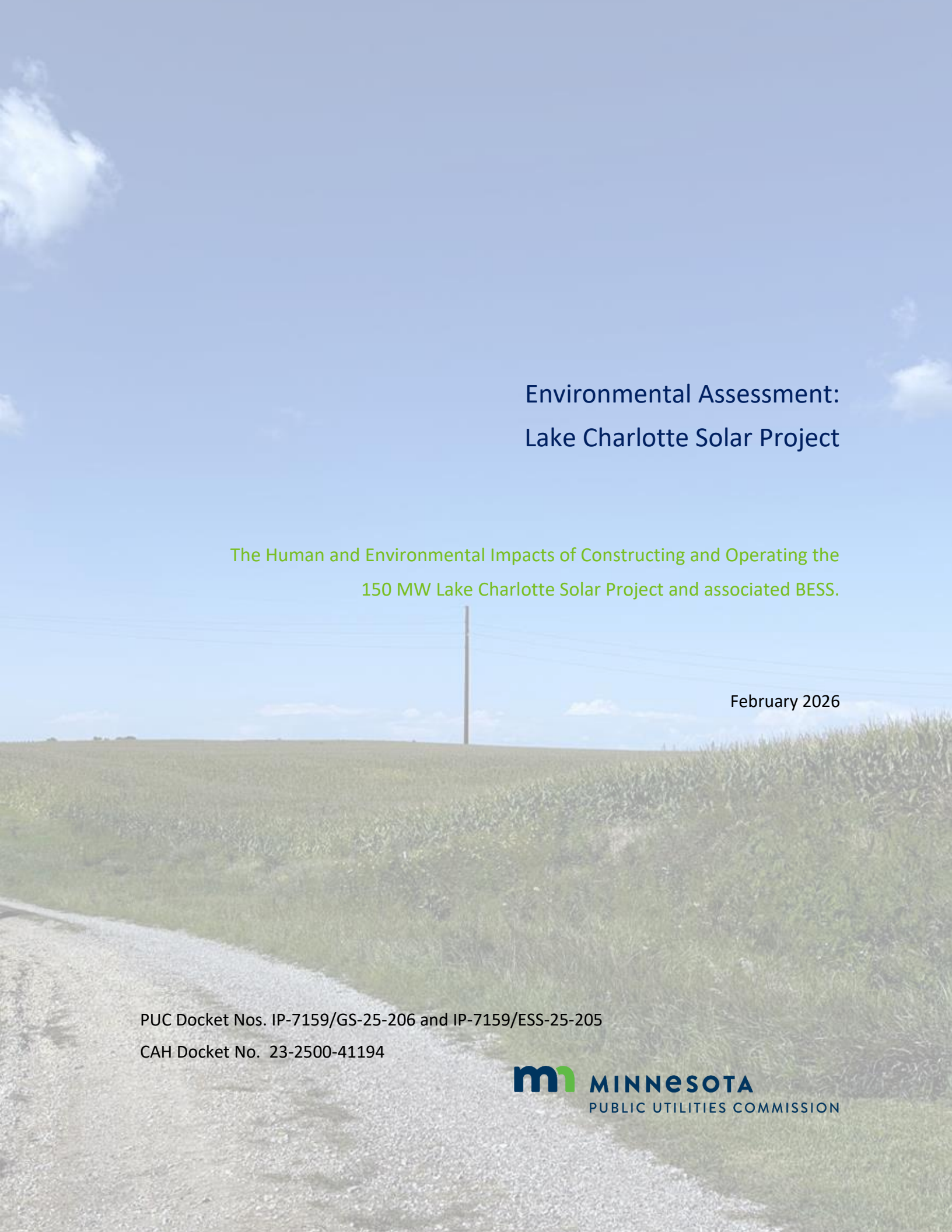




Environmental Assessment: Lake Charlotte Solar Project

The Human and Environmental Impacts of Constructing and Operating the
150 MW Lake Charlotte Solar Project and associated BESS.

February 2026

PUC Docket Nos. IP-7159/GS-25-206 and IP-7159/ESS-25-205

CAH Docket No. 23-2500-41194

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Lake Charlotte Solar proposes to construct the Lake Charlotte Solar Facility (Solar Facility) and Battery Energy Storage System (BESS), in Rutland Township, Martin County, Minnesota. The Solar Facility is proposed as a solar energy conversion facility with a 150-megawatt (MW) alternating current (AC) nameplate capacity. The associated BESS will consist of a stand-alone structure with a 150 MW / 600-megawatt hour (MWh) nameplate capacity and ancillary support infrastructure. Lake Charlotte Solar must obtain two site permits from the Minnesota Public Utilities Commission before it can construct the proposed Lake Charlotte Solar Project.

Sources

Much of the information used to prepare this environmental assessment comes from Lake Charlotte Solar's joint site permit application. Additional sources include information from relevant federal and state environmental review documents for similar projects, spatial data and site visits.

Project Mailing List

To place your name on the project mailing list contact docketing.puc@state.mn.us or (651) 201-2246 and provide the docket number (24-245 and 24-426), your name, email address, and mailing address. Please indicate whether you would like to receive notices by email or U.S. mail.

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Acronyms and Abbreviations

Acronym/Abbreviation	Description
AC	alternating current
AIMP	Agricultural Impact Mitigation Plan
ALJ	administrative law judge
applicant	Lake Charlotte Solar
BESS	Battery Energy Storage System
BMP	best management practice
BWSR	Board of Water and Soil Resources
Commerce	Department of Commerce
Commission	Public Utilities Commission
CSW Permit	Construction Stormwater Permit
dBA	A-weighted sound level recorded in units of decibels
DC	direct current
DNR	Minnesota Department of Natural Resources
DSP	draft site permit
EA	environmental assessment
EJ	Environmental justice
EMF	electromagnetic fields
EPA	United States Environmental Protection Agency
FAA	Federal Aviation Administration
FEMA	Federal Emergency Management Agency
GHG	Greenhouse gas
kV	kilovolt
kWh	kilowatt hour
MBS	Minnesota Biological Survey
MDA	Minnesota Department of Agriculture
MDH	Minnesota Department of Health
MW	megawatt
MWh	megawatt hour
mG	milligauss
MnDOT	Minnesota Department of Transportation
MPCA	Minnesota Pollution Control Agency
MWI	Minnesota Well Index
NAC	noise area classification
NHIS	Natural Heritage Information System
NLEB	Northern Long Eared Bat
NWI	National Wetland Inventory
project	Lake Charlotte Solar Project
PV	photovoltaic
PWI	Public Waters Inventory
ROI	region of influence
ROW	right-of-way

Summary

SCADA	supervisory control and data acquisition
SHPO	State Historic Preservation Office
SNA	Scientific and Natural Area
SWPPP	Stormwater Pollution Prevention Plan
THPO	Tribal Historic Preservation Officer
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
VMP	Vegetation Management Plan
WCA	Wetland Conservation Act
WHPA	Wellhead Protection Area
WMA	Wildlife Management Area

DEFINITIONS

Several terms used in this document have specific meaning in Minnesota law or regulation. Other terms are defined for clarity.

associated facilities means buildings, equipment, and other physical structures that are necessary to the operation of a large electric power generating plant or high voltage transmission line (Minnesota Rule 7850.1000, subpart 3).

construction means any clearing of land, excavation, or other action that would adversely affect the natural environment of the site or route but does not include changes needed for temporary use of sites or routes for nonutility purposes, or uses in securing survey or geological data, including necessary borings to ascertain foundation conditions (Minnesota Statute 216E.01, subdivision 3).

distribution line means power lines that operate below 69 kilovolts.

easement means a grant of one or more of the property rights by the property owner to and /or for the use by the public, a corporation, or another person or entity

energy storage system means equipment and associated facilities designed with a nameplate capacity of 10 MW or more that is capable of storing generated electricity for a period of time and delivering the electricity for use after storage (Minnesota Statute 216E.01, subd. 3).

gen-tie line means the associated 365-foot 161 kilovolt (kV) transmission line proposed as a component of the Lake Charlotte Solar project.

high voltage transmission line means a conductor of electric energy and associated facilities designed for and capable of operation at a nominal voltage of 100 kilovolts or more and is greater than 1,500 feet in length (Minnesota Statute 216E.01, subdivision 4).

land control area means the Approximately 1,277-acre area of privately-owned land for which Lake Charlotte Solar, LLC has leases and purchase options to allow siting and construction of the project.

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The term is used to bound a review area and should not be understood to imply the applicant has secured, or will definitely secure, the necessary land rights.

large electric power generating plant means electric power generating equipment and associated facilities designed for or capable of operation at a capacity of 50,000 kilowatts or more (Minnesota Statute 216E.01, subdivision 5).

local vicinity means 1,600 feet from the project site area and collection line corridor.

mitigation means to avoid, minimize, correct, or compensate for a potential impact.

power line means a distribution, transmission, or high voltage transmission line.

preliminary development area means the 1,004-acre area within the Land Control Area where Lake Charlotte Solar proposes to build the project facilities.

project area means one mile from the land control area and collection line corridor.

solar facility means ground-mounted photovoltaic equipment capable of operation at 50,000 kilowatts or more connected directly to the electrical grid and the associated facilities such as access roads and collector lines.

solar energy generation system means a set of devices whose primary purpose is to produce electricity by means of any combination of collecting, transferring, or converting solar-generated energy (Minnesota Statute 216E.01, subdivision 9a).

transmission line means power lines that operate at 69 kilovolts and above.

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Summary

What is this document?

This document is an environmental assessment. The Minnesota Public Utilities Commission will use the information in this document to inform their permit decisions for the project. You can use it to help make comments about the project.

This environmental assessment (EA) contains an overview of the resources potentially affected by the construction and operation of the project. It also discusses potential human and environmental impacts and mitigation measures. Environmental Review and Analysis (EERA) staff within the Department of Commerce (Commerce) began working on this project as part of the environmental review process. On July 1, 2025, EERA staff moved from Commerce to the Public Utilities Commission (Commission) and are now part of the Energy Infrastructure Permitting (EIP) unit at the Commission. Accordingly, this document has been prepared and issued as a Commission document.

Where do I get more information?

For additional information don't hesitate to contact Commission staff.

If you would like more information or if you have questions, please contact Commission staff: Jessica Livingston (jessica.livingston@state.mn.us), 651-539-1068 or Cezar Panait (cezarcpanait@state.mn.us) (651) 201-2207.

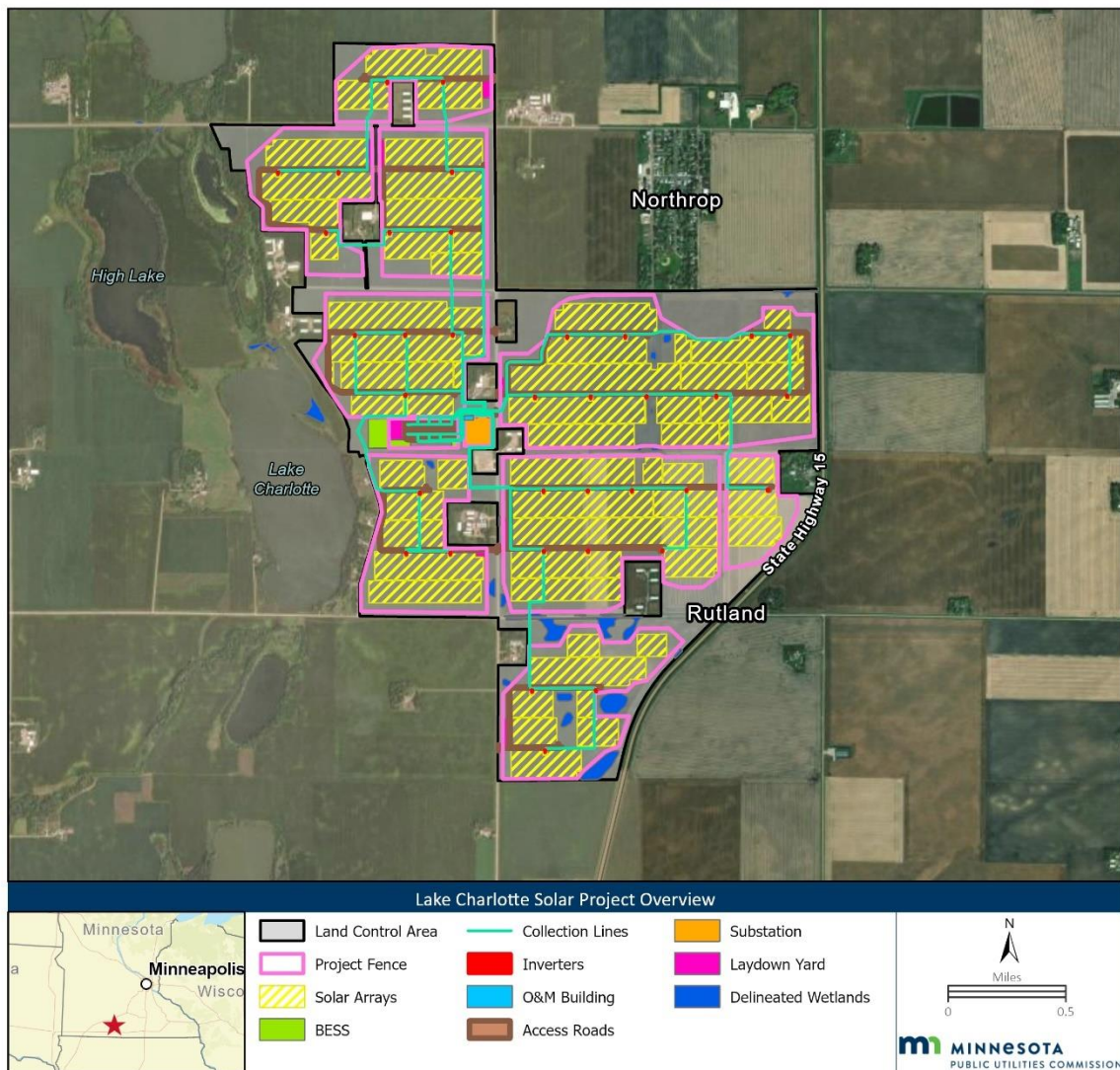
Information about the project, including the permit applications, notices, and public comments, can be found on eDockets: <https://www.edockets.state.mn.us/documents> by searching "25-205", "25-206" under "Docket #'s". Information is also available on the Commission's webpage for the project: <https://puc.eip.mn.gov/web/project/16339>.

What is the applicant proposing to construct and why?

The project includes a solar energy generating facility and battery storage facility.

Lake Charlotte Solar, LLC, proposes to build the Lake Charlotte Solar Project in Rutland Township, Martin County, Minnesota. The project includes a solar generating facility and energy storage facility to help provide power when demand is high, and generation is low. The solar generating facility will help address electrical reliability concerns for current and future electricity consumers and assist in Minnesota's goal to provide 100% carbon-free energy by 2040. The high voltage transmission is proposed as part of the project to connect the facility to an existing substation, adjacent to the BESS and proposed project. **Figure 1** shows an overview map of the current project design. For a detailed map of the project, please reference **Appendix B**.

Figure 1: Proposed Lake Charlotte Solar Project



What permits are needed?

Two site permits from the Commission are required. Federal, state, and local permits may also be necessary to construct the project.

The project requires two site permits from the Commission – a site permit for the solar generation facility and a site permit for the energy storage facility.

Various federal, state, and local approvals will be required for activities related to the construction and operation of the project. These permits are referred to as “downstream permits” and must be obtained by the applicant prior to constructing the project.

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What are the potential impacts of the project?

The project will impact human and environmental resources. Impacts will occur during construction and operation.

A potential impact is the anticipated change to an existing condition caused directly or indirectly by the project. Potential impacts can be positive or negative, short- or long-term, and can accumulate incrementally. Impacts vary in duration and size, by resource, and across locations. The impacts of constructing and operating a project can be mitigated by avoiding, minimizing, or compensating for the adverse effects and environmental impacts of a project.

The context of an impact—in combination with its anticipated on-the-ground effect and mitigation measures—is used to determine an impact intensity level. Discussion of impacts in this EA are grouped by topic: human settlement, human health and safety, land-based economies, archaeological and historic resources, and natural resources.

Select resource topics received abbreviated study because they were deemed to be of minor importance to the Commission's permit decisions. Potential impacts are anticipated to be negligible for displacement, forestry, and mining.

Human Settlement

Large energy projects can impact human settlement. Impacts range from short-term, such as increased local expenditures during construction, to long-term, such as changes to viewsheds.

Aesthetics The impact intensity level is expected to be moderate and long-term. Locations where visual impacts may potentially be the greatest are adjacent to residences and along public roadways. The solar arrays and BESS will be visible from nearby residences and adjacent roadways.

Cultural Values The impact intensity level is anticipated to be minimal. The project is not anticipated to impact or alter the work and leisure pursuits of residents in such a way as to impact the underlying culture of the area. Differences between cultural values related to renewable energy and rural character has the potential to create tradeoffs that cannot be addressed in the site permits.

Electronic Interference No impacts to electronic devices are anticipated and if unanticipated impacts do occur, the applicant would be required to restore services.

Land Use and Zoning The impact intensity level is anticipated to be moderate due to the conversion of agricultural land to land used for energy generation. Land use impacts are anticipated to be long-term and localized. Constructing the project will change land use from agricultural to solar energy production for a minimum of 30 years. After the project's useful life, the land control area could be restored to agricultural or other planned land uses by implementing appropriate restoration measures. Impacts can be minimized by using best practices to protect land and water quality.

Noise Distinct noises are associated with the different phases of project construction. The impact intensity level during construction will range from negligible to significant depending on the activity and location. Potential impacts are anticipated to be intermittent and short-term. These localized

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impacts may affect nearby residences and might exceed state noise standards. Impacts are unavoidable but can be minimized. Operational impacts are anticipated to be negligible.

Recreation The impact intensity level on recreation resources is anticipated to be minimal. Most impacts will be short-term and related to construction. Coordination with local recreational groups can help reduce potential disruptions from project construction.

Socioeconomics The impact intensity level is anticipated to be minimal to significant and positive. Effects associated with construction will, overall, be short-term and minimal. Significant positive effects may occur for individuals. Impacts from operation will be long-term and significant. Adverse impacts are not anticipated.

Environmental Justice The project will not have disproportionately high and adverse human health or environmental effects on low-income, minority, or tribal populations.

Property Values Impacts in the local vicinity are anticipated to be minimal to moderate and decrease with distance and over time. Impacts on the value of specific properties within the local vicinity are difficult to determine but could occur.

Public Services Potential impacts to the electrical grid, roads and railroads, and other utilities are anticipated to be short-term, intermittent, and localized during construction. Impacts to water (wells and septic systems) are not expected to occur. Overall, construction-related impacts are expected to be minimal, and are associated with possible traffic delays. During operation, negligible traffic increases would occur for maintenance. Impacts are unavoidable but can be minimized.

Human Health and Safety

Large energy projects have potential to impact human health and safety. Most concerns are related to the construction phase.

Public Safety and Emergency Services Like any construction project, there are risks. These include potential injury from falls, equipment and vehicle use, electrical accidents, etc. Public risks involve electrocution. Electrocution risks could also result from unauthorized entry into the fenced area. The project has potential to aid in the severity of snow trapping on nearby highways. There is also the potential that during construction, one may encounter land that has previously been impacted by hazardous substances. If this occurs, hazardous materials must be documented, monitored, and disposed of in coordination with MPCA. Potential impacts are anticipated to be minimal. Impacts would be short- and long-term and can be minimized through agency coordination.

Electronic and Magnetic Fields (EMF) Impacts to human health from possible exposure to EMFs are not anticipated. Potential impacts will be long-term and localized. These unavoidable impacts will be of a small size. Impacts can be mitigated.

