to minimize indirect adverse environmental effects.

If RUS elects to fund the Project, it will become an undertaking subject to review under Section 106 of the National Historic Preservation Act, 54 U.S.C. 306108, and its implementing regulations, 36 CFR Part 800.

RUS defines the area of potential effect (APE), as an area that includes all Project construction and excavation activity required to construct, modify, improve, or maintain any facilities; any right-of-way or easement areas necessary for the construction, operation, and maintenance of the Project; all areas used for excavation of borrow material and habitat creation; all construction staging areas, access routes, utilities, spoil areas, and stockpiling areas. Impacts that come from the undertaking at the same time and place with no intervening causes, are considered "direct" regardless of its specific type (e.g., whether it is visual, physical, auditory, etc.). "Indirect" effects to historic properties are those caused by the undertaking that are later in time or farther removed in distance but are still reasonably foreseeable.

Based on this definition, TPI proposes that the APE for the referenced project consists of a rural area of approximately 12 acres previously cleared for agricultural use as shown on the enclosed map. The Project will include a facility entrance for site access. The entrance will be constructed from the existing road right-of-way and easement to minimize disturbance in the APE. The geographic scope of the APE will not be final until a determination is made by RUS pursuant to 36 CFR § 800.4(a)(1). Additionally, the APE does not include any tribal lands as defined pursuant to 36 CFR § 800.16(x).

Pursuant to 36 CFR § 800.2(c)(4), and 7 CFR § 1970.5(b)(2) of the regulations, "Environmental Policies and Procedures" (7 CFR Part 1970), RUS has issued a blanket delegation for its applicants to initiate and proceed through Section 106 review if there is agreement.

In delegating this authority, RUS is advocating for the direct interaction between its Electric Program applicants and Indian tribes. RUS believes this interaction, prior to direct agency involvement, will support and encourage the consideration of impacts to historic properties of importance to Indian tribes earlier in project planning.

TPI is notifying you about the referenced project because of the possible interest of the United Keetoowah Band in Comanche County. Should the United Keetoowah Band elect to participate in Section 106 review of the referenced project, please notify me in writing via letter or preferably email as soon as possible at the following addresses:

Justin McCann, PE
Vice President of Engineering
Today's Power, Inc.
7300 Industry Dr.
North Little Rock, AR 72117
Email: jmccann@todayspower.com

Please include with your affirmative response, a description of any specific historic properties or important tribal resources in the APE and your recommendations about the level of effort needed to identify additional historic properties which might be affected by the referenced project. TPI will respect the confidentiality of the information which you provide to the fullest extent possible.

If at any time you wish to share your interests, recommendations and concerns directly with RUS, as the agency responsible for conducting Section 106 review, or to request that RUS participate directly in Section 106 review, please notify me at once, preferably via email. However, you may contact RUS directly. If you wish to do so, please submit your request to:

Alexandria Anderson
Anthropologist
Engineering and Environmental Staff
Rural Utilities Service, Rural Development
United States Department of Agriculture
1400 Independence Ave., S.W.
Washington, DC 20250
Phone: (202) 401-9141
Email: alexandria.anderson@usda.gov

Please submit your response **electronically** by March 23, 2021. RUS will proceed to the next step in Section 106 review if you fail to provide a timely response. Should you have any questions or require additional information you may contact me at the mailing address and email provided above.

Sincerely,

Today's Power, Inc.

Justin McCann, P.E.
Vice President of Engineering

Enclosures:

Enclosure A: RUS 1230 Coldwater Solar Facility Project Description
Enclosure B: RUS 1230 Coldwater Solar Facility Project Map

United Keetoowah Band
Of Cherokee Indians in Oklahoma
Office of Historic Preservation

P.O. Box 746 • Tahlequah, OK 74465
4547 S Whitmore Lane • Tahlequah, OK 74464 Phone: (918) 871-2800 • Fax: (918) 414-4038 ukbthpo@ukb-nsn.gov

February 23, 2021

RE: Today's Power, Coldwater, Comanche County, Kansas

To whom it may concern,

Thank you for consulting with the United Keetoowah Band of Cherokee Indians in Oklahoma (UKB). This response is regarding the request from your office for a review of the project listed above located in Coldwater, Comanche County, Kansas. We have reviewed the information provided in your letter of February 23, 2021. We find after review of the information we concur with your findings of "no adverse effects".

We remain interested in further communication regarding this project due to the location. The UKB people have a documented historical presence in Coldwater, Comanche County, Kansas. While there are no documented village sites within the project site or within a proximity outside the project site, there is always the potential of finding unknown sites in and surrounding the project location. There is the possibility that unrecorded cultural resources, including archaeological artifact or human remains, may be encountered during construction, demolition, or earthmoving activities of this project. Should this occur, we require that you contact our office immediately so we may offer appropriate comments under 36 CFR 800.13. As the project moves forward, we request the following conditions be followed:

Condition 1: Inadvertent Discoveries - If human remains, burials, funerary items, sacred objects, or objects of cultural patrimony are found during project implementation, the proponent or his/her authorized agent shall cease work immediately within 200 ft of the find. They shall take steps to protect the find from further damage or disruption. They shall contact the Certified Tribal Historic Preservation Officer (CTHPO), Whitney Warrior to report the find. The CTHPO shall contact the appropriate law enforcement authority if human remains are found. No further work shall be allowed on the project until the CTHPO has approved a plan for managing or preserving the remains or items.

Condition 2: Post Review Discoveries - In the event that pre-contact artifacts (i.e., arrowheads, spear points, mortars, pestles, other ground stone tools, knives, scrapers, pottery or flakes from the manufacture of tools, fire pits, culturally modified trees, etc.) or historic period artifacts or features (i.e., fragments of old plates or ceramic vessels, weathered glass, dumps of old cans, cabins, root cellars, etc.) are found during project implementation, the proponent or his/her

authorized agent shall cease work immediately within 200 ft of the find. They then shall contact the Certified Tribal Historic Preservation Officer, Whitney Warrior to report the find. No further

United Keetoowah Band
Of Cherokee Indians in Oklahoma
Office of Historic Preservation
P.O. Box 746 • Tahlequah, OK 74465
4547 S Whitmore Lane • Tahlequah, OK 74464 Phone: (918) 871-2800 • Fax: (918) 414-4038 ukbthpo@ukb-nsn.gov

work shall be allowed on the project until the CTHPO has approved a work plan for managing or preserving the artifacts or features.

Condition 3: Activities that have the potential to disturb cultural resources outside the areas specified in the accompanying document(s) are not approved and will not proceed until cultural resources review of potential adverse effects in the new area has been completed.

Please note that due to COVID-19, response times are longer than expected for correspondences. Thank you for your patience during this time. We are diligently working to complete all Section 106 consultations in as timely a manner as possible. If you have any questions or concerns, please feel free to contact our office. These comments are based on information available to us at the time of the project review. We reserve the right to revise our comments as information becomes available. If you have any questions or concerns, please contact our Certified Tribal Historic Preservation Officer/NAGPRA Coordinator, Whitney Warrior at (918) 871-2838 or by email wwarrior@ukbnsn.gov.

Thank you for your consultation,

Whitney Warrior

Whitney Warrior
Director Office of Historic Preservation
United Keetoowah Band of Cherokee
918-871-2838
wwarrior@ukb-nsn.gov

Today's Power
Your Energy Partner

www.todayspower.com

February 23, 2021

Robin Williams
Wichita and Affiliated Tribes
P.O. Box 729
Anadarko, OK 73005
By Email: robin.williams@wichitatribe.com

RE: United States Department of Agriculture (USDA) - Rural Development (RD)
Rural Utilities Service (RUS) Applicant THPO Section 106 Initiation
Coldwater Solar Facility
Comanche County, Kansas

Dear Ms. Williams,

Today's Power, Inc. (TPI) plans to seek financial assistance from the USDA Rural Development (RD), Rural Utilities Service (RUS) under its Electric Program for the Coldwater Solar Facility (Project). This Project will not be using the Nationwide Programmatic Agreement.

The Project proposes to construct a 12-acre, 2.8-Megawatt solar electric array located on land previously cleared and developed for agricultural use. The Project will interconnect to the CMS Electric Cooperative electric distribution system which would require little to no upgrades. The solar array is located northwest of Coldwater near the intersection of Cm 11 Rd. and Cm Ave. 11. A summary project description and United States Geological Survey topographical map of location is included as Enclosures A and B, respectively.

The construction phase of the project, which includes grading, will be planned and designed to minimize the use of mechanized grading and fill materials procured off site. Controls, such as silt fences and stabilization, will be used during and after construction as needed to minimize indirect adverse environmental effects.

If RUS elects to fund the Project, it will become an undertaking subject to review under Section 106 of the National Historic Preservation Act, 54 U.S.C. 306108, and its implementing regulations, 36 CFR Part 800.

RUS defines the area of potential effect (APE), as an area that includes all Project construction and excavation activity required to construct, modify, improve, or maintain any facilities; any right-of-way or easement areas necessary for the construction, operation, and maintenance of the Project; all areas used for excavation of borrow material and habitat creation; all construction staging areas, access routes, utilities, spoil areas, and stockpiling areas. Impacts that come from the undertaking at the same time and place with no intervening causes, are considered "direct" regardless of its specific type (e.g., whether it is visual, physical, auditory, etc.). "Indirect" effects to historic properties are those caused by the undertaking that are later in time or farther removed in distance but are still reasonably foreseeable.

Based on this definition, TPI proposes that the APE for the referenced project consists of a rural area of approximately 12 acres previously cleared for agricultural use as shown on the enclosed map. The Project will include a facility entrance for site access. The entrance will be constructed from the existing road right-of-way and easement to minimize disturbance in the APE. The geographic scope of the APE will not be final until a determination is made by RUS pursuant to 36 CFR § 800.4(a)(1). Additionally, the APE does not include any tribal lands as defined pursuant to 36 CFR § 800.16(x).

Pursuant to 36 CFR § 800.2(c)(4), and 7 CFR § 1970.5(b)(2) of the regulations, "Environmental Policies and Procedures" (7 CFR Part 1970), RUS has issued a blanket delegation for its applicants to initiate and proceed through Section 106 review if there is agreement.

In delegating this authority, RUS is advocating for the direct interaction between its Electric Program applicants and Indian tribes. RUS believes this interaction, prior to direct agency involvement, will support and encourage the consideration of impacts to historic properties of importance to Indian tribes earlier in project planning.

TPI is notifying you about the referenced project because of the possible interest of the Wichita and Affiliated Tribes in Comanche County. Should the Wichita and Affiliated Tribes elect to participate in Section 106 review of the referenced project, please notify me in writing via letter or preferably email as soon as possible at the following addresses:

Justin McCann, PE
Vice President of Engineering
Today's Power, Inc.
7300 Industry Dr.
North Little Rock, AR 72117
Email: jmccann@todayspower.com

Please include with your affirmative response, a description of any specific historic properties or important tribal resources in the APE and your recommendations about the level of effort needed to identify additional historic properties which might be affected by the referenced project. TPI will respect the confidentiality of the information which you provide to the fullest extent possible.

If at any time you wish to share your interests, recommendations and concerns directly with RUS, as the agency responsible for conducting Section 106 review, or to request that RUS participate directly in Section 106 review, please notify me at once, preferably via email. However, you may contact RUS directly. If you wish to do so, please submit your request to:

Alexandria Anderson
Anthropologist
Engineering and Environmental Staff
Rural Utilities Service, Rural Development
United States Department of Agriculture
1400 Independence Ave., S.W.
Washington, DC 20250
Phone: (202) 401-9141
Email: alexandria.anderson@usda.gov

Please submit your response **electronically** by March 23, 2021. RUS will proceed to the next step in Section 106 review if you fail to provide a timely response. Should you have any questions or require additional information you may contact me at the mailing address and email provided above.

Sincerely,

Today's Power, Inc.

Justin McCann, P.E.
Vice President of Engineering

Enclosures:

Enclosure A: RUS 1230 Coldwater Solar Facility Project Description
Enclosure B: RUS 1230 Coldwater Solar Facility Project Map

Today's Power
Your Energy Partner

www.todayspower.com

March 17, 2021

Robin Williams
Wichita and Affiliated Tribes
P.O. Box 729
Anadarko, OK 73005
By Email: robin.williams@wichitatribe.com

RE: United States Department of Agriculture (USDA) - Rural Development (RD)
Rural Utilities Service (RUS) Applicant THPO Section 106 Recommended Finding of No Historic Properties Affected
Coldwater Solar Facility
Comanche County, Kansas

Dear Ms. Williams,

Today's Power, Inc. (TPI) plans to seek financial assistance from the USDA Rural Development (RD), Rural Utilities Service (RUS) under its Electric Program for the Coldwater Solar Facility (Project). This Project will not be using the Nationwide Programmatic Agreement.

The Project proposes to construct a 12-acre, 2.8-Megawatt solar electric array located on land previously cleared and developed for agricultural use. The Project will interconnect to the CMS Electric Cooperative electric distribution system which would require little to no upgrades. The solar array is located northwest of Coldwater near the intersection of Cm Road 11 and CM Ave. H. A summary project description and United States Geological Survey topographical map of location is included as Enclosures A and B, respectively.

The construction phase of the project, which includes grading, will be planned and designed to minimize the use of mechanized grading and fill materials procured off site. Controls, such as silt fences and stabilization, will be used during and after construction as needed to minimize indirect adverse environmental effects.

If RUS elects to fund the Project, it will become an undertaking subject to review under Section 106 of the National Historic Preservation Act, 54 U.S.C. 306108, and its implementing regulations, 36 CFR Part 800.

RUS defines the area of potential effect (APE), as an area that includes all Project construction and excavation activity required to construct, modify, improve, or maintain any facilities; any right-of-way or easement areas necessary for the construction, operation, and maintenance of the Project; all areas used for excavation of borrow material and habitat creation; all construction staging areas, access routes, utilities, spoil areas, and stockpiling areas. Impacts that come from the undertaking at the same time and place with no intervening causes, are considered "direct" regardless of its specific

type (e.g., whether it is visual, physical, auditory, etc.). “Indirect” effects to historic properties are those caused by the undertaking that are later in time or farther removed in distance but are still reasonably foreseeable.

At the direction of RUS, on 2/23/2021 TPI notified the following Indian tribes about the Coldwater Solar Facility: Cheyenne and Arapaho Tribes, Osage Nation, United Keetoowah Band, and Wichita and Affiliated Tribes. As of the date of this letter only the United Keetoowah Band has responded to the Section 106 initiation letter. The United Keetoowah Band has concurred with the project, stating that the project development may proceed. No response to the 2/23/2021 initiation letter has been received from the Cheyenne and Arapaho Tribes, Osage Nation, or Wichita and Affiliated Tribes.

The enclosed letter titled, KHS Coldwater Response Letter dated 3/11/2021 describes the results of the review of the APE. The review was conducted by the Kansas SHPO, Kansas Historical Society, to determine whether the project will adversely affect properties that are listed or determined to eligible for listing in the National Register of Historic Places. The SHPO has determined that the proposed project will not affect any property listed or determined eligible for listing in the National Register and that the project may proceed. Today’s Power agrees with the Kansas SHPO determination that the Coldwater Solar Facility will not affect historic properties. Based on the findings of the KHS Coldwater Response Letter dated 3/11/2021, a finding of no historic properties affected in accordance with 36 CFR § 800.4(d)(1) is appropriate for the referenced project.

Accordingly, TPI is submitting a recommended finding of no historic properties affected in accordance with 36 CFR § 800.4(d)(1) and supporting documentation for review and consideration by the Wichita and Affiliated Tribes.

Pursuant to 36 CFR § 800.2(c)(4), and 7 CFR § 1970.5(b)(2) of the regulations, “Environmental Policies and Procedures” (7 CFR Part 1970), RUS has issued a blanket delegation for its applicants to initiate and proceed through Section 106 review if there is agreement.

In delegating this authority, RUS is advocating for the direct interaction between its Electric Program applicants and Indian tribes. RUS believes this interaction, prior to direct agency involvement, will support and encourage the consideration of impacts to historic properties of importance to Indian tribes earlier in project planning.

Please provide your concurrence or objection, electronically within 30 days of your receipt of this recommended finding. In accordance with 36 CFR § 800.3(c)(4), RUS will proceed to the next step in review if we do not receive a response from you within thirty days. Please direct any questions you may have to the following addresses:

Justin McCann, PE
Vice President of Engineering
Today’s Power, Inc.
7300 Industry Dr.
North Little Rock, AR 72117
Email: jmccann@todayspower.com

Please include with your affirmative response, a description of any specific historic properties or important tribal resources in the APE and your recommendations about the level of effort needed to identify additional historic properties which might be affected by the referenced project. TPI will respect the confidentiality of the information which you provide to the fullest extent possible.

If at any time you wish to share your interests, recommendations and concerns directly with RUS, as the agency responsible for conducting Section 106 review, or to request that RUS participate directly in Section 106 review, please notify me at once, preferably via email. However, you may contact RUS directly. If you wish to do so, please submit your request to:

Alexandria Anderson
Anthropologist
Engineering and Environmental Staff
Rural Utilities Service, Rural Development
United States Department of Agriculture
1400 Independence Ave., S.W.
Washington, DC 20250
Phone: (202) 401-9141
Email: alexandria.anderson@usda.gov

Please submit your response **electronically** by April 16, 2021. RUS will proceed to the next step in Section 106 review if you fail to provide a timely response. Should you have any questions or require additional information you may contact me at the mailing address and email provided above.

Sincerely,

Today's Power, Inc.

Justin McCann, P.E.
Vice President of Engineering

Enclosures:

Enclosure A: RUS 1230 Coldwater Solar Facility Project Description
Enclosure B: RUS 1230 Coldwater Solar Facility Project Map
Enclosure C: KHS Coldwater Response Letter

POST REVIEW/UNANTICIPATED DISCOVERIES PLAN

This Plan and Procedures for Addressing Unanticipated Discoveries of Cultural Resources or Human Remains During Construction (Unanticipated Discoveries Plan) has been prepared to ensure that the Coldwater Solar Facility (project), proposed by Today's Power, Inc. maintains full and complete compliance with all federal and state regulations concerning the protection of cultural resources, including Section 106 of the National Historic Preservation Act (NHPA) as well as Kansas Statute K.S.A. 75-2724 and associated regulations as applicable, and to maintain compliance with the National Environmental Policy Act (NEPA) (42 United States Code [USC] 4321 et seq.; 7 Code of Federal Regulations [CFR] 1970.8(c)) and Section 106 of the National Historic Preservation Act (NHPA) (54 USC 306108).

Personnel Responsibilities

The Today's Power, Inc. Environmental Inspector (EI) will be responsible for training and advising the construction contractor's personnel on the procedures to follow in the event that an unanticipated discovery is made. The United Keetowah Band of Cherokee Indians in Oklahoma will be provided a copy of the training materials regarding cultural resources and unanticipated discoveries including any pictures or powerpoints prior to the pre-construction training to review and edit if needed. Training will occur as part of the pre-construction on-site training program for foremen, company inspectors, and construction supervisors, and training will include focus on types of cultural resources that could be encountered and how to identify artifacts, features, and bone. The EI will formally train and advise all operators of equipment involved in grading, stripping, or trenching activities to:

A. Stop work immediately if they observe any indications of the presence of cultural materials (artifacts or other man-made features), animal bone, or possibly human bone;

B. Contact the EI (or the Construction Inspector [CI] if the EI is not available) immediately;

C. Comply with unanticipated discovery procedures (see below); and

D. Treat human remains with dignity and respect.

Unanticipated Discovery of Cultural Resources

All EIs have the responsibility to monitor the area of construction for potential archaeological materials or features throughout the period involving earth disturbance. If during the course of construction potential cultural resources are identified, all work will be immediately halted at the general location of the discovery. The construction personnel and/or monitors involved in the discovery will immediately notify the CI and EI, who will notify Today's Power, Inc. The EI or CI will ensure the find is protected and make stop work recommendations to Today's Power, Inc.

All construction work involving subsurface disturbance in the immediate vicinity of the resource will be halted unless immediate cessation of construction activities will create an unsafe condition or endanger the construction crew. Specifically, work will be stopped at the location where the potential cultural resource was found and will not resume within 100 meters (in any direction) of the find until the construction is cleared to proceed. The size of the stop-work buffer may change for an identified resource depending on the results of initial findings by the SOI-qualified cultural resource consultant.

The SOI-qualified cultural resources consultant will conduct an on-site inspection of the identified cultural discovery in accordance with the approved methodology by the next business day, or as soon as practicable. This on-site inspection will assess the nature of the cultural discovery to determine if it represents a cultural site and if the site is eligible for the NRHP, to include shovel testing and site delineation, as well as consultation. The cultural resources consultant will verbally report to RUS with further description of the discovery and a recommendation regarding the need for future treatment. RUS will then consult with Today's Power, Inc., Kansas State Historic Preservation Officer (SHPO), as well as the interested tribes to determine the NRHP eligibility of the cultural discovery. Tribal representatives will be invited to visit the site.