Stray Voltage Constructing the project to NESC standards and Commission route permit requirements would mitigate stray voltage and induced voltage concerns. Therefore, potential impacts from stray voltage and induced voltage are anticipated to be minimal.

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Land-based Economies

Large energy projects can impact land-based economies by limiting land use for other purposes.

Agriculture Potential impacts to agricultural producers are anticipated to be minimal—lost farming revenues will be offset by lease agreements. A negligible loss of farmland in Martin County would occur for the life of the project. With respect to prime farmland, the applicant indicates that no feasible or prudent alternatives to the project exist. Potential impacts are localized and unavoidable but can be minimized.

Tourism The impact intensity is expected to be minimal, and short-term in duration. There may be potential for impacts to local recreational activities during construction, however impacts will be temporary and can be minimized through coordination.

Archeological and Historic Resources

The impact intensity level is anticipated to be negligible to minimal. Impacts would be localized. Impacts can be mitigated through siting and construction monitoring.

Natural Resources

Large energy projects can impact the natural environment. Impacts are dependent upon many factors, such as how the project is designed, constructed, maintained, and decommissioned. Other factors, such as the environmental setting, influence potential impacts. Impacts vary significantly within and across projects.

Air Quality Potential impacts to air quality during construction would be intermittent, localized, short-term, and minimal. Impacts are primarily associated with fugitive dust and exhaust. Impacts can be mitigated. Once operational, the solar array will not generate criteria pollutants or carbon dioxide. Negligible fugitive dust and exhaust emissions would occur as part of routine maintenance activities. Impacts are unavoidable and do not affect a unique resource. Impacts can be minimized.

Climate Change Construction emissions will have a short-term negligible increase in greenhouse gases that contribute to climate change. Overall, the project will generate energy that can be used to displace energy otherwise generated by carbon-fueled sources. The total GHG emissions produced by construction and operation of the project will be minimal when compared to the reduction in GHG emissions long-term. The project's design incorporates design elements that minimize impacts from the increase in extreme weather events such as increased flooding, storms, and heat wave events that are expected to accompany a warming climate.

Geology and Groundwater Impacts on geology and domestic water supplies are not expected. Localized impacts to groundwater resources, should they occur, would be intermittent, but have the potential to take place over the long-term. Indirect impacts from surface waters might occur during construction. Impacts can be mitigated through use of Best Management Practices (BMPs) for stormwater management and coordinating with state agencies.

Soils Impacts to soils will occur during construction and decommissioning of the project. The impact intensity level is expected to be minimal. Potential impacts will be both positive and negative, and

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short- and long-term. Isolated moderate to significant negative impacts associated with high rainfall events could occur. Because the soil at the solar facility will be covered with native perennial vegetation for the life of the project, soil health is likely to improve long-term.

Surface Water The impact intensity level is anticipated to be minimal. Direct impacts to surface waters are not expected. Indirect impacts to surface waters may occur. These impacts will be short-term, of a small size, and localized. Impacts can be mitigated through consultation with local organizations and government agencies, and through implementing BMPs for sediment and erosion control.

Floodplains and Topography The impact intensity for floodplains is predicted to be short- and long-term, with both negative and beneficial impacts. Short-term and negatively minimal during construction, as the floodplain topography could be affected by construction. Beneficially long-term during operation, as reestablishing native vegetation helps with soil infiltration. The topography impacts are expected to be minimal, as the topography is not anticipated to be changed much.

Wetlands The impact intensity level is anticipated to be minimal. Although there is a potential for wetlands to be indirectly affected, direct impacts are not expected. These impacts will be short-term, of a small size, and localized. Impacts can be mitigated.

Vegetation The solar facility will convert row crop farmland to perennial vegetation for the life of the project. Potential impacts of constructing the solar facility can be mitigated through the development of a vegetative management plan (VMP) and a selection of a seed mix that will promote diverse establishment of native species.

Wildlife and Habitat Potential impacts may be positive or negative and are species dependent. Long-term, minimal positive impacts to small mammals, insects, snakes, etc. would occur. Impacts to large wildlife species, for example, deer, may occur due to project fencing. Impacts can be minimized through wildlife-friendly fencing design. Significant negative impacts could occur to individuals during construction and operation of the project. Once restored, the land control area will provide native habitat for the life of the project. The project does not contribute to significant habitat loss or degradation or create new habitat edge effects. The introduction of PV panels and fencing creates the potential for bird collisions. Potential impacts can be mitigated in part through project design and BMPs. The impact intensity level is expected to be minimal.

Rare and Unique Resources The impact intensity level is anticipated to be minimal. Impacts could be both short and long term and could be positive (e.g., through introduction of habitat), or negative (e.g., by removing vegetation during migratory season). Impacts can be mitigated.

1 Introduction

Lake Charlotte Solar, LLC (Lake Charlotte Solar, applicant) is proposing to construct and operate the Lake Charlotte Solar Project (project). The project includes an up to 150 megawatt (MW) photovoltaic (PV) solar energy generating facility and a Battery Energy Storage System (BESS) that can provide up to 150 MW of battery storage, along with associated infrastructure. The project is proposed in Rutland Township within Martin County, Minnesota. Lake Charlotte Solar must obtain a site permit for the solar facility and a site permit for the BESS from the Minnesota Public Utilities Commission (Commission) before it can construct and operate the project. The project will connect to the electric transmission grid through the existing 230 kV substation at the Southern Minnesota Municipal Power Agency (SMPA) Rutland Substation, located directly adjacent to the project.

The applicant filed a site permit application (application) for the project on June 3, 2025,¹ and the Commission found the application to be substantially complete on July 22, 2025.²

Commission Energy Infrastructure Permitting (EIP) staff prepared this Environmental Assessment (EA) for the project. An EA contains an overview of the resources affected by the project. It also discusses potential human and environmental impacts and possible mitigation measures.³ These mitigation measures can become enforceable conditions of the Commission's permits.

An EA is not a decision-making document, but rather an informational document. The EA is intended to facilitate informed decisions by state agencies, particularly with respect to the goals of the Minnesota Power Plant Siting Act to "minimize adverse human and environmental impacts while ensuring continuing electric power system reliability and integrity and ensuring that electric energy needs are met and fulfilled in an orderly and timely fashion".⁴

On July 1, 2025, Department of Commerce Energy Environmental Review and Analysis (DOC EERA) unit staff moved to the Minnesota Public Utilities Commission Energy Infrastructure Permitting (PUC EIP) unit as directed by state law (Laws of Minn. 2024, ch.126, art. 7) and in response to permitting reform under Minnesota Statute 216I (2024).

The review of this application began under and will continue under Minnesota Statute 216E (2023). DOC EERA staff initiated environmental review of this proposal prior to July 1, 2025, and will continue to exclusively perform environmental review duties for this application under 216E (2023) as EIP staff. Likewise, analyst staff at the PUC will continue to exclusively perform analyst duties on this application as PUC staff.

¹ Lake Charlotte Solar, LLC – Joint Application to the Minnesota Public Utilities Commission for a Site Permit: Lake Charlotte Solar Project, June 3, 2025. eDocket no. [20256-219557-01](#) (through -12). (Joint Site Permit Application), (SPA).

² Minnesota Public Utilities Commission, Order, July 22, 2025. eDocket no. [20257-221270-01](#).

³ Minnesota Statute 216E.04, subd. 5, Edition Year 2023; Minn. Rule 7850.3700, subp. 4, Published 2024.

⁴ Minnesota Statutes [216E.02](#), subd. 1. Published 2024.

Chapter 1: Introduction

1.1 How is this document organized?

The EA addresses the matters identified in the scoping decision.

This EA is based on the applicant’s site permit application and public scoping comments. It addresses the matters identified in the EA scoping decision ([Appendix A](#)).

- **Chapter 1** briefly describes the state of Minnesota’s role; discusses how this EA is organized; and provides a summary of potential impacts and mitigation.
- **Chapter 2** summarizes the regulatory framework, including the site permit process, the environmental review process, other approvals that might be required for the project, and the criteria the Commission uses to make its decisions.
- **Chapter 3** describes the project—design, construction, operation, and decommissioning
- **Chapter 4** describes the environmental setting; details potential human and environmental impacts from the Lake Charlotte Solar Project; and identifies measures to mitigate adverse impacts. It summarizes the cumulative potential effects of the project and other projects and lists unavoidable impacts and irreversible and irretrievable commitments of resources.
- **Chapter 5** identifies the sources used to prepare the document.

1.2 What is the state of Minnesota’s role?

The applicant needs two site permits from the Commission to construct the project. Commission staff prepared this EA. An administrative law judge will oversee a public hearing.

To build the project, the applicant needs two site permits from the Commission. The project may also require additional approvals from other federal and state agencies and local governments, for example, a driveway permit from Martin County or a Construction Stormwater Permit from the Minnesota Pollution Control Agency (MPCA). Commission site permits supersede local zoning, building, and land use rules.⁵ Commission permit decisions must be guided, in part, however, by consideration of impacts to local zoning and land use in accordance with the legislative goal to “minimize human settlement and other land use conflicts.”⁶

Lake Charlotte Solar applied to the Commission for site permits for the project on June 3, 2025.⁷ The Commission must consider whether the record supports issuing these permits, and what conditions should be placed on them.⁸

⁵ Minnesota Statutes [216E.10](#), subd. 1. Published 2024.

⁶ Minnesota Statutes [216E.03](#), subd. 7. Published 2024.

⁷ Lake Charlotte Solar, LLC – Joint Application to the Minnesota Public Utilities Commission for a Site Permit: Lake Charlotte Solar Project, June 3, 2025. eDocket no. [20256-219557-01](#) (through -12). (Joint Site Permit Application), (SPA).

⁸ If the Commission grants a site or route permit, it chooses which of the studied locations is most appropriate. In this matter only one site location is studied

To ensure a fair and robust airing of the issues, the Minnesota Legislature has set out a process for the Commission to follow when considering permit applications.⁹ Under this process, an EA is the only required state environmental review document. The EA describes the project, highlights resources affected by the project, and discusses potential human and environmental impacts on these resources. It also discusses ways to mitigate potential impacts. After the EA has been prepared and issued, public hearings will be held. The goal of the EA is to describe the potential human and environmental impacts of the project (*the facts*); the goal of the public hearings is to allow interested persons the opportunity to advocate, question, and debate what the Commission should decide about the project (*what the facts mean*). The record developed during this process—including all public input—will be considered by the Commission when it makes its decisions on the applicant’s site permit application.

1.3 What is the public’s role?

Minnesota needs your help to make informed decisions.

During scoping, you told us your concerns about the project so that we could collect the right facts. At the public hearing, which comes next, you can tell us what those facts mean, and if you think we have represented them correctly in this EA. Your help in pulling together the facts and determining what they mean will help the Commission make informed decisions regarding the project.

1.4 What factors guide the Commission’s decision?

Minnesota statute and rule identify the factors the Commission must consider when determining whether to issue a site permits.

After reviewing the project record—including public comments—the Commission will determine whether to issue site permits for the project.

Minnesota Statutes 216E.03 lists considerations that guide the study, evaluation, and designation of site and route permits.¹⁰ Minnesota Rule 7850.4100 lists the factors the Commission must consider when making a permit decision:

- A. Effects on human settlement, including, but not limited to, displacement, noise, aesthetics, cultural values, recreation, and public services.
- B. Effects on public health and safety.
- C. Effects on land-based economies, including, but not limited to, agriculture, forestry, tourism, and mining.
- D. Effects on archaeological and historic resources.
- E. Effects on the natural environment, including effects on air and water quality resources and flora and fauna.
- F. Effects on rare and unique natural resources.

⁹ See generally Minnesota Statute [216E](#). Published 2024.

¹⁰ Minnesota Statutes 216E.03. Published 2024.

- G. Application of design options that maximize energy efficiencies, mitigate adverse environmental effects, and could accommodate expansion of transmission or generating capacity.
- H. Use or paralleling of existing rights-of-way, survey lines, natural division lines, and agricultural field boundaries.
- I. Use of existing large electric power generating plant sites.
- J. Use of existing transportation, pipeline, and electrical transmission systems or rights-of-way.
- K. Electrical system reliability.
- L. Costs of constructing, operating, and maintaining the facility which are dependent on design and route.
- M. Adverse human and natural environmental effects which cannot be avoided.
- N. Irreversible and irretrievable commitments of resources.

The Commission is also guided by the “state's goals to conserve resources, minimize environmental impacts, minimize human settlement and other land use conflicts, and ensure the state's electric energy security through efficient, cost-effective power supply and electric transmission infrastructure.”¹¹

1.5 Solar Facility and BESS Siting Factors – Analysis and Discussion

This analysis applies the siting factors to the project. Some factors are described in just a few words. Other factors are more descriptive and include a list of elements that, when grouped, make up the factor. Finally, certain factors are relatively succinct, but the scoping process identified elements to be analyzed in this EA. For example, the public safety factor includes an EMF element.

Factor M (unavoidable impacts) and **Factor N** (irreversible and irretrievable resource commitments) are discussed in [Section 4.8](#) and [Section 0](#), respectively, of this EA. **Factor G** (application of design options) and **Factor L** (costs dependent on design) do not apply as the design of the proposed project is the only design under consideration.

Other factors are ranked as follows:

	Impacts are anticipated to be negligible to minimal and able to be mitigated or consistent with factor
	Impacts are anticipated to be minimal to moderate and able to be mitigated in part or less consistent with factor, but nonetheless consistent
	Impacts are anticipated to be moderate to significant and unable to be mitigated fully or consistent in part or not consistent with factor

¹¹ Minnesota Statutes [216E.03](#), subd. 7(a).

Table 1. Application of Siting Factors- Solar Facility and BESS

Factor A: Human Settlement				
Element	Solar Facility		BESS	
	Construction	Operation	Construction	Operation
Aesthetics	○	○	○	○
Displacement	●	●	●	●
Cultural Values	○	○	○	○
Electric Interference	●	●	●	●
Environmental Justice	●	●	●	●
Land Use and Zoning	●	●	●	●
Noise	⊘	●	⊘	●
Property Values	○	○	○	○
Recreation	○	●	○	●
Socioeconomics	●	●	●	●
Factor B: Public Services				
Element	Construction	Operation	Construction	Operation
Airports	●	●	●	●
Roads	○	●	○	●
Utilities	●	●	●	●
Factor C: Public Safety				
Element	Construction	Operation	Construction	Operation
EMF	●	●	●	●
Emergency Services	●	●	●	●
Medical Devices	●	●	●	●
Public Safety	●	●	●	●
Stray Voltage	●	●	●	●
Worker Safety	●	●	●	●
Factor D: Land-based Economies				
Element	Construction	Operation	Construction	Operation
Agriculture	○	○	○	○
Forestry	●	●	●	●
Mining	●	●	●	●
Tourism	●	●	●	●

Factor E: Archaeological and Historic Resources				
Element	Solar Facility		BESS	
	Construction	Operation	Construction	Operation
Archeological	●	●	●	●
Historic	●	●	●	●
Factor F: Natural Resources				
Element	Construction	Operation	Construction	Operation
Air Quality	●	●	●	●
Climate Change	●	●	●	●
Geology and Groundwater	●	●	●	●
Soils	○	●	○	●
Surface Water and Floodplains	○	●	○	●
Topography	●	●	●	●
Vegetation	●	●	●	●
Wetlands	●	●	●	●
Wildlife	○	●	○	●
Wildlife Habitat	○	●	○	●
Factor G: Rare and Unique Resources				
Element	Construction	Operation	Construction	Operation
Fauna	○	●	○	●
Flora	●	●	●	●
Factor H: Use of Existing Generating Plants				
Element	Construction	Operation	Construction	Operation
Existing Plants	⊘	⊘	⊘	⊘

Discussion

The following discussion highlights potential impacts to factor elements that are anticipated to be minimal to moderate or moderate to significant, and factors determined less consistent, consistent in part, or not consistent.

FACTOR A: HUMAN SETTLEMENT

Aesthetics Visual impacts are subjective. Thus, potential impacts are unique to the individual and can vary widely. Because there is existing energy infrastructure in the area, including, transmission lines, substations, and distribution lines (See Section 0), the project will not be an entirely new type of feature on the landscape. However, the addition of solar panels and associated infrastructure will create a new aesthetic feature. For those with high viewer sensitivity, for example, neighboring landowners, or those

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traveling along Trunk Highway 15, visual impacts are anticipated to be moderate to significant, while for those that travel through the general project area, such as along I-90, visual impacts are likely to be minimal, although noticeable.

Cultural Values The project is not anticipated to impact or alter the work and leisure pursuits of residents in such a way as to impact the underlying culture of the area. In the case that cultural resources are discovered during project construction, the permittee shall work with the appropriate LGU regarding next steps. Differences between cultural values related to renewable energy and rural character have the potential to create tradeoffs that cannot be addressed in the site permit.

Land Use and Zoning Land use impacts are anticipated to be long-term and localized. Constructing the project will change land use from agricultural land to solar energy production for a minimum of 30 years. After the project's useful life, the land control area could be restored to agricultural or other planned land uses by implementing appropriate restoration measures. Impacts can be minimized by using best practices to protect land and water quality.

Noise Distinct noises are associated with the different phases of project construction. These impacts will be temporary and intermittent and range from negligible to significant depending on the construction equipment used and the location of the listener.

Property Values On whole, impacts to property values are anticipated to be minimal and to decrease with distance and over time. However, impacts to a specific property's value are difficult to determine. Because of this uncertainty, impacts on the value of specific properties could be minimal to moderate. Impacts can be minimized with visual screening plans between adjacent landowners and the project applicant.

Recreation Potential impacts to recreational resources associated with construction are anticipated to be short-term, intermittent, and localized. The impact intensity level is expected to be minimal to moderate, most likely occurring due to increased traffic and noise from construction. Temporary impacts to snowmobile trails could occur during construction. During operation, no impacts to recreation are anticipated; negligible traffic increases would occur for maintenance. Access to recreational trails and areas will remain open throughout the life of the project.

FACTOR B: PUBLIC SERVICES

Transportation Potential impacts to roads and highways associated with construction are anticipated to be short-term, intermittent, and localized. The impact intensity level is expected to be minimal to moderate. During operation, no impacts to roads are anticipated; negligible traffic increases would occur for maintenance.

FACTOR C: LAND-BASED ECONOMICS

Agriculture Potential impacts to agricultural producers are anticipated to be minimal to moderate —lost farming revenues will be offset by lease or easement agreements. A negligible loss of farmland in Martin County would occur for the life of the project. Potential impacts are localized and unavoidable but can be minimized.

FACTOR E: NATURAL RESOURCES

Surface Water and Floodplains Indirect impacts from surface waters might occur during construction. The project area is adjacent to an existing chain of lakes, including Lake Charlotte, Martin Lake, and High Lake. Indirect impacts due to erosion and sediment from construction activities could occur. Impacts can be mitigated through proper consultation with local groups and agencies regarding surface waters, in addition to following BMPs for erosion and sediment control. The project area is currently within an area of minimal flood risk, and impacts to floodplains are not anticipated. Proper planning and emergency preparedness can minimize the potential risk from severe storm and flooding events.

Soils Impacts to soils will occur during construction and decommissioning of the project. The impact intensity level is expected to be minimal to moderate. Potential impacts will be both positive and negative, and short- and long-term. Isolated moderate to significant negative impacts associated with high rainfall events could occur but can be mitigated with erosion prevention and sediment control BMPs. Because the soil at the solar facility will be covered with native perennials and other beneficial vegetation for the life of the project, soil health is likely to improve.

Wildlife and Habitat Impacts to wildlife are anticipated to be minimal to moderate during construction and operation of the project. Potential impacts may be positive or negative and are species dependent. Long-term, minimal positive impacts to small mammals, insects, reptiles, amphibians, etc. would occur. Impacts to large wildlife species, for example, deer, could potentially occur depending on the final fence design. Indirect impacts on aquatic life could occur. Significant negative impacts could occur to individuals during the construction and operation of the project. Once restored, the land control area will provide perennial vegetated habitat for the life of the project. The project does not contribute to significant habitat loss or degradation or create new habitat edge effects. Project components can be designed to reduce the potential impact by following the Minnesota Department of Natural Resources (DNR) guidance and BMPs. Additional BMPs can be implemented to avoid impacts on local and rare and unique wildlife, such as choosing a pollinator-friendly seed mix (e.g., Monarch Butterflies.).

FACTOR I: POWER PLANTS

Because the solar facility is not constructed at an existing power plant, the solar facility is inconsistent with this siting factor.

1.6 What's next?

A public hearing will be held in the project area; you can provide comments at the hearing. The Commission will then review the record and decide whether to grant a site permit and a route permit for the project.

An administrative law judge (ALJ) from the Court of Administrative Hearings (CAH) will hold a public hearing after the EA is complete and available. At the hearing you may ask questions and submit comments about the project. After the close of the comment period, the ALJ will provide a written report to the Commission with findings, conclusions, and recommendations for the Commission.

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The Commission reviews all the information in the project record in determining whether to issue permits for the project. Site and route permits define the location of the project and include conditions specifying mitigation measures. The Commission is expected to make a permit decision in mid-2026.

2 Regulatory Framework

Chapter 2 discusses the permit approvals required from the Commission. It describes the environmental review process and lists the factors the Commission considers when making its decisions. This chapter also discusses required approvals from federal and state agencies and local units of government with permitting authority for actions related to the project. Lastly, it lists topics outside the scope of this EA.

2.1 What Commission approvals are required?

The project requires two site permits from the Commission before it can be constructed.

The project's solar generating facility requires a site permit from the Commission because it meets the definition of a *large electric power generating plant*, which means any electric power generating equipment designed for or capable of operation at a capacity of 50 MW or more (Minn. Stat. [216E.01](#), subd. 5). The project does not require a certificate of need requirement per Minn. Stat. 216B.243, subd. 9.

The project's BESS requires a site permit from the Commission because it meets the definition of an *energy storage system*, which means equipment and associated facilities designed with a nameplate capacity of 10 MW or more that is capable of storing generated electricity for a period of time and delivering the electricity for use after storage.¹²

2.2 What is environmental review?

Environmental review informs interested persons about potential impacts and possible mitigation measures associated with the project; environmental review informs Commission decisions.

Minnesota law requires that potential human and environmental impacts be analyzed before the Commission decides whether to grant permits for the project. This analysis is called environmental review.

For Lake Charlotte Solar's proposed project, Minnesota law requires that an EA be prepared and that a public hearing be held.¹³

2.3 What permitting steps have occurred to date?

The Commission accepted the site permit application as complete on July 22, 2025. Public information and scoping meetings were held in person in Fairmont, Minnesota on August 28 and online on September 2, 2025.

¹² Minnesota Statutes [216E.01](#), subd. 3.

¹³ Minnesota Statutes [216E.04](#), subd. 1 and 5; Minn. R. [7850.3700](#), subp. 1. Applicants are free to elect the alternative process if their project qualifies for it. Published in 2024.

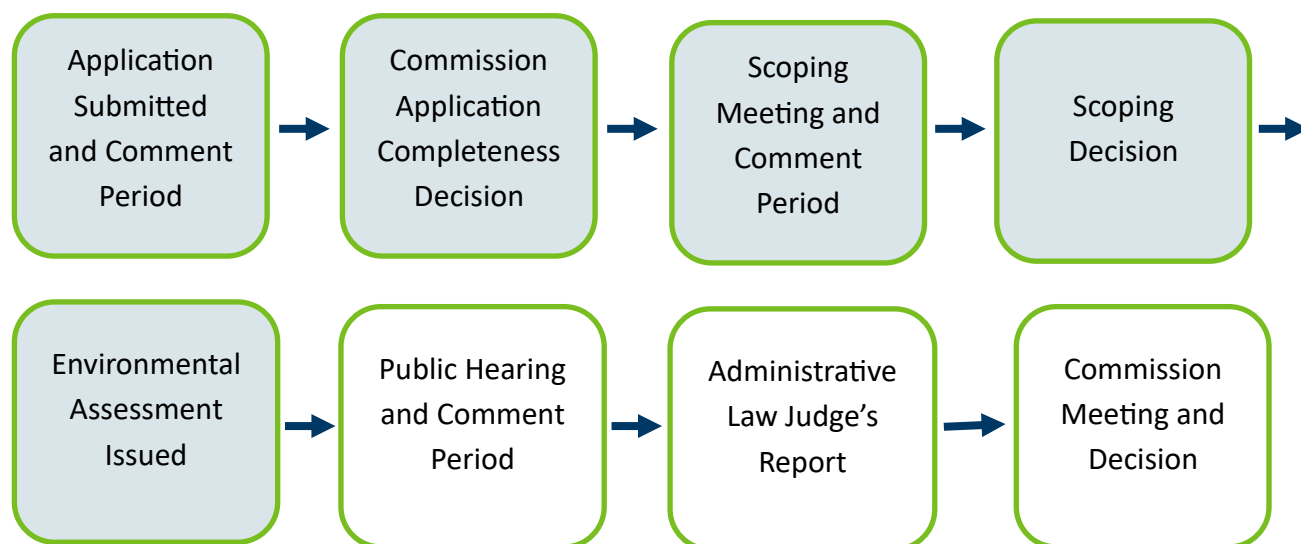
2.3.1 APPLICATION FILING AND ACCEPTANCE

Lake Charlotte Solar provided the required written notice of its intent to file a joint site permit application under the alternative process on April 30, 2025.¹⁴

Lake Charlotte filed a joint site permit application for two site permits on June 3, 2025.¹⁵ The Commission accepted the application as substantially complete in its order dated July 22, 2025.¹⁶ The order also referred the matter to the Court of Administrative Hearings for appointment of an administrative law judge (ALJ) to conduct a public hearing for the project. Commission staff provided a *Sample Site Permit for a Solar Energy Generating System* and a *Sample Site Permit for a Battery Energy Storage System* on February 3, 2026.¹⁷

Figure 2. outlines the permitting process as it has unfolded for this project.

Figure 2. Permitting Process Summary¹⁸



¹⁴ Lake Charlotte Solar, LLC, *Notice of Intent to Submit a Joint Site Permit Application under the Alternative Permitting Process* Docket No. IP-7159/GS-25-206 and ESS-25-205, April 20, 2025, eDocket no. [20254-218352-01](#).

¹⁵ Lake Charlotte Solar, LLC – *Joint Application to the Minnesota Public Utilities Commission for a Site Permit: Lake Charlotte Solar Project*, June 3, 2025. eDocket no. [20256-219557-01](#) (through -12). (Joint Site Permit Application), (SPA).

¹⁶ Commission, *Order*, July 22, 2025, eDocket no. [20257-221270-01](#).

¹⁷ Commission Staff, *Sample Solar Site Permit*, February 3, 2026, eDockets Nos. [20262-227811-01](#) and [20262-227812-01](#).

¹⁸ Read from left to right; shaded steps are complete.

2.3.2 SCOPING PROCESS

Scoping is the first step in the environmental review process. It helps focus the EA on the most relevant information needed by the Commission to make informed decisions.

Scoping includes a public meeting and comment period that provides opportunities for interested persons to help develop the scope (or contents) of the EA.¹⁹ The purpose of the public information and scoping meetings is to provide information and answer questions about a proposed project and the permitting process. The meeting and associated comment period also provide an opportunity to gather input regarding potential impacts and mitigative measures that should be studied in the EA.

On August 7, 2025, the Commission issued a *Notice of Public Information and Environmental Assessment Scoping Meetings* and associated public comment period.²⁰ The notice was sent to those individuals on the project contact list and was also available on the webpage for the project.

Staff held public information and scoping meetings in Fairmont, Minnesota on August 28, 2025, and an online meeting on September 2, 2025. The comment period closed on September 17, 2025. Approximately 70 people attended the Fairmont public meeting, and several attendees provided public comments. Approximately 75 people attended the online meeting and provided comments.²¹ Written comments were received from nine members of the public, in addition to Martin County, and two state agencies.²²

Public comments addressed a number of potential impacts and concerns related to the project. Potential human impacts and concerns included the use of local labor; aesthetics; buffers and setbacks; drain tile; glare and public health impacts; property values; tax revenue; prime farmland; decommissioning; and disposal of solar panels. Potential environmental impacts and concerns included water, soil, and air quality; runoff and drainage; wildlife; snow drift; extreme weather; greenhouse gases; microclimates; and land classification. Other concerns that were raised included the conservation of prime farmland, the project's proximity to the city of Northrop, aesthetic impacts, impacts to the environment and wildlife, impacts to the local farming economy, and the potential for environmental contamination resulting from panel-damaging scenarios, such as hailstorms or fires.²³

Martin County's comments included a request to abide by county setbacks for the locations of the solar panels, particularly with respect to residences and protected waters.²⁴

¹⁹ Minn. R. [7850.3700](#), subp. 2.

²⁰ Commission *Notice of Public Information and Environmental Review Scoping Meeting*, August 7, 2025. eDocket no. [20258-221847-01](#).

²¹ *Oral Comments on the Scope of Environmental Assessment, Public Scoping and Information Meetings, Fairmont, Minnesota*, August 28, 2025 and virtual meeting, September 2, 2025. eDocket no. [20259-223226-02](#).

²² *Written Comments on the Scope of Environmental Assessment*, September 23, 2025. eDocket no. [20259-223226-01](#).

²³ PUC EIP, *Environmental Assessment Scoping Decision*, Lake Charlotte Solar Project, October 29, 2025. eDocket no. [202510-224375-01](#).

²⁴ *Written Comments on the Scope of Environmental Assessment*, September 23, 2025. eDocket no. [20259-223226-01](#).

The Minnesota Department of Natural Resources (DNR) provided comments related to security fencing for the project, recommending that the applicant adhere to DNR's fencing guidance. DNR also recommended the utilization of the project's vegetation management plan (VMP), offering recommendations on technical guidance, and vegetative screening. Other topics raised by DNR include the potential impact to Grant-in-Aid Snowmobile Trails, recommending additional coordination with local clubs, as well as project lighting, dust control, and wildlife friendly erosion control.²⁵

The Minnesota Department of Transportation (MnDOT) provided comments on the project's proximity to trunk highway (TH) 15, noting that there are several water basins in close proximity to the TH 15 right of way (ROW). MnDOT also outlines the potential need for a permit in the case that project work affects MnDOT ROW, and notes that the project is located along a high vulnerability snow trap. It recommended that the applicant work with MnDOT's Blowing Snow Control team to discuss and resolve potential impacts to this area.²⁶

2.3.3 SCOPING DECISION

The scoping decision identifies the issues studied in this EA.

After considering public comments and recommendations by staff, a scoping decision was issued on October 29, 2025 (**Appendix A**). The scoping decision identifies the issues to be evaluated in this EA.

2.4 Are other permits or approvals required?

Yes, other permits and approvals are required for the project.

The site permits from the Commission are the only state permits required for the project. However, various federal, state, and local approvals might be required for activities related to construction and operation of the project. These subsequent permits are referred to as "downstream" permits and must be obtained by the permittee prior to construction.²⁷ **Table 2** lists potential downstream permits that might be required, several of which are discussed below.

²⁵ DNR, *Scoping Comments*, Lake Charlotte Solar Project, September 16, 2025. eDockets no. [20259-223095-01](#).

²⁶ MnDOT, *Scoping Comments*, Lake Charlotte Solar Project, September 16, 2025. eDockets no. [20259-223056-01](#).

²⁷ DSP (Appendix C), Section 4.5.2 (stating the permittee "shall obtain all required permits for the project and comply with the conditions of those permits").

Table 2. Potential Downstream Permits²⁸

Unit of Government	Type of Application	Purpose	Anticipated for Project
Federal			
U.S. Army Corps of Engineers	Section 404 Clean Water Act – Dredge and Fill		Possible
	National Permit 51 for solar facility	Protects water quality by controlling discharges of dredged and fill material	Pre-construction notification may be required if permanent impacts exceed threshold for Nationwide Permit or Regional General Permit.
	St. Paul District Utility Regional General Permit for gen-tie line		
U.S. Environmental Protection Agency	Spill Prevention, Control and Countermeasures Plan	Protect facilities with oil storage of more than 1,320 gallons	Possible
U.S. Fish and Wildlife Service	Threatened and Endangered Species Consultation	Consultation to mitigate impacts to federally listed species	Possible
	Section 10 Endangered Species Incidental Take Permit	Potential impacts on federally endangered or threatened species	Possible
State			
Minnesota Department of Natural Resources	Utility License to Cross Public Lands and Waters	Prevent impacts associated with crossing public lands and waters	No
	Water Appropriation Permit	Balances competing management objectives; may be required for construction dewatering of more than 10,000 gallons of water per day or 1 million gallons per year	Possible
	Public Water Work Permit	Regulates placement of structures and work in public waters.	No
	Consultation and review of state threatened and endangered species and/or take permit	Potential impacts to state protected species	Possible, in-progress ²⁹

²⁸ Lake Charlotte Solar, LLC – *Joint Application to the Minnesota Public Utilities Commission for a Site Permit: Lake Charlotte Solar Project*, pp. 7-10. June 3, 2025. eDocket no. [20256-219557-01](#) (through -12). (Joint Site Permit Application), (SPA).

²⁹ SPA, Section 5.5.8.

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Unit of Government	Type of Application	Purpose	Anticipated for Project
Minnesota Pollution Control Agency	National Pollutant Discharge Elimination System General Permit (includes Stormwater Pollution Prevention Plan)	Minimizes temporary and permanent impacts from stormwater	Yes
	Section 401 Clean Water Act – Water Quality Certification	Ensures project will comply with state water quality standards	Possible
	Air Quality Permit Applicability Determination Request	Determines the permitting need of a proposed emissions-generating project, including the installation of equipment	Yes, will be submitted prior to installation and operation of emergency generators and fuel tanks.
	Air Quality Permit	Required if operational facility criteria pollutant and hazardous air pollutant emissions exceed permitting threshold levels.	Possible, will be determined per the applicability determination request.
State Historic Preservation Office	Review and Coordination	Ensures adequate consideration of impacts to significant cultural resources	Yes
Department of Agriculture	Agricultural Impact Mitigation Plan	Establishes measures for protection of agricultural resources	Yes, developed in consultation with MDA ³⁰
Department of Labor and Industry	Electrical Inspection	Necessary to comply with electric code.	Yes
Department of Transportation	Utility Accommodation on Trunk Highway ROW Permit	Controls utilities being placed along or across highway rights-of-way (ROW)	Possible
	Oversize/Overweight Permit	Controls use of roads for oversize or overweight vehicles	Possible
	Access (Driveway) Permit	Required for construction of a driveway/access road utilizing MNDOT rights- of-way.	No
Minnesota Department of Health	Well Construction Permit	Installation of a water supply well	Possible
Local			
Martin County	Subsurface Sewage Treatment System Permit	Required prior to installation of any septic system in Martin County	Possible

³⁰ SPA, Appendix E - AIMP. eDockets no. [20256-219557-07](#).

Unit of Government	Type of Application	Purpose	Anticipated for Project
	Driveway or Entrance Permit	Required for access from county roads.	Possible
	Utility Permit	Required to place, construct, maintain utilities across, along or within county highway road right-of-way	Possible
	Moving Permit	Required for overweight or over size loads.	Possible
	Petition to realign / abandon public drain tile	Required if any public drain tile needs to be partially realigned or partially abandoned to accommodate the Project	Possible

Federal

The U.S. Army Corps of Engineers (USACE) “regulates the discharge of dredged or fill material into waters of the United States, including wetlands.”³¹ Dredged or fill material, including material that moves from construction sites into these waters, could impact water quality. Nationwide permit 51 regulates the discharges of dredged or fill material into non-tidal waters of the United States for the construction, expansion, or modification of land-based renewable energy production facilities, including attendant features. Permits may be required from USACE for the project if the potential for significant adverse impacts exists.

The U.S. Environmental Protection Agency (USEPA) enforces the Spill Prevention, Control and Countermeasures Plan (SPCCP). “The purpose of the Spill Prevention, Control, and Countermeasure (SPCC) rule is to help facilities prevent a discharge of oil into navigable waters or adjoining shorelines. The SPCC rule requires facilities to develop, maintain, and implement an oil spill prevention plan, called an SPCC Plan.” If a plan is required for this project, it would prevent oil spills, as well as control a spill should one occur. This plan may be required for the storage of fuel for construction.

A permit is required from the U.S. Fish and Wildlife Service (USFWS) for the incidental taking³² of any threatened or endangered species. As a result, USFWS encourages project proposers to consult with the agency to determine if a project has the potential to impact federally listed threatened or endangered species. Additionally, consultation can lead to the identification of measures to mitigate potential impacts associated with the project.

³¹ U.S. Environmental Protection Agency (February 26, 2025) *Section 404 Permit Program*, retrieved from: <http://www.epa.gov/cwa-404/section-404-permit-program>.

³² [16 U.S. § 1532\(19\)](#) (defining “take” to mean to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to engage in such conduct).

The United States Federal Aviation Administration (FAA) Requires notification if project features are above 200 feet tall or located within a 100:1 notification surface area.

State

Potential impacts to state lands and waters, as well as fish and wildlife resources, are regulated by the DNR. Licenses are required to cross state lands or waters.³³ Projects affecting the course, current, or cross-section of lakes, wetlands, and streams that are public waters may require a *Public Waters Work Permit*.³⁴ Not unlike the USFWS, DNR encourages project proposers to consult with the agency to determine if a project has the potential to impact state-listed threatened or endangered species. Additionally, consultation can lead to the identification of measures to mitigate potential impacts associated with the project. If project construction requires dewatering greater than or equal to 10,000 gallons per day or 1 million gallons per year, a dewatering permit is also required by the DNR.

Construction projects that disturb one or more acres of land require a general *National Pollutant Discharge Elimination System / State Disposal System Construction Stormwater Permit* ("CSW Permit") from the MPCA. This permit is issued to "construction site owners and their operators to prevent stormwater pollution during and after construction."³⁵ The CSW Permit requires use of best management practices; the development of a Stormwater Pollution Prevention Plan; and adequate stormwater treatment capacity once the project is complete. Projects must be designed so that stormwater discharged after construction does not violate state water quality standards. Specifically, projects with net increases of one acre or more to impervious surface must be designed to treat water volumes of one inch times the net increase in impervious surface. PV panels are impervious and are counted towards total impervious surface along with access roads, buildings, etc. The area beneath the panel, however, is pervious if properly vegetated. To account for this, MPCA developed a solar panel calculator that estimates the amount of stormwater retained by PV solar facilities. This amount can be applied as a credit towards the total amount of stormwater treatment needed for a project.³⁶

A Clean Water Act Section 401 *Water Quality Certification* from MPCA might also be required. "Section 401 of the Clean Water Act requires any applicant for a federal license or permit to conduct an activity that may result in a discharge of a pollutant into waters of the United States to obtain a certification from the State in which the discharge originates that the discharge complies the applicable water quality standards."³⁷ The certification becomes a condition of the federal permit.

Additionally, MPCA is in charge of enforcing statewide air quality permits, required if operational facility criteria pollutant and hazardous air pollutant emissions exceed permitting threshold levels. Lake Charlotte

³³ Minnesota Statutes [84.415](#).