- If the cultural resources consultant determines that the cultural discovery is not likely to be determined significant, is an isolated find, or is completely disturbed by prior construction activities, and if the SHPO, RUS, and interested tribes concur with this finding, RUS will inform Today's Power, Inc. that construction may resume. The decision will be documented by the cultural resources consultant. The method of documentation will be determined at the time and, depending on the circumstances, may range from a letter report to an email.

- If the cultural resources consultant determines that the cultural discovery represents a significant archaeological site and the SHPO, RUS, and interested tribes concur with this determination, then the cultural resources consultant will develop a plan for additional cultural investigations and/or mitigation of the identified cultural site. The plan will be submitted to RUS for their review. RUS will then submit this plan to the SHPO and interested tribes for review and concurrence. All proposed archaeological investigations will conform to SOI Standards and Guidelines for Archeological Documentation and will be conducted by an archaeologist who meets or exceeds the SOI's Professional Qualification Standards for Archeology as published in the Federal Register on September 29, 1983 (Federal Register 48:190:44738-44739) and meeting the requirements outlined in 36 CFR 61 per Kansas State requirements.

Care will be taken to prevent any disturbance of the potential cultural resources, human remains and/or associated artifacts/materials during removal of vehicles and equipment. Until appropriate consultation has occurred, the discovery shall remain protected from any disturbance, such that no human remains or associated artifacts/materials are touched, moved, or collected.

Construction in the area of the cultural site will not resume until all required fieldwork, consultation, and coordination tasks are completed. Upon receipt of SHPO, RUS, and interested tribes concurrence that all required fieldwork has been completed, the cultural resources consultant will notify Today's Power, Inc. that work at the location of the cultural discovery may resume. The decision will be documented appropriately by the cultural resources consultant. The method of documentation may range from a letter report to an email, depending on the circumstances.

A technical report describing the work at all locations where unanticipated discoveries resulted in additional survey and/or data recovery will be prepared and submitted to RUS and APPLICANT for review within one year of the completion of fieldwork. If a consulting party requests information from the consultant, the consultant will supply the documentation to all consulting parties at the same time. RUS will submit the reviewed technical report to SHPO and interested tribes.

Unanticipated Discovery of Human Remains and/or Associated Artifacts

The following procedures will be initiated in the event unanticipated human remains are discovered. Should human remains be encountered during cultural resources survey or construction or maintenance and operation of the project, all work will be immediately halted at the general location of the discovery.

The construction personnel and/or monitors involved in the discovery will immediately notify the CI and EI, who will notify Today's Power, Inc. Today's Power, Inc. would then notify the appropriate law enforcement agency and County Coroner/Office of the Chief Medical Examiner (ME) according to Kansas State burial laws. Each party will state their interest and arrange to meet to discuss the discovery.

In all cases, the location will be immediately secured, including a buffer zone of at least a 100-meter-radius from the discovery. Any human remains will be carefully covered with a tarp made of natural materials. Construction personnel and vehicles will promptly vacate the buffer zone. Vehicle traffic within the buffer zone will be limited to that necessary to remove vehicles and equipment from the buffer zone.

Care will be taken to prevent any disturbance of the potential human remains and/or associated artifacts/materials during removal of vehicles and equipment. Until appropriate consultation has occurred, the discovery shall remain protected from any disturbance, such that no human remains, or associated artifacts/materials are touched, moved, or collected.

Today's Power, Inc. will notify the local law enforcement agency (the County Sheriff's Office, as appropriate) and the County Coroner/ME. The law enforcement agency and County Coroner/ME will determine whether the discovery is a crime scene or if it should be forwarded to the SHPO, RUS, and interested tribes for their review. The subsequent treatment of the discovery will comply with regulations in the following Kansas State Statutes (K.S.A. 75-2741 through 75-2754) governing unmarked burials and cemeteries. Other laws (KSA 80-916, 19-3106, and 17-1366) describe who is responsible for abandoned or desecrated cemeteries. For more information, please contact the Kansas State Archeologist at 785-272-8681, ext. 269. The RUS and SHPO will formally initiate consultation with local Native American Tribes that have an expressed interest where the found human remains were identified.

Until consultation is complete, and a removal strategy or avoidance is defined, the human remains will remain in place (in the ground), protected from natural forces and from vandalism and looting. No photographs, aside from those necessary for law enforcement, will be taken. Construction in the area of discovery may resume only upon approval from the appropriate point of contact (e.g., RUS, SHPO, law enforcement, or County Coroner/ME). Consulting party representatives with an interest in the discovery will be invited to visit the site once law enforcement has determined that the discovery is not of forensic interest.

Technical reports describing work at each location where human remains and/or associated artifact discoveries resulted in additional investigations will be prepared and submitted to RUS for review within one year of the completion of fieldwork. Human remains discovery reports need to be separate, individual reports, to protect confidential information. RUS will submit the reviewed technical report to SHPO and interested tribes.

Federal and State Agency Contacts

RUS Contact

NAME:	Marcus Brundage, REM
TITLE:	Environmental Protection Specialist
	Environmental and Engineering Staff
	Water and Environmental Programs
	Rural Utilities Services, Rural Development
	United States Department of Agriculture
	1400 Independence Ave. SW
	Washington DC 20250
PHONE:	202-692-5311
EMAIL:	Marcus.Brundage@usda.gov

SHPO Contact

NAME:	Tim Weston
TITLE:	State Historic Preservation Officer
CONTACT INFO:	785-272-8681 ext. 214

TRIBE(S) Contact(s)

NAME:	Whitney Warrior
TITLE:	Director, Office of Historic Preservation
CONTACT INFO:	918-871-2838

County Law Enforcement/Coroner Contacts

TITLE:	Comanche County Medical Examiner & Coroner
CONTACT INFO:	620-371-7300

Appendix I

NEPAssist Report

Coldwater Facility

August 8, 2021

Coldwater Facility

Search Result (point)

1:24,892

0 0.25 0.5 1 mi

0 0.38 0.75 1.5 km

Input Coordinates: 37.281470,-99.364398,37.281470,-99.362306,37.280446,-99.362306,37.280446,-99.364398,37.281470,-99.364398

Project Area	0.01 sq mi
Within an Ozone 8-hr (1997 standard) Non-Attainment/Maintenance Area?	no
Within an Ozone 8-hr (2008 standard) Non-Attainment/Maintenance Area?	no
Within a Lead (2008 standard) Non-Attainment/Maintenance Area?	no
Within a SO2 1-hr (2010 standard) Non-Attainment/Maintenance Area?	no
Within a PM2.5 24hr (2006 standard) Non-Attainment/Maintenance Area?	no
Within a PM2.5 Annual (1997 standard) Non-Attainment/Maintenance Area?	no
Within a PM2.5 Annual (2012 standard) Non-Attainment/Maintenance Area?	no
Within a PM10 (1987 standard) Non-Attainment/Maintenance Area?	no
Within a Federal Land?	no
Within an impaired stream?	no
Within an impaired waterbody?	no
Within a waterbody?	no
Within a stream?	no
Within an NWI wetland?	Available Online
Within a Brownfields site?	no
Within a Superfund site?	no
Within a Toxic Release Inventory (TRI) site?	no
Within a water discharger (NPDES)?	no
Within a hazardous waste (RCRA) facility?	no

Within an air emission facility?	no
Within a school?	no
Within an airport?	no
Within a hospital?	no
Within a designated sole source aquifer?	no
Within a historic property on the National Register of Historic Places?	no
Within a Toxic Substances Control Act (TSCA) site?	no
Within a Land Cession Boundary?	yes
Within a tribal area (lower 48 states)?	no
Within the service area of a mitigation or conservation bank?	no
Within the service area of an In-Lieu-Fee Program?	yes

Created on: 8/8/2021 7:53:00 PM

Appendix J

Save as PDF

EJSCREEN Report ()

The area is too small or sparsely populated to generate an EJSCREEN report.

State Percentile Regional Percentile National Percentile

This report shows the values for environmental and demographic indicators and EJSCREEN indexes. It shows environmental and demographic raw data (e.g., the estimated concentration of ozone in the air), and also shows what percentile each raw data value represents. These percentiles provide perspective on how the selected block group or buffer area compares to the entire state, EPA region, or nation. For example, if a given location is at the 95th percentile nationwide, this means that only 5 percent of the US population has a higher block group value than the average person in the location being analyzed. The years for which the data are available, and the methods used, vary across these indicators. Important caveats and uncertainties apply to this screening-level information, so it is essential to understand the limitations on appropriate interpretations and applications of these indicators. Please see EJSCREEN documentation for discussion of these issues before using reports.

August 8, 2021

Coldwater Facility

1:4,514

0 0.04 0.09 0.18 mi

0 0.05 0.1 0.2 km

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community, Sources: Esri, HERE, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community

*The National-Scale Air Toxics Assessment (NATA) is EPA's ongoing, comprehensive evaluation of air toxics in the United States. EPA developed the NATA to prioritize air toxics, emission sources, and locations of interest for further study. It is important to remember that NATA provides broad estimates of health risks over geographic areas of the country, not definitive risks to specific individuals or locations. More information on the NATA analysis can be found at: https://www.epa.gov/national-air-toxics-assessment.

For additional information, see: www.epa.gov/environmentaljustice (http://www.epa.gov/environmentaljustice)

EJSCREEN is a screening tool for pre-decisional use only. It can help identify areas that may warrant additional consideration, analysis, or outreach. It does not provide a basis for decision-making, but it may help identify potential areas of EJ concern. Users should keep in mind that screening tools are subject to substantial uncertainty in their demographic and environmental data, particularly when looking at small geographic areas. Important caveats and uncertainties apply to this screening-level information, so it is essential to understand the limitations on appropriate interpretations and applications of these indicators. Please see EJSCREEN documentation for discussion of these issues before using reports. This screening tool does not provide data on every environmental impact and demographic factor that may be relevant to a particular location. EJSCREEN outputs should be supplemented with additional information and local knowledge before taking any action to address potential EJ concerns.

Form RD 2006-38
(Rev. 07-07)

Rural Development
Environmental Justice (EJ) and Civil Rights Impact Analysis (CRIA)
Certification

1 . Applicant's name and proposed project description: Today's Power, Inc.
construction of an approximately 12 acre, 2.8 MWDC solar array

2. Rural Development's loan/grant program/guarantee or other Agency action: USDA Rural Development,
Rural Utilities Service (RUS), under its Electric Program

3. ☐ Attach a map of the proposal's area of effect identifying location or EJ populations, location of the proposal, area of impact or

☑ Attach results of EJ analysis from the Environmental Protection Agency's (EPAs) EnviroMapper with proposed project location and impact footprint delineated.

4. Does the applicant's proposal or Agency action directly, indirectly or cumulatively affect the quality and/or level of services provided to the community?
☑ Yes ☐ No ☐ N/A

5. Is the applicant's proposal or Agency action likely to result in a change in the current land use patterns (types of land use, development densities, etc)?
☐ Yes ☑ No ☐ N/A

6. Does a demographic analysis indicate the applicant's proposal or Agency's action may disproportionately affect a significant minority and/or low-income populations?
☐ Yes ☑ No ☐ N/A

If answer is no, skip to item 12. If answer is yes, continue with items 7 through 12.

7. Identify, describe, and provide location of EJ population _____

_____

8. If a disproportionate adverse affect is expected to impact an EJ population, identify type/level of public outreach implemented. _____

_____

9. Identify disproportionately high and adverse impacts on EJ populations. _____

_____

_____

10. Are adverse impacts appreciably more severe or greater in magnitude than the adverse impacts expected on non-minority/low-income populations?
☐ Yes ☐ No ☐ N/A

11. Are alternatives and/or mitigation required to avoid impacts to EJ populations?
☐ Yes ☐ No ☐ N/A

If yes, describe _____

_____

12. I certify that I have reviewed the appropriate documentation and have determined that:
☑ No major EJ or civil rights impact is likely to result if the proposal is implemented.
☐ A major EJ or civil rights impact is likely to result if the proposal is implemented.

_____ _____
Name and Title of Certifying Official Date

United States Census Bureau

QuickFacts

Comanche County, Kansas

QuickFacts provides statistics for all states and counties, and for cities and towns with a ***population of 5,000 or more***.

Table

All Topics	Comanche County, Kansas
Population estimates, July 1, 2019, (V2019)	**1,700**
PEOPLE	
Population	
Population estimates, July 1, 2019, (V2019)	**1,700**
Population estimates base, April 1, 2010, (V2019)	1,891
Population, percent change - April 1, 2010 (estimates base) to July 1, 2019, (V2019)	-10.1%
Population, Census, April 1, 2020	1,689
Population, Census, April 1, 2010	1,891
Age and Sex	
Persons under 5 years, percent	⚠ 5.4%
Persons under 18 years, percent	⚠ 23.7%
Persons 65 years and over, percent	⚠ 25.5%
Female persons, percent	⚠ 51.3%
Race and Hispanic Origin	
White alone, percent	⚠ 95.8%
Black or African American alone, percent (a)	⚠ 0.5%
American Indian and Alaska Native alone, percent (a)	⚠ 1.1%
Asian alone, percent (a)	⚠ 0.5%
Native Hawaiian and Other Pacific Islander alone, percent (a)	⚠ 0.2%
Two or More Races, percent	⚠ 1.9%
Hispanic or Latino, percent (b)	⚠ 7.9%
White alone, not Hispanic or Latino, percent	⚠ 88.9%
Population Characteristics	
Veterans, 2015-2019	99
Foreign born persons, percent, 2015-2019	0.6%
Housing	
Housing units, July 1, 2019, (V2019)	1,028
Owner-occupied housing unit rate, 2015-2019	79.6%
Median value of owner-occupied housing units, 2015-2019	$70,300
Median selected monthly owner costs -with a mortgage, 2015-2019	$910
Median selected monthly owner costs -without a mortgage, 2015-2019	$430
Median gross rent, 2015-2019	$443
Building permits, 2020	0
Families & Living Arrangements	
Households, 2015-2019	751
Persons per household, 2015-2019	2.22
Living in same house 1 year ago, percent of persons age 1 year+, 2015-2019	93.4%
Language other than English spoken at home, percent of persons age 5 years+, 2015-2019	3.2%
Computer and Internet Use	
Households with a computer, percent, 2015-2019	87.0%
Households with a broadband Internet subscription, percent, 2015-2019	73.9%
Education	
High school graduate or higher, percent of persons age 25 years+, 2015-2019	93.9%
Bachelor's degree or higher, percent of persons age 25 years+, 2015-2019	16.0%
Health	
With a disability, under age 65 years, percent, 2015-2019	8.8%
Persons without health insurance, under age 65 years, percent	⚠ 13.9%
Economy	
In civilian labor force, total, percent of population age 16 years+, 2015-2019	67.2%
In civilian labor force, female, percent of population age 16 years+, 2015-2019	57.4%
Total accommodation and food services sales, 2012 ($1,000) (c)	1,531
	7,115

Total health care and social assistance receipts/revenue, 2012 ($1,000) (c)	
Total manufacturers shipments, 2012 ($1,000) (c)	D
Total retail sales, 2012 ($1,000) (c)	18,733
Total retail sales per capita, 2012 (c)	$9,792
Transportation	
Mean travel time to work (minutes), workers age 16 years+, 2015-2019	11.8
Income & Poverty	
Median household income (in 2019 dollars), 2015-2019	$54,821
Per capita income in past 12 months (in 2019 dollars), 2015-2019	$30,355
Persons in poverty, percent	⚠ 11.6%

BUSINESSES

Businesses	
Total employer establishments, 2019	68
Total employment, 2019	395
Total annual payroll, 2019 ($1,000)	11,702
Total employment, percent change, 2018-2019	-1.7%
Total nonemployer establishments, 2018	176
All firms, 2012	231
Men-owned firms, 2012	99
Women-owned firms, 2012	32
Minority-owned firms, 2012	F
Nonminority-owned firms, 2012	222
Veteran-owned firms, 2012	37
Nonveteran-owned firms, 2012	188

GEOGRAPHY

Geography	
Population per square mile, 2010	2.4
Land area in square miles, 2010	788.30
FIPS Code	20033

About datasets used in this table

Value Notes

⚠ Estimates are not comparable to other geographic levels due to methodology differences that may exist between different data sources.

Some estimates presented here come from sample data, and thus have sampling errors that may render some apparent differences between geographies statistically indistinguishable. Click the Quick Info ⓘ icon to th row in TABLE view to learn about sampling error.

The vintage year (e.g., V2019) refers to the final year of the series (2010 thru 2019). *Different vintage years of estimates are not comparable.*

Fact Notes

- **(a)** Includes persons reporting only one race
- **(b)** Hispanics may be of any race, so also are included in applicable race categories
- **(c)** Economic Census - Puerto Rico data are not comparable to U.S. Economic Census data

Value Flags

- **D** Suppressed to avoid disclosure of confidential information
- **F** Fewer than 25 firms
- **FN** Footnote on this item in place of data
- **NA** Not available
- **S** Suppressed; does not meet publication standards
- **X** Not applicable
- **Z** Value greater than zero but less than half unit of measure shown
- **-** Either no or too few sample observations were available to compute an estimate, or a ratio of medians cannot be calculated because one or both of the median estimates falls in the lowest or upper in open ended distribution.
- **N** Data for this geographic area cannot be displayed because the number of sample cases is too small.

QuickFacts data are derived from: Population Estimates, American Community Survey, Census of Population and Housing, Current Population Survey, Small Area Health Insurance Estimates, Small Area Income and P Estimates, State and County Housing Unit Estimates, County Business Patterns, Nonemployer Statistics, Economic Census, Survey of Business Owners, Building Permits.

Appendix K

NEPAssist Report

Coldwater Facility

August 8, 2021

Coldwater Facility

Search Result (point)

1:24,892

0 0.25 0.5 1 mi

0 0.38 0.75 1.5 km

Input Coordinates: 37.281470,-99.364398,37.281470,-99.362306,37.280446,-99.362306,37.280446,-99.364398,37.281470,-99.364398

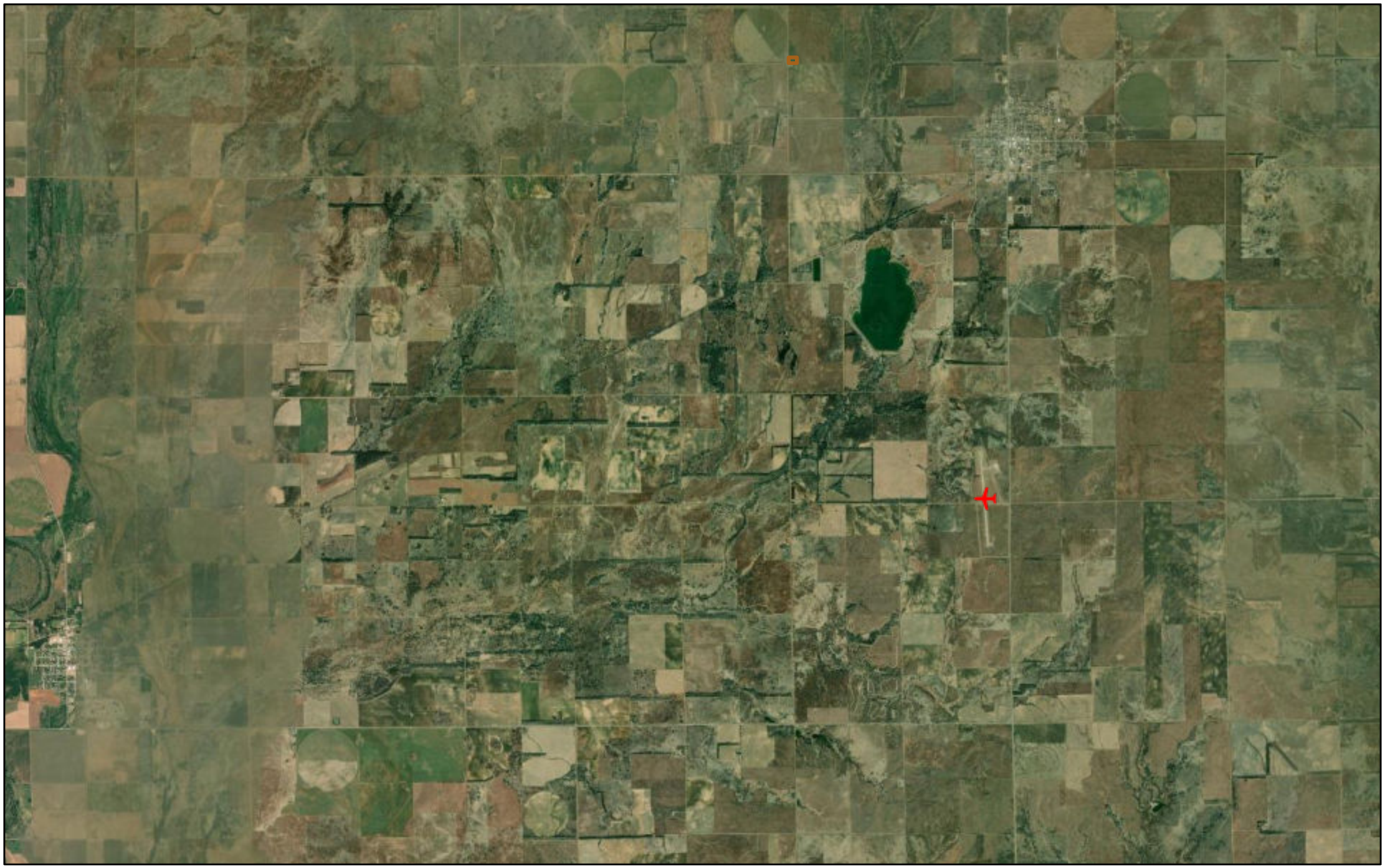
Project Area	0.01 sq mi
Within an Ozone 8-hr (1997 standard) Non-Attainment/Maintenance Area?	no
Within an Ozone 8-hr (2008 standard) Non-Attainment/Maintenance Area?	no
Within a Lead (2008 standard) Non-Attainment/Maintenance Area?	no
Within a SO2 1-hr (2010 standard) Non-Attainment/Maintenance Area?	no
Within a PM2.5 24hr (2006 standard) Non-Attainment/Maintenance Area?	no
Within a PM2.5 Annual (1997 standard) Non-Attainment/Maintenance Area?	no
Within a PM2.5 Annual (2012 standard) Non-Attainment/Maintenance Area?	no
Within a PM10 (1987 standard) Non-Attainment/Maintenance Area?	no
Within a Federal Land?	no
Within an impaired stream?	no
Within an impaired waterbody?	no
Within a waterbody?	no
Within a stream?	no
Within an NWI wetland?	Available Online
Within a Brownfields site?	no
Within a Superfund site?	no
Within a Toxic Release Inventory (TRI) site?	no
Within a water discharger (NPDES)?	no
Within a hazardous waste (RCRA) facility?	no

Within an air emission facility?	no
Within a school?	no
Within an airport?	no
Within a hospital?	no
Within a designated sole source aquifer?	no
Within a historic property on the National Register of Historic Places?	no
Within a Toxic Substances Control Act (TSCA) site?	no
Within a Land Cession Boundary?	yes
Within a tribal area (lower 48 states)?	no
Within the service area of a mitigation or conservation bank?	no
Within the service area of an In-Lieu-Fee Program?	yes

Created on: 8/8/2021 7:53:00 PM

Appendix L

Airport



August 9, 2021

Coldwater Solar Facility

Airport Points

1:100,000

0 0.5 1 2 mi

0 1 2 4 km

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community, EPA OEI

Title 14

§ 77.9 Construction or alteration requiring notice.