³⁴ MNDNR (n.d.) *Requirements for Projects Involving Public Waters Work Permits*, http://www.dnr.state.mn.us/waters/watermgmt_section/pwpermits/requirements.html.

³⁵ MPCA. *Construction Stormwater*. (2025). <https://www.pca.state.mn.us/business-with-us/construction-stormwater>

³⁶ MPCA. *Minnesota Stormwater Manual*. (2025). <https://www.pca.state.mn.us/water/minnesotas-stormwater-manual>.

³⁷ MPCA. (n.d.) *Clean Water Act Section 401 Water Quality Certifications*, <https://www.pca.state.mn.us/water/clean-water-act-section-401-water-quality-certifications>.

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will submit an Air Quality Permit Applicability Determination Request with MPCA prior to the installation of any qualifying equipment.

The State Historic Preservation Office (SHPO) is charged with preserving and protecting the state's historic resources. SHPO consults with project proposers and state agencies to identify historic resources to avoid and minimize impacts to these resources.

The Minnesota Department of Agriculture (MDA) ensures the integrity of Minnesota's food supply while protecting the health of its environment and the resources required for food production. MDA assists in the development of agricultural impact mitigation plans (AIMP) that outline necessary steps to avoid and mitigate impacts on agricultural lands.

The Minnesota Department of Labor and Industry requires an electrical inspection as a component of an electrical permit.³⁸

A permit from MnDOT is required for construction, placement, or maintenance of utility lines adjacent or across trunk highway rights-of-way.³⁹ Coordination would be required to construct access roads or driveways from trunk highways.⁴⁰ A permit is also required for oversized/overweight vehicles exceeding MnDOT limits. These permits are required to ensure that use of the right-of-way does not interfere with free and safe flow of traffic, among other reasons.⁴¹

The Minnesota Department of Health (MDH) requires permits for the installation of a water supply well. In the case Lake Charlotte Solar will need to install a well, a permit will be obtained prior to construction

Local

Commission permits preempt local zoning, building, and land use rules, regulations, or ordinances promulgated by regional, county, local, and special purpose government; however, coordination with local governments may be required for the issues listed below.

- **Access/Driveway:** Coordination may be required to construct access roads or driveways from county or township roads.
- **Overwidth Load:** Coordination may be required to move over-width or heavy loads on county or township roads.
- **Road Crossing and Right-of-Way:** Coordination may be required to cross or occupy county or township road rights-of-way.

³⁸ MNDLI (n.d.) *Electrical Permits, Contractors*, <https://www.dli.mn.gov/business/electrical-contractors/electrical-permits-contractors>.

³⁹ Minnesota. Rules, Part. [8810.3300](#), subp. 1.

⁴⁰ MnDOT *Land Management*. (2025). <https://www.dot.state.mn.us/landmanagement/index.html>.

⁴¹ MnDOT. *Utility Accommodation on Trunk Highway Right of Way: Policy OP002*. (2025). <https://www.dot.state.mn.us/policy/operations/oe002.html>.

Martin County local permits may be required as a component of this project, including:

- **Subsurface Sewage Treatment System Permit:** Required prior to installation of any septic system in Martin County.
- **Driveway or Entrance Permit:** Required for access from county roads.
- **Utility Permit:** Required to place, construct, maintain utilities across, along or within county highway road right-of-way
- **Moving Permit:** Required for overweight or over size loads.
- **Petition to realign / abandon public drain tile:** Required if any public drain tile needs to be partially realigned or partially abandoned to accommodate the project

2.5 Do electrical codes apply?

Yes, if constructed the project must meet electrical safety code requirements.

The project must meet requirements of the National Electrical Safety Code.⁴² These standards are designed to safeguard human health “from hazards arising from the installation, operation, or maintenance of conductors and equipment in electric supply stations and overhead and underground electric supply lines.”⁴³ They also ensure that facilities and all associated structures are built from materials that will withstand the operational stresses placed upon them over the expected lifespan of the equipment, provided operational maintenance is performed.

2.6 Are any issues outside the scope of this EA?

Yes, the scoping decision identified several issues that will not be studied.

The EA will not address following topics:

- Any site other than the project site proposed by the applicant.
- The manner in which landowners are compensated for the project.

⁴² See Minnesota. Statute. [326B.35](#); Minn. R. [7826.0300](#), subp. 1 (requiring utilities to comply with the most recent edition of the National Electric Safety Code when constructing new facilities or reinvesting capital in existing facilities)

⁴³ IEEE Standards Association (2023) – *National Electrical Safety Code*, retrieved from: <https://standards.ieee.org/products-programs/nesc/products/>.

3 Proposed Project

Lake Charlotte Solar (applicant) is proposing to construct and operate the Lake Charlotte Solar Project (project), an up to 150 megawatt (MW) solar energy generating facility and a Battery Energy Storage System (BESS) with a 150 MW / 600 MWh nameplate capacity and ancillary support infrastructure in Martin County, Minnesota. The project will generate electricity and send it from the project substation to the electric transmission grid through the Southern Minnesota Municipal Power Agency (SMPMPA) Rutland Substation, located adjacent to the project area. This chapter describes the project and how it would be constructed, operated, and decommissioned.

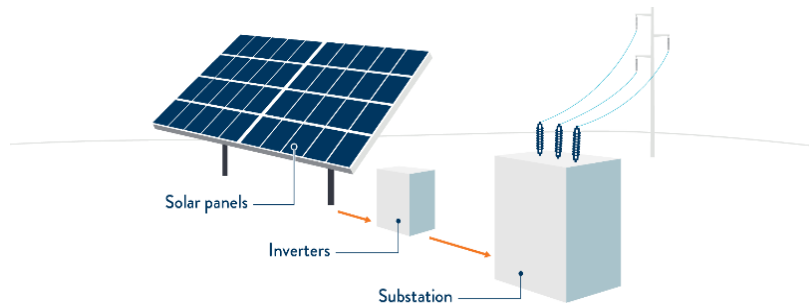
3.1 Solar Facility

3.1.1 How do solar facilities generate electricity?

The *photovoltaic effect* is the physical process through which a PV cell converts sunlight directly into electricity by capitalizing on nature's inherent desire to keep electrical charges in balance.

When direct and indirect solar radiation (direct and scattered sunlight) strikes a PV cell, some radiation is absorbed, which excites electrons within the cell. This results in a continuous flow of electrons from the front to the back of the panel through electrical connections, which results in a continuous flow of electricity.

Figure 3. Solar Facility Schematic



Solar panels (sometimes referred to as solar modules) are made up of PV cells that generate direct current (DC) electricity, which must be converted to alternating current (AC) electricity before reaching the electrical grid. Solar panels are arranged into electrically connected blocks and connected to inverters. An inverter converts DC electricity to AC electricity. Transformers then step up the electrical voltage before the electrical power is collected through an above- or below-ground collection system. Collection systems combine the electricity from across the array and deliver it to a project substation. **Figure 3** shows a simplified schematic of the major components of the solar generating facility.

3.1.2 Where is the Project located?

The Project is located in Rutland Township in Martin County, Minnesota (Figure 1).

As shown in **Figure 1**, the proposed solar facility and BESS will be located in Rutland Township in Martin County, Minnesota. The project location is adjacent to the boundary of the city of Northrop and extends to approximately four miles north of the city of Fairmont, Minnesota. **Table 3** summarizes the project location. Solar panels, BESS equipment and associated infrastructure would be located on approximately 1,004 acres (Preliminary Development Area) within an area of approximately 1,277 acres of land (Land Control Area). Lake Charlotte Solar has obtained leases or has purchase options for each of the parcels within the site. The project will connect to the existing SMPMPA Rutland Substation, located adjacent to

the project area which will be the project point of interconnection (POI) to the grid. Currently, the site is primarily used as cultivated agricultural farmland, with adjacent farmsteads, and township and county roads.

In its Joint Site Permit Application (SPA), Lake Charlotte Solar notes that the total acreage of the Preliminary Development Area is overstated by approximately 58.0 acres, due to the potential for drain tile to occur within the Preliminary Development Area. Lake Charlotte Solar has proposed an alternative layout of the solar arrays to place solar arrays and associated infrastructure in the northeastern portion of the Preliminary Development Area. This alternative layout will be adopted if, with Martin County approval, the existing drain tile can be abandoned within the site. To provide flexibility during Lake Charlotte Solar's coordination with Martin County regarding the drain tile, Lake Charlotte Solar included both the currently contemplated solar array layout and the potential alternate array layout in the Preliminary Development Area described throughout their SPA.⁴⁴

Lake Charlotte Solar selected the proposed site location because of landowner interest, transmission and interconnection suitability, optimal solar resource, and minimal impact on environmental resources. Existing infrastructure in the vicinity of the project allows Lake Charlotte Solar to minimize the need to construct beyond the immediate footprint of the project. Existing infrastructure includes the SMMPA Rutland Substation and high voltage transmission lines that tie directly into the existing electrical grid.⁴⁵

Table 3: Project Location

Township	Range	Sections	Location	County
103N	30W	5, 8, 9, 16, 17, 20, and 21	Rutland Township	Martin

3.1.3 How are the solar facility and BESS designed?

The solar facility will consist of solar panels and racking, inverters, transformers security fencing, a project substation, below-ground or hybrid below-ground and above-ground electrical collection and communication lines, stormwater facilities, the project BESS, and up to six weather stations.⁴⁶

3.1.3.1 SOLAR ARRAYS

Lake Charlotte Solar anticipates using thin film photovoltaic (PV) solar panels with tempered glass, generally four to seven feet long by two to four feet wide, and one to two inches thick. The panels will be installed north to south and affixed to a steel and aluminum tracking system. The tracking system will allow the racking and attached panels to rotate from east to west throughout the day, tracking the sun. The current design shows approximately 362,000 panels in the primary array. The final PV panel selection may change prior to construction.⁴⁷

⁴⁴ SPA, p. 11.

⁴⁵ Id.

⁴⁶ SPA, p. 14.

⁴⁷ SPA, p. 23.

Figure 4 and **Figure 5** show examples of typical solar mounting and tracking systems. At a tilt angle range of 45 degrees, the edge of the modules will be approximately 15 feet off the ground. Panel height may vary and could potentially reach a height of approximately 20 feet from the ground. The photovoltaic panels will contain several design elements for weather protection, including a silicon and weatherized plastic backing, a side-mount or under-mount aluminum frame, heat strengthened front glass, and laminate material encapsulation. The protection built into the modules protects them from wind, dust, sand, and precipitation. Tracker technology helps prevent hail and wind damage to the modules by safely stowing the modules in a way that limits/reduces the risk of damage to the modules.

To limit reflection, solar photovoltaic panels are constructed of dark, light-absorbing materials. Today's panels reflect as little as two percent of the incoming sunlight, depending on the angle of the sun and assuming use of anti-reflective coatings, which Lake Charlotte Solar will use.⁴⁸ The solar arrays will occupy most of the solar facility.⁴⁹ The racking system will be mounted on top of vertical steel piers that are typically driven into the ground at an embedment depth of 8 to 15 feet, depending on site-specific conditions, which will be determined through geotechnical borings prior to construction.⁵⁰

Figure 4. Typical Solar Array

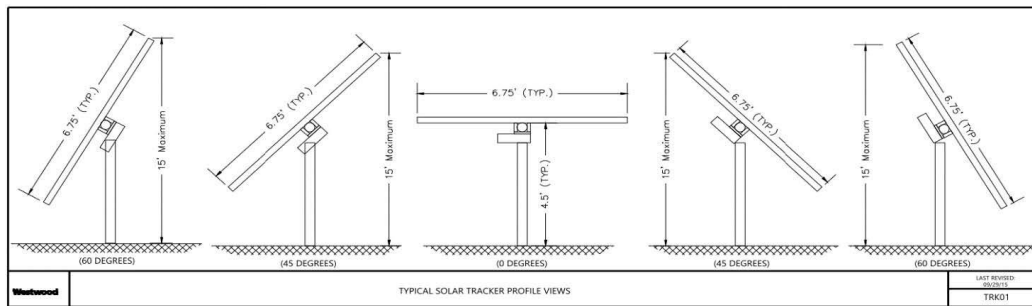


⁴⁸ SPA, p. 23.

⁴⁹ Id.

⁵⁰ SPA, p. 24.

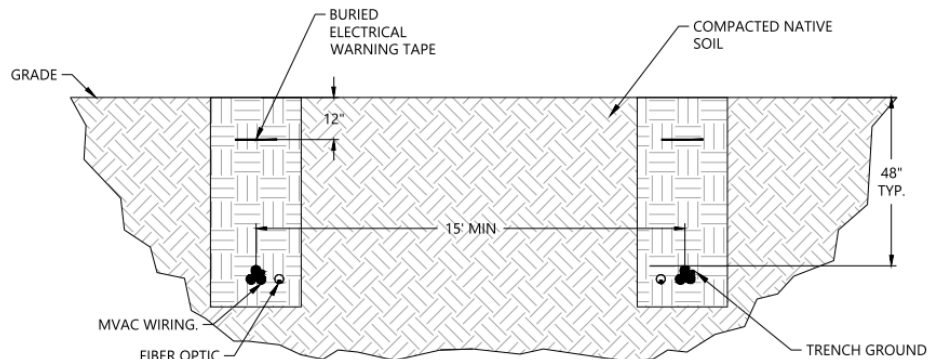
Figure 5. Typical Solar Tracking Profile



3.1.3.2 ELECTRICAL COLLECTION SYSTEM

The solar panels will deliver power to project inverters through a combination of both aboveground and underground collector lines. Buried collector lines will be installed via trenching or bore methods. A below-ground collection system will involve the installation of all cables in trenches or ploughed into place at a depth of approximately four feet below grade.⁵¹ (Figure 6).

Figure 6: Underground Cabling



Following installation, Lake Charlotte Solar indicates that the area will be backfilled with subsoil and topsoil that was removed and stockpiled separately during trenching in accordance with the Agricultural Impact Mitigation Plan (AIMP).⁵²

Inverters, placed at the end of solar arrays, are required to convert the DC power generated by the solar panels to the AC power that is needed to transmit the energy ultimately into the electrical grid.

⁵¹ SPA, p. 14.

⁵² SPA, p. 42.

Figure 7. Inverter



The preliminary project design is anticipated to require approximately 32 inverters (**Figure 7**). The final number of inverters will depend on size and availability of equipment. Each inverter will be mounted on a steel skid and set on a concrete pad or pier foundation. The inverter skid has approximate dimensions of 25 feet long by 10 feet wide by 12 feet tall. The concrete pad is typically 1 to 1.5 feet deep, and pier foundations can be up to 15 feet deep. Concrete slabs would be used if subgrade soil conditions are such that skin friction and end bearing values are too low to support driven pile foundations. Pier foundations would be used as a typical foundation solution as long as the subgrade soil conditions allow for driven piles.⁵³

Inside the inverter skid are the AC-DC inverters, where a transformer will step up the electrical current to a voltage of 34.5 kV, allowing for delivery to the electrical grid.

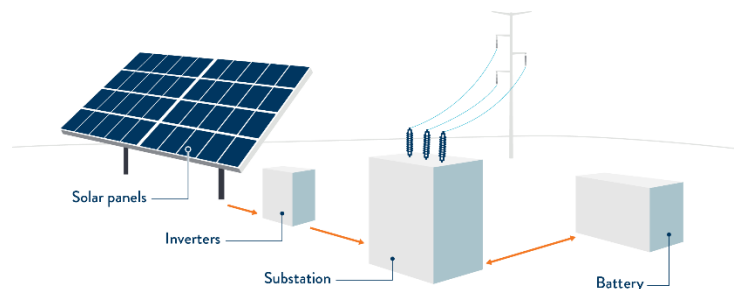
3.1.3.3 FENCING

Lake Charlotte Solar indicates permanent security fencing will be installed along the perimeter of the solar arrays within the solar facility and around the project substation and BESS. This fencing will be in compliance with National Electric Safety Code (NESC) requirements. The perimeter fencing design around the solar facility is expected to extend to a height of approximately seven feet tall. In place of barbed wire, one foot of three to four strands of smooth wire will be placed atop of the woven wire fence for a total height of approximately eight feet above grade. Lake Charlotte Solar states that gates will be strategically installed at corners for deer egress and contact information for the site manager will be posted at the gates. Fencing around the project substation and BESS will be a six-foot chain-link fence, including one foot of barbed wire on top in order to comply with NESC, and designed to prevent public access to electrical equipment that could cause injury or death.⁵⁴

3.1.3.4 BATTERY ENERGY STORAGE SYSTEM (BESS)

Figure 8 shows the layout of a standard solar and BESS facility. The project BESS will include 192 BESS modules containing multiple batteries and installed in enclosures, with six augmentation batteries adjacent to each BESS unit, for a total of 288 augmentation batteries. Within the BESS, underground collection and communication lines will be installed to connect the BESS units to the project substation.

Figure 8. Typical Solar and BESS Facility



⁵³ SPA, p. 27.

⁵⁴ SPA, p. 33.

From there, the BESS will interconnect to the project POI via the same gen-tie line that will interconnect the solar facility.⁵⁵

Lake Charlotte Solar notes that the project may be designed to allow the BESS to charge its batteries from the solar facility. However, if this functionality is incorporated into the final project design, it would be used sparingly and only as needed, with the BESS pulling charge from the electrical grid being the primary function of the BESS facility.⁵⁶

3.1.3.5 STORMWATER MANAGEMENT

The preliminary design for Lake Charlotte Solar includes 48 stormwater ponds throughout the preliminary development area, ranging in size from 0.12 to 0.78 acres, for a total for 20 acres. The area within the stormwater basins, if integrated as a permanent feature, will be vegetated with a wet seed mix that is intended to help stabilize soils after rain events.⁵⁷ Project design is preliminary and subject to change.

In its scoping comments, MnDOT noted that there are several water basins near the Trunk Highway (TH) 15 right of way (ROW), recommending that Lake Charlotte Solar ensure that any water basins located will not negatively impact existing land and infrastructure surrounding the project area.⁵⁸ Specifically, water basin locations should not change peak runoff rates to the TH ROW. A MnDOT District Hydraulics Engineer may need to review the project to determine if a drainage permit is needed. A drainage permit is required for all types of drainage changes on TH ROW.

Before beginning construction, Lake Charlotte Solar will obtain a National Pollutant Discharge Elimination System permit from the MPCA to discharge stormwater from construction facilities. Lake Charlotte Solar will develop and submit a Stormwater Pollution Prevention Plan (SWPPP) to be reviewed and approved by the Minnesota Pollution Control Agency (MPCA). The SWPPP includes erosion and sediment control best management practices (BMPs) including silt fence, revegetation plans, and the management of exposed soils.⁵⁹

3.1.3.6 LAYDOWN AREAS AND COMMUNICATION SHELTER

Lake Charlotte Solar will utilize 8 temporary laydown areas during construction serving both as a parking area, as well as staging and storage of construction materials and supplies. After construction is complete, Lake Charlotte Solar will restore the area according to the project Vegetation Management Plan (VMP) and the Agricultural Impact Mitigation Plan (AIMP).⁶⁰

3.1.3.7 LIGHTING

Operational lighting will be necessary at entrance gates to the solar facility, project substation, and BESS for safety and security during construction and operation. However, Lake Charlotte notes that lighting will be shielded and downlit in accordance with the DNR's recommended lighting preferences. Preliminary

⁵⁵ SPA, p. 14.

⁵⁶ Id.

⁵⁷ SPA, p. 34.

⁵⁸ MNDOT, Scoping comments, September 16, 2025. eDocket no. [20259-223056-01](#).