If requested by the FAA, or if you propose any of the following types of construction or alteration, you must file notice with the FAA of:

(a) Any construction or alteration that is more than 200 ft. AGL at its site.

(b) Any construction or alteration that exceeds an imaginary surface extending outward and upward at any of the following slopes:

(1) 100 to 1 for a horizontal distance of 20,000 ft. from the nearest point of the nearest runway of each airport described in paragraph (d) of this section with its longest runway more than 3,200 ft. in actual length, excluding heliports.

(2) 50 to 1 for a horizontal distance of 10,000 ft. from the nearest point of the nearest runway of each airport described in paragraph (d) of this section with its longest runway no more than 3,200 ft. in actual length, excluding heliports.

(3) 25 to 1 for a horizontal distance of 5,000 ft. from the nearest point of the nearest landing and takeoff area of each heliport described in paragraph (d) of this section.

(c) Any highway, railroad, or other traverse way for mobile objects, of a height which, if adjusted upward 17 feet for an Interstate Highway that is part of the National System of Military and Interstate Highways where overcrossings are designed for a minimum of 17 feet vertical distance, 15 feet for any other public roadway, 10 feet or the height of the highest mobile object that would normally traverse the road, whichever is greater, for a private road, 23 feet for a railroad, and for a waterway or any other traverse way not previously mentioned, an amount equal to the height of the highest mobile object that would normally traverse it, would exceed a standard of paragraph (a) or (b) of this section.

(d) Any construction or alteration on any of the following airports and heliports:

(1) A public use airport listed in the Airport/Facility Directory, Alaska Supplement, or Pacific Chart Supplement of the U.S. Government Flight Information Publications;

(2) A military airport under construction, or an airport under construction that will be available for public use;

(3) An airport operated by a Federal agency or the DOD.

(4) An airport or heliport with at least one FAA-approved instrument approach procedure.

(e) You do not need to file notice for construction or alteration of:

(1) Any object that will be shielded by existing structures of a permanent and substantial nature or by natural terrain or topographic features of equal or greater height, and will be located in the congested area of a city, town, or settlement where the shielded structure will not adversely affect safety in air navigation;

(2) Any air navigation facility, airport visual approach or landing aid, aircraft arresting device, or meteorological device meeting FAA-approved siting criteria or an appropriate military service siting criteria on military airports, the location and height of which are fixed by its functional purpose;

(3) Any construction or alteration for which notice is required by any other FAA regulation.

(4) Any antenna structure of 20 feet or less in height, except one that would increase the height of another antenna structure.

Appendix M

Health Issues Related to the Static and Power-Frequency Electric and Magnetic Fields (EMFs) of the Soitec Solar Energy Farms

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Memorandum on Scientific Information Related to Human Health Effects

Prepared by:
Asher R. Sheppard, Ph.D.
Asher Sheppard Consulting
Santa Rosa, California
April 30, 2014

1 Summary of Conclusions

Tierra del Sol Solar LLC, Rugged Solar LLC, LanWest Solar LLC, LanEast Solar LLC, and Soitec Solar Development LLC (applicants) have proposed four solar farm projects in southeastern San Diego County (collectively, the Proposed Project). These four projects include the Tierra del Sol, Rugged, LanEast, and LanWest solar farms. A Draft Programmatic Environmental Impact Report (DPEIR) was prepared to analyze the potential environmental impacts associated with the Proposed Project. The Tierra del Sol and Rugged solar farms were analyzed at a project-level of detail in the DPEIR because the applicants are seeking project-level approvals for those projects. The LanEast and LanWest projects were analyzed at a programmatic level of detail in the DPEIR because no project-level approvals are being sought and sufficient project-level data has not yet been developed at this time.

The analysis in this memorandum focuses on the Tierra del Sol and Rugged solar farms because project-level detail is available for those projects, however, it is equally applicable to the LanEast and LanWest solar farms assuming they are constructed using technology and layout comparable to those of the Tierra del Sol and Rugged solar farms.

This memorandum reaches three conclusions:

- There is no agreement among scientists that time-varying EMFs comparable to those of the project pose a potential health risk, and there are no defined or adopted CEQA/NEPA impacts concerning a health risk from EMF exposures;

- EMFs from the CPV trackers would not be significant outside each project's boundary;

- The static electric and magnetic fields of the Proposed Project are highly localized, very much weaker than limits found in all safety guidelines, and imperceptible at all locations accessible to the public. They pose no known concern for human health.

2 Introduction

Each of the proposed projects would introduce static and power-frequency (principally 60-Hz) electric and magnetic fields into the environment. Static fields would be produced by the CPV (Concentrator Solar Photovoltaics) modules and associated cabling for the 1 kV (1000 volt) DC underground collection system. The DC-to-AC inverters are a source of alternating electric and magnetic fields with a principal frequency of 60-Hz and also higher frequencies (harmonic frequencies). The overhead and underground transmission lines used to transfer power from the projects to the power grid also are sources of power-frequency electric and magnetic fields.

Recognizing that there is public interest and concern regarding potential health effects from exposure to electric and magnetic fields (EMFs) from power lines and other utility infrastructure, this section provides information regarding EMFs associated with electricity generation and transmission facilities with an emphasis on the potential for effects of the proposed project on public health and safety.

This memorandum supports the conclusion reached in the DPEIR (DPEIR, Sec. 3.1.4.5) that the Proposed Project would not create a health risk under CEQA because there is no agreement among scientists that EMFs comparable to those of the project pose a potential health risk, and there are no defined or adopted CEQA/NEPA impacts concerning a health risk from EMF exposures. The California Public Utilities Commission has addressed potential EMF health risks and established EMF policy (CPUC 1995; CPUC 2006a) with guidelines for project designs to implement the policy (CPUC 2006b), particularly a policy promoting designs that reduce EMFs when that can be accomplished at low-cost or no-cost. San Diego County has no policy to regulate EMF exposure. The information on EMF science and regulatory approaches presented below is given in some depth for the interest and benefit of the public and decision makers.

The recognized adverse effects of electric and magnetic fields (IEEE Std C95.6-2002 2002) occur at field strengths very much greater than can be found in areas accessible to the public near the project sites and associated transmission lines. Safety from recognized potential adverse effects is further enhanced because both electric and magnetic field strengths drop rapidly with increasing distance from EMF sources of the Proposed Project.

In general, EMFs present concerns in addition to those from possible direct influences of fields on tissues and organs of the body. These include potential health risks from induced currents, electric shock, effects on cardiac pacemakers, and nuisance factors due to corona.[1] Corona is associated with audible noise, potential interference with radio and television broadcast reception, and with electronic equipment. Mitigation measures are available in cases where environmental impacts of the just-mentioned nuisance factors could be significant.

2.1 Defining EMFs

Electric fields and magnetic fields occur both naturally and in the operation of many technological devices. Static and low frequency fields broadly relevant to EMFs of the Proposed Project occur naturally due to atmospheric phenomena and earth's geomagnetic field. Technological applications throughout modern society generate EMFs across the electromagnetic spectrum. This spectrum goes from low frequencies, such as the 60 Hz power frequency associated with the generation, transmission, and local distribution of electricity, to frequencies many millions or billions of times greater that are used for communications systems, radar, medical diagnostics, and many other purposes.

Electric and magnetic fields at all frequencies (including static fields) are vector quantities, that is, they have the properties of direction and amplitude (field strength). These fields are created, respectively, by the electric voltage and electric current. Electric power very often is created by a generator whose rotary motion yields alternating current that changes in direction and amplitude at a rate of 60 times per second in North American power systems. Power generation by solar panels uses electronic devices to produce alternating currents from the direct currents of the solar panels. The designations "60 cycle" and "60 Hz" are synonymous because the hertz, abbreviated Hz, is the unit for cycles per second. The frequency of electric power systems in Europe and many other countries is 50 Hz, the frequency at which relevant research has been done.

[1] Corona effects include audible noise, electromagnetic interference with radio or television signals, a glowing region in the air, and heat. Corona-generated audible noise is characterized as a crackling, hissing, or humming that is most noticeable during rain or fog. During fair weather, audible noise may be barely perceptible, depending on line voltage and a variety of factors. The Tierra del Sol 138-kV gen-tie and Rugged Solar 69-kV gen-tie transmission lines would create corona, but the effects would not be as strong as with higher voltage transmission lines such as the 500-kV Sunrise Powerlink.

At the much higher frequencies used for communications, electric and magnetic fields exist in a mutual relationship known as the electromagnetic field. The additional properties of electromagnetic fields make communication systems possible, but the information presented in this memo is restricted to phenomena of EMFs – independent electric and magnetic fields – from power lines operating at frequencies of 50 or 60 Hz. Possible confusion exists because electromagnetic fields also may be abbreviated as "EMFs," but electromagnetic fields can radiate a beam of energy from an antenna, in sharp distinction with the independent electric and magnetic fields of power systems that do not create a radiating energy beam.

2.2 Basic Features of Electric Power Systems and Solar Power Generation

Electric power flows across transmission systems from generating sources to serve electrical loads within the community. The energy for electricity generation may come from sources such as solar conversion panels, water power, and heat, which may be derived from nuclear reactions or the burning of gas, oil, and coal. The power flowing over a transmission line is determined by the transmission line voltage and the current. The higher the voltage level of the transmission line, the lower the amount of current needed to deliver the same amount of power. For example, a 138 kV (138,000 volt) transmission line carrying 200 amperes of current transmits approximately 47,800 kilowatts (kW), whereas a 256 kV transmission line would require only 100 amperes of current to deliver the same 47,800 kW.

The CPV trackers proposed for the Proposed Project create direct current (DC) electricity from sunlight, therefore requiring the use of inverters to create alternating current (AC) electricity suitable for use on the power system. Inverters produce currents that predominantly are at 60 Hz, but higher frequency currents also occur. Consequently, EMFs are created at 60 Hz and at harmonic frequencies. For example, inverter harmonics may be strong at 180-, 300- and 420-Hz, the third fifth and seventh harmonics of 60-Hz, but the strengths of harmonic frequency EMFs of the Proposed Project will be characteristic of the specific electronic and electrical design of the inverter/transformer units and associated equipment. Filters typically reduce most harmonic frequencies such that 60-Hz electric and magnetic fields are the dominant feature in all the parts of the system, that is, those operating at 350-400 V, 34.5 kV, 69 kV and 138 kV.

For the Tierra del Sol project, the 34.5 kV collector trunk would be on the existing right-of-way of the 500 kV AC Southwest Powerlink that is an existing source of 60-Hz EMFs and its 138 kV gen-tie would be routed underground and overhead. The Rugged Solar 69 kV gen-tie transmission line would be underslung on the approved Tule Wind 138 kV transmission line right of way.

2.3 Electric Fields

Whenever AC lines are energized, power-frequency electric fields are created with a field strength that depends directly on the voltage on the line creating it. Electric field strength is typically described in units of kilovolts per meter (kV/m). Electric field strength attenuates (gets weaker) rapidly with increasing distance from the source. Electric fields are strongly reduced at many environmental receptors because they are effectively shielded by trees, walls and roofs of buildings.

A static electric field is a feature of everyday experiences such as when pulling off a sweater, sliding across a fabric car seat, scuffing shoes across a carpet, combing hair, and grooming fur on a pet. These phenomena are more pronounced during dry weather or indoors when humidity is very low. A person walking on a carpet can acquire a voltage of several thousand volts but there is no direct health hazard from such momentary discharges to the body (World Health Organization 2006 sec. 3.2.1). In fair weather, the potential difference between the ionosphere and earth's surface results in a static electric field that averages approximately 130 V/m, but static electric fields of 3 kV/m or more are created under clouds (World Health Organization 2006 sec. 3.1.1) and in dust storms. DC transmission lines, which can be energized at ±400 kV or more, are used for transmission of large quantities of power over long distances. Ground level static electric fields of as much as 20 kV/m can occur beneath DC transmission lines (World Health Organization 2006 sec. 3.2.1), but, in comparison, a typical solar farm DC collector system carries current in cables that create negligible external electric fields.

Some phenomena of power-frequency electric fields are similar to those of static fields because a frequency of 60 Hz involves a relatively slow oscillation of field polarity. The switching of positive and negative current flow at 60 times per second means that polarity changes occur

within approximately one-hundredth second. In comparison, at typical radiofrequencies polarity switches within millionths or billionths of a second.

Unlike magnetic fields, which penetrate all non-conducting materials and are therefore unaffected by trees, most building materials, and other obstacles, both static and 60-Hz electric fields are distorted by any object that is within the electric field, including the human body. Even trying to measure an electric field with electronic instruments is difficult because the devices themselves would alter the levels recorded. Determining an individual's exposure to electric fields requires understanding many variables, including the strength and direction of the electric field itself, effectiveness of a person's electrical connection to the earth or other electrical ground, and body surface area within the electric field.

Potential health effects from exposure to electric fields from power lines, substation buswork, switchgear and transformers are typically not a focus of concern because these fields are attenuated by common environmental features such as trees with foliage and the building materials used for homes, offices and manufacturing sites. Levallois et al. (1995) found that even close to a powerline right-of-way, electric fields inside homes are similar to those in homes far from transmission lines.

Electric fields in the vicinity of power lines can cause "spark discharges" that are similar to the static electricity experiences mentioned above. Such electric discharges can occur when touching long metal fences, metal gutters, pipelines, or large vehicles with a potential safety hazard from a startle reaction causing, for example, a dropped tool or a fall from a ladder. A more threatening potential impact to public health from electric transmission lines is the acknowledged hazard of electric shock that results from accidental or unintentional contact by the public with energized wires. The issues of spark discharges and shock hazards are not addressed further because the electric fields associated with the Proposed Project are not strong enough to cause discernible spark discharges except at positions on powerline towers or poles that are inaccessible to the public.

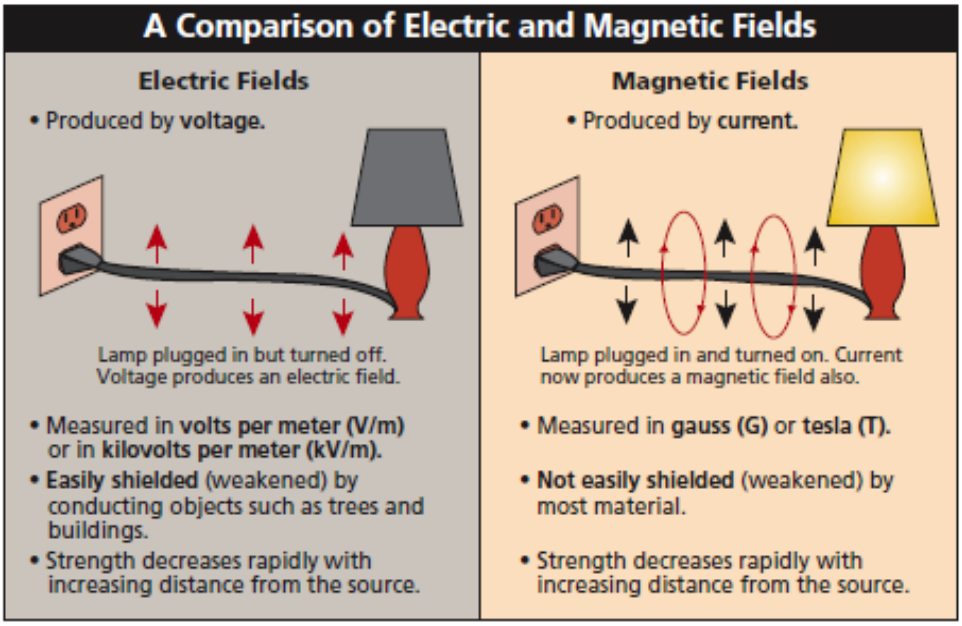
2.4 Magnetic Fields

Magnetic fields are created whenever current flows through power lines at any voltage. The strength of the field is directly dependent on the current in the line. The intensity of a magnetic field is often measured in milligauss (mG) or microtesla (μT). Like electric fields, magnetic fields attenuate rapidly with distance from the source, but unlike electric fields, magnetic fields are not shielded by most objects or materials.

2.5 Contrast between Electric and Magnetic Fields at Appliances

The nature of electric and magnetic fields can be illustrated by considering a household appliance that is plugged into an outlet but not turned on (Fig. 1). As long as it is switched off, no current flows and consequently there is no magnetic field generated in the appliance and its

Figure 1.



An appliance that is plugged in and therefore connected to a source of electricity has an electric field even when the appliance is turned off. To produce a magnetic field, the appliance must be plugged in and turned on so that the current is flowing.

Source: (NIEHS 2002 p 5)

wiring (particularly the electric "cord"). However, when off, an electric field originates from the cord the cord that is energized at the line voltage, typically 115 V (volts), and from any other parts at line voltage. Electric field strength is directly related to the magnitude of the voltage from the outlet, and when the appliance is switched on magnetic field strength is directly related

to the magnitude of the current flowing in the cord and appliance. Thus, an appliance operating at 230 V generally has higher electric field strengths than one at 115 V, and the magnetic fields surrounding the cord of an iron that draws perhaps 10 ampere (A) of current would be higher than those surrounding the cord of a typical desk lamp drawing less than 1 A.

3 EMF Sources Associated with the Proposed Project

The following EMF sources are confined to the 420-acre and 765-acre project sites of Tierra del Sol and Rugged, respectively:

- Approximately 2,657 CPV trackers at the Tierra del Sol site and 3,588 CPV trackers at the Rugged site would have localized EMFs due to the DC produced by the panel. During operation, the tracker motors and electronics would create localized EMFs typical of small-scale equipment. EMFs from the panels and related tracking equipment would not be significant outside the solar array area and therefore are not given further consideration.

- A 1 kV DC underground collection system would be a source of EMF near the cables.

- A maximum of 45 (Tierra del Sol) and 59 (Rugged) inverter stations and associated transformers would change the 1 kV DC power into 34.5 kV AC power (with an intermediary stage at 350-400 VAC).

- Tierra del Sol and Rugged each would have 34.5 kV overhead and underground collection systems to link the trackers to the on-site project substation. The 34.5 kV cables would be underground and then transition to overhead poles for the trunk lines leading to a collector substation.

- A collector substation site that includes switchgear for transfer of power on the multiple 34.5 kV lines into the 138 kV (Tierra del Sol) or 69 kV (Rugged) gen-tie transmission lines. Unlike substations typical of the electric power system, for example, the Rebuilt Boulevard Substation, the collector substation does not provide a point of interconnection for system distribution and transmission lines.

- The gen-tie transmission lines would connect each project's on-site collector substations to the Rebuilt Boulevard Substation. The Rebuilt Boulevard Substation is not considered in this memo.

The 138-kV gen-tie line of Tierra del Sol solar farm would be carried northward from the on-site substation on an underground 138-kV cable along Tierra del Sol Road for approximately 0.5 miles, turn to the east for approximately 1-mile, at which point it would transition to an overhead 138 kV structure running northward to a point just east of Jewel Valley Road. At that point the gen-tie line would then again become an underground cable running for approximately 1.5 miles in segments that carry the line in a generally northeasterly direction toward its end at the connection with the Rebuilt Boulevard Substation. EMFs along the overhead portion would be typical for the adopted design typical of this voltage class with magnitudes and spatial extent in the surrounding environment determined by the specific structures and conductor design. Figure 2 illustrates the manner in which electric and magnetic fields attenuate with distance for typical transmission lines of three voltage classes. The magnitude of the peak EMFs and their strength at distances from the 138 kV gen-tie transmission line would likely be comparable to the 115 kV line illustrated with respect to peak magnitude and the decline in strength with distance. EMFs generated by the underground cable would generally be lower in magnitude and spatial extent, except that EMF magnitudes may be relatively high within several feet of an underground cable or cables. As for the overhead sections, magnitudes and spatial extent would be determined by the specific design. EMFs of all 138-kV transmission-line magnetic fields would be greater upon completion of Phase II than for Phase I alone.

The Rugged 69-kV transmission line to be constructed as an underslung overhead line for its entire length of approximately 2.75-miles would be the source of EMFs at levels typical for the adopted design in this voltage class. The magnitudes and spatial extent of environmental EMFs generated by the overhead 69-kV line would be determined by the specific structures and conductor design for the overhead transmission circuit and the specific cable design for underground portions. During operation, nearby EMFs would depend on interaction with the existing 138-kV Tule Wind Project line. Those interactions could reduce or increase total EMFs depending on operational and design factors. Figure 2 illustrates the manner in which electric

and magnetic fields attenuate with distance for transmission lines of several voltage classes that are greater than 69 kV. The magnitude of the peak EMFs and their strength at distances from the 69 kV line would be significantly lower and follow a comparable rate of decline in strength with distance.

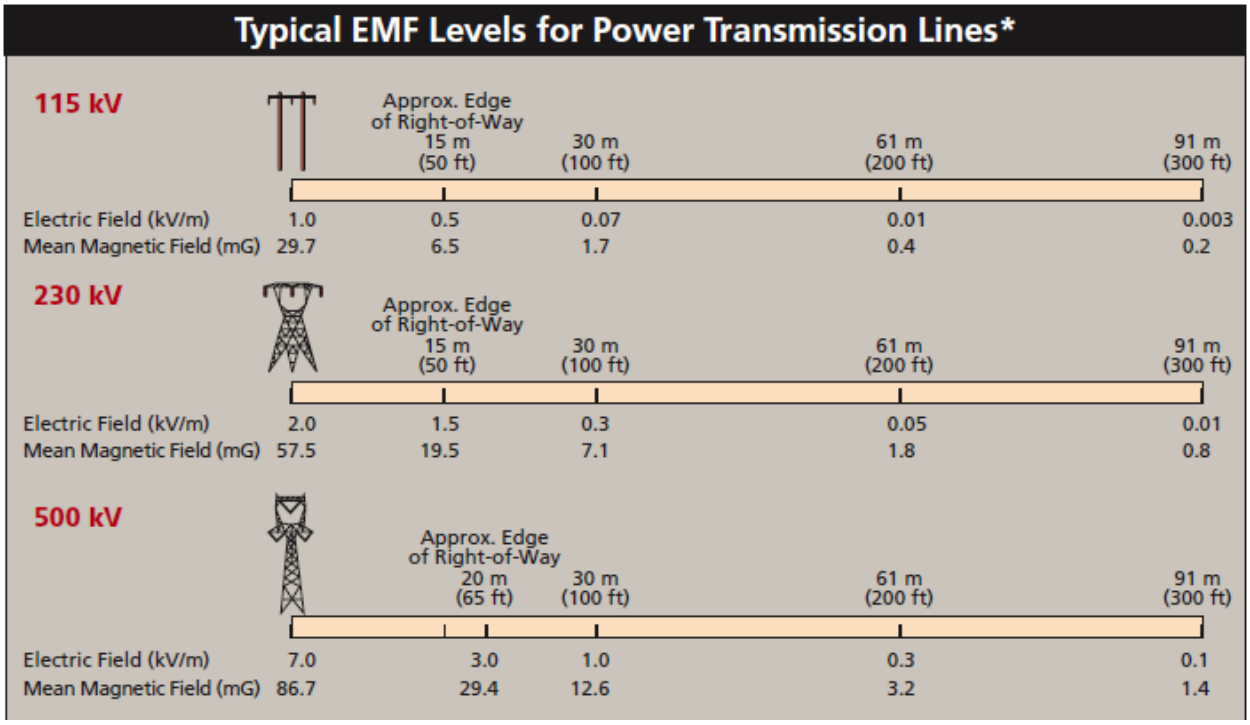
In general, common EMF exposures to the public vary over a range of field intensities and durations in reflection of sources in the home and work environments, electric power distribution system, and infrequently, from proximity to transmission lines. In contrast, for undeveloped and natural areas such as the Proposed Project area, EMFs greater than the very low natural background level are not present except in the vicinity of existing power line corridors, such as the 500 kV Southwest Powerlink (SWPL) that transects the Tierra del Sol project site and the 500 kV Sunrise Powerlink (Sunrise) transmission line that runs proximate to the Rugged project site. Rural areas that resemble undeveloped natural areas may have pole-mounted distribution circuits, and sometimes isolated residential, commercial and industrial buildings, but otherwise are characterized by low natural background EMF levels. Presently, public exposure to 60-Hz EMF in the project area at levels above those typical of residences would be limited to a strip of land parallel to the route for the underground and overhead 138-kV transmission line for Tierra del Sol, and a similar strip of land along co-existing Rugged 69-kV and Tule Wind Project transmission lines.

4 Typical Electric and Magnetic Fields of 60 Hz Transmission Lines

The Proposed Project gen-tie transmission lines will create electric and magnetic fields similar to those of other transmission lines of similar design, operating at the same voltage, and carrying similar currents. In the absence of particular designs for the 138 kV and 69 kV transmission lines of Tierra del Sol and Rugged projects, respectively, it is useful to consider the features of generic high-voltage AC transmission lines. Figure 2 illustrates that for all three voltage levels shown, and for the different support designs (dual poles or steel lattices, both with conductors suspended from a horizontal beam), both the electric and magnetic fields drop off in strength with distance from the tower.

For the 115 kV transmission line shown, the electric fields drops to approximately one-half of maximum at 50 ft from the tower and is just 7 percent of maximum at 100 ft. The magnetic fields drop to approximately one-fifth of maximum at 50 ft. and approximately 6% of maximum at 100

Figure 2



Source: (NIEHS 2002 p 37)

ft, with continuing decreases at greater distances. Numerous factors of a specific engineering design determine the actual field strengths and their patterns of decay with distance from the tower. The most significant design factors are line voltage, line current, conductor height above ground, and spatial arrangement of the conductors. In cases, there can be more than one circuit in parallel on the same right-of-way and two circuits on the same tower, as in the case of the 69 kV line of the Rugged Solar project that is placed beneath an existing 138 kV line. Nearby parallel circuits can reduce or increase the fields generated by one line in isolation depending on both design and operational factors. Most of the just-mentioned features of power transmission lines are fixed features of an installation, but load current and therefore magnetic field strength vary with the amount of power being transmitted. The power transmitted from a solar energy project varies with time-of-day, cloud cover, and seasonal changes in daylight duration.

5 Regulatory Standards and Guidelines for EMF Exposures

5.1 Scientific Background

For more than 45 years, questions have been asked regarding the potential health effects of EMFs from power lines resulting in a considerable body of research conducted to provide a foundation for a science-based response. Initial studies focused primarily on interactions with the electric fields from power lines. The subject of magnetic field interactions began to receive additional public attention in the 1980s as research increased in response to studies showing a possible association with cancer, particularly, childhood leukemia. A substantial amount of research investigating both electric and magnetic fields has been conducted worldwide over the past several decades. However, public health risks, particularly for magnetic field exposures to children, remain a subject of controversy because, according to many individual scientists and scientific panels that have reviewed the voluminous research findings, the data on that topic are inconclusive.

At sufficiently high levels, external extremely low frequency (ELF) fields can interact with - tissues through electrical effects due to currents induced in tissues and cells of the body. High-level effects of induced body currents are precluded if exposures are below the limits set by health and safety standards. (The process of induction is found widely in electrical technology. One common device relying on induction is the electric transformer where current in one coil induces current in another nearby coil. Similarly, an electromagnet powered by an alternating current works by inducing current in a nearby conducting metallic object, resulting in an attractive force that can lift the object. Contact with an electrical conductor stands in sharp contrast to induction and, of course, is the way in which electrical injuries occur.)

However, the electric currents induced by ELF fields commonly found in the environment – even those from transmission lines, substations, and transformers – are very weak when compared to certain electric currents that occur naturally in the body, such as those that control the beating of the heart and others generated by muscular activity. Only some utility employees get close enough to transmission lines and electrical machinery to experience induced electricity comparable to the electrical phenomena of natural biological functions. Of course, EMF-induced currents in the body also are vastly weaker than the currents found in electrical machines themselves, such as transformers, motors and magnets.

Research related to EMF can be grouped into four broad categories: a) mechanistic; b) cellular level studies; c) animal and human experiments; and d) epidemiological studies. Epidemiological studies, while carrying great weight in public health evaluations, have provided mixed results. Some studies show an apparent relationship between magnetic fields and health effects but other studies of comparable design do not. Laboratory studies with cells, animals, and humans, and studies investigating a possible mechanism for health effects (mechanistic studies) provide little or no evidence to support a magnetic field influence on health, especially, cancer.

Public interest and concern specifically regarding magnetic fields from power lines increased following publication in 1979 of the results of a single epidemiological study that observed an association between the wiring configuration on electric power lines outside homes in greater Denver and the incidence of childhood cancer (Wertheimer and Leeper 1979). Following publication of the Wertheimer and Leeper study, many epidemiological, laboratory, and animal studies regarding EMF have been conducted attempting to confirm the validity of the finding and determine a plausible mechanism, most of which focused on exposures to power-frequency magnetic fields.

The wide use of electricity results in background levels of EMFs in nearly all locations where people spend time – homes, workplaces, schools, cars, the supermarket, etc. A person's average exposure depends upon the sources they encounter, how close they are to them, and the amount of time they spend there. In most U.S.A. homes, background magnetic field levels average about 1 milligauss (mG) due to wiring within the home, electrical appliances, and power lines outside the home (Zaffanella 1993). Since the intensity of magnetic fields diminishes quickly with distance from the source, distance from a power line reduces the effect on the magnetic field level within the home. In fact, the strongest magnetic fields that are encountered indoors are from electrical appliances.

In accord with national findings, ambient magnetic fields in homes and buildings in several western states also averaged approximately 1 mG, and in rooms with appliances magnetic fields

Table 1. Typical 60-Hz Electric Field Values for Appliances at ~12 Inches

Appliance	Electric Field Strength (kV/m)
Electric blanket*	0.250
Broiler	0.130
Stereo	0.090
Refrigerator	0.060
Iron	0.060
Hand mixer	0.050
Phonograph	0.040
Toaster	0.040
Coffee pot	0.030
Vacuum cleaner	0.016
Electric range	0.004

Source: (Miller 1974 Table IV-VI).
* 1 to 10 kV/m next to blanket wires (Enertech Consultants 1985)

ranged from 9 to 20 mG (Severson et al. 1988; Silva et al. 1988). Immediately adjacent to appliances (within 12 inches), electric and magnetic field values are much higher, as illustrated in Tables 1 and 2 that indicate typical sources and levels of electric and magnetic field exposure from appliances for the general public.

5.2 Methods to Reduce EMF Levels

EMF levels from an AC transmission line can be reduced by shielding, field cancelation, or increasing the distance from the line. Shielding of electric fields can be actively accomplished by placing trees or other physical barriers along the transmission line ROW and by common building materials used in home construction. Magnetic fields can be reduced either by cancelation or by increasing distance from the source, but shielding a large volume is impractical and is used only in a few scientific research laboratories. Cancelation can be achieved between

two or more nearby circuits by taking advantage of the three-phase design used in power transmission. Placement of conductors with oppositely-directed fields of the same magnitude close to each other on a tower or pole can reduce fields significantly. Similarly, underground cables usually place the three phase conductors close together, or even wrapped into one concentric cable, thereby obtaining considerable field cancelation nearby. Field cancelation techniques have has practical limitations because of the need to avoid arcing between phases if overhead high-voltage wires are placed too close together.

Although static electric fields also can be effectively shielded by trees and building materials, field-canceling configurations on towers and poles may not be practical. Concentric DC cables and bipolar DC cables placed close to each other have excellent field cancelation properties, comparable to those of AC cables.

For both AC and DC sources of EMFs, placement of overhead power line conductors at greater heights above ground, burying underground cables more deeply, and increasing the width of the ROW can achieve significant field reductions for nearby people.

Table 2. Magnetic Field Near Household Appliances

Appliance	Magnetic Field (mG) at 1 foot
Can opener	40 to 300
Coffee maker	1
Crock pot	1
Dishwasher	6 to 30
Electric range	8 to 30
Electric oven	1 to 5
Garbage disposal	8 to 20
Microwave oven	1 to 200
Mixer	5 to 100
Refrigerator	2 to 20
Toaster	3 to 7
Clothes washer	2 to 30
Clothes dryer	1 to 3
Fans / blowers	0.4 to 40
Iron	1 to 3
Portable heater	1 to 40
Vacuum cleaner	20 to 200
Baby monitor	0 to 2
Hair dryer	1 to 70
Electric shaver	20 to 100
AC adapter	0 to 7.5
Circular saws	10 to 250
Compact fluorescent bulb	0 to 0.1
Digital clock	0 to 8
Electric drill	25 to 35
Fluorescent fixture	2 to 40
Fluorescent desk lamp	6 to 20
TV (1980s era)	9 to 20
TV – flat screen LCD	0 to 2.5

Sources: (NIEHS and US DOE 1995); (EPRI 2012b)

5.3 Scientific Panel Reviews on Power-Frequency EMF

Numerous panels of expert scientists have convened to review the data relevant to the question of whether exposure to power-frequency EMF is associated with adverse health effects. These evaluations have been conducted in order to advise governmental agencies or professional standard-setting groups. In a typical procedure, scientific panels first evaluated the available studies individually, not only to determine what specific information they can offer, but also to evaluate the validity of experimental designs, methods of data collection, nature and quality of the data, data analysis, and suitability of the authors' conclusions. Subsequently, the individual studies, with their previously identified strengths and weaknesses, were evaluated collectively in an effort to identify whether there is a consistent pattern or trend in the data that would lead to a determination of possible or probable hazards to human health resulting from exposure to these fields.

Expert panel reviews have been prepared by international agencies such as the World Health Organization (WHO, 1984, 1987, 2001 and 2007) and the international Non-Ionizing Radiation Committee of the International Radiation Protection Association (IRPA/INIRC, 1990) and governmental agencies of a number of countries, such as the U.S. EPA, the National Radiological Protection Board of the United Kingdom, the Health Council of the Netherlands, and the French and Danish Ministries of Health. As noted below these scientific panels have varied conclusions on the strength of the scientific evidence concerning health risks from exposure to power frequency EMF.

The U.S. Congress passed legislation that resulted in EMF RAPID, a program of scientific research, public information, and health risk assessment to inform government policy. Its conclusions were derived from extensive analysis of existing scientific research and from the results of studies conducted under EMF RAPID in neurophysiology, behavior, reproduction, development, cell physiology, genetics, cancer, and melatonin (the hormone regulating circadian rhythm). In May 1999 the director of the National Institute of Environmental Health Sciences (NIEHS) submitted to Congress its report titled, "Health Effects from Exposure to Power-Line

Frequency Electric and Magnetic Fields," containing the following conclusion regarding power-frequency EMF health effects:

> Using criteria developed by the International Agency for Research on Cancer (IARC), none of the Working Group considered the evidence strong enough to label ELF-EMF exposure as a known human carcinogen or probable human carcinogen. However, a majority of the members of this Working Group concluded that exposure to power-line frequency ELF-EMF is a possible carcinogen. (NIEHS 1999)

In June 2001, a scientific working group of IARC (an agency of WHO) reviewed studies related to the carcinogenicity of EMF. Using the standard IARC classification system used for chemicals in the environment and foods, magnetic fields were classified as "*possibly carcinogenic to humans*" based on epidemiological studies. "Possibly carcinogenic to humans" is a classification used to denote an agent for which there is *limited evidence of carcinogenicity in humans* and *less than sufficient evidence of carcinogenicity in experimental animals*. Other agents identified as *possibly carcinogenic to humans* include gasoline exhaust, styrene, welding fumes, and coffee (WHO, 2001).

On behalf of the California Public Utilities Commission (CPUC), the California Department of Health Services (DHS) completed a comprehensive review of existing studies related to EMF from power lines, particularly those involving several potential health risks (Neutra et al., 2002). This risk evaluation was undertaken in 2000-2002 by three DHS staff epidemiologists using Bayesian analytic techniques instead of the weight-of-the-evidence approach used by other expert panels. The conclusions found in the executive summary are:

- To one degree or another, all three DHS scientists are inclined to believe that EMFs can cause some degree of increased risk of childhood leukemia, adult brain cancer, Lou Gehrig's Disease (ALS), and miscarriage. For adult leukemia, two of the scientists are "close to the dividing line between believing or not believing" and one was "prone to believe" that EMFs cause some degree of increased risk.
- All strongly believe that EMFs are not universal carcinogens because there are a number of cancer types that are not associated with EMF exposure.

· To one degree or another all three are inclined to believe that EMFs do not cause an increased risk of breast cancer, heart disease, Alzheimer's Disease, depression, or symptoms attributed by some to sensitivity to EMFs. However, all three scientists had judgments that were "close to the dividing line between believing and not believing" that EMFs cause some degree of increased risk of suicide.
· All strongly believe that EMFs do not increase the risk of birth defects, or low birth weight.

The DHS scientists were more inclined to believe that EMF exposure increased the risk of the above health problems than the majority of the members of scientific committees that have previously convened to evaluate the scientific literature. With regard to why the DHS review's conclusions differ from those of other recent reviews, the report states:

> The three DHS scientists thought there were reasons why animal and test tube experiments might have failed to pick up a mechanism or a health problem; hence, the absence of much support from such animal and test tube studies did not reduce their confidence much or lead them to strongly distrust epidemiological evidence from statistical studies in human populations. They therefore had more faith in the quality of the epidemiological studies in human populations and hence gave more credence to them.

In addition to the uncertainty regarding the level of health risk posed by EMF, individual studies and scientific panels have not been able to determine or reach consensus regarding what level of magnetic field exposure might constitute a health risk. In some early epidemiological studies, increased health risks were discussed for daily time-weighted average field levels greater than 2 mG. However, the IARC scientific working group indicated that studies with average magnetic field levels of 3 to 4 mG played a pivotal role in their classification of EMF as a possible carcinogen.

An extensive WHO review (World Health Organization 2007) concluded that evidence for a link between extremely low frequency magnetic fields and health risks is based on epidemiological studies demonstrating a consistent pattern of increased risk for childhood leukemia. However, "...virtually all of the laboratory evidence and the mechanistic evidence fail to support a

relationship between low-level ELF magnetic fields and changes in biological function or disease status. Thus, on balance, the evidence is not strong enough to be considered causal but sufficiently strong to remain a concern." For the many other diseases considered and for numerous laboratory studies, the WHO panel found "inadequate" or "no evidence" of health effects at low exposure levels.

A 2009 European Commission report identified a research gap concerning the association of ELF EMF exposures with neurodegenerative diseases and put the need for a multidisciplinary research as "very important and given high priority based on their relevance for fundamental understanding of the issue and/or their relevance for public health" (Scientific Committee on Emerging and Newly Identified Health Risks 2009). In Australia, ARPANSA provides an EMF fact sheet that concludes, "The scientific evidence does not firmly establish that exposure to 50 Hz electric and magnetic fields found around the home, the office or near powerlines is a hazard to human health" (ARPANSA), and organizations such as ICNIRP (2009; 2010), ICES (2010), and ACGIH (2006) continue to review and refine their guidelines and standards.

EMF health issues continue to be the subject of research and examination in the context of regulatory standards and guidelines. EPRI, which describes itself as "the only organization in North America funding long-term, multidisciplinary EMF research," sponsors research and scientific meetings in areas of current interest, and provides a semi-annual public newsletter on EMF research (EPRI 2014).

5.4 Regulatory Standards and Guidelines for EMF Exposures: Policy in California

Government agencies outside the U.S.A. and international- and U.S.-based standards-setting bodies have developed detailed guidance for EMF exposure across a wide range of frequencies with specific focus on power-frequency EMF. Those shown in Table 3 are notable for extended reviews of the scientific literature, risk assessment narratives, and technical details far beyond those tabulated here. These scientific reviews consistently found no conclusive evidence of human health effects below the recommended standard or guideline levels and recognized as inconclusive the epidemiologic findings concerning an association of childhood leukemia with

apparent magnetic field exposures. IEEE also developed detailed procedures for field measurements and computations (IEEE Std C95.3.1-2010 2010).

Table 3. Selected international and national standards and guidelines for exposure to 60-Hz frequency electric and magnetic fields (unperturbed rms values).