⁵⁹ SPA, p. 97.

⁶⁰ SPA, p. 35.

design includes LED lighting designed to limit the maximum nominal color temperature to 4000K. The typical pole height for security lighting will be 10 feet and the lighting will be manually operated by switch as well as motion activated. Each inverter within the Solar Facility will also be downlit and switch controlled for repair purposes.⁶¹

3.1.3.8 PROJECT SUBSTATION

The project substation will convert the power from the solar facility to be carried and connected to the transmission grid at the POI. The project substation will be a 34.5/161 kV step-up substation with metering and switching gear, shared by the solar facility and BESS. The substation will have separate transformers and metering for each facility, and will be designed according to regional utility practices, MISO Standards, Midwest Reliability Organization Standards, NESC, and the Rural Utility Service Code. The project substation will take up approximately 4.7 acres of land within the project area, and will be surrounded by an six-foot-tall chain-link security fence with one foot of barbed wire in accordance with NESC standards.⁶² The voltage from the solar facility inverters will be stepped up from 34.5 kV to 161 kV at the substation and then transmitted to the existing SMMPA Rutland Substation.

A Spill Prevention, Control, and Countermeasures Plan is required by the EPA if any facility associated with the Project has oil storage of more than 1,320 gallons. Because the Substation will contain two industry-standard main power transformers, it will require a Spill Prevention, Control, and Countermeasures Plan. Lake Charlotte Solar states that a plan will be prepared prior to the start of commercial operation.⁶³

3.1.3.9 METEOROLOGICAL STATIONS

During operation of the project, five permanent meteorological stations will be installed at the site to measure critical weather data. Weather data will be downloaded weekly or monthly from the onsite stations.⁶⁴

3.1.3.10 ACCESS ROADS

For access to the solar facility, Lake Charlotte Solar will construct approximately 8.2 miles of gravel access roads within the Project Area, including approximately 0.24 miles of graveled access roads associated with the BESS and project substation. Lake Charlotte Solar indicates that these roads are typically 16 feet wide on straight paths, and approximately 45 wide along curves and at internal road intersections, with the final length depending on equipment selection and final engineering design.⁶⁵

During construction, access road installation and use could result in temporary soil disturbance with a width of 16 feet. After gravel is installed and compacted to the engineers' requirements, drainage ditches will be shaped as identified on the final grading plan. Finally, the previously stripped and windrowed topsoil material will be re-spread throughout the Solar Facility.⁶⁶

⁶¹ SPA, p. 33.

⁶² Id.

⁶³ Id.

⁶⁴ Appendix D: Response to Data Requests; SPA, p. 21.

⁶⁵ SPA, p. 32.

⁶⁶ SPA, p. 41.

The anticipated access points for the project include six access points to the solar facility from 210th Avenue, and one access point to the BESS and project substation at 210th Avenue. All proposed entrances will be secured with locked gates.⁶⁷ There are no access points currently located on MnDOT ROW.

Lake Charlotte Solar will work with the appropriate government unit that has jurisdiction over the roads to facilitate any necessary upgrades or changes to public roads to meet required standards. Upgrades or changes to roads could include, but are not limited to, road improvements, additional aggregate, and driveway changes. Lake Charlotte Solar will create a Development Agreement with the appropriate governmental unit that will describe any road use and improvements. Driveway changes, access, and encroachment within a county road right-of-way will require a county entrance permit from Martin County, which will be obtained prior to construction.⁶⁸

3.1.3.11 OPERATING AND MAINTENANCE BUILDING

An operation and maintenance (O&M) building will be shared by the solar facility and BESS, and will be located adjoined to the project substation. The O&M building will be constructed of metal, and contain office areas for onsite staff, a technician room, a restroom, and a storage area for required equipment. Equipment will include a SCADA cabinet, spare panels, spare parts for the project substation and BESS, and safety equipment. Lake Charlotte Solar states that a permanent emergency generator or generators will be installed as a backup to be used in the case of a power outage to support project SCADA equipment. The emergency generator may be powered by diesel or propane and is typically 50KW in size.⁶⁹

3.1.4 How would the solar facility be constructed?

Lake Charlotte Solar anticipates that construction of the solar facility will begin in 2027, and extend through 2028, with an expected in-service date of Q1 2029. This section summarizes construction activities.

3.1.4.1 CONSTRUCTION ACTIVITIES

Lake Charlotte Solar anticipates that construction will begin in Q3 2027, to meet an in-service goal of Q1 2029.⁷⁰ The actual construction schedule will be dependent upon permitting and the availability of required materials.

Pre-construction, construction and post-construction activities for the solar facility will consist of the following:

1. Pre-construction
 - a. Geotechnical analysis
 - b. Design substation and electrical collection system
 - c. Design solar array, access roads, and O&M building
 - d. Underground utility discovery
 - e. Procure all necessary facility components (solar panels, tracking system, transformers)

⁶⁷ SPA, p. 32.

⁶⁸ SPA, p. 32.

⁶⁹ SPA, pp. 32-33.

⁷⁰ SPA, p. 5.

Chapter 3: Proposed Project

- f. Implement management techniques as prescribed in the project Vegetation Management Plan (VMP), determining permanent seeding management approaches and if temporary seeding of a cover crop is applicable.
- 2. Construction
 - a. Gopher One Locate
 - b. Staking
 - c. Site preparation, grubbing, and grading
 - d. Construct laydown areas and set up temporary job site trailers
 - e. Construct fencing
 - f. Civil construction of access roads
 - g. Install PV mounting posts
 - h. Install below-ground or hybrid collection system
 - i. Install electrical enclosure/inverter
 - j. Tracker installation
 - k. PV panel installation
 - l. Construct gen-tie line
- 3. Post-construction
 - a. Restore disturbed areas not intended for permanent above-ground facilities (substation, access roads, etc.).
 - b. Implement vegetation management in accordance with the project VMP to control invasive or noxious species, perennial weeds, problematic native species or woody species.
 - c. Implement vegetation monitoring in accordance with the project VMP
 - d. Test solar facility
 - e. Begin commercial production

Pre-construction, construction, and post-construction activities for the BESS will include the following:

- 1. Pre-construction
 - a. Geotechnical investigation
 - b. Underground utility identification and location
 - c. Initiate soil/vegetation stabilization in areas with no disturbance
 - d. Design BESS
 - e. Procure necessary facility components (BESS inverters, storage devices/containers, emergency generators)
- 2. Construction
 - a. Gopher One Locate
 - b. Staking
 - c. Site preparation, grubbing, and grading
 - d. Maintain perennial vegetation established during preconstruction activities
 - e. Establish temporary or permanent (seasonally dependent) vegetation in disturbed areas, as practical
 - f. Civil construction of access roads
 - g. Construct fencing

- h. Install BESS foundation
 - i. Install BESS components and electrical connection to the project substation
- 3. Post-construction
 - a. Restore disturbed areas not intended for permanent above-ground facilities
 - b. Maintain and restore established vegetation in accordance with the project VMP
 - c. Replace temporary vegetation with perennial vegetation as applicable
 - d. Test BESS facility
 - e. Begin Commercial Operation

During construction of the project, equipment and work vehicles will travel to and from the site. Portions of the Preliminary Development Area will require grading of the land. Typical construction equipment will include scrapers, dozers, dump trucks, watering trucks, motor graders, vibratory compactors and pile drivers, pickup trucks, and backhoes will be used during construction. Specialty construction equipment that may be utilized include a skid steer loader, medium duty crane, all-terrain forklift, concrete truck and boom truck, high reach bucket truck, and truck-mounted auger or drill rig.⁷¹

Lake Charlotte Solar states that upon completion of construction, heavy equipment will be removed from the site.⁷²

Lake Charlotte Solar also notes that geotechnical and pull testing studies will be performed to determine the topsoil and subsoil types, and the mechanical properties of the soils. These variables will be used to engineer the solar array foundation system.⁷³

3.1.4.2 SITE CLEARING AND VEGETATION REMOVAL

Lake Charlotte Solar indicates that after acquiring the necessary permits, construction will begin with the initial site preparation work, including utility locates. Construction of the solar facility may require the clearing of residual row-crop debris from the previous seasons, depending on timing. Alternatively, Lake Charlotte Solar may plant a cover crop in accordance with the project VMP in order to stabilize soils where row crops or other vegetation are not present.⁷⁴

3.1.4.3 EARTHWORK

In order to construct the project, areas of the site will require grading. Areas of the site to be graded will have topsoil and organic matter stripped and segregated from the subsoil in accordance with the project Agricultural Impact Mitigation Plan (AIMP).⁷⁵

3.1.4.4 ACCESS ROADS

Permanent access roads and permanent turnouts will be developed as a component of earthwork for this project. This work will start with stripping and segregating topsoil materials from the anticipated 16-foot-wide road width. Topsoil removed will be moved to suitable locations near the site of removal and spread

⁷¹ SPA, p. 40.

⁷² Id.

⁷³ SPA, p. 40.

⁷⁴ SPA, pp. 40-41.

⁷⁵ SPA, p. 41.

across existing topsoil for storage. Lake Charlotte Solar indicates that storage locations will be identified and recorded on site maps to facilitate final reclamation after decommissioning. Subgrade materials will be compacted to the specified compaction requirements laid out by the civil and geotechnical engineer. After compaction is verified, the road will be installed as designed, with or without geo-fabric depending on soil type, and with a surface of 4 to 12 inches of gravel. Gravel will be placed level with the existing grade to facilitate drainage and minimize ponding. After gravel is installed and compacted, drainage ditches will be shaped as identified on the final grading plan. The final step is to re-spread the previously stripped and windrowed topsoil material throughout the solar facility.⁷⁶

3.1.4.5 SOLAR ARRAYS

Solar array racking system supports will be constructed once grading activities are complete, using steel piles driven into the ground. Lake Charlotte Solar states that the solar facilities will be constructed in blocks, and multiple blocks could be constructed simultaneously. Construction of the blocks will include pre-positioning and driving piles, mounting the tracking rack system to the piles, pre-positioning of panel pallets, mounting panels to the tracking rack system, the completion of electrical connections, terminations and grounding, and installation of cable management systems. In situations where soils are low strength, or consist of loose, non-cohesive sand, helical screw or auger-type foundation posts may be used. Helical screw or auger-type foundation posts are not anticipated; however, Lake Charlotte Solar will make the final determinations after the geotechnical work is completed.

Foundations are typically steel and are used where high load bearing capacities are required. Piles are driven using a hydraulic ram that moves along tracks and is operated by two workers. Soil disturbance will temporarily occur at each pile insertion location and while driving between drilling locations, however it will be restricted to the hydraulic ram/screw machinery, about the size of a small tractor. The remainder of the tracking rack system will be installed by construction crews using hand tools and all-terrain tracked equipment to distribute materials. Array racking will be bolted on top of the foundation piling, creating a “rack” that can fasten to the solar panels.⁷⁷

During array and racking assembly, multiple crews and various types of vehicles will be working within the project area. Lake Charlotte Solar states that to the extent practicable, vehicular traffic will be limited to permanent and temporary access roads to minimize soil disturbance, mixing, and compaction. However, vehicular traffic will occur off the access roads throughout project construction. Panels will be staged in advance throughout the preliminary development area and brought to specific work areas for installation by wagon-type trailers pulled by small tractors or by all-terrain tracked equipment. Lake Charlotte Solar states that installation crews will proceed in serpentine fashion along staked temporary access roads in a pre-established route in order to minimize off-road traffic.⁷⁸

3.1.4.6 ELECTRICAL COLLECTION SYSTEM

Electrical wiring will be necessary to connect the solar panels to inverters, which convert the power generated from Direct Current (DC) to Alternating Current (AC). The AC power will be stepped up through a transformer and brought to the project substation through a system of collection cables. These cables

⁷⁶ Id.

⁷⁷ SPA, pp. 41-42.

⁷⁸ SPA, p. 42.

may be installed in a below-ground system or a hybrid above-ground/below-ground system. In areas where the lines will be located within a wetland or below ground, directional boring will be used during construction. In addition, electrical cables connecting blocks of solar arrays will be directionally bored under public roadways.⁷⁹

3.1.4.7 PROJECT SUBSTATION

Construction of the substation site will include site preparation and installation of substructures and electrical equipment. The substation will include above-ground and below-ground features housing conduits and equipment. Crushed rock will cover the area of the substation, and adequate lighting will be installed around the substation for worker safety during construction and operation.⁸⁰

Substation foundations will either be installed using a small tire backhoe to dig out major foundations prior to pouring the concrete slabs or by using an auger/drill type machine for minor foundations. In both scenarios, all topsoil from the substation footprint will be removed to a suitable pre-established location for storage near the site where the soil was removed and graded to facilitate revegetation. Subsoil will be removed, if necessary, to an acceptable pre-established and approved area for storage. After decommissioning, subsoil will be returned to the area from which it was excavated (as needed), topsoil will be replaced, and the area will be brought back to preconstruction contours.⁸¹

3.1.4.8 BATTERY ENERGY STORAGE SYSTEM (BESS)

Lake Charlotte Solar states that after the necessary permits are received, construction of the BESS will begin with initial site preparation work, including utility locates. Construction of the BESS will require grading of approximately 15.9 acres, and site leveling. Topsoil will be segregated and placed in a designated location.⁸²

Site preparation will include installation of substructures and electrical equipment both above-ground and below-ground. Each equipment enclosure containing the power conversion system and BESS containers will be installed on a foundation designed to support its weight on regional soil conditions. These foundations will either be steel-reinforced concrete slabs or steel pile foundations. For concrete foundations, a small excavator would be used to dig the major foundation areas before pouring the concrete slabs. For steel pile installation, a pile driver embeds steel piles to create a foundation on which the enclosures can be set and attached.⁸³

The power conversion system and BESS containers will be placed on the foundations using an overhead crane and will then be secured and fastened to the concrete pads or steel piles with anchor bolts. Crushed rock will be placed between and around installed BESS equipment, and adequate lighting will be installed around the BESS site for worker safety during construction and operation.⁸⁴

⁷⁹ Id.

⁸⁰ SPA, p. 43.

⁸¹ SPA, p. 43.

⁸² SPA, p. 43.

⁸³ SPA, pp. 43-44.

⁸⁴ Id.

3.1.4.9 COMMISSIONING AND INSPECTION

Lake Charlotte Solar states that the solar facility and BESS will undergo equipment inspection and testing prior to beginning commercial operations and in compliance with site permit requirements. Individual and combined inspection and testing will occur for each component of the solar facility and BESS. Testing, inspections, and commissioning will occur periodically during construction and upon completion of construction.⁸⁵

3.1.4.10 RESTORATION

Restoration of temporary laydown yards and other temporary disturbances will occur as portions of the project near completion in accordance with the project VMP. This will include final spread of topsoil and grading, following de-compaction methods in accordance with the project AIMP. Lake Charlotte Solar anticipates that the post-construction clean-up and site restoration activities will take approximately two to four months.⁸⁶

Lake Charlotte Solar's project VMP⁸⁷ outlines several vegetation maintenance strategies that may be implemented for the project, as well as additional information on site preparation, seed mixes, stormwater and erosion control, temporary cover crops, management of invasive species and noxious weeds, establishment of vegetation, and long-term maintenance and monitoring throughout the life of the project.⁸⁸

3.1.5 How would the solar facility be operated and maintained?

Lake Charlotte Solar estimates the service life of the project to be 30 years. This section summarizes operation and maintenance activities throughout the life of the project.

3.1.5.1 OPERATION AND MAINTENANCE

Lake Charlotte Solar states that following commissioning and commercial operation, the care, custody, and control of the facility will transfer from the construction team to operations staff. Operations staff will have full responsibility for the facility to ensure operations and maintenance are conducted in compliance with approved permits, prudent industry practice, and the equipment manufacturer's recommendations.⁸⁹ The Solar facility and BESS will be professionally maintained and operated by Lake Charlotte Solar, an affiliate, or a contractor. Primary tasks include scheduled monthly and quarterly inspections of electrical equipment, vegetation management, and snow removal on access drives.⁹⁰

The expected life of service of the Lake Charlotte Solar project is 30 years. At the end of 30 years, should Lake Charlotte Solar desire to extend operations, it would apply for Site Permit amendments to allow continued operation of the project, and determine if equipment could be used or if upgrades are required.⁹¹

⁸⁵ SPA, p. 44.

⁸⁶ Id.

⁸⁷ SPA - Appendix C: Vegetation Management Plan (VMP). eDocket no. [20256-219557-05](#).

⁸⁸ SPA, pp. 44-45.

⁸⁹ SPA, pp. 45-46.

⁹⁰ Id.

⁹¹ Id.

Lake Charlotte Solar states that all maintenance activities for the solar facility and BESS will be performed by qualified personnel. Activities will take place during the day to the extent that they do not disrupt energy production. Activities that have the potential for substantial noise generation will be performed during the day to minimize impacts in areas where residents are present. Approved technicians will service the BESS unit and associated equipment monthly, and a performance audit and inspection of the quality of the equipment will be conducted annually. If any equipment needs to be replaced before the end-of-life for the project, Lake Charlotte Solar states that it will reuse, recycle, or dispose of equipment in accordance with applicable regulations and best management practices.⁹²

Substation Control House and Supervisory Control and Data Acquisition System

The project Supervisory Control and Data Acquisition System (SCADA) provides data on solar energy generation and production, availability, meteorology, and communications by communicating with the solar modules. Operators will be notified immediately of any abnormalities allowing for timely corrective action regardless of the time of day.⁹³

The BESS will have a battery management system that will allow automated monitoring and managing of the batteries including performance and temperature, providing control for the charging/discharging of the batteries and control of the individual battery cell temperature with an integrated cooling system.⁹⁴

Performance monitoring of the solar facility and BESS will consist of a weekly or monthly download of the data acquired by the onsite meteorological stations and SCADA system (energy produced, alarms, faults, etc.) and the battery management system.⁹⁵

3.1.5.2 EQUIPMENT INSPECTION

Inspection of the main equipment will occur at regular intervals and will include activities as outlined below and in the joint site permit application.⁹⁶

- Photovoltaic panels: visual check of the panels, tracking system and surrounding grounds to verify the integrity of the panels and tracking structure, the presence of animals and nests, etc.;
- Inverters, transformers, and electrical panels: visual check of the devices including the connection cabinet and the grounding network. Check for presence of water and dust;
- BESS: Performance verification, check of air filters, heating, ventilation, and air conditioning system, and fire suppression systems;
- Electrical check: measurement of the insulation level and dispersion. Check of the main switches and safety devices (fuses);
- Noise: check of abnormal sounds;
- Cabling and wiring: visual check of the buried and aerial electrical line and connection box to verify their status.

⁹² Id.

⁹³ SPA, pp 46-47.

⁹⁴ Id.

⁹⁵ Id.

⁹⁶ SPA, p. 47.

- Gen-tie line, structures, and components: Routine visual inspection (maintenance of structures may be performed by other parties); and
- Project Substation: Scheduled visual inspections.

Table 4 describes the regular operations and maintenance tasks that are anticipated to occur for the project.

Table 4. Regular Operations and Maintenance Tasks⁹⁷

Equipment	Task	Frequency
PV modules	Visual inspection of the panels, wirings and junction, PV strings measurement of insulation, thermal drone scan to detect hot spots	Annual
	Advanced Diagnostics	At owner's direction
	PV panels washing	Only as site-specific conditions warrant
	Vegetation management (if necessary)	Up to three times a year depending on site conditions
BESS	System visual inspection and filter inspection	Quarterly
	Fire safety system inspection and maintenance	Annually
Electric Boards	Case visual check, fuses, surge arresters, torque, DC voltage and current, and grounding check.	Annually
Inverters	Case visual inspection, air intake and filters inspections, conversion stop for lack of voltage, AC voltage and current check, conversion efficiency inspection, datalogger memory download, fuses check, grounding check, torque check	Annually
Support Structures	Visual check, PV panels torque check on random sample	Annually

⁹⁷ SPA, pp. 48-49: Table 4.5.1-1: Operations and Maintenance Tasks and Frequency.