Source	E-field strength[(a)] (kV/m)	B-field strength[(a)] (mG)	Notes	Reference
General public				
Health Council of the Netherlands	4.17	833	Reference level, whole body	(Health Council of the Netherlands: ELF Electromagnetic Fields Committee 2000); (Health Council of the Netherlands 2008)
Health Protection Agency (UK)	4.17	833	Reference level, whole body	(Radiation Protection Division and Health Protection Agency 2005)
ICNIRP	4.17	833	Reference level, whole body	(ICNIRP 2010)
IEEE Std C95.6	5[(a)]	9040[(b)]	Maximum permissible exposure	(IEEE Std C95.6-2002 2002)
Occupational				
ACGIH; AIHA[(c)]	25	10,000		(American Conference of Governmental Industrial Hygienists 1991); (AIHA 2002)
ICNIRP, HPA (UK)[(d)]	8.33	4,170	Reference level, whole body	(ICNIRP 2010); (Radiation Protection Division and Health Protection Agency 2005)

Notes:
(a) Whole body; 10 kV/m within a powerline ROW.
(b) Exposure to head and torso; for arms or legs, MPE = 632,000 mG.
(c) Ceiling values (ACGIH: American Council of Government and Industrial Hygienists; AIHA: American Industrial Hygiene Association).
(d) These are reference levels (not exposure limits).

In the absence of conclusive findings of a health hazard from exposure to power-frequency EMF, there are no federal exposure limits at power-frequencies adopted as guidelines or put into law. However, various federal agencies have sponsored and collaborated on research and policy questions, including the Environmental Protection Agency (EPA), Department of Defense, National Institute of Occupational Safety and Health (NIOSH), Department of Energy (DOE), and National Institute of Environmental Health Sciences (NIEHS). The latter two agencies

collaborated under the Congressionally mandated EMF RAPID program that concluded with the 1999 report to Congress cited above (NIEHS 1999).

Likewise, no state has determined there is conclusive evidence for adverse health effects of ELF EMF exposures, but several states have developed regulatory guidance for electric utilities and particularly new transmission line projects, in the face of uncertain and inconclusive research. In some states, only electric fields are considered, in others, only magnetic fields, and in others rules were developed for both field types. A 2002 white paper treats EMF policy considerations and reviews regulatory positions in several states (Minn. W.G. 2002). Table 4 below lists rules and guidance for transmission lines in 9 states. In cases, such as North Dakota, EMF level is not specified, but a right-of-way width is specified. Some rules were determined from existing right-of-way widths to set benchmarks for the corresponding field strengths. In contrast, Florida specifies maximum electric and magnetic fields at the edge of the right-of-way and within the right-of-way.

The Calilfornia Public Utilities Commission (CPUC) established (1995) and reaffirmed (2006a) an EMF policy that does not specify EMF field strength limits but instead requires new construction to use designs and equipment that result in lower environmental EMF levels. Implementation of the CPUC field reduction policy was formulated in terms of “low-cost, no-cost” steps for EMF reduction, where “low-cost” was set at roughly 4% of total project cost. Thus, during the design phase, new facilities for electricity generation, transmission, distribution and related substations can show compliance by no-cost steps such as, for example, selection of a design that reduces EMFs by the choice of overhead line electrical phasing that takes advantage of opportunities for EMF reduction by field cancelation. Relocation of substation electrical equipment on a substation site provides another example of a no-cost option. Methods of field reduction that increase project cost, such as increasing pole or tower height, or using underground cables would be appropriate and necessary if they result in numerically significant field reductions within a cost of approximately 4% of total project cost.

Table 4. Transmission line EMF-based siting considerations of selected states.*

State	Application	Location	Electric Field (kV/m)	Magnetic Field (mG)	Notes, References
California	Project	Project	(a)	(a)	California Public Utilities Commission, General Order 131-D (http://www.cpuc.ca.gov/PUBLISHED/Graphics/589.PDF); Decision D.06-01-042
Connecticut	Project	Project		best practices for no-cost/low-cost (4%) mitigation	Siting Council assess compliance with PA 04-286, PA 04-246, PA 07-4, and best mgt. practices http://www.cga.ct.gov/2001/rpt/2001-R-0666.htm, including special focus on sensitive receptors, and possible undergrounding. K.E. McCarthy, Health effects of electric and magnetic fields, # 2009-R-0280, Office of legislative Research, 8/5/2009,see (http://www.cga.ct.gov/2009/rpt/2009-R-0280.htm) (accessed 6/11/2013); www.ct.gov/csc/cwp/view.asp?a=3&q=311180)
Florida (b)	>500 kV	In ROW	15	--	Electric and Magnetic Field Regulations: S. 62-814.450 Florida Statutes; Ch. 62-814, Florida Register & Florida Administrative Code) https://www.flrules.org/gateway/ChapterHome.asp?Chapter=62-814
	" "	Edge of ROW & substa. boundary	5.5	250	
	≤500kV & >230kV	In ROW	10	--	
	" "	Edge of ROW & substa. boundary	2	200	Exception of 250 mG for double ckt. ROWs and certain other ROWs existing before 1989
	≤230 kV	In ROW	8	--	
	" "	Edge of ROW & substa. boundary	2	150	
Minnesota	> 200 kV	In ROW	8		
Montana (b)	> 69 kV	Edge of ROW	1		(Administrative Rules of Montana 2005)
	Road crossings	In ROW	7		

State	Application	Location	Electric Field (kV/m)	Magnetic Field (mG)	Notes, References
New Jersey	all	Edge of ROW	3	--	Guideline
New York	> 125 kV, > 1 mile length	Edge of ROW	1.6	200	Interim magnetic field standard for maximum design current.
	Public roads	In ROW	7		
	Public roads	In ROW	11		
	Other terrain	In ROW	11.8		
North Dakota	Route siting	Route	--	--	Avoid siting within 500 ft. of a residence, school, or place of business (EMFs not specified); may be waived; NDCC 49-22-08 (North Dakota 2013)
Oregon[b]	≥230 kV, ≥10 miles	In ROW	9	--	Energy Facility Siting Council

* The Edison Electric Institute Generation and Transmission Siting Directory provides state-by-state information on all aspects of power system siting, including EMF considerations in transmission line siting where rules exist (EEI 2012).

[a] Submit design plan that reduces EMFs at no cost or low cost (up to approximately 4% of project cost), prioritized by land use; usually applied to magnetic fields only

[b] Regulations in Florida, Montana and Oregon were codified.

6 Health and Safety Considerations for Static Electric and Magnetic Fields

Static (zero frequency) electric and magnetic fields will occur on each of the solar farm sites in association with the underground 1-kV DC collector systems within the boundaries of each project. As noted above in section 2.3, overhead high-voltage DC transmission lines that can operate at much greater voltages such as ±500 kV can create large static electric fields near the line. These high-voltage lines also create air ions and static magnetic fields that can come into consideration in environmental reviews. However, the Proposed Project involves a very different source of static EMF because the CPV trackers and underground 1-kV cables create EMFs that are localized to the immediate area near a CPV tracker or collector cable, and are expected to be insignificant outside the site boundary.

Specific quantitative data on the EMF produced by a CPV tracker and collector cable depend on the particular equipment used. Static electric fields can be measured with commercially available instruments based on the classic electric field mill design, while static magnetic fields can be measured with a variety of commercially available gaussmeters (magnetometers). Project electric fields can be considered in context of naturally occurring atmospheric electric fields that, as mentioned above (section 2.32.3), range from a fair-weather average of 130 V/m to much greater levels during storms and near high-voltage DC transmission lines. Static magnetic fields can be compared with the naturally occurring static geomagnetic field that is approximately 470 mG at the Proposed Project locations.

People can detect electrostatic fields of several thousand volt per meter, such as occur under storm clouds because hair on the arm, head or elsewhere becomes charged. The resulting small forces deflect the hairs, which stimulate touch sensors in the skin surface causing a tingling sensation. Slight movements of body hair in a strong electrostatic field are the mechanism for perception of a static electric field for all practical exposure situations (Reilly 1998 p 357). Electrostatic effects like these are sharply distinguished from effects of the considerable currents that can flow upon direct contact with a live electric conductor, potentially causing the serious hazards of electric shock. Project electrostatic fields can be anticipated to be lower than typical ambient atmospheric levels (that are of the order of 100 V/m) at distances of several meters from an aboveground conductor at 1 kV and at much closer distances from aboveground and underground cables. Consequently, both

electrostatic effects and electric shock do not appear possible for off-site exposures from Proposed Project static electric fields.

Static magnetic fields at levels in the environment near CPV trackers, onsite DC cables, or in the general environment outside the Proposed Project solar farms, cannot be perceived by human beings. However, rapid head movement in very much stronger magnetic field can produce apparent light flashes (magnetophosphenes) in the visual field, providing a sensitive benchmark for magnetic field perception. Magnetophosphenes are due to stimulation of neuronal cells in the retina. The threshold for magnetophosphenes in an alternating magnetic field at 20-Hz (frequency of greatest sensitivity) is approximately 10 mT, or 100,000 mG. Magnetophosphenes also would occur if it were possible to move the head at a 20-Hz rate in a static magnetic of 10 mT or greater. From these considerations it is evident that the threshold static magnetic field for magnetophosphenes due to rapid head movement would be greater than 100,000 mG. For this reason, the very much weaker static magnetic fields of the proposed solar farm projects would be imperceptible.

Static magnetic fields at utility solar generation facilities have been measured and characterized with regard for electrical equipment found at solar facilities (EPRI 2012a). Measurements were made as close as 1 inch from equipment. At such close separations, static magnetic fields were measured at up to 2,000 mG at a DC fuse box and 3,000 mG at an inverter. The static fields attenuated to very much lower levels at distances greater than inches from the equipment and nowhere, including at the fuse box and inverter, did static magnetic fields exceed exposure guidelines of IEEE, ICNIRP or ACGIH (see Table 5).

In summary, the static electric and magnetic fields of the solar farm projects are highly localized, very much weaker than limits found in all safety guidelines, and imperceptible at all locations accessible to the public. They pose no known concern for human health.

Table 5. Guidelines for maximum permissible exposures to static (0-Hz) electric and magnetic fields.

Source	E-field strength (kV/m)	B-field (mT)	Notes	Reference
General public				
ICES-IEEE	5[(a)]	118 (1,180,000 mG)	Electric field: whole body exposure; Magnetic field: torso and head exposure	(IEEE Std C95.6-2002 2002; IEEE Std C95.3.1-2010 2010)
ICNIRP	[(c)]	400 (4,000,000 mG)	Magnetic field: applies to any part of body	(ICNIRP 2009)
Occupational				
ACGIH	25	60/600[(b)]	24-h average (TLV-TWA-8) for whole body/ extremities	(ACGIH 2011)
ICES-IEEE	20	353 (3,530,000 mG)	Magnetic field exposure to torso and head	(IEEE Std C95.6-2002 2002)
ICNIRP	[(d)]	2,000/8,000	head, trunk/limbs	(ICNIRP 2009)

Notes:
(a) Electric field limit is 10 kV/m within a powerline right-of-way.
(b) TLV-TWA-8 shown in table; ceiling values (not to exceeded): 2000/5000 mT for whole body/extremities; 0.5 mT for pacemakers and other implanted medical electronics (ACGIH: American Council of Governmental Industrial Hygienists).
(c) Limit at 1 Hz is 5 kV/m.
(d) Limit at 1 Hz is 20 kV/m.

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Silva JM, Hummon N, Rutter D, Hooper C. 1988. Power frequency magnetic fields in the home. Piscataway (NJ): Institute of Electrical and Electronics Engineers. 88 WM 101-8, 10.

Wertheimer N, Leeper E. 1979. Electrical wiring configurations and childhood cancer. American Journal of Epidemiology 109:273-284.

World Health Organization. 2006. *Static Fields*. 351 p, (accessed 28-Nov-2011).

World Health Organization. 2007. *Extremely low frequency fields: Environmental Health Criteria 238*. Geneva: WHO Press, World Health Organization, Geneva, Switzerland, 519 p.

Zaffanella L. 1993. Survey of residential magnetic field sources. Volume 1: Goals, results and conclusions (Final Report). Palo Alto (CA): EPRI. TR-102759-V1.

Curriculum Vitae of

ASHER R. SHEPPARD

February 4, 2014

Asher Sheppard Consulting
4960 Hoen Avenue **707 538 8509 (voice); 909 762 0461 (mobile)**
Santa Rosa, California 95405 **707 538 8528 (facsimile)**

***PERSONAL*:**
Married to Ann Sheppard; three adult offspring.

***EDUCATION AND EMPLOYMENT HISTORY*:**

Consultant and Research Scientist, biological, biophysical and health effects of electric and magnetic fields and electromagnetic radiation, 1975–present.

Principal, Asher Sheppard Consulting, 1993–present.

Assistant Research Professor of Physiology, Loma Linda University, Loma Linda, California, 1979–2009.

Member, Research Staff, Department of Neurosurgery, Loma Linda University School of Medicine, 1988–1993.

Research Physicist, Jerry L. Pettis Memorial Veterans Medical Center, Loma Linda, California. Electrophysiological research on invertebrate and mammalian nervous system interactions with ELF electric and magnetic fields. Theory of the biophysical transduction of ELF signals in biological systems. Design and develop instrumentation; design and develop computer techniques for data acquisition and data analysis. Design and develop apparatus for use by my colleagues in investigations of field exposure of cells, tissues and animals. Supervise technical personnel, manage laboratory and electronics shop. April, 1978–May, 1993.

National Institute of Environmental Health Sciences (NIEHS) Fellow and UCLA Postdoctoral Scholar, Environmental Neurobiology Laboratory (W.R. Adey, director) of the Brain Research Institute at UCLA (C.D. Clemente, director). Biophysics and physiology of the neuronal membrane; brain response to self-generated fields (EEG) and to external fields. Experimental research on invertebrate neurophysiology. May 1976–March 1978.

NIEHS Fellow and NYU Postdoctoral Intern, Laboratory of Environmental Studies (M. Eisenbud, director), Institute of Environmental Medicine (N. Nelson, director), New York University Medical Center. Researched and co-authored book on biophysics and biological effects of extremely low frequency electric and magnetic fields. Training in environmental science, the toxicology of chemical and radioactive agents, and the biological effects of non-ionizing (microwave) radiation. October 1974–April 1976.

Graduate studies in physics at State University of New York, Buffalo, New York. Instructor in astronomy and physics. Doctoral thesis research in experimental atomic and molecular physics (beam resonance spectroscopy); dissertation, "Elastic scattering cross sections of metastable barium on helium and argon." MS, June 1971, PhD, February 1975.

Consolidated Edison Company of New York, Inc., Cadet Engineer 1963–1964; summer app't. June–August 1965.

Student, Union College, Schenectady, New York, BS, June 1963.

***RESEARCH GRANTS and CONTRACTS*:**

"Improved Exposure Assessment for Epidemiologic Studies of Mobile Phone Users," Subcontractor to Exponent Health Group, Inc. (Menlo Park, CA), Cooperative Research and Development Agreement (CRADA) between for US Food and Drug Administration (Rockville, MD) and Cellular Telephone and Internet Association (Washington, D.C.), 2003 – 2006.

"Attributable Fraction Estimates for EMF Exposures," NIEHS and DOE (RAPID Program), Principal Investigator, 1997–1999.

"Policy Analysis for Public Schools (K–12) and School District Day Care Centers Pertaining to Possible Health Effects from Power Frequency Electromagnetic Fields (EMFs)," California Department of Health Services and Public Health Institute of California, Electric and Magnetic Fields Program (under subcontract to EcoAnalysis, Inc.), 1995–present.

"Estimating the Potential Public Health Risks Attributable to Residential Exposures to Power Frequency Electric and Magnetic Fields Using Data from Epidemiologic Studies and Exposure Assessment Research, Southern California Edison Co., 1994–1996.

"Animal Models and Tissue Culture Studies of Possible Brain Tumor Promotion by Simulated Cellular Car Phone RF Fields," Motorola, Inc., (co-investigator), 1991–1993.

"Tissue Interactions with Non-Ionizing Electromagnetic Fields," U.S. Department of Energy (co-investigator), 1978–1993.

"Information Concerning Regulation of Electromagnetic Fields of Electric Power Facilities," State of Florida, Department of Environmental Regulation (principal investigator), 1986–1987.

Assay for Tumor Promotion by Sinusoidal 60-Hz Electric Fields Using C3H/10T1/2 Fibroblast Cultures," Southern California Edison Co. (co-investigator), 1986–1990.

"**Tests of a Model for Macromolecular Migration on Myoblast Cell Surfaces Exposed to Alternating Electric Fields," Office of Naval Research (principal investigator), 1984–1986.**

"Bioeffects of Electric Fields, Neurophysiological and Sensory Behavior: Studies of Frequency and Field Strength Dependencies," Southern California Edison Co. (co-principal investigator), 1979–1986.

"**Cellular and Organismal Response to Combined Kilohertz and other Nonionizing Electromagnetic Fields," Office of Naval Research (co-investigator), 1984–1987.**

"**Electromagnetic Radiation and Biological Systems," National Center for Radio logical Devices (formerly Bureau of Radiological Health), Department of Health and Human Services (researcher), 1979–1983.**

***REVIEW, ADVISORY, and CONSULTATIVE POSITIONS*:**

Consultant to Nevada Energy – EMF health and safety (transmission line and substation) of Bordertown Project as subcontractor to Enertech (2012 -2013).

Consultant to EPRI – Preparation of resource paper on environmental, health and safety issues of HVDC transmission (2011- 2012).

Consultant to Seattle City Light -- framework for utility managers on issues of health and safety of power frequency electric and magnetic fields, Seattle, WA, 2009-present.

Consultant to City of Yucaipa on RF fields near a 4-G cellular network base station and related health & safety issues, 2009-2010.

Consultant to Montana Department of Environmental Quality – EMF health and safety (transmission, and substations) of Montanore Project as subcontractor to ERO Resources (2006-2007).

Chairman, NIH Center for Scientific Review, Special Emphasis Panel (Electromagnetics), Feb., 2008; Invited reviewer 1993 -

Reviewer for *Bioelectromagnetics, BioScience, Brain Research, FASEB Journal, Health Physics, IEEE Transactions on Biomedical Engineering, Neuroscience, Journal of Bioelectricity, Radiation Research, Risk Analysis,* National Institutes of Health, National Science Foundation, Electric Power Research Institute.

California Department of Education— workshops on transmission line setback policy at school facilities, participant, contributor of written analysis and comments, 2005 – 2006.

ANATEL (Federal Telecommunications Agency) Brasilia, Brazil, 2000–2001.

California Public Utilities Commission through subcontracts to Dudek & Associates, Inc., 1998–present, Aspen Environmental Group (2003-present).

National Council on Radiation Protection and Measurements Scientific Committee 89-4 (Pulse-Modulated Radiofrequency Fields), 1995–2003.

Motorola, Inc., 1994–2005.

Harvard Center for Risk Analysis Peer Review Board for Cellular Telephones, 1994–1999.

General Electric Company, 1996–1997.

***Bioelectromagnetics* (journal)–Associate Editor, 1992–1994; Member, Editorial Board, 1984–2008.**

Scientific Advisor, California Department of Health Services, Oakland, 1989–2000.

IEEE International Committee on Electromagnetic Safety (ICES), Standards Coordinating Committee 28 (SCC28) Subcommittee 4 on Effects of Radiofrequency Electromagnetic Fields 1993–present; Chairman, subcommittee on Role of Mechanisms in Standards-Setting (1995–present).

IEEE International Committee on Electromagnetic Safety (ICES), Standards Coordinating Committee 28 (SCC28) Subcommittee 3 on Effects of Extremely Low Frequency Electric and Magnetic Fields, Member, 1993–present; Chairman, subcommittee on Literature Review (1996–2001).

Consultant on evaluation of scientific literature on biological effects of ELF electromagnetic fields for the Department of the Navy, Research and Development Laboratories, Culver City, CA, 1985–1999.

EMF Science Review Symposium for Epidemiological Research Findings, organized by the National Institute of Environmental Health Science for the NIEHS/DOE EMF *RAPID* Program. (a) Rapporteur, "Methodological Issues and Problems: Can These Explain the Effect or Lack of Effect Seen in Epidemiological Studies?"; (b) Member, "EMF and Adverse Reproductive Outcomes", 1998.

Santa Clara Unified School District, 1994; City of Beverly Hills, 1994, California Public Utilities Commission, 1993; National Institutes of Health (Reviewer, Radiation Studies ad hoc panel on EMFs, 1992).

Department of Energy Workshop on a National Research Strategy, 1991, Arlington, VA.

Member, Bioelectromagnetics Committee on a National Research Plan on Electric and Magnetic Field Health Effects Research, 1991–1992.

Member, Feasibility Study Committee on ELF Electric and Magnetic Field Health Effects, Health Effects Institute, Cambridge, MA, 1991.

Consultant to the Seattle City Council on policy, regulations, and scientific literature concerning non-ionizing radiation from telecommunications facilities (radiofrequency fields), Seattle, WA, 1991.

Consultant to Seattle City Light on health and safety of power frequency electric and magnetic fields, Seattle, WA, 1988.

Consultant, reviewer for United States Environmental Protection Agency on "Evaluation of the potential carcinogenicity of electromagnetic fields," (1990, 1991).

Member, IEEE Committee on Man and Radiation (COMAR), 1988–1996.

Member, Nonionizing Radiation Protection Scientific Working Group, WHO Regional Office for Europe, 1986–1990.

Member, Science Advisory Group on Biological and Human Health Effects of ELF Electric and Magnetic Fields. American Institute of Biological Sciences, Arlington, VA, 1984–1985.

Scientific Advisor, Minnesota Environmental Quality Board, 1984–1985.

Consultant to Seattle City Light on health and safety of the proposed Duwamish-Delridge transmission line, Seattle, WA, July, 1984–1986.

Scientific Advisor, World Health Organization, "Working Group on Criteria Document on Health Effects of ELF Fields," Geneva, Switzerland, 1980–1984.

Rapporteur, World Health Organization "Task Group on Health Effects of ELF Fields." Geneva, Switzerland, 1984.

Member, Advisory Group, CRC Handbook on Air Ions, 1983–1986.

Scientific Advisor, Montana Department of Natural Resources and Conservation, Helena, MT, 1982–1983.

Scientific Advisor, Minnesota Environmental Quality Board, 1981–1982.

Member, Scientific Advisory Panel on Health Effects of Electric Fields, Bonneville Power Administration, Vancouver, WA, 1980.

***HONORS and AWARDS*:**

Chairman, "Bioelectromagnetics 2005", Dublin, Ireland. Outstanding Environmental Analysis Document award (2005) by AEP San Diego Chapter as Dudek team member on CPUC/SDG&E Otay Mesa Power Purchase Agreement Transmission Project EIR. President (2001-2002) of The Bioelectromagnetics Society. EEEL Outstanding Paper Award, National Institute of Standards and Technology, 1994. NIEHS Fellow, 1974–1976. Listed in: Who's Who in American Science, Guide to Energy Specialists. Sternfeld Prize in Philosophy (1963). New York State Regents Science and Engineering Scholarship (1959–1963).

***MEMBERSHIPS*:**

American Association for Advancement of Science, American Physical Society, Bioelectromagnetics Society, European Bioelectromagnetics Association, Biophysical Society, Society for Neuroscience.

Bioelectromagnetics Society (BEMS) activities: Member, Long-range planning committee (2002-2005); President (2001-2002); Chairman, Publications Committee (1998-2001); Member, Board of Directors, (1998-2001; 1986–1989); chairman, Membership Committee (1987–1989).

***SELECTED INVITATIONS to SPEAK*:**

2006: Progress in Electromagnetics Research Symposium (PIERS), Cambridge, MA, March.

2004: Gordon Research Conference on Bioelectrochemistry, invited speaker and chairperson of session on biophysical mechanisms for RF and MRI, New London, CT, July; International workshop: "Biological Effects of Electromagnetic Fields", Kos, Greece, invited speaker and member of Advisory Committee, October;

2003: "Mobile Telephony and Health". Finnish National Research Programme 1998-2003, Helsinki, Finland, October 17.

2002: International workshop: "Biological Effects of Electromagnetic Fields", Rhodes, Greece; Workshop: "Epidemiological Considerations in Electromagnetics", (The Bioelectromagnetics Society), Washington, D.C.

2001: Asia-Pacific Radio Science Conference (International Union of Radio Scientists – URSI), Tokyo, Japan.

***LICENSURE*:**

General Radiotelephone Communications Certificate (formerly First Class Certificate), Federal Communications Commission, Washington, DC.

***PUBLICATIONS and REPORTS*:**

Kuehn S, Kelsh MA, Kuster N, Sheppard AR, Shum M, 2013. Analysis of mobile phone design features affecting radio frequency power absorbed in a human head phantom. Bioelectromagnetics 34(6):479-488.

Shum M, Sheppard AR, Zhao K, Kelsh MA, 2011. An evaluation of self-reported mobile phone use compared to billing records among a group of engineers and scientists. Bioelectromagnetics 32:37-48.

Kelsh MA, Shum M, Sheppard AR, McNeely M, Kuster N, Lau E, Weidling R, Fordyce T, Kuhn S, Sulser C. 2010. Measured radiofrequency exposure during various mobile-phone use scenarios. J Expo Sci Environ Epidemiol 21(4):343-354.

Sheppard AR, Swicord ML, Balzano Q, 2008. Quantitative evaluations of mechanisms of radiofrequency interactions with biological molecules and processes. Health Phys 95(4):365-396.

Balzano Q, Foster KR, Sheppard AR, 2007. Field and temperature gradients from short conductors in a dissipative medium. Online publication in Int. J. Antennas and Propagation 2007, 5760:1-8.

Swicord ML, Sheppard AR, Balzano Q, 2007: Comment on "Denaturation of hen egg white lysozyme in electromagnetic fields: A molecular dynamics study" [J. Chem. Phys. 126 091105 (2007)] J. Chem. Phys. 127, 117101; Online publication in JCP: BioChemical Physics at http://jcp-bcp.aip.org

Balzano Q, Sheppard AR (2007). RF Nonlinear Interactions in Living Cells–I: Non-equilibrium Thermodynamic Theory (erratum). Bioelectromagnetics 28(1):47.

Erdreich LS, Van Kerkove MD, Scrafford C, Barraj L, Shum M, MM, Sheppard AR, Kelsh MA. 2007. Factors that influence RF power output of GSM mobile phones. Radiation Research 168:253-261.

Sheppard AR, Blackman CF (eds) 2004. The Bioelectromagnetics Society: history of the first 25 years. Internet URL http://bioelectromagnetics.org/doc/bems-history.pdf. Frederick, MD: The Bioelectromagnetics Society, 44 p. Print copy available from cafepress.com, Hayward, CA.

NCRP Scientific Committee 89-4 (2003): Biological effects of modulated radiofrequency fields (NCRP Commentary No. 18). National Council on Radiation Protection and Measurements, Bethesda, MD, 52 p.

Balzano Q, Sheppard AR, 2003: RF Nonlinear Interactions in Living Cells–I: Non-equilibrium Thermodynamic Theory. Bioelectromagnetics 24:473-482.

Sheppard AR, Swicord, ML, 2002: Biophysical Considerations for Selection of Averaging Volumes for Radiofrequency Standards. Biological Effects of Electromagnetic Fields: 2nd International Workshop, October, Rhodes, Greece, p 712-718.

Sheppard AR, Glaser R (2002): Report from a Workshop on: "Physical Effects of Pulsed RF Fields at Microscopic and Molecular Dimensions (Microdosimetry)" December 2001, Dresden (Germany).

Balzano Q, Sheppard AR, 2002: The precautionary principle and sound public policy. Journal of Risk Research, 5(4):351-369.

Sheppard AR, Kavet R, and Renew DC (2002): Exposure Guidelines for Low-Frequency Electric and Magnetic Fields: Report from the Brussels Workshop. Health Physics 83(3):324-332.

Greenland S, Sheppard AR, Kaune WT, Poole C, Kelsh MA (2001): Pooled analysis of magnetic fields, wire codes, and childhood leukemia: In reply. Epidemiology 2001;12:472-474.

Glaser R, Portier C, Sheppard A (rapporteurs) (2001). Report from a Workshop on: "Biological and Biophysical Research at Extremely Low- and Radio-Frequencies". Forschungsgemeinschaft Funk, Bonn (Germany). Available (Dec. 2001) at: http://www.fgf.de/english/fup/meeting/index.html.

Greenland S, Sheppard AR, Kaune WT, Poole C, Kelsh MA (2000): A pooled analysis of magnetic fields, wire codes, and childhood leukemia. Epidemiology 9(6):624-634.

Sheppard, AR (2000): Environmental and ecological considerations for static and ELF electric power transmission line projects. Matthes R, Bernhardt JH, Repacholi M (eds): Effects of Electromagnetic Fields on the Living Environment, Proceedings, International Seminar on Effects of electromagnetic Fields on the Living Environment, Ismaning, Germany, ICNIRP 10/2000, p 211-230.

Sheppard, AR, Kelsh, MA, Florig, HK (1998): Health Risks and Costs That May Be Attributable to Electric and Magnetic Field Exposures in California Public Schools. Report to Public Health Insitute and California Department of Health Services, Oakland, CA, 51 pp.

Sheppard, AR (1998). Where does the energy go? Microwave energy absorption in biological objects on the microscopic and molecular scales (Chap. 13). In: GL Carlo (ed) *Wireless Phones and Health: Scientific Progress*. Boston: Kluwer Academic Publishers, pp. 165-175.

— (1997). Biological and Health effects of electric and magnetic fields from video display terminals. A technical Information Statement. COMAR VDT sub-committee, AR Sheppard, chairman. *IEEE Engineering in Medicine and Biology 16(3)*:87-92.

Sheppard, AR (1997). Biological research in North America (Chapter 7). In: Kuster N, Balzano Q, Lin JC (eds), *Mobile Communications Safety*. Chapman & Hall, London, pp. 173-193.

Sheppard, AR (in preparation, 1997). Significance and Limitations of Laboratory Studies on ELF Fields. Proceedings of the National Council on Radiation Protection and Measurements.

Sheppard, AR and Q Balzano (1995). Comments on "Absorbed Energy distribution from radiofrequency electromagnetic radiation in a mammalian cell model: effect of membrane-bound water," by Liu and Cleary. *Bioelectromagnetics 16(6)*:407.

Sheppard, AR (1995). Comments on "Trivial influences: a doubly stochastic poisson process model permits the detection of arbitrarily small electromagnetic signals." *Bioelectromagnetics 16:*12-16.

Sheppard, AR (1993). Epidemiologic and Laboratory Research on Potential Human Health Effects from Exposure to Power Frequency Electric and Magnetic Fields. A Background Paper. NTIS # PB-94114485. Minnesota Environmental Quality Board, St. Paul, August, 71 pp.

Misakian, M, AR Sheppard, D Krause, ME Frazier and DL Miller, 1993. Biological, Physical, and Electrical Parameters for In Vitro Studies with ELF Magnetic and Electric Fields: A Primer. *Bioelectromagnetics 14(Sup. 2)*:1-73.

Sheppard, AR and WR Adey, 1993. Electrical models for nerve cells exposed to ELF electric fields. In: *Electricity and Magnetism in in Biology and Medicine,* M Blank, ed. San Francisco Press, San Francisco, pp. 540-542.

Stell, M, AR Sheppard and WR Adey, 1993. The effect of moving air on detection of a 60-Hz electric field. Bioelectromagnetics 14(1):67-78.

Jones, RA and AR Sheppard, 1992. An integrated ELF magnetic-field generator and incubator for long-term in vitro studies. *Bioelectromagnetics 13(3):*199-207.

Sheppard, AR, 1991. What More Do We Need to Know about the Biological Effects of ELF Electric and Magnetic Fields and Why? The Health Physics Society's Newsletter, October, pp 38-41.

Lyle, DB, X Wang, RD Ayotte, AR Sheppard, and WR Adey, 1991. Calcium uptake by leukemic and normal T-lymphocytes exposed to low frequency magnetic fields. *Bioelectromagnetics 12(3):145-156*.

Sheppard, AR, 1989. Addressing the possible human health effects of electric and magnetic fields from electric power lines: a critical evaluation of laboratory data and biophysical models. In: "Potential Health Effects of Electric and Magnetic Fields from Electric Power Facilities: A report to the California State Legislature by the California Public Utilities Commission in Cooperation with the California Department of Health Services," California Department of Health Services, Berkeley, 15 September 1989.

Elder, JA, PA Czerski, MA Stuchly, KH Mild, and AR Sheppard, 1989. Radiofrequency radiation (chapter 4). In: *Nonionizing radiation protection*, second edition, MJ Suess and DA Benwell-Morison, eds. World Health Organization Regional Publications, European Series, No. 25. World Health Organization Regional Office for Europe, Copenhagen. pp 117-173.

Lyle, DB, RD Ayotte, AR Sheppard and WR Adey, 1988. Suppression of T-lymphocyte cytotoxicity following exposure to 60-Hz electric fields. *Bioelectromagnetics 9(3)*:303-313.

Sheppard, AR, 1987. Effects of a 60-Hz magnetic field on a spontaneously active neuronal system. Proceedings of the Ninth Annual Conference of the IEEE Engineering in Medicine and Biology Society, IEEE #87CH2513-0, Boston, November. pp. 79-80.

Lin-Liu, S and AR Sheppard, 1987. Tests of a model for macromolecular migration on myoblast cell surfaces exposed to alternating electric fields. Final Report on Contract N00014-84-K-0707, Office of Naval Research, Arlington.

Sheppard, AR, 1987. Review of CRC Handbook of *Biological Effects of Electromagnetic Fields*, Polk and Postow, eds. Microwave News, July-August, 1987.

Sheppard, AR, 1987. ELF studies, a review of *Biological Effects and Dosimetry of Static and ELF Electromagnetic Fields*, M Grandolfo, SM Michaelson and A Rindi, eds., Plenum Press, New York, 1985, *Bioscience* 37(10) :740-1, Nov.

Adey, WR and AR Sheppard, 1987. Cell surface ionic phenomena in transmembrane signaling to intracellular enzyme systems. In: *Mechanistic Approaches to Interactions of Electromagnetic Fields with Living Systems*, M Blank and E Findl, eds., Plenum Press, N.Y., pp 365-387.

WEST Associates. Justesen DR, Peters JM, Sahl JD, Sheppard AR, Smith RF, and Wright WE, 1986. A critical review of the scientific literature on low-frequency electric and magnetic fields: assessment of possible effects on human health and recommendations for research. Southern California Edison Company, Rosemead, California, 95pp. + 6 app.

Bawin, SM, ML Abu-Assal, AR Sheppard, MD Mahoney and WR Adey, 1986. Long-term effects of sinusoidal extracellular electric fields in penicillin-treated rat hippocampal slices. *Brain Research 399*:194-199.

Bawin, SB, Sheppard, AR, Mahoney, MD, Abu-Assal, M and Adey, WR, 1986. Comparison between the effects of extracellular direct and sinusoidal currents on excitability in hippocampal slices. *Brain Research 362*: 350-354.

Sheppard, AR, 1985. Cellular studies of effects of ELF electric and magnetic fields. In: *Biological and Human Health Effects of ELF Electric and Magnetic Fields*, Report on the Navy ELF Communication System, American Institute of Biological Sciences, Arlington, VA.

Bawin, SM, AR Sheppard, MD Mahoney and WR Adey, 1984. Influences of sinusoidal electric fields on excitability in the hippocampal slice. *Brain Research 323*: 227-237.

Sheppard, AR, 1983. "Biological Effects of High Voltage AC Transmission Lines" Report to the Montana Department of Natural Resources and Conservation, Helena. NTIS publication, PB 83 207241, February.

Sheppard, AR, 1983. "Biological Effects of High Voltage Direct Current Transmission Lines," Report to the Montana Department of Natural Resources and Conservation, Helena. NTIS publication, PB 83 207258, April.

Sheppard, AR, 1982. Biological effects of radio frequency radiation. In: Proceedings of the Lighting-Electromagnetic Compatibility Conference, R.R. Verderber, SM Berman, eds. LBL-15199, UC-95d. Lawrence Berkeley Laboratory, Berkeley, CA, March. pp. 9-23.

Sheppard, AR, 1979. The role of cell surface polarization in biological effects of extremely low frequency. In: *Biological effects of extremely low frequency electromagnetic fields*, RD Phillips, MF Gillis, WT Kaune and DD Mahlum, eds. Proceedings of 18th Annual Hanford Life Sciences Symposium on Biological Effects of Extremely Low Frequency Electromagnetic Fields, Richland, WA, U.S. Department of Energy Publication CONF-781016, pp. 147-158.

Sheppard, AR, 1979. Biological effects of static electric fields and air ions in relation to DC power transmission. In: *Proceedings of the Workshop on HVDC Transmission*, T. Dan Bracken, ed., Battelle Pacific Northwest Laboratory Publication PNL-3121/UC-97a, pp. 3.1-3.29.

Sheppard, AR, 1979. Magnetic interactions in man and other mammals: an overview. In: *Magnetic Field Effects on Biological Systems*, Tom S. Tenforde, ed., Plenum Press, New York, pp. 33-37.

Sheppard, AR, SM Bawin and WR Adey, 1979. Models of long-range order in cerebral macromolecules: effects of sub-ELF and of modulated VHF and UHF fields. *Radio Science, 14*, No. 6S, 141-145.

Bawin, SM, AR Sheppard and WR Adey, 1978. Possible mechanisms of weak electromagnetic coupling in brain tissue. *Bioelectrochemistry and Bioenergetics, 5*: 67-76.

Sheppard, AR and M Eisenbud, 1977. *Biological effects of electric and magnetic fields of extremely low frequency*. New York University Press, New York.

ABSTRACTS of SELECTED MEETING PRESENTATIONS:

Balzano Q, Sheppard AR, Bit-Babik G 2013. Medium Geometry: The Dominant Factor of In Vitro Exposure. Thirty-fifth Annual Meeting of BEMS, Thessaloniki, June.

Balzano Q, Sheppard AR, Bit-Babik G 2013. Thermal dosimetry and thermodynamics of in vitro rf bioassays. PIERS 2013 in Taipei, March.

Balzano Q, Sheppard AR, Bit-Babik G 2012. Thermal dosimetry and thermodynamics in test tubes and Petri dishes. EMC EUROPE 2012, International Symposium on Electromagnetic Compatibility, Rome, September 17-21.

Balzano Q, Sheppard AR 2011. A Simple Method to Compute Meniscus Effects on SAR at the bottom of Petri Dishes. Thirty-third Annual Meeting of BEMS, Halifax, Nova Scotia, June.

Balzano Q, Sheppard AR 2010. Considerations on the exposure of cell preparations in petri dishes. Thirty-second Annual Meeting of BEMS, Seoul, Korea, June.

Balzano Q, Sheppard A, Swicord M 2010. Considerations on the limitations of rf bioresearch. PIERS 2010 in Xi'an, CHINA, 22-26 March 2010.

Swicord ML, Balzano Q, Sheppard AR, 2010. A Review of Physical Mechanisms of Radiofrequency Interaction with Biological Systems. 2010 Asia-Pacific Symposium on Electromagnetic Compatibility, Beijing International Conference Center, April 12-16, Beijing, China.

Balzano Q, Sheppard A, Swicord M 2009. Establishing biophysical mechanisms of EM fields: Not an easy task. Thirty-first Annual Meeting of BEMS, Davos, Switzerland, June.

Sheppard AR, Balzano Q 2008. Would temperature-based exposure limits improve RF safety standards? Thirtieth Annual Meeting of BEMS, San Diego, June.

Shum M, Sheppard AR, Lau E, Erdreich L, Kuster N, McNeeley M, Kelsh M 2008. Factors Affecting Radiofrequency Power Output of Mobile Phones. Thirtieth Annual Meeting of BEMS, San Diego, June.

Kelsh M, Sheppard A, Shum M, Zhao K 2008. Recall Studies of Reported Mobile Phone Use: Analysis of Longer-Term Recall Accuracy: Summary of Existing Research and Implications for Epidemiologic Studies. Thirtieth Annual Meeting of BEMS, San Diego, June.

Balzano Q, Sheppard AR, Swicord ML 2008. Advances in rf bioeffect mechanisms. PIERS 2008 in Hangzhou, Hangzhou, China, 24 - 29 March.

Shum M, Erdreich LS, Van Kerkhove MD, Scrafford C, Barraj L, McNeely M, Sheppard AR, Kelsh M 2007. Factors that influence RF power output of GSM mobile phones. American Industrial Hygiene Association CE, June, Philadelphia, PA.

Sheppard AR 2006. RF interactions with biological molecules and processes: Quantifying thermal and non-thermal mechanisms. PIERS 2006 in Cambridge, Cambridge, USA, 26 - 29 March.

Shum M, Kelsh M, Lau E, Sheppard AR, Kuster N, McNeely M 2006. Correlation of power control setting to radiofrequency power levels from software modified phones. Twenty-eighth Annual Meeting of the Bioelectromagnetics Society (p 282), Cancun, Mexico.

Shum M, Kelsh M, Lau E, Sheppard AR, McNeely M, Kuster N 2006. Evaluation of Mobile Phone Handset Exposures Using a Portable Phantom System (p 63). Twenty-eighth Annual Meeting of the Bioelectromagnetics Society, Cancun, Mexico.

Kelsh M, Shum M, Fordyce T, Sheppard AR 2006. Evaluation of Power Output of Software Modified Mobile Phones as a Function of Time of Day. Twenty-eighth Annual Meeting of the Bioelectromagnetics Society (p 66), Cancun, Mexico.

Swicord ML, Sheppard AR 2005. Biophysical Mechanisms for Effects of RF Energy. 11th IPEM Annual Scientific Conference, Glasgow, 7-9 September.

Swicord ML, Sheppard AR 2005. Biophysical Mechanisms for Thermal and Non-thermal Effects of RF Energy. Kunming, China. The Fourth International Seminar on Electromagnetic Fields and Biological Effects. September.

Foster KR, Sheppard AR, Swicord ML 2005. What mechanisms are responsible for biological effects of RF fields? Froehlich Centenary International Symposium: Coherence and Electromagnetic Fields in Biological Systems, July 14, Prague, Czech Republic.