3.1.6 What happens at the end of the solar facility's useful life?

3.1.6.1 REPOWERING AND FUTURE EXPANSION

As the project progresses through its service life, the applicant may seek to repower the project. The applicant's decision on whether to pursue repowering will consider the equipment performance, maintenance costs, extending the useful life of the project, or a desire to increase generation output. Any site permit issued by the Commission will specify the maximum generating capacity, so if the generation capacity increases, the existing site permit must be amended, or a new site permit may be required. Lake Charlotte Solar indicates that any repowering of the project will abide by all applicable local, state, and federal regulations.⁹⁸

3.1.6.2 DECOMMISSIONING

If the project is not repowered, Lake Charlotte Solar will decommission the project and remove the project facilities. Commission-issued site permits require that the permittee be responsible for removing all project components and restoring the site to pre-construction conditions at the end of a project's useful life and that the permittee is responsible for all costs associated with decommissioning the project. Lake Charlotte Solar provided a draft decommissioning plan as Appendix F of its joint site permit application.⁹⁹ The Commission requires updates of the decommissioning plan at five-year intervals and at project milestones such as repowering or changes in ownership.

Decommissioning would include the removal of the solar arrays (panels, racking, and foundation posts and beams), inverters, transformers, equipment pads and foundations, equipment cabinets, access roads, cables and lines, fencing, and drainage features. Standard decommissioning practices will be used, including dismantling and repurposing, salvaging, recycling, or disposing of the solar energy and battery improvements, and restoration. Lake Charlotte Solar states that 90 days prior to the start of the decommission, notice will be sent in writing to the Commission, landowners, affected parties, and county and local units of government. These parties will again be notified once decommissioning activities have been completed.¹⁰⁰

Lake Charlotte Solar estimates that decommissioning will take approximately 60 to 70 weeks to complete and indicates that all equipment and materials will be recycled or disposed of appropriately.¹⁰¹

Lake Charlotte Solar anticipates that the total estimated net cost to decommission the project is approximately \$19,241,732 (approx. \$100,217 per MW). Estimated salvage/scrap value is approximately \$17,081,226, reducing net decommissioning costs to approximately \$2,160,600 (approx. \$11,253 per MW). Lake Charlotte Solar will provide financial assurance through escrow account or surety bond equal to 125% of the costs to ensure proper decommissioning will be provided, with Martin County listed as the beneficiary.¹⁰² The financial assurance will begin on the tenth anniversary of the commercial operation date. The amount of the financial assurance will be adjusted accordingly to offset any increases or decreases in decommissioning costs and salvage values determined during each plan reassessment. Lake

⁹⁸ SPA, p. 54.

⁹⁹ SPA – Appendix F: Decommissioning Plan. eDockets no. [20256-219557-08](#).

¹⁰⁰ SPA, pp. 49.

¹⁰¹ Id; SPA – Appendix F: Decommissioning Plan.

¹⁰² Id.

Charlotte Solar shall submit a revised decommissioning estimate every five years, or any time there is a change in ownership. Each revised plan will reflect advancements in construction techniques, reclamation equipment, and decommissioning standards.¹⁰³

3.2 Project Costs

Lake Charlotte Solar estimates the total cost to construct the project to be approximately \$360.9 - 434.5 million (**Table 5**).¹⁰⁴ Project cost components include construction costs, taxes, tariffs, and panel selection, along with associated electrical and communication systems, and access roads.¹⁰⁵ Actual costs will depend on final material and labor costs, and salvage value from decommissioning.

Table 5. Estimated Project Cost Ranges¹⁰⁶

Project Component	Estimated Cost (\$USD)
Solar Facility	
Engineering, procurement, construction contractor	225 – 260 million
Development Expense	6 – 8 million
BESS	
Engineering, procurement, construction contractor	120 – 150 million
Development Expense	2 - 3.5 million
Solar Facility and BESS	
Interconnection	2.8 million
Financing	5 – 10 million
Project gen-tie line	100 – 150 thousand
Total Project Cost	360.9 – 434.5 million

¹⁰³ Id; SPA - Appendix F: Decommissioning Plan.

¹⁰⁴ SPA, p. 15.

¹⁰⁵ Id.

¹⁰⁶ Id.

3.3 Project Schedule

Lake Charlotte Solar anticipates the project will be in service for commercial operation by 2029, following construction and testing.¹⁰⁷ **Table 6** shows the estimated project development and construction milestones.

Table 6. Anticipated Project Schedule¹⁰⁸

Activity	Anticipated Timeframe
File Commission Site Permit Application	Completed
Acquire Commission Site Permits	Q2 2026
Provide the majority equity investment	Q1 2027
Construction	Q3 2027 – Q4 2028
Testing of Solar Facility and BESS	Q4 2028
Begin Commercial Operation	Q1 2029

¹⁰⁷ SPA, p. 5.

¹⁰⁸ SPA, p. 3.

4 Project Impacts and Mitigation

Chapter 4 describes the environmental setting, affected resources, and potential impacts from the project. It also discusses mitigation of potential impacts.

4.1 How are potential impacts measured?

Potential impacts are measured on a qualitative scale based on an expected impact intensity level; the impact intensity level takes mitigation into account.

A potential impact is the anticipated change to an existing condition caused either directly or indirectly by the construction and operation of a proposed project. Potential impacts can be positive or negative, short- or long-term, and, in certain circumstances, can accumulate incrementally. Impacts vary in duration and size, by resource, and across locations.

Direct impacts are caused by the proposed action and occur at the same time and place. An indirect impact is caused by the proposed action but is further removed in distance or occurs later in time. This EA considers direct and indirect impacts that are reasonably foreseeable, which means a reasonable person would anticipate or predict the impact. Cumulative potential effects are the result of the incremental impacts of the proposed action in addition to other projects in the environmentally relevant area.

4.1.1 Potential Impacts and Mitigation

The following terms and concepts are used to describe and analyze potential impacts:

- **Duration** Impacts vary in length. Short-term impacts are generally associated with construction. Long-term impacts are associated with the operation and usually end with decommissioning and reclamation. Permanent impacts extend beyond the decommissioning stage.
- **Size** Impacts vary in size. To the extent possible, potential impacts are described quantitatively, for example, the number of impacted acres or the percentage of affected individuals in a population.
- **Uniqueness** Resources are different. Common resources occur frequently, while uncommon resources are not ordinarily encountered.
- **Location** Impacts are location-dependent. For example, common resources in one location might be uncommon in another.

The context of an impact—in combination with its anticipated on-the-ground effect—is used to determine an impact intensity level, which can range from beneficial to harmful. Impact intensity levels are described using a qualitative scale, which is explained below. These terms are not intended as value judgments, but rather a means to ensure common understanding among readers and to compare potential impacts between alternatives.

- **Negligible** impacts do not alter an existing resource condition or function and are generally not noticeable to an average observer. These short-term impacts affect common resources.

Chapter 4: Project Impacts and Mitigation

- **Minimal** impacts do not considerably alter an existing resource condition or function. Minimal impacts might, for some resources and at some locations, be noticeable to an average observer. These impacts generally affect common resources over the short- or long-term.
- **Moderate** impacts alter an existing resource condition or function and are generally noticeable to the average observer. Impacts might be spread out over a large area making them difficult to observe but can be estimated by modeling. Moderate impacts might be long-term or permanent to common resources, but generally short- to long-term to uncommon resources.
- **Significant** impacts alter an existing resource condition or function to the extent that the resource is impaired or cannot function. Significant impacts are likely noticeable or predictable to the average observer. Impacts might be spread out over a large area making them difficult to observe but can be estimated by modeling. Significant impacts can be of any duration and affect common or uncommon resources.

Also discussed are opportunities to avoid, minimize, or compensate for potential impacts. Collectively, these actions are referred to as mitigation.

- To **avoid** an impact means to eliminate it altogether, for example, by not undertaking parts or all of a project, or relocating the project.
- To **minimize** an impact means to limit its intensity, for example, by reducing project size or moving a portion of the project.
- To **correct** an impact means to repair, rehabilitate, or restore the affected resource.
- To **compensate** for an impact means replacing it or providing a substitute resource elsewhere, or by fixing it by repairing, rehabilitating, or restoring the affected resource. Compensating an impact can be used when an impact cannot be avoided or further minimized.

Some impacts can be avoided or minimized; some might be unavoidable but can be minimized; others might be unavoidable and unable to be minimized, but compensation can be applied. The level at which an impact can be mitigated might change the impact intensity level.

Regions of Influence

Potential impacts to human and environmental resources are analyzed within specific geographic areas called regions of influence ("ROI"). This EA uses the following ROIs:

- Land Control Area (entire project site including solar generating facility, substation collection corridors, and BESS)
- Local vicinity (1,600 feet from the boundary of the solar generating facility)
- Project area (one mile from the boundary of the solar generating facility)
- Region (Martin County)

Impacts to resources may extend beyond these distances but are expected to diminish quickly. ROIs vary between resources. **Table 7** summarizes the ROIs used in this EA.

Table 7. Regions of Influence for Human and Environmental Resources

Resource Type	Resource Element	Region of Influence
Human Settlement	Displacement, Land Use and Zoning	Land Control Area
	Noise, Property Values	Local vicinity
	Aesthetics, Recreation and Tourism, Cultural Values, Transportation and Public Services	Project area
	Socioeconomics, Environmental Justice, Cultural Values	Region
Public Health and Safety	Electric and Magnetic Fields, Implantable Medical Devices, Public Safety and Emergency Services	Land Control Area
Land-based Economies	Agriculture, Forestry, Mining	Land Control Area, Region
	Tourism	Project area
Archaeological and Historic Resources	—	Project area
Natural Environment	Geology and Groundwater, Soils, Surface Water and Floodplains, Wetlands	Land Control Area
	Vegetation, Wildlife and Habitat (except birds)	Project Area
	Wildlife and Habitat (birds), Rare and Unique Resources	Local vicinity
	Air Quality, Climate Change	Region

4.2 Project Setting

The project is in a rural area, located in Rutland Township in Martin County, Minnesota. The project area is primarily used for agricultural row crop production. Roads within and surrounding the area include state highways, county roads, or township roads.

The proposed solar facility will be located in Rutland Township within Martin County, Minnesota. The location is directly adjacent to the town of Northrop, where the southern boundary of the town is located next to the northeastern perimeter of the project area. Other municipalities near the project area include the cities of Fairmont (approx. 2.8 miles south), Granada (about 4.9 miles east), Trimont (14.4 miles west), and Madelia (21.3 miles north).¹⁰⁹ The project area is bounded by several public roadways, including Minnesota State Trunk Highway 15 to the east, 170th Street on part of the northern perimeter, and 210th Avenue (County Highway 143) along part of the eastern perimeter. A portion of the southwestern perimeter is bound by Charlotte Oak Drive, and public roads 175th Street (County Highway 38), 170th Street, and 160th Street run parallel to each other in an east-west direction through the Land Control Area. The Land Control Area is bisected by County Highway 143 (210th Avenue) running north-south. Several residences border the project and are situated along public roadways. Land use inside the boundary of the Land Control Area is focused on row crop production of predominantly corn and soybean¹¹⁰

The Minnesota DNR and the U.S. Forest Service have developed an Ecological Classification System (ECS) for mapping and landscape classification in Minnesota. Ecological land classifications are used to identify, describe, and map progressively smaller areas of land with increasingly uniform ecological features.¹¹¹ The project is in the Minnesota River Prairie ecological subsection (251B) within the North Central Glaciated Plains Section of the Prairie Parkland Province (251B).¹¹² The subsection is primarily bounded by large till plains flanking the Minnesota River. The southwest area is bounded by the Prairie Coteau, with a series of end moraines defining the eastern boundary. The subsection consists of loamy ground moraine (till plain) as the dominant landform but also includes a significant area of end moraines and lake plains.¹¹³

Most of the subsection is covered by 100 to 400 feet of glacial drift. Cretaceous shales, sandstones, and clays are the most common kinds of bedrock. Dominant soils include well- to moderately well-drained loamy soils formed in gray calcareous till of Des Moines lobe origin. Some soils are clayey and sandy and gravelly soils are present locally, but these account for only a small percentage of soils in the subsection. Annual precipitation ranges from 25 inches in the west to 30 inches in the east, with 11 to 13 inches of growing-season precipitation. The growing season length is approximately 147 to 152 days. The subsection is drained by the Minnesota River, with most smaller rivers and streams eventually emptying into the Minnesota or the Upper Iowa river. The drainage network is poorly developed due to landscape characteristics. The subsection has several lakes, 150 of which are greater than 160 acres in size, however

¹⁰⁹ SPA, p. 56.

¹¹⁰ SPA, pp. 56-57.

¹¹¹ MNDNR (n.d.) *Ecological Classification System: Ecological Land Classification Hierarchy*, retrieved from: <https://www.dnr.state.mn.us/ecs/index.html>

¹¹² SPA, p. 56.

¹¹³ MNDNR, (n.d.) *Ecological Classification System: Minnesota River Prairie Subsection*, retrieved from: <https://www.dnr.state.mn.us/ecs/251Ba/index.html>

many of these are shallow perched lakes. Prior to settlement, wetlands were very common. Most wetlands have since been drained for cropland use.¹¹⁴

Pre-European settlement vegetation included a mixture of tallgrass prairie, with many islands of wet prairie. Forests of silver maple, elm, cottonwood, and willow grew on floodplains along the Minnesota River and other streams. Portions of the Big Stone Moraine supported dry and dry-mesic prairie, with areas of dry gravel prairies on kames. Currently, agriculture is the dominant land use. The subsection in the heart of the Minnesota Cornbelt, with upland prairie species common throughout most of the subsection. Remnant stands of tallgrass prairie are now rare to find.¹¹⁵

4.3 Human Settlement

Large energy projects can impact human settlements. Impacts might be short-term, such as increased local expenditures during construction, or long-term, such as changes to viewshed.

4.3.1 Aesthetics

The ROI for aesthetics is the project area. The project will introduce new manmade structures into the existing landscape. Portions of the project will be visible from local roads adjacent to the project, and nearby residences. For most people who pass through the area on more distant local roads, the impact intensity level is expected to be minimal. For individuals with greater viewer sensitivity, such as people who live in the project area, or those who pass through adjacent roads such as Trunk Highway 15, 160th street, the impact intensity level is anticipated to be moderate to significant. Impacts will be short- and long-term and localized. Potential impacts are unavoidable but can be mitigated in part through visual screening and proper project design.

Aesthetics refers to the visual quality of an area as perceived by the viewer and forms the impression a viewer has of an area. Aesthetics are subjective, meaning their relative value depends upon the perception and philosophical or psychological responses unique to individuals. Aesthetic impacts are equally subjective and depend upon the sensitivity and exposure of an individual. How an individual values aesthetics, as well as perceived impacts to a viewshed, can vary greatly.

A viewshed includes the natural landscape and built features visible from a specific location. Natural landscapes can include wetlands, surface waters, distinctive landforms, and vegetation patterns. Buildings, roads, bridges, energy infrastructure and power lines are examples of built features.

Viewer exposure refers to variables associated with observing a viewshed, and can include the number of viewers, frequency and duration of views, and view location. For example, a high exposure viewshed would be observed frequently by large numbers of people. These variables, as well as other factors such as viewing angle or time of day, affect the aesthetic impact.

The existing landscape in the project is area is primarily rural and agricultural consisting of generally level and gently rolling terrain. The area is primarily comprised of agricultural use with scattered farmsteads

¹¹⁴ Id.

¹¹⁵ MNDNR, (n.d.) *Ecological Classification System: Minnesota River Prairie Subsection*, retrieved from: <https://www.dnr.state.mn.us/ecs/251Ba/index.html>.

situated along roads. Outside of the Land Control Area, a lake-wetland corridor is to the west, and a forested riparian corridor is to the northwest. Lakes within one mile of the Land Control Area include Martin Lake, High Lake, Lake Charlotte, Keister Lake, and Canright Lake. Elm Creek and an associated forest riparian corridor is located to the northwest, outside of the Land Control Area, but within a mile buffer.¹¹⁶ Viewsheds in the area are typically broad, interrupted by cropland, farmsteads and associated residences. Views in the site are largely comprised of agricultural fields and pastures, with local roads and residences visible.

Adjacent to the site are areas of residential and recreational land. The Northrop Softball Field is located between 170th Street and Park Street. The project, including associated infrastructure such as stormwater ponds, will be visible to residences and visitors to the softball field. Residences are primarily located within farmsteads with windrows or shelterbelts of trees. Within the wetland complex, Martin Lake and Lake Charlotte occur along the western portion of the Land Control Area. Slightly larger forested areas exist along the margins of the lakes and the associated wetland complex. There are no residences located within the Land Control Area or the Preliminary Development Area. However, several residences are surrounded by the Land Control Area. Lake Charlotte Solar indicates that these rural residences were intentionally carved out of the project design to ensure that residential yards are avoided. There is also the presence of existing energy infrastructure, including the existing SMMPA Rutland Substation (the POI for the project), which is adjacent to the Land Control Area. Additional infrastructure includes six transmission lines located at least partially within the Land Control Area, three running generally from east to west, and three running generally from north to south, five of which interconnect to the SMMPA Rutland Substation. Three of the electric lines operate at 69 kV, and two operate at 161 kV.¹¹⁷ **Figure 9** and **Figure 10** show the existing viewshed along the east and southern border of the project area.

¹¹⁶ SPA, pp. 57-58.

¹¹⁷ SPA, p. 58.

Figure 9. Existing Landscape and Lines within the Lake Charlotte Solar Project Area¹¹⁸



¹¹⁸ Agricultural fields and existing distribution lines along 160th Street and Charlotte Oak Drive.