Sheppard AR. 2005. Cooperativity as an amplifier of physical effects in bioelectromagnetics. Twenty-seventh Annual Meeting of BEMS, Bioelectromagnetics 2005, Dublin, Ireland.

Sheppard AR, Swicord ML, Astumian RD, Balzano Q, Barnes FS, Glaser R, Foster KR, Prohofsky EW, Weaver JC 2005. Biophysical Mechanisms for Effects of RF Energy: Report of a Multi-investigator Review. II- Nonthermal Interactions. Twenty-seventh Annual Meeting of BEMS, Bioelectromagnetics 2005, Dublin, Ireland.

Swicord ML, Sheppard AR, Astumian RD, Balzano Q, Barnes FS, Glaser R, Foster KR, Prohofsky EW, Weaver JC 2005. Biophysical Mechanisms for Effects of RF Energy: Report of a Multi-investigator Review. I - Fields and Energy Absorption at Tissue, Cellular, and Molecular Levels. Twenty-seventh Annual Meeting of BEMS, Bioelectromagnetics 2005, Dublin, Ireland.

Weingart M, Kelsh M, Shum M, Sheppard AR, Kuster N 2005. Statistical analysis of the influences of technology, antenna, mobile phone shape and position on SAR measurements from FCC compliance testing data. Twenty-seventh Annual Meeting of BEMS, Bioelectromagnetics 2005, Dublin, Ireland.

Balzano Q, Sheppard AR 2005. Possible differences in the RF exposure of cells in test tubes versus flasks or petri dishes. Twenty-seventh Annual Meeting of BEMS, Bioelectromagnetics 2005, Dublin, Ireland.

Sheppard AR 2004. Magnitude of cooperativity required in models for nonthermal biochemical effects. 3rd International Workshop in Biological Effects of electromagnetic fields. October, Kos, Greece.

Sheppard AR, Balzano Q, Erdreich L, Swicord L, Kelsh MA 2004. Methods for estimation of exposures to radiofrequency energy from mobile phone base stations. International Society for Environmental Epidemiology (ISEE), August, New York City.

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Health and Safety Impacts of Solar Photovoltaics

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Health and Safety Impacts of Solar Photovoltaics

The increasing presence of utility-scale solar photovoltaic (PV) systems (sometimes referred to as solar farms) is a rather new development in North Carolina's landscape. Due to the new and unknown nature of this technology, it is natural for communities near such developments to be concerned about health and safety impacts. Unfortunately, the quick emergence of utility-scale solar has cultivated fertile grounds for myths and half-truths about the health impacts of this technology, which can lead to unnecessary fear and conflict.

Photovoltaic (PV) technologies and solar inverters are not known to pose any significant health dangers to their neighbors. The most important dangers posed are increased highway traffic during the relative short construction period and dangers posed to trespassers of contact with high voltage equipment. This latter risk is mitigated by signage and the security measures that industry uses to deter trespassing. As will be discussed in more detail below, risks of site contamination are much less than for most other industrial uses because PV technologies employ few toxic chemicals and those used are used in very small quantities. Due to the reduction in the pollution from fossil-fuel-fired electric generators, the overall impact of solar development on human health is overwhelmingly positive. This pollution reduction results from a partial replacement of fossil-fuel fired generation by emission-free PV-generated electricity, which reduces harmful sulfur dioxide (SO_2), nitrogen oxides (NO_x), and fine particulate matter ($PM_{2.5}$). Analysis from the National Renewable Energy Laboratory and the Lawrence Berkeley National Laboratory, both affiliates of the U.S. Department of Energy, estimates the health-related air quality benefits to the southeast region from solar PV generators to be worth 8.0 ¢ per kilowatt-hour of solar generation.[1] This is in addition to the value of the electricity and suggests that the air quality benefits of solar are worth more than the electricity itself.

Even though we have only recently seen large-scale installation of PV technologies, the technology and its potential impacts have been studied since the 1950s. A combination of this solar-specific research and general scientific research has led to the scientific community having a good understanding of the science behind potential health and safety impacts of solar energy. This paper utilizes the latest scientific literature and knowledge of solar practices in N.C. to address the health and safety risks associated with solar PV technology. These risks are extremely small, far less than those associated with common activities such as driving a car, and vastly outweighed by health benefits of the generation of clean electricity.

This paper addresses the potential health and safety impacts of solar PV development in North Carolina, organized into the following four categories:

(1) Hazardous Materials
(2) Electromagnetic Fields (EMF)
(3) Electric Shock and Arc Flash
(4) Fire Safety

1. Hazardous Materials

One of the more common concerns towards solar is that the panels (referred to as "modules" in the solar industry) consist of toxic materials that endanger public health. However, as shown in this section, solar energy systems may contain small amounts of toxic materials, but these materials do not endanger public health. To understand potential toxic hazards coming from a solar project, one must understand system installation, materials used, the panel end-of-life protocols, and system operation. This section will examine these aspects of a solar farm and the potential for toxicity impacts in the following subsections:

1.1 Project Installation/Construction

The system installation, or construction, process does not require toxic chemicals or processes. The site is mechanically cleared of large vegetation, fences are constructed, and the land is surveyed to layout exact installation locations. Trenches for underground wiring are dug and support posts are driven into the ground. The solar panels are bolted to steel and aluminum support structures and wired together. Inverter pads are installed, and an inverter and transformer are installed on each pad. Once everything is connected, the system is tested, and only then turned on.

Figure 1: Utility-scale solar facility (5 MW_{AC}) located in Catawba County. Source: Strata Solar

1.2 System Components

1.2.1 Solar Panels: Construction and Durability

Solar PV panels typically consist of glass, polymer, aluminum, copper, and semiconductor materials that can be recovered and recycled at the end of their useful life.[2] Today there are two PV technologies used in PV panels at utility-scale solar facilities, silicon, and thin film. As of 2016, all thin film used in North Carolina solar facilities are cadmium telluride (CdTe) panels from the US manufacturer First Solar, but there are other thin film PV panels available on the market, such as Solar Frontier's CIGS panels. Crystalline silicon technology consists of silicon wafers which are made into cells and assembled into panels, thin film technologies consist of thin layers of semiconductor material deposited onto glass, polymer or metal substrates. While there are differences in the components and manufacturing processes of these two types of solar technologies, many aspects of their PV panel construction are very similar. Specifics about each type of PV chemistry as it relates to toxicity are covered in subsections a, b, and c in section 1.2.2; on crystalline silicon, cadmium telluride, and CIS/CIGS respectively. The rest of this section applies equally to both silicon and thin film panels.

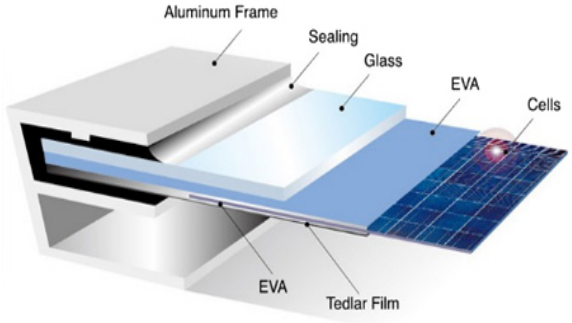

Figure 2: Components of crystalline silicon panels. The vast majority of silicon panels consist of a glass sheet on the topside with an aluminum frame providing structural support. Image Source: www.riteksolar.com.tw

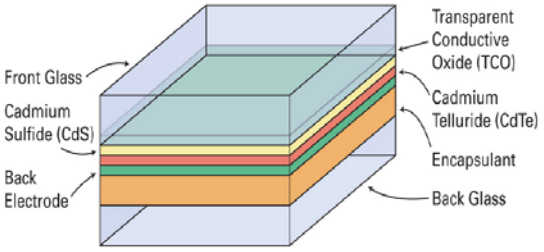

Figure 3: Layers of a common frameless thin-film panel (CdTe). Many thin film panels are frameless, including the most common thin-film panels, First Solar's CdTe. Frameless panels have protective glass on both the front and back of the panel. Layer thicknesses not to scale. Image Source: www.homepower.com

To provide decades of corrosion-free operation, PV cells in PV panels are encapsulated from air and moisture between two layers of plastic. The encapsulation layers are protected on the top with a layer of tempered glass and on the backside with a polymer sheet. Frameless modules include a protective layer of glass on the rear of the panel, which may also be tempered. The plastic ethylene-vinyl acetate (EVA) commonly provides the cell encapsulation. For decades, this same material has been used between layers of tempered glass to give car windshields and hurricane windows their great strength. In the same way that a car windshield cracks but stays intact, the EVA layers in PV panels keep broken panels intact (see Figure 4). Thus, a damaged module does not generally create small pieces of debris; instead, it largely remains together as one piece.

Figure 4: The mangled PV panels in this picture illustrate the nature of broken solar panels; the glass cracks but the panel is still in one piece. Image Source: http://img.alibaba.com/photo/115259576/broken_solar_panel.jpg

PV panels constructed with the same basic components as modern panels have been installed across the globe for well over thirty years.[3] The long-term durability and performance demonstrated over these decades, as well as the results of accelerated lifetime testing, helped lead to an industry-standard 25-year power production warranty for PV panels. These power warranties warrant a PV panel to produce at least 80% of their original nameplate production after 25 years of use. A recent SolarCity and DNV GL study reported that today's quality PV panels should be expected to reliably and efficiently produce power for thirty-five years.[4]

Local building codes require all structures, including ground mounted solar arrays, to be engineered to withstand anticipated wind speeds, as defined by the local wind speed requirements. Many racking products are available in versions engineered for wind speeds of up to 150 miles per hour, which is significantly higher than the wind speed requirement anywhere in North Carolina. The strength of PV mounting structures were demonstrated during Hurricane Sandy in 2012 and again during Hurricane Matthew in 2016. During Hurricane Sandy, the many large-scale solar facilities in New Jersey and New York at that time suffered only minor damage.[5] In the fall of 2016, the US and Caribbean experienced destructive winds and torrential rains from Hurricane Matthew, yet one leading solar tracker manufacturer reported that their numerous systems in the impacted area received zero damage from wind or flooding.[6]

In the event of a catastrophic event capable of damaging solar equipment, such as a tornado, the system will almost certainly have property insurance that will cover the cost to cleanup and repair the project. It is in the best interest of the system owner to protect their investment against such risks. It is also in their interest to get the project repaired and producing full power as soon as possible. Therefore, the investment in adequate insurance is a wise business practice for the system owner. For the same

reasons, adequate insurance coverage is also generally a requirement of the bank or firm providing financing for the project.

1.2.2 Photovoltaic (PV) Technologies

a. Crystalline Silicon

This subsection explores the toxicity of silicon-based PV panels and concludes that they do not pose a material risk of toxicity to public health and safety. Modern crystalline silicon PV panels, which account for over 90% of solar PV panels installed today, are, more or less, a commodity product. The overwhelming majority of panels installed in North Carolina are crystalline silicon panels that are informally classified as Tier I panels. Tier I panels are from well-respected manufacturers that have a good chance of being able to honor warranty claims. Tier I panels are understood to be of high quality, with predictable performance, durability, and content. Well over 80% (by weight) of the content of a PV panel is the tempered glass front and the aluminum frame, both of which are common building materials. Most of the remaining portion are common plastics, including polyethylene terephthalate in the backsheet, EVA encapsulation of the PV cells, polyphenyl ether in the junction box, and polyethylene insulation on the wire leads. The active, working components of the system are the silicon photovoltaic cells, the small electrical leads connecting them together, and to the wires coming out of the back of the panel. The electricity generating and conducting components makeup less than 5% of the weight of most panels. The PV cell itself is nearly 100% silicon, and silicon is the second most common element in the Earth's crust. The silicon for PV cells is obtained by high-temperature processing of quartz sand (SiO_2) that removes its oxygen molecules. The refined silicon is converted to a PV cell by adding extremely small amounts of boron and phosphorus, both of which are common and of very low toxicity.

The other minor components of the PV cell are also generally benign; however, some contain lead, which is a human toxicant that is particularly harmful to young children. The minor components include an extremely thin antireflective coating (silicon nitride or titanium dioxide), a thin layer of aluminum on the rear, and thin strips of silver alloy that are screen-printed on the front and rear of cell.[7] In order for the front and rear electrodes to make effective electrical contact with the proper layer of the PV cell, other materials (called glass frit) are mixed with the silver alloy and then heated to etch the metals into the cell. This glass frit historically contains a small amount of lead (Pb) in the form of lead oxide. The 60 or 72 PV cells in a PV panel are connected by soldering thin solder-covered copper tabs from the back of one cell to the front of the next cell. Traditionally a tin-based solder containing some lead (Pb) is used, but some manufacturers have switched to lead-free solder. The glass frit and/or the solder may contain trace amounts of other metals, potentially including some with human toxicity such as cadmium. However, testing to simulate the potential for leaching from broken panels, which is discussed in more detail below, did not find a potential toxicity threat from these trace elements. Therefore, the tiny amount of lead in the grass frit and the solder is the only part of silicon PV panels with a potential to create a negative health impact. However, as described below, the very limited amount of lead involved and its strong physical and chemical attachment to other components of the PV panel means that even in worst-case scenarios the health hazard it poses is insignificant.

As with many electronic industries, the solder in silicon PV panels has historically been a lead-based solder, often 36% lead, due to the superior properties of such solder. However, recent advances in lead-free solders have spurred a trend among PV panel manufacturers to reduce or remove the lead in their panels. According to the 2015 Solar Scorecard from the Silicon Valley Toxics Coalition, a group that tracks environmental responsibility of photovoltaic panel manufacturers, fourteen companies (increased from twelve companies in 2014) manufacture PV panels certified to meet the European Restriction of

Hazardous Substances (RoHS) standard. This means that the amount of cadmium and lead in the panels they manufacture fall below the RoHS thresholds, which are set by the European Union and serve as the world's de facto standard for hazardous substances in manufactured goods.[8] The Restriction of Hazardous Substances (RoHS) standard requires that the maximum concentration found in any homogenous material in a produce is less than 0.01% cadmium and less than 0.10% lead, therefore, any solder can be no more than 0.10% lead.[9]

While some manufacturers are producing PV panels that meet the RoHS standard, there is no requirement that they do so because the RoHS Directive explicitly states that the directive does not apply to photovoltaic panels.[10] The justification for this is provided in item 17 of the current RoHS Directive: "The development of renewable forms of energy is one of the Union's key objectives, and the contribution made by renewable energy sources to environmental and climate objectives is crucial. Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources (4) recalls that there should be coherence between those objectives and other Union environmental legislation. Consequently, this Directive should not prevent the development of renewable energy technologies that have no negative impact on health and the environment and that are sustainable and economically viable."

The use of lead is common in our modern economy. However, only about 0.5% of the annual lead consumption in the U.S. is for electronic solder for all uses; PV solder makes up only a tiny portion of this 0.5%. Close to 90% of lead consumption in the US is in batteries, which do not encapsulate the pounds of lead contained in each typical automotive battery. This puts the lead in batteries at great risk of leaching into the environment. Estimates for the lead in a single PV panel with lead-based solder range from 1.6 to 24 grams of lead, with 13g (less than half of an ounce) per panel seen most often in the literature.[11] At 13 g/panel[12], each panel contains one-half of the lead in a typical 12-gauge shotgun shell. This amount equates to roughly 1/750th of the lead in a single car battery. In a panel, it is all durably encapsulated from air or water for the full life of the panel.[14]

As indicated by their 20 to 30-year power warranty, PV modules are designed for a long service life, generally over 25 years. For a panel to comply with its 25-year power warranty, its internal components, including lead, must be sealed from any moisture. Otherwise, they would corrode and the panel's output would fall below power warranty levels. Thus, the lead in operating PV modules is not at risk of release to the environment during their service lifetime. In extreme experiments, researchers have shown that lead can leach from crushed or pulverized panels.[15, 16] However, more real-world tests designed to represent typical trash compaction that are used to classify waste as hazardous or non-hazardous show no danger from leaching.[17, 18] For more information about PV panel end-of-life, see the Panel Disposal section.

As illustrated throughout this section, silicon-based PV panels do not pose a material threat to public health and safety. The only aspect of the panels with potential toxicity concerns is the very small amount of lead in some panels. However, any lead in a panel is well sealed from environmental exposure for the operating lifetime of the solar panel and thus not at risk of release into the environment.

b. Cadmium Telluride (CdTe) PV Panels

This subsection examines the components of a cadmium telluride (CdTe) PV panel. Research demonstrates that they pose negligible toxicity risk to public health and safety while significantly reducing the public's exposure to cadmium by reducing coal emissions. As of mid-2016, a few hundred MWs of

cadmium telluride (CdTe) panels, all manufactured by the U.S. company First Solar, have been installed in North Carolina.

Questions about the potential health and environmental impacts from the use of this PV technology are related to the concern that these panels contain cadmium, a toxic heavy metal. However, scientific studies have shown that cadmium telluride differs from cadmium due to its high chemical and thermal stability.[19] Research has shown that the tiny amount of cadmium in these panels does not pose a health or safety risk.[20] Further, there are very compelling reasons to welcome its adoption due to reductions in unhealthy pollution associated with burning coal. Every GWh of electricity generated by burning coal produces about 4 grams of cadmium air emissions.[21] Even though North Carolina produces a significant fraction of our electricity from coal, electricity from solar offsets much more natural gas than coal due to natural gas plants being able to adjust their rate of production more easily and quickly. If solar electricity offsets 90% natural gas and 10% coal, each 5-megawatt (5 MW_{AC}, which is generally 7 MW_{DC}) CdTe solar facility in North Carolina keeps about 157 grams, or about a third of a pound, of cadmium *out of* our environment.[22, 23]

Cadmium is toxic, but all the approximately 7 grams of cadmium in one CdTe panel is in the form of a chemical compound cadmium telluride,[24] which has $1/100^{th}$ the toxicity of free cadmium.[25] Cadmium telluride is a very stable compound that is non-volatile and non-soluble in water. Even in the case of a fire, research shows that less than 0.1% of the cadmium is released when a CdTe panel is exposed to fire. The fire melts the glass and encapsulates over 99.9% of the cadmium in the molten glass.[27]

It is important to understand the source of the cadmium used to manufacture CdTe PV panels. The cadmium is a byproduct of zinc and lead refining. The element is collected from emissions and waste streams during the production of these metals and combined with tellurium to create the CdTe used in PV panels. If the cadmium were not collected for use in the PV panels or other products, it would otherwise either be stockpiled for future use, cemented and buried, or disposed of.[28] Nearly all the cadmium in old or broken panels can be recycled which can eventually serve as the primary source of cadmium for new PV panels.[29]

Similar to silicon-based PV panels, CdTe panels are constructed of a tempered glass front, one instead of two clear plastic encapsulation layers, and a rear heat strengthened glass backing (together >98% by weight). The final product is built to withstand exposure to the elements without significant damage for over 25 years. While not representative of damage that may occur in the field or even at a landfill, laboratory evidence has illustrated that when panels are ground into a fine powder, very acidic water is able to leach portions of the cadmium and tellurium,[30] similar to the process used to recycle CdTe panels. Like many silicon-based panels, CdTe panels are reported (as far back ask 1998[31]) to pass the EPA's Toxic Characteristic Leaching Procedure (TCLP) test, which tests the potential for crushed panels in a landfill to leach hazardous substances into groundwater.[32] Passing this test means that they are classified as non-hazardous waste and can be deposited in landfills.[33, 34] For more information about PV panel end-of-life, see the Panel Disposal section.

There is also concern of environmental impact resulting from potential catastrophic events involving CdTe PV panels. An analysis of worst-case scenarios for environmental impact from CdTe PV panels, including earthquakes, fires, and floods, was conducted by the University of Tokyo in 2013. After reviewing the extensive international body of research on CdTe PV technology, their report concluded, "Even in the worst-case scenarios, it is unlikely that the Cd concentrations in air and sea water will exceed the environmental regulation values."[35] In a worst-case scenario of damaged panels abandoned on the ground, insignificant amounts of cadmium will leach from the panels. This is because this scenario is

much less conducive (larger module pieces, less acidity) to leaching than the conditions of the EPA's TCLP test used to simulate landfill conditions, which CdTe panels pass.[36]

First Solar, a U.S. company, and the only significant supplier of CdTe panels, has a robust panel take-back and recycling program that has been operating commercially since 2005.[37] The company states that it is "committed to providing a commercially attractive recycling solution for photovoltaic (PV) power plant and module owners to help them meet their module (end of life) EOL obligation simply, cost-effectively and responsibly." First Solar global recycling services to their customers to collect and recycle panels once they reach the end of productive life whether due to age or damage. These recycling service agreements are structured to be financially attractive to both First Solar and the solar panel owner. For First Solar, the contract provides the company with an affordable source of raw materials needed for new panels and presumably a diminished risk of undesired release of Cd. The contract also benefits the solar panel owner by allowing them to avoid tipping fees at a waste disposal site. The legal contract helps provide peace of mind by ensuring compliance by both parties when considering the continuing trend of rising disposal costs and increasing regulatory requirements.

c. CIS/CIGS and other PV technologies

Copper indium gallium selenide PV technology, often referred to as CIGS, is the second most common type of thin-film PV panel but a distant second behind CdTe. CIGS cells are composed of a thin layer of copper, indium, gallium, and selenium on a glass or plastic backing. None of these elements are very toxic, although selenium is a regulated metal under the Federal Resource Conservation and Recovery Act (RCRA).[38] The cells often also have an extremely thin layer of cadmium sulfide that contains a tiny amount of cadmium, which is toxic. The promise of high efficiency CIGS panels drove heavy investment in this technology in the past. However, researchers have struggled to transfer high efficiency success in the lab to low-cost full-scale panels in the field.[39] Recently, a CIGS manufacturer based in Japan, Solar Frontier, has achieved some market success with a rigid, glass-faced CIGS module that competes with silicon panels. Solar Frontier produces the majority of CIS panels on the market today.[40] Notably, these panels are RoHS compliant,[41] thus meeting the rigorous toxicity standard adopted by the European Union even thought this directive exempts PV panels. The authors are unaware of any completed or proposed utility-scale system in North Carolina using CIS/CIGS panels.