Figure 10. Existing viewshed of the Lake Charlotte Solar Project Area¹¹⁹

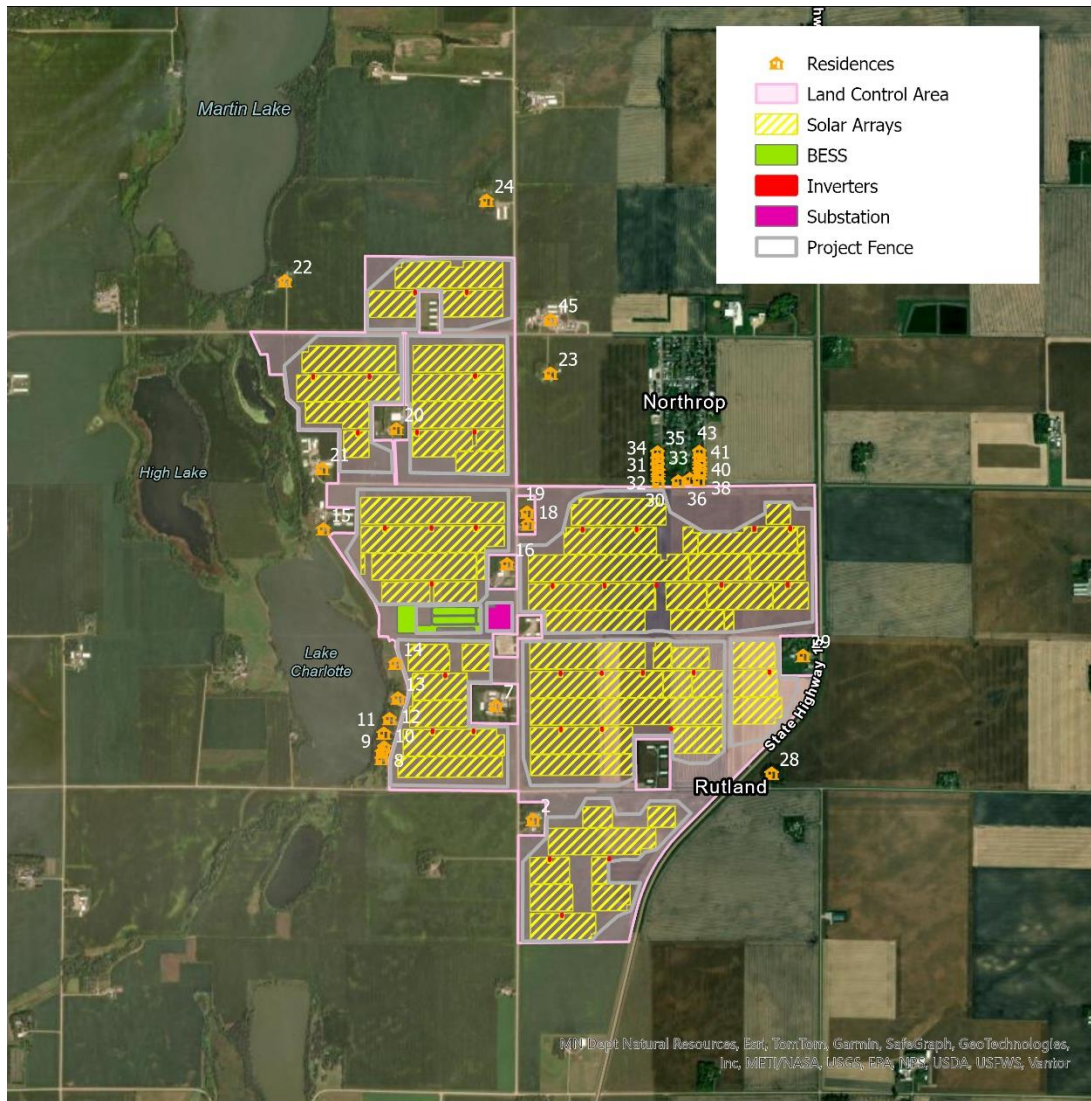


The built environment in the project area includes farmsteads and residences scattered throughout the area, as well as existing energy infrastructure associated with the SMMPA Rutland Substation. There are no businesses within the project area and no residences located within the Land Control Area; however, there are 149 residences within one mile of the project area, including two residences within 150 feet of the preliminary development area.¹²⁰

¹¹⁹ Agricultural fields off Charlotte Oak Drive looking east.

¹²⁰ SPA, pp. 58: Table 5.2.1-1 Residences within One Mile of the Land Control Area

Figure 11. Residences within 1,000 Feet of the Land Control Area



As shown in **Figure 11**, there are approximately 45 residences within 1,000 feet of the Land Control Area. Most adjacent farmsteads and residences are surrounded by shelter breaks of land or trees. The closest residence to the project area is located in the Town of Northrop, approximately 94 feet north of the Preliminary Development Area, and close to 300 feet from the nearest solar array.

POTENTIAL IMPACTS

Solar Facility

The visible elements of the solar facility will consist of new PV solar modules, transformers and inverters, access roads, an O&M facility, a new substation, and security fencing surrounding the project. The project will be a noticeable change in the landscape, converting approximately 1,004 acres of agricultural fields into solar production and BESS facilities. These new features, characterized by complex geometric forms,

lines, and surfaces, may be divergent from the surrounding rural landscape. Lake Charlotte Solar indicates that the majority of the 1,004-acre Preliminary Development Area will be filled with rows of low-profile solar PV panels and perennial vegetation.¹²¹ Although the change will be noticeable from nearby residences and roadways, there are other existing infrastructure features in the landscape such as gravel roads and distribution lines, as well as existing high voltage transmission lines and substations associated with the SMMPA Rutland Substation (**Figure 13**). How an individual viewer perceives the change from a field of corn, or an area of forest, to a field of solar panels depends, in part, on how a viewer perceives solar panels. Will the viewer consider the harvesting of solar energy to be like harvesting crops or will the viewer see agricultural use be replaced by an industrial use? For residents outside the project vicinity and for others with low viewer sensitivity, such as travelers along Interstate 90, aesthetic impacts are anticipated to be minimal, though still noticeable. For these viewers, the solar panels would be relatively difficult to see due to distance, fencing and vegetation, or would be visible for a very short period. For residents in the project vicinity and for others with high viewer sensitivity traveling on local roads in the project vicinity, such as Trunk Highway 15, 160th Street, County Highway 38, or 10th County Highway 143, aesthetic impacts are anticipated to be moderate to significant.

Current agricultural fields and cropland will be converted to acres of solar panels. In addition to the solar arrays, the aboveground project components within the preliminary development area will be visible to residences or those traveling on public roads, including the BESS facility, project substation, inverters, O&M building, fenceline, and gen-tie line structures. Other visible features will include access roads, as well as above-ground electrical lines if the hybrid design option is utilized. If the hybrid electrical configuration is selected, cabling will be strung under each row of panels on steel arms and a steel cable attached to the piles. Lake Charlotte Solar indicates that the above-ground cabling would not likely be visible outside the facility due to a combination of them being attached to the underside of the panels and in-between rows as well as the line of sight with other components (arrays, inverters), distance from observer, and existing vegetative screening around residence.¹²²

PV panels are designed to absorb light to convert the light to electricity. The reflection of light from a solar panel is undesirable, as it results in losses to the panel's electricity generation capacity. When light reaches the interface between two transparent materials with different refractive indexes, such as air and glass, it is both refracted and reflected, a phenomenon known as Fresnel's Law. Only the refracted light crosses the interfaces and continues passing through to the next material, resulting in an incremental loss of light transmission. These transmission losses are compounded as light passes through the consecutive transparent layers in a solar panel to reach the photovoltaic cell, resulting in an optical loss of electrical power.¹²³ To combat these losses, modern-day solar modules come equipped with an anti-reflection coating similar to the type on eyeglasses. These coatings reduce optical losses by applying destructive interference that cancels out the light reflected by the top surface of the module and the photovoltaic cell, increasing solar panel efficiency. Lake Charlotte Solar states that to limit reflection, solar photovoltaic panels are constructed of dark, light-absorbing materials, and covered in an anti-reflective coating. The

¹²¹ SPA, p. 59.

¹²² Id.

¹²³ Shanmugam, N., Pugazhendhi, R., Elavarasan, R.M., Kasiviswanathan, P., & Das, N. (2020). *Anti-Reflective Coating Materials: A Holistic Review from PV Perspective*. DOI: 10.3390/en13102631.

applicant notes that today's panels can reflect as little as two percent of the incoming sunlight, depending on the angle of the sun and assuming use of anti-reflective coatings.¹²⁴

Residents who live adjacent to the solar facility or use the recreational resources surrounding the project will not experience viewsheds interrupted by glare from the solar panels, and aesthetic impacts resulting from glare are not anticipated. Structures from the solar facility, BESS, and gen-tie line would be similar in profile to the existing SMMPA Rutland Substation, as most of the facilities are designed to be low-profile in height (i.e. less than 20 feet), except for the structures for the gen-tie line, which would be less than 150 feet in height.¹²⁵

Lake Charlotte Solar notes that operation of the Project will require downlit security lighting at the entrance of the project, however the lighting will be downlit, switch controlled lights at each inverter for repair purposes.¹²⁶ Impacts to light-sensitive land uses are not anticipated given the rural project location coupled with minimal required lighting for operations.

MITIGATION

Minimizing aesthetic impacts from solar generating facilities is primarily accomplished by locating the facilities so that they are not immediately adjacent to homes, ensuring that damage to natural landscapes during construction is minimized, and shielding the facilities from view by terrain or vegetation. Impacts from facility lighting can be minimized by using shielded and downward-facing light fixtures and using lights that minimize blue hue.

Lake Charlotte Solar states that the project has been designed to avoid tree clearing and, as such, existing trees, windrows, and shelterbelts around residences will be maintained and provide some natural vegetative screening. It also notes that vegetative plantings will be prescribed along and in the vicinity of 170th Street to visually screen the residential areas within the Town of Northrop from the solar arrays.¹²⁷

Site-specific landscaping plans can minimize visual impacts to adjacent land uses and homes through vegetation screening, berms, or fencing. Lake Charlotte Solar can work with adjacent landowners to determine the need for additional vegetation screening and landscaping to minimize aesthetic impacts of the project.

Impacts can be mitigated through standard or special permit conditions. Draft site permits (DSP) for both the solar facility and the BESS are included in [Appendix C](#) and contain several permit conditions related to aesthetic impacts.¹²⁸

- Section 4.3.8 of the DSP is a standard condition that requires the permittee to consider landowner input with respect to visual impacts and to use care to preserve the natural landscape, minimize

¹²⁴ SPA, p. 59.

¹²⁵ Id.

¹²⁶ Id.

¹²⁷ SPA, p. 60.

¹²⁸ Appendix C – Proposed Draft Site Permits.

tree removal and prevent any unnecessary destruction of the natural surroundings in the vicinity of the project during construction and operation.

- Section 5.1 of the Solar DSP is a special condition for visual screening plans: The Permittee shall develop a site-specific Visual Screening Plan. The Visual Screening Plan shall be designed and managed to mitigate visual impacts to adjacent residences and roadsides. The Visual Screening Plan shall at a minimum include:
 - (a) objectives for screening of nearby residences and roadsides; and
 - (b) a description of the types of trees and shrub species to be used, the location of plantings, and plans for installation, establishment, and maintenance.

The location of trees and shrubs included in the Visual Screening Plan that are located within the Permittee's site control shall be included in the Site Plan filed under Section 8.3. The Permittee is required to maintain and ensure the successful growth, health, and maintenance of the vegetation for 3 years.

At least 14 days prior to the pre-construction meeting, the Permittee shall file:

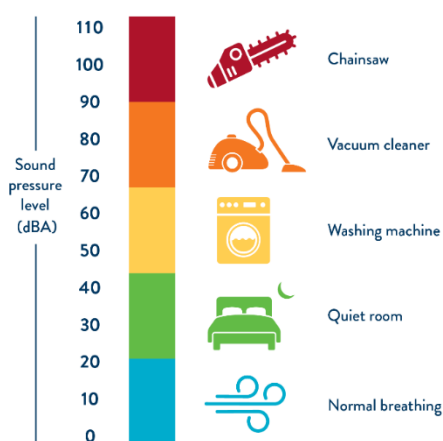
- (a) the Visual Screening Plan;
 - (b) documentation of coordination between landowners within 500 feet of the site boundary; and
 - (c) an affidavit of its distribution of the Visual Screening Plan to landowners within 500 feet of the site boundary.
- Section 5.2 of the DSP is a special condition relating to Roadside Vegetation Management and Blowing Snow Control. The Permittee is required to coordinate with the Minnesota Department of Transportation (MnDOT) regarding vegetative design between the project area and Trunk Highway 15 to ensure the safe operation of Trunk Highway 15.

4.3.2 Noise

The ROI for noise is the local vicinity. Distinct noises are associated with the different phases of project construction. The impact intensity level during construction will range from negligible to significant depending on the activity. Potential impacts are anticipated to be intermittent and short-term. These localized impacts during construction could affect nearby residences and might temporarily exceed state noise standards. Impacts are unavoidable but can be minimized. Operational impacts are anticipated to be minimal.

Noise can be defined as any undesired sound. It is measured in units of decibels on a logarithmic scale. The A-weighted scale ("dBA") is used to duplicate the sensitivity of the human ear.¹²⁹ A three dBA change in sound is barely detectable to average human hearing, whereas a five dBA change is clearly noticeable.

¹²⁹ MPCA. *A Guide to Noise Control in Minnesota*. (2015). <https://www.pca.state.mn.us/sites/default/files/p-gen6-01.pdf>.

Figure 12. Common Noise Levels

A 10 dBA change is perceived as a sound doubling in loudness. Noise perception is dependent on a number of factors, including wind speed, wind direction, humidity, and natural and built features between the noise source and the receptor.

Figure 12 provides decibel levels for common indoor and outdoor activities.¹³⁰

In Minnesota, noise standards are based on *noise area classifications* (“NAC”) corresponding to the location of the listener, referred to as a receptor. NACs are assigned to areas based on the type of land use activity occurring at that location. Household units, designated camping and picnicking areas, resorts and group camps are assigned to NAC 1; recreational activities (except designated camping and picnicking areas) and parks are assigned to NAC 2; agricultural and related activities are assigned to NAC 3.

Noise standards are expressed as a range of permissible dBA over a one-hour period. L₁₀ may be exceeded 10 percent of the time, or six minutes per hour, while L₅₀ may be exceeded 50 percent of the time, or 30 minutes per hour. Standards vary between daytime and nighttime hours. There is no limit to the maximum loudness of a noise. **Table 8** provides current Minnesota noise standards.

Table 8. Noise Area Classifications (dBA)

Noise Area Classification	Daytime (7:00 a.m. to 10:00 p.m.)		Nighttime (10:00 p.m. to 7:00 a.m.)	
	L ₁₀	L ₅₀	L ₁₀	L ₅₀
1	65	60	55	50
2	70	65	70	65
3	80	75	80	75

The MPCA noise standards are public health standards. That is, they protect people from noise generated by all sources at a specific time and place. The total sum of noise at a specific time and location cannot exceed the standards. The MPCA evaluates whether a specific noise source is in violation by determining if the source causes or significantly contributes to a violation of the standards.

¹³⁰ Federal Aviation Administration (2022) *Fundamentals of Noise and Sound*, retrieved from: https://www.faa.gov/regulations_policies/policy_guidance/noise/basics/.

The project area is currently within a rural, agricultural and residential area. The project area may have existing sounds that can interact with project construction noise. Lake Charlotte Solar describes common sounds from equipment, such as tractors and combines, sounds from birds and insects, sound generated from traffic on roadways, and wind rustling through vegetation as potentially occurring in the project area.¹³¹

POTENTIAL IMPACTS

The primary noise receptors are the local residences. There are no residences within the site, however there are 43 residences within 1,000 feet, and 149 residences within one mile of the Land Control Area (**Figure 11**).¹³² The proposed project is in a rural area, mostly comprised of agricultural and forested land. Typical rural sound levels in rural residential areas vary from 40 dBA during the day to 34 dBA at nighttime.¹³³ Residences are in NAC 1. Noise receptors could also include individuals working outside in the project vicinity. Potential noise impacts from the project are associated with construction noise and operational noise.

Construction

Noise from construction will be temporary in duration, and the amount of noise will vary based on what type of construction is occurring, and the distance from the noise source. Sound levels from grading equipment and backhoes are anticipated to generate noise between 80 and 85 dBA at 50 feet,¹³⁴ and are not dissimilar from the typical tractors and larger trucks used in agricultural communities during harvest.

Pile driving equipment associated with installing the solar array foundations will be the most significant source of construction noise at roughly 101 dBA at 50 feet.¹³⁵ The noise from construction activities would dissipate with distance and be audible at varying decibels, depending on the locations of the equipment and receptor. Thus, this construction noise will generate a temporary increase in ambient noise, which could exceed state noise standards at select times and locations. Lake Charlotte anticipates the pile driving activities will take up to 16 weeks across the site. However, Lake Charlotte Solar notes that workers will sequence construction activities; site preparation may occur at one portion of the site while pile driving occurs at a different location.¹³⁶ Impacts from project construction will be intermittent and localized, however, and times that exceed noise standards will likely be within the maximum allowable noise levels that can occur within the NAC-1 L₁₀ and L₅₀ limits (**Table 8**).

Lake Charlotte Solar indicates that construction will be limited to daytime operations as much as possible, minimizing potential disturbances associated with construction equipment.¹³⁷

¹³¹ SPA, pp. 66-67.

¹³² SPA, p. 58.

¹³³ SPA, p. 67.

¹³⁴ SPA, p. 68.

¹³⁵ SPA, pp. 68-69.

¹³⁶ Id.

¹³⁷ SPA, p. 70.

Operation

Noise levels during operation of the project are anticipated to be minimal. The primary source of noise from the solar facility will be from the cooling system housed in the inverters and BESS units, along with limited noise from panel rotation and transformers.¹³⁸ Lake Charlotte Solar identified sound receptors near the project and located 75 receptors within 3,200 feet of the land control area. For the inverters, the nearest sound receptor is a nearby residence located approximately 352 feet from the nearest inverter. A sound pressure level of less than 50 dBA is modeled at 58 feet from the inverter, therefore, this residence should not experience significant sound impacts. The closest residential noise impact from the project will most likely be on the nearest residence to the BESS, which is within 815 ft and models a noise level of 49.4 dBA. Lake Charlotte Solar states that modeling of all planned BESS units indicates that the anticipated noise level of the BESS site operating at 100% capacity will remain below 50 dBA, confirming compliance with Minnesota's state noise standard.¹³⁹ However, this residence will likely experience moderate noise impacts from BESS cooling.

MITIGATION

Sound control devices on vehicles and equipment (e.g., mufflers), conducting construction activities during daylight hours, and running vehicles and equipment only when necessary are common ways to mitigate noise impacts. Lake Charlotte Solar indicates that construction will be limited to daylight hours.¹⁴⁰

- Section 4.3.7 of the DSP (**Appendix C**) is a standard condition that requires the permittee to comply with Minnesota noise standards as established under Minnesota Rule, part 7030.010 to 7030.0080, and to limit construction and maintenance activities to daytime hours to the extent practicable.
- Section 5.3 of the Solar DSP is a special condition that requires the permittee to provide notice to adjacent residences detailing when major noise-producing construction activities are planned to occur.
- Section 5.1 of the BESS DSP is a special condition that requires the permittee file a noise impact assessment at least 14 days prior to the pre-construction meeting. The noise impact assessment shall summarize the results from noise propagation modeling that incorporates noise inputs from the selected equipment and the facility layout shown in the site plans.
- Section 5.2 of the BESS DSP is a special condition that requires the permittee develop a post-construction noise study methodology in consultation with Commission staff. The Permittee must conduct the postconstruction noise study and file with the Commission the completed post-construction noise study within 18 months of commencing commercial operation. The BESS facilities and associated facilities shall be placed and operated such that the Permittee shall, at all times, comply with noise standards established by the MPCA. Operation of the facility shall be modified, or project components shall be removed from service if necessary to comply with these noise standards

¹³⁸ SPA, p. 70.

¹³⁹ SPA, pp. 69-70.

¹⁴⁰ SPA, p. 70.

4.3.3 Cultural Values

The ROI for cultural values is the region. Development of the project will change the character of the area, potentially changing residents' sense of place. There are tradeoffs for rural communities between renewable energy projects and retaining the rural character of an area. Construction and operation of the project is not anticipated to impact or alter the work and leisure pursuits or community events of residents in the project area in such a way as to impact the underlying culture of the area.

Cultural values can be defined as shared community beliefs or attitudes that define what is collectively important to the group. These values provide a framework for individuals and community thought and action. Infrastructure projects believed inconsistent with these values can deteriorate community character. Those found consistent with these values can strengthen it. Projects often invoke varying reactions and can, at times, weaken community unity.

Individual and community-based renewable energy is becoming more valued across the nation. Utility scale renewable projects—generally located far from load centers in rural areas—are also valued, but, at times, opposed by residents. The highly visible, industrial look and feel of these projects can erode the rural feeling that is part of residents' sense of place.