1.2.3 Panel End-of-Life Management

Concerns about the volume, disposal, toxicity, and recycling of PV panels are addressed in this subsection. To put the volume of PV waste into perspective, consider that by 2050, when PV systems installed in 2020 will reach the end of their lives, it is estimated that the global annual PV panel waste tonnage will be 10% of the 2014 global e-waste tonnage.[42] In the U.S., end-of-life disposal of solar products is governed by the Federal Resource Conservation and Recovery Act (RCRA), as well as state policies in some situations. RCRA separates waste into hazardous (not accepted at ordinary landfill) and solid waste (generally accepted at ordinary landfill) based on a series of rules. According to RCRA, the way to determine if a PV panel is classified as hazardous waste is the Toxic Characteristic Leaching Procedure (TCLP) test. This EPA test is designed to simulate landfill disposal and determine the risk of hazardous substances leaching out of the landfill.[43, 44, 45] Multiple sources report that most modern PV panels (both crystalline silicon and cadmium telluride) pass the TCLP test.[46, 47] Some studies found that some older (1990s) crystalline silicon panels, and perhaps some newer crystalline silicon panels (specifics are not given about vintage of panels tested), do not pass the lead (Pb) leachate limits in the TCLP test.[48, 49]

The test begins with the crushing of a panel into centimeter-sized pieces. The pieces are then mixed in an acid bath. After tumbling for eighteen hours, the fluid is tested for forty hazardous substances that all must be below specific threshold levels to pass the test. Research comparing TCLP conditions to conditions of damaged panels in the field found that simulated landfill conditions provide overly conservative estimates of leaching for field-damaged panels.[50] Additionally, research in Japan has found no detectable Cd leaching from cracked CdTe panels when exposed to simulated acid rain.[51]

Although modern panels can generally be landfilled, they can also be recycled. Even though recent waste volume has not been adequate to support significant PV-specific recycling infrastructure, the existing recycling industry in North Carolina reports that it recycles much of the current small volume of broken PV panels. In an informal survey conducted by the NC Clean Energy Technology Center survey in early 2016, seven of the eight large active North Carolina utility-scale solar developers surveyed reported that they send damaged panels back to the manufacturer and/or to a local recycler. Only one developer reported sending damaged panels to the landfill.

The developers reported at that time that they are usually paid a small amount per panel by local recycling firms. In early 2017, a PV developer reported that a local recycler was charging a small fee per panel to recycle damaged PV panels. The local recycling firm known to authors to accept PV panels described their current PV panel recycling practice as of early 2016 as removing the aluminum frame for local recycling and removing the wire leads for local copper recycling. The remainder of the panel is sent to a facility for processing the non-metallic portions of crushed vehicles, referred to as "fluff" in the recycling industry.[52] This processing within existing general recycling plants allows for significant material recovery of major components, including glass which is 80% of the module weight, but at lower yields than PV-specific recycling plants. Notably almost half of the material value in a PV panel is in the few grams of silver contained in almost every PV panel produced today. In the long-term, dedicated PV panel recycling plants can increase treatment capacities and maximize revenues resulting in better output quality and the ability to recover a greater fraction of the useful materials.[53] PV-specific panel recycling technologies have been researched and implemented to some extent for the past decade, and have been shown to be able to recover over 95% of PV material (semiconductor) and over 90% of the glass in a PV panel.[54]

A look at global PV recycling trends hints at the future possibilities of the practice in our country. Europe installed MW-scale volumes of PV years before the U.S. In 2007, a public-private partnership between the European Union and the solar industry set up a voluntary collection and recycling system called PV CYCLE. This arrangement was later made mandatory under the EU's WEEE directive, a program for waste electrical and electronic equipment.[55] Its member companies (PV panel producers) fully finance the association. This makes it possible for end-users to return the member companies' defective panels for recycling at any of the over 300 collection points around Europe without added costs. Additionally, PV CYCLE will pick up batches of 40 or more used panels at no cost to the user. This arrangement has been very successful, collecting and recycling over 13,000 tons by the end of 2015.[56]

In 2012, the WEEE Directive added the end-of-life collection and recycling of PV panels to its scope.[57] This directive is based on the principle of extended-producer-responsibility. It has a global impact because producers that want to sell into the EU market are legally responsible for end-of-life management. Starting in 2018, this directive targets that 85% of PV products "put in the market" in Europe are recovered and 80% is prepared for reuse and recycling.

The success of the PV panel collection and recycling practices in Europe provides promise for the future of recycling in the U.S. In mid-2016, the US Solar Energy Industry Association (SEIA) announced that they are starting a national solar panel recycling program with the guidance and support of many

leading PV panel producers.[58] The program will aggregate the services offered by recycling vendors and PV manufacturers, which will make it easier for consumers to select a cost-effective and environmentally responsible end-of-life management solution for their PV products. According to SEIA, they are planning the program in an effort to make the entire industry landfill-free. In addition to the national recycling network program, the program will provide a portal for system owners and consumers with information on how to responsibly recycle their PV systems.

While a cautious approach toward the potential for negative environmental and/or health impacts from retired PV panels is fully warranted, this section has shown that the positive health impacts of reduced emissions from fossil fuel combustion from PV systems more than outweighs any potential risk. Testing shows that silicon and CdTe panels are both safe to dispose of in landfills, and are also safe in worst case conditions of abandonment or damage in a disaster. Additionally, analysis by local engineers has found that the current salvage value of the equipment in a utility scale PV facility generally exceeds general contractor estimates for the cost to remove the entire PV system.[59, 60, 61]

1.2.4 Non-Panel System Components (racking, wiring, inverter, transformer)

While previous toxicity subsections discussed PV panels, this subsection describes the non-panel components of utility-scale PV systems and investigates any potential public health and safety concerns. The most significant non-panel component of a ground-mounted PV system is the mounting structure of the rows of panels, commonly referred to as "racking". The vertical post portion of the racking is galvanized steel and the remaining above-ground racking components are either galvanized steel or aluminum, which are both extremely common and benign building materials. The inverters that make the solar generated electricity ready to send to the grid have weather-proof steel enclosures that protect the working components from the elements. The only fluids that they might contain are associated with their cooling systems, which are not unlike the cooling system in a computer. Many inverters today are RoHS compliant.

The electrical transformers (to boost the inverter output voltage to the voltage of the utility connection point) do contain a liquid cooling oil. However, the fluid used for that function is either a non-toxic mineral oil or a biodegradable non-toxic vegetable oil, such as BIOTEMP from ABB. These vegetable transformer oils have the additional advantage of being much less flammable than traditional mineral oils. Significant health hazards are associated with old transformers containing cooling oil with toxic PCBs. Transfers with PCB-containing oil were common before PCBs were outlawed in the U.S. in 1979. PCBs still exist in older transformers in the field across the country.

Other than a few utility research sites, there are no batteries on- or off-site associated with utility-scale solar energy facilities in North Carolina, avoiding any potential health or safety concerns related to battery technologies. However, as battery technologies continue to improve and prices continue to decline we are likely to start seeing some batteries at solar facilities. Lithium ion batteries currently dominate the world utility-scale battery market, which are not very toxic. No non-panel system components were found to pose any health or environmental dangers.

1.4 Operations and Maintenance – Panel Washing and Vegetation Control

Throughout the eastern U.S., the climate provides frequent and heavy enough rain to keep panels adequately clean. This dependable weather pattern eliminates the need to wash the panels on a regular basis. Some system owners may choose to wash panels as often as once a year to increase production, but most in N.C. do not regularly wash any PV panels. Dirt build up over time may justify panel washing a few times over the panels' lifetime; however, nothing more than soap and water are required for this activity.

The maintenance of ground-mounted PV facilities requires that vegetation be kept low, both for aesthetics and to avoid shading of the PV panels. Several approaches are used to maintain vegetation at NC solar facilities, including planting of limited-height species, mowing, weed-eating, herbicides, and grazing livestock (sheep). The following descriptions of vegetation maintenance practices are based on interviews with several solar developers as well as with three maintenance firms that together are contracted to maintain well over 100 of the solar facilities in N.C. The majority of solar facilities in North Carolina maintain vegetation primarily by mowing. Each row of panels has a single row of supports, allowing sickle mowers to mow under the panels. The sites usually require mowing about once a month during the growing season. Some sites employ sheep to graze the site, which greatly reduces the human effort required to maintain the vegetation and produces high quality lamb meat.[62]

In addition to mowing and weed eating, solar facilities often use some herbicides. Solar facilities generally do not spray herbicides over the entire acreage; rather they apply them only in strategic locations such as at the base of the perimeter fence, around exterior vegetative buffer, on interior dirt roads, and near the panel support posts. Also unlike many row crop operations, solar facilities generally use only general use herbicides, which are available over the counter, as opposed to restricted use herbicides commonly used in commercial agriculture that require a special restricted use license. The herbicides used at solar facilities are primarily 2-4-D and glyphosate (Round-up®), which are two of the most common herbicides used in lawns, parks, and agriculture across the country. One maintenance firm that was interviewed sprays the grass with a class of herbicide known as a growth regulator in order to slow the growth of grass so that mowing is only required twice a year. Growth regulators are commonly used on highway roadsides and golf courses for the same purpose. A commercial pesticide applicator license is required for anyone other than the landowner to apply herbicides, which helps ensure that all applicators are adequately educated about proper herbicide use and application. The license must be renewed annually and requires passing of a certification exam appropriate to the area in which the applicator wishes to work. Based on the limited data available, it appears that solar facilities in N.C. generally use significantly less herbicides per acre than most commercial agriculture or lawn maintenance services.

2. Electromagnetic Fields (EMF)

PV systems do not emit any material during their operation; however, they do generate electromagnetic fields (EMF), sometimes referred to as radiation. EMF produced by electricity is non-ionizing radiation, meaning the radiation has enough energy to move atoms in a molecule around (experienced as heat), but not enough energy to remove electrons from an atom or molecule (ionize) or to damage DNA. As shown below, modern humans are all exposed to EMF throughout our daily lives without negative health impact. Someone outside of the fenced perimeter of a solar facility is not exposed to significant EMF from the solar facility. Therefore, there is no negative health impact from the EMF

produced in a solar farm. The following paragraphs provide some additional background and detail to support this conclusion.

Since the 1970s, some have expressed concern over potential health consequences of EMF from electricity, but no studies have ever shown this EMF to cause health problems.[63] These concerns are based on some epidemiological studies that found a slight increase in childhood leukemia associated with average exposure to residential power-frequency magnetic fields above 0.3 to 0.4 μT (microteslas) (equal to 3.0 to 4.0 mG (milligauss)). μT and mG are both units used to measure magnetic field strength. For comparison, the average exposure for people in the U.S. is one mG or 0.1 μT, with about 1% of the population with an average exposure in excess of 0.4 μT (or 4 mG).[64] These epidemiological studies, which found an association but not a causal relationship, led the World Health Organization's International Agency for Research on Cancer (IARC) to classify ELF magnetic fields as "possibly carcinogenic to humans". Coffee also has this classification. This classification means there is limited evidence but not enough evidence to designate as either a "probable carcinogen" or "human carcinogen". Overall, there is very little concern that ELF EMF damages public health. The only concern that does exist is for long-term exposure above 0.4 μT (4 mG) that may have some connection to increased cases of childhood leukemia. In 1997, the National Academies of Science were directed by Congress to examine this concern and concluded:

> "Based on a comprehensive evaluation of published studies relating to the effects of power-frequency electric and magnetic fields on cells, tissues, and organisms (including humans), the conclusion of the committee is that the current body of evidence does not show that exposure to these fields presents a human-health hazard. Specifically, no conclusive and consistent evidence shows that exposures to residential electric and magnetic fields produce cancer, adverse neurobehavioral effects, or reproductive and developmental effects."[65]

There are two aspects to electromagnetic fields, an electric field and a magnetic field. The electric field is generated by voltage and the magnetic field is generated by electric current, i.e., moving electrons. A task group of scientific experts convened by the World Health Organization (WHO) in 2005 concluded that there were no substantive health issues related to *electric* fields (0 to 100,000 Hz) at levels generally encountered by members of the public.[66] The relatively low voltages in a solar facility and the fact that electric fields are easily shielded (i.e., blocked) by common materials, such as plastic, metal, or soil means that there is no concern of negative health impacts from the electric fields generated by a solar facility. Thus, the remainder of this section addresses magnetic fields. Magnetic fields are not shielded by most common materials and thus can easily pass through them. Both types of fields are strongest close to the source of electric generation and weaken quickly with distance from the source.

The direct current (DC) electricity produced by PV panels produce stationary (0 Hz) electric and magnetic fields. Because of minimal concern about potential risks of stationary fields, little scientific research has examined stationary fields' impact on human health.[67] In even the largest PV facilities, the DC voltages and currents are not very high. One can illustrate the weakness of the EMF generated by a PV panel by placing a compass on an operating solar panel and observing that the needle still points north.

While the electricity throughout the majority of a solar site is DC electricity, the inverters convert this DC electricity to alternating current (AC) electricity matching the 60 Hz frequency of the grid. Therefore, the inverters and the wires delivering this power to the grid are producing non-stationary EMF, known as extremely low frequency (ELF) EMF, normally oscillating with a frequency of 60 Hz. This frequency is at the low-energy end of the electromagnetic spectrum. Therefore, it has less energy than

other commonly encountered types of non-ionizing radiation like radio waves, infrared radiation, and visible light.

The wide use of electricity results in background levels of ELF EMFs in nearly all locations where people spend time – homes, workplaces, schools, cars, the supermarket, etc. A person's average exposure depends upon the sources they encounter, how close they are to them, and the amount of time they spend there.[68] As stated above, the average exposure to magnetic fields in the U.S. is estimated to be around one mG or 0.1 μT, but can vary considerably depending on a person's exposure to EMF from electrical devices and wiring.[69] At times we are often exposed to much higher ELF magnetic fields, for example when standing three feet from a refrigerator the ELF magnetic field is 6 mG and when standing three feet from a microwave oven the field is about 50 mG.[70] The strength of these fields diminish quickly with distance from the source, but when surrounded by electricity in our homes and other buildings moving away from one source moves you closer to another. However, unless you are inside of the fence at a utility-scale solar facility or electrical substation it is impossible to get very close to the EMF sources. Because of this, EMF levels at the fence of electrical substations containing high voltages and currents are considered "generally negligible".[71, 72]

The strength of ELF-EMF present at the perimeter of a solar facility or near a PV system in a commercial or residential building is significantly lower than the typical American's average EMF exposure.[73, 74] Researchers in Massachusetts measured magnetic fields at PV projects and found the magnetic fields dropped to very low levels of 0.5 mG or less, and in many cases to less than background levels (0.2 mG), at distances of no more than nine feet from the residential inverters and 150 feet from the utility-scale inverters.[75] Even when measured within a few feet of the utility-scale inverter, the ELF magnetic fields were well below the International Commission on Non-Ionizing Radiation Protection's recommended magnetic field level exposure limit for the general public of 2,000 mG.[76] It is typical that utility scale designs locate large inverters central to the PV panels that feed them because this minimizes the length of wire required and shields neighbors from the sound of the inverter's cooling fans. Thus, it is rare for a large PV inverter to be within 150 feet of the project's security fence.

Anyone relying on a medical device such as pacemaker or other implanted device to maintain proper heart rhythm may have concern about the potential for a solar project to interfere with the operation of his or her device. However, there is no reason for concern because the EMF outside of the solar facility's fence is less than 1/1000 of the level at which manufacturers test for ELF EMF interference, which is 1,000 mG.[77] Manufacturers of potentially affected implanted devices often provide advice on electromagnetic interference that includes avoiding letting the implanted device get too close to certain sources of fields such as some household appliances, some walkie-talkies, and similar transmitting devices. Some manufacturers' literature does not mention high-voltage power lines, some say that exposure in public areas should not give interference, and some advise not spending extended periods of time close to power lines.[78]

3. Electric Shock and Arc Flash Hazards

There is a real danger of electric shock to anyone entering any of the electrical cabinets such as combiner boxes, disconnect switches, inverters, or transformers; or otherwise coming in contact with voltages over 50 Volts.[79] Another electrical hazard is an arc flash, which is an explosion of energy that can occur in a short circuit situation. This explosive release of energy causes a flash of heat and a shockwave, both of which can cause serious injury or death. Properly trained and equipped technicians and electricians know how to safely install, test, and repair PV systems, but there is always some risk of

injury when hazardous voltages and/or currents are present. Untrained individuals should not attempt to inspect, test, or repair any aspect of a PV system due to the potential for injury or death due to electric shock and arc flash, The National Electric Code (NEC) requires appropriate levels of warning signs on all electrical components based on the level of danger determined by the voltages and current potentials. The national electric code also requires the site to be secured from unauthorized visitors with either a six-foot chain link fence with three strands of barbed wire or an eight-foot fence, both with adequate hazard warning signs.

4. Fire Safety

The possibility of fires resulting from or intensified by PV systems may trigger concern among the general public as well as among firefighters. However, concern over solar fire hazards should be limited because only a small portion of materials in the panels are flammable, and those components cannot self-support a significant fire. Flammable components of PV panels include the thin layers of polymer encapsulates surrounding the PV cells, polymer backsheets (framed panels only), plastic junction boxes on rear of panel, and insulation on wiring. The rest of the panel is composed of non-flammable components, notably including one or two layers of protective glass that make up over three quarters of the panel's weight.

Heat from a small flame is not adequate to ignite a PV panel, but heat from a more intense fire or energy from an electrical fault can ignite a PV panel.[80] One real-world example of this occurred during July 2015 in an arid area of California. Three acres of grass under a thin film PV facility burned without igniting the panels mounted on fixed-tilt racks just above the grass.[81] While it is possible for electrical faults in PV systems on homes or commercial buildings to start a fire, this is extremely rare.[82] Improving understanding of the PV-specific risks, safer system designs, and updated fire-related codes and standards will continue to reduce the risk of fire caused by PV systems.

PV systems on buildings can affect firefighters in two primary ways, 1) impact their methods of fighting the fire, and 2) pose safety hazard to the firefighters. One of the most important techniques that firefighters use to suppress fire is ventilation of a building's roof. This technique allows superheated toxic gases to quickly exit the building. By doing so, the firefighters gain easier and safer access to the building, Ventilation of the roof also makes the challenge of putting out the fire easier. However, the placement of rooftop PV panels may interfere with ventilating the roof by limiting access to desired venting locations.

New solar-specific building code requirements are working to minimize these concerns. Also, the latest National Electric Code has added requirements that make it easier for first responders to safely and effectively turn off a PV system. Concern for firefighting a building with PV can be reduced with proper fire fighter training, system design, and installation. Numerous organizations have studied fire fighter safety related to PV. Many organizations have published valuable guides and training programs. Some notable examples are listed below.

- The International Association of Fire Fighters (IAFF) and International Renewable Energy Council (IREC) partnered to create an online training course that is far beyond the PowerPoint click-and-view model. The self-paced online course, "Solar PV Safety for Fire Fighters," features rich video content and simulated environments so fire fighters can practice the knowledge they've learned. www.iaff.org/pvsafetytraining
- Photovoltaic Systems and the Fire Code: Office of NC Fire Marshal
- Fire Service Training, Underwriter's Laboratory

- Firefighter Safety and Response for Solar Power Systems, National Fire Protection Research Foundation
- Bridging the Gap: Fire Safety & Green Buildings, National Association of State Fire Marshalls
- Guidelines for Fire Safety Elements of Solar Photovoltaic Systems, Orange County Fire Chiefs Association
- Solar Photovoltaic Installation Guidelines, California Department of Forestry & Fire Protection, Office of the State Fire Marshall
- PV Safety & Firefighting, Matthew Paiss, Homepower Magazine
- PV Safety and Code Development: Matthew Paiss, Cooperative Research Network

Summary

The purpose of this paper is to address and alleviate concerns of public health and safety for utility-scale solar PV projects. Concerns of public health and safety were divided and discussed in the four following sections: (1) Toxicity, (2) Electromagnetic Fields, (3) Electric Shock and Arc Flash, and (4) Fire. In each of these sections, the negative health and safety impacts of utility-scale PV development were shown to be negligible, while the public health and safety benefits of installing these facilities are significant and far outweigh any negative impacts.

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