Martin County has a rural character, with scattered areas of natural areas such as prairie and wetlands living among an agricultural-dominant culture. The Martin County Historical Society describes the early history of Martin County as a colorful time. It was marked by courageous individuals willing to brave the elements of the Minnesota prairie in order to make a better life for themselves and their families. Much of what they accomplished has in many ways influenced present day Martin County, whether it be names of geographic locations such as streets, cities, and lakes or the initiation of business interests which, although having evolved over time, may not have existed had it not been for the entrepreneurial endeavors of many of those early pioneers.¹⁴¹

Prior to European settlement, Native American groups lived in the project study area for thousands of years. Original indigenous tribes living in the project area include the Winnebago, whose historic territory spans across southwestern Minnesota as well as parts of Wisconsin, Illinois, Nebraska, and Iowa. The Tribe was moved from what is now northeast Iowa, to Minnesota to South Dakota, and finally to their current location in Nebraska where the Winnebago Indian Reservation was established by treaties of 1865 and 1874.¹⁴² The Winnebago, or Ho-Chunk are a branch of the Sioux Nation, with other Sioux branches residing nearby including the Upper Sioux Community Pezihutazizi Oyate (Dakota Nation), the Lower Sioux Indian Community, and the Mdewakanton Band of Dakota.¹⁴³

Cultural values in the region can also be informed by ethnic heritage. Residents of Martin County derive primarily from white alone or European ancestry (not Hispanic or Latino), which accounts for the 88.6 percent of the population, followed by 8.0 percent Hispanic or Latino, 1.1 percent Black or African

¹⁴¹ Martin County Historical Society, *History*. <https://www.mchsmn.org/county-history>.

¹⁴² Winnebago Tribe (n.d.), *Tribal History*. <https://winnebagotribe.com/tribal-history/>.

¹⁴³ SPA, p. 60.

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American, 0.9 percent Asian American, 0.7 percent Native American, and 0.4 percent Native Hawaiian and Pacific Islander. 1.5 percent represent two or more races.¹⁴⁴

Overall, the region surrounding the project area has cultural values tied to the area's heritage, geographic features, seasonal events, national holidays, and municipal events, and the local agricultural economy. According to the U.S. Department of Agriculture (USDA) Census of Agriculture, approximately 99.5 percent of the land in Martin County is used for agricultural purposes.¹⁴⁵ Examples of regional cultural events include the Fairmont-Red Rock Center for the Arts in Fairmont, Minnesota which hosts live music and weekly art walk throughs, the Northrop- Martin Luther High School in Northrop, Minnesota which hosts a surplus of events throughout the year, and the Chubb House, a historic house in Fairmont, Minnesota from 1867 that hosts weekly coffee chats and other events. Examples of winter events in the area include the Southern Minnesota Pond Hockey Tournament, the Fairmont Lakes Foundation Ice Fishing Tournament, and free weekly yoga classes hosted by the Fairmont United Methodist Church. Summertime events include the Martin County Fair, Interlaken Heritage Days, and the Fairmont Triathlon.¹⁴⁶

POTENTIAL IMPACTS

The project contributes to the growth of renewable energy and is likely to strengthen and reinforce this value in the area. At the same time, the development of the project will change the character of the area. The value residents put on the character of the landscape within which they live is subjective, meaning its relative value depends upon the perception and philosophical or psychological responses unique to individuals. Because of this, construction of the project might—for some residents—change their perception of the area's character, thus potentially eroding their sense of place. The project area is not located within areas where regional community events typically occur, so impacts on community events are not anticipated. Construction of the project is not anticipated to alter existing cultural resources. However, in the event that cultural discoveries are made during construction, or if there are anticipated impacts to cultural and historic resources, Lake Charlotte Solar should ensure that the proper local government unit (LGU) is contacted, such as the county, or MnDOT, to determine next steps.

MITIGATION

Two permit conditions included in the DSP address cultural values.

- Section 4.3.23 of the DSP is a standard condition that addresses impacts to cultural properties. The permittee is required to avoid impacts to archeological and historic resources during construction, and the permit condition describes requirements for in the event resources are encountered. The permittee is also required to train workers about cultural resources.
- Section 5.4 of the DSP is a special condition requiring the permittee to work with the appropriate LGU regarding cultural discoveries during construction. This includes MNDOT coordination if there are discoveries within MNDOT Right of Way, and coordination with the Tribal Nations if there are cultural discoveries within the project site.

¹⁴⁴ U.S. Census Bureau (2020). <https://www.census.gov/quickfacts/fact/table/martincountyminnesota/HSD310223>.

¹⁴⁵ USDA, *Census of Agriculture County Profile, Martin County Minnesota* (2022). https://www.nass.usda.gov/Publications/AgCensus/2022/Online_Resources/County_Profiles/Minnesota/cp27091.pdf

¹⁴⁶ SPA, pp. 60-61.

4.3.4 Land Use and Zoning

The ROI for land use and zoning is the land control area. The impact intensity level is anticipated to be moderate due to the conversion of agricultural land to land used for energy generation. Land use impacts are anticipated to be long-term and localized. Constructing the project will change land use from agricultural to solar energy production for a minimum of 30 years. After the project's useful life, the land control area could be restored to agricultural or other planned land uses by implementing appropriate restoration measures. Impacts can be minimized by using best practices to protect land and water quality.

Land use is the characterization of land based on what can be built on it and how the land is used. Zoning is a regulatory tool used by local governments (cities, counties, and some townships) to guide specific land uses within specific geographic areas. Land cover documents how much of a region is covered by forests, wetlands, impervious surfaces, agriculture, and other land and water types, including wetlands. Construction of solar generating facilities and transmission line will alter current and future land use and land cover.

The National Land Cover Database (NLCD) provides "spatial reference and descriptive data for characteristics of the land surface" nationwide.¹⁴⁷ This data was used to determine the land use conversion that will take place. As shown in

Table 9, the project site land cover is largely used by cultivated agriculture including cropland and hay/pasture (approx. 95 percent). Other land cover types include developed areas around residences and farmsteads, roads, and the SMMPA Rutland substation. There are also very small pockets of herbaceous wetlands, woody wetlands, and forested land, totaling less than one percent of the land.¹⁴⁸

Table 9. Project Site Land Cover

Category	Land Control Area (Acres)	Percentage
Cultivated Crops	1,216.7	95.3%
Developed*	59.9	4.7%
Emergency Herbaceous Wetlands	0.1	<0.1%
Woody Wetlands	0.1	<0.1%
Forested	<0.1	<0.1%
Total	1,276.7	100%

*Developed land includes low intensity, medium intensity, and open space

¹⁴⁷ U.S. Geological Survey. *The National Land Cover Database (NLCD) 2019 Products (ver 3.0)*. (February 2024), retrieved from: <https://www.usgs.gov/data/national-land-cover-database-nlcd-2019-products-ver-30-february-2024#publications>.

¹⁴⁸ SPA, pp. 74-75.

Permits from the Commission supersede local zoning, building, or land use rules.¹⁴⁹ Though zoning and land use rules are superseded, the Commission's permit decisions must be guided, in part, by consideration of impacts to local zoning and land use in accordance with the legislative goal to "minimize human settlement and other land use conflicts."¹⁵⁰

The project area is located within Rutland Township, and adjacent to the town of Northrop in Martin County, Minnesota. The project site falls within areas primarily zoned as Agriculture, with areas zoned as Shoreland Special Protection adjacent to Martin Lake, and a portion zoned as Shoreland Residential Recreation in the vicinity of Charlotte Oak Drive.¹⁵¹

Martin County has a Renewable Energy Ordinance, which defines a Solar Energy System to include both solar energy generating and storage equipment, classifying the project as a Large Solar Energy System. According to the ordinance, Large Solar Energy Systems are conditionally permitted in Agricultural Districts, however not in Shoreland Special Protection and Shoreland Residential Recreation districts.¹⁵²

This also identifies setbacks that are to be applied within zoning districts, which are included in

Table 10: County Setbacks. Lake Charlotte Solar reviewed Martin County's Zoning standards, noting that the Martin County Renewable Energy Ordinance states that the regulations of the underlying zoning districts apply for these projects. For the Land Control Area, this would be within the Agricultural Zoning District.¹⁵³

Table 10: County Setbacks¹⁵⁴

Feature	Setback Requirement to Solar Facility (feet)	Preliminary Development Area Fence (at closest in feet)	Solar Array (at closest in feet)	BESS (at closest in feet)
Front yard (from the centerline of public roads)	200	130	200	635
Side yard	30	41	50	172
Rear yard	30	53	47	172
Centerline of County Drain Tile*	75	0*	86	N/A

*The County Ordinance does not have a specified setback from county drain tile. Recommended buffer distances based on tile diameter were provided by Martin County Drainage Administration.

¹⁴⁹ Minnesota Statutes [216E.10](#), subd. 1.

¹⁵⁰ Minnesota Statutes [216E.03](#), subd. 7.

¹⁵¹ SPA, p. 76.

¹⁵² Id.

¹⁵³ SPA, p. 36.

¹⁵⁴ SPA, pp. 36-37, Table 4.2-1: Martin County Setbacks.

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****Because county drain tile is present within the Preliminary Development Area, no distance to county drain tile is provided. Distance between solar arrays and County drain tile is provided for the primary solar arrays; the alternate arrays are not considered.**

Martin County is also part of the Region Nine Development Commission (RNDC). The RNDC's 2022-2026 Comprehensive Economic Development Strategy includes a strategy to preserve natural assets, protect the natural environment, and sustain local and regional ecosystems while maintaining innovation and economic growth without impacting the way of life for future generations. The strategy encourages a just transition to clean energy. The plan lists strategies to maintain and expand clean energy production and invest in value-added opportunities from agricultural and forest products as well as strategies to explore incentives and expand renewable energy development while also developing land use objectives that balance economic competitiveness/resilience with human well-being and natural amenities preservation.¹⁵⁵

Lake Charlotte Solar indicates that it is coordinating with Martin County and Rutland Township to confirm that the project is in alignment with applicable current and future zoning and to obtain any required permits or approvals not otherwise pre-empted by the state site permit process. Additionally, Lake Charlotte Solar states that it will coordinate with Martin County and the township on a road use agreement to protect local roads.¹⁵⁶

POTENTIAL IMPACTS

Development of a solar farm in this area will temporarily change the land use from predominantly agricultural use to energy generation for the life of the project. The land use change of the site would be consistent with the future economic development of the region, which emphasizes encouraging a just transition to clean energy by understanding and addressing its impacts on the workforce and energy infrastructure.¹⁵⁷ The anticipated development of large solar energy and battery storage systems within the Martin County Agricultural District are conditionally permitted uses. However, the project will be sited within a Shoreland Special Protection area and a Shoreland Residential Area, which may create trade-offs for the local community.

Commission permits supersede local zoning and permitting. However, the placement of energy infrastructure near floodplains and water resources can have impacts on the ability for the structures to appropriately function over time, which may require additional planning and preparation with LGUs, including emergency response teams. Lake Charlotte Solar is expected to thoroughly engage with LGUs, including the county, township, and local community groups on emergency plans throughout the life of the project.

Lake Charlotte Solar indicated that coordination is ongoing with Martin County, including the Martin County Drainage Systems Manager, who noted that county-maintained drainage systems are present within the Land Control Area and shared the digitally mapped locations of tile. The Drainage System Manager provided typical buffer distances from county drain tile to maintain sufficient area to allow for

¹⁵⁵ Region Nine Development Commission, *Comprehensive Economic Development Strategy*. (2022). <https://www.rndc.org/wp-content/uploads/2022/02/2022-2026-CEDS-Final.pdf>.

¹⁵⁶ SPA, p. 76.

¹⁵⁷ Region Nine Development Commission, *Comprehensive Economic Development Strategy*. (2022). <https://www.rndc.org/wp-content/uploads/2022/02/2022-2026-CEDS-Final.pdf>.

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routine maintenance and repair and to avoid damage to the drain tiles. Lake Charlotte Solar will continue coordination with Martin County.¹⁵⁸

Overall, the change of land use is in line with local government goals. The addition of the solar facility and BESS is expected to have a minimal to moderate impact on the rural character of the surrounding area, and a minimal impact on the township or county land use throughout the life of the project. The project has the potential to change the character of land use in shoreland areas, which may require additional coordination and mitigation through engagement with the local government and community.

MITIGATION

The project is proposed on a site of 1,276.7 acres, mostly comprised of agricultural cropland. Construction of the project will convert approximately 1,216.7 acres of cultivated cropland to development for solar energy production. In coordination with the Minnesota Department of Agriculture (MDA), Lake Charlotte Solar has developed an Agricultural Impact Mitigation Plan (AIMP).¹⁵⁹ In addition, Lake Charlotte Solar has developed a draft Vegetation Management Plan (VMP)¹⁶⁰ that will undergo review by several state agencies within the Interagency Vegetation Management Planning Working Group (VMPWG), including MDA, MPCA, DNR, and BWSR.

The AIMP and VMP identify measures to avoid, minimize, mitigate, and/or repair potential negative agricultural and land impacts that may result from the construction operation, or decommissioning of the project. The AIMP and VMP outline ensures the project area may be returned to future agricultural use after the end of the project's useful life, including identifying best management practices (BMPs) that will be used during construction and strategies to reduce impacts such as runoff and erosion.

Although the project is subject to oversight by the State of Minnesota under the Minnesota Power Plant Siting Act, coordination with Rutland Township, Martin County, and state agencies such as MnDOT will be important. It may be necessary to develop area-specific plans, such as a road-use agreement, or an emergency response plan, to ensure impacts to local resources are mitigated in a way that is consistent with community goals.

The DSP's (**Appendix C**) have several permit conditions related to the preservation and restoration of agricultural land:

- Section 4.3.17 requires the applicant to prepare a vegetation management plan to prevent soil erosion and invest in soil health by establishing a plan to protect soil resources by ensuring perennial cover. The applicant's draft VMP is found in Appendix C of the site permit application.¹⁶¹
- Section 4.3.18 requires the applicant to prepare an AIMP that details methods to minimize soil compaction, preserve topsoil, and establish and maintain appropriate vegetation to ensure the project is designed, constructed, operated and ultimately restored in a manner that would

¹⁵⁸ SPA, p. 78.

¹⁵⁹ SPA – Appendix E: Agricultural Impact Mitigation Plan (AIMP).

¹⁶⁰ SPA – Appendix C: Vegetation Management Plan (VMP).

¹⁶¹ Id.

preserve soils to allow for the land to be returned to agricultural use. The applicant's draft AIMP is found in Appendix E of the site permit application.¹⁶²

- Section 5.5 of the Solar DSP is a special condition requiring the permittee to coordinate with Martin County and Rutland Township to create a road use agreement. The road use agreement shall include requirements for maintenance and repair as necessary to ensure the safe operation of local roads within Martin County and Rutland Township.
- Section 9 requires the applicant to prepare a decommissioning plan focused on returning the project site to pre-project condition at the end of the project's useful life. The applicant's draft decommissioning plan is found in Appendix F of the site permit application.¹⁶³
- Section 9.2 requires removal of all project-related infrastructure upon decommissioning.

4.3.5 Property Values

The ROI for property values is the local vicinity. Impacts to property values within the local vicinity could occur; however, changes to a specific property's value are difficult to determine. Because of this uncertainty, impacts to specific properties in the project vicinity could be minimal to moderate and would decrease with distance and over time.

Impacts to property values can be measured in three ways: sale price, sales volume, and marketing time. These measures are influenced by a complex interaction of factors. Many of these factors are parcel specific, and can include condition, size, acreage, improvements, and neighborhood characteristics; the proximity to schools, parks, and other amenities; and the presence of existing infrastructure, for example, highways or transmission lines. In addition to property-specific factors, local and national market trends, as well as interest rates, can affect all three measures. The presence of a solar facility becomes one of many interacting factors that could affect a specific property's value.

Because each landowner has a unique relationship and sense of value associated with their property a landowner's assessment of potential impacts to their property's value is often a deeply personal comparison of the property "before" and "after" a proposed project is constructed. The landowner's judgments, however, do not necessarily influence the market value of a property. Professional property appraisers assess a property's value by looking at the property "after" a project is constructed. Moreover, potential market participants are likely to see the property independent of the changes brought about by a project; therefore, they do not take the "before" and "after" into account the same way a current landowner might. Staff acknowledge this section does not and cannot consider or address the fear and anxiety felt by landowners when facing the potential for negative impacts to their property's value.¹⁶⁴

¹⁶² SPA – Appendix E: AIMP.

¹⁶³ SPA – Appendix G: Decommissioning Plan.

¹⁶⁴ This paragraph is based, in part, on the following: Chalmers, James (October 30, 2019) *High Voltage Transmission Lines and Residential Property Values in New England PowerPoint Presentation*, retrieved from: https://www.nhmunicipal.org/sites/default/files/uploads/Annual_Conference/2019/Sessions/Wednesday/market_effects_of_utility_rows_presentation-1045am.pdf; Department of Commerce (2022) *Rights-of-way and Easements for Energy Facility Construction and Operation*, retrieved from: <https://apps.commerce.state.mn.us/eera/web/project-file/12227>.

Electrical generating facilities can impact property values. Often, negative effects result from impacts that extend beyond the project location. Examples include emissions, noise, and visual impacts. Unlike fossil-fueled electric generating facilities, the project would not generate emissions. Potential impacts from operational noise are not anticipated. Aesthetic impacts will occur, but because the project is relatively low in height – as compared to a wind turbine or a smokestack – impacts would be localized.

Large solar facilities exist in Minnesota; however, limited sales information is available. A review of the literature identified one peer-reviewed journal article that addressed impacts to property values based on proximity to utility-scale, PV solar facilities. The Lawrence Berkeley National Lab studied over 1,500 large-scale PV solar facilities in six states (including Minnesota) to determine whether home sale prices were influenced within 0.5 miles (from over 1.8 million home sale transactions).¹⁶⁵ In summary, the study found that effects, “on home sale prices depend on many factors that are not uniform across all solar developments or across all states.”

In Minnesota in particular, the study found that homes within one-half mile of large-scale PV solar facilities had a 4 percent reduction in home sale prices compared to homes 2-4 miles away. This finding was considered statistically significant. Additionally, only large-scale PV solar facilities developed on previously agricultural land, near homes in rural areas, and larger facilities (roughly 12 acres or more) were found to be linked to adverse home sale price impacts within one-half mile. The analysis did not include consideration of site features or site design, for example setbacks or landscaping features, which could play a role in nearby property valuation. Another limitation of the study was the lack of examination of the broader economic impacts or benefits to host communities from large-scale PV solar facilities, which might positively impact home sale prices.

Other studies with smaller sample sizes did not find a consistent negative impact to the sales value of properties near large solar facilities. Chisago County Environmental Services and Zoning found that home sales exceeded assessed value near the 100 MW North Star solar facility at a rate comparable to the general real estate market in the area.¹⁶⁶ Additionally, a study prepared by CohnReznick examined compared sale prices of properties near 10 existing large solar facilities (including the North Star project) with comparable properties, and did not find a consistent negative impact to the sales value of properties near large solar facilities.¹⁶⁷

POTENTIAL IMPACTS

Impacts to the value of specific properties within the project vicinity are difficult to determine but could occur. Considerations such as setbacks, benefits to the community, economic impact, and vegetative screening could have an unpredictable range of influence over property value. Several, but not all, of the closest residents have some screening from the project.

¹⁶⁵ Elmallah, S., Hoen, B., Fujita, K.S., Robson, D., & Brunner, E. (2023). *Shedding light on large-scale solar impacts*, Retrieved from: <https://www.sciencedirect.com/science/article/pii/S0301421523000101>.

¹⁶⁶ Kurt Schneider, Environmental Services Director, (October 20, 2017) *Email to Commerce staff*.

¹⁶⁷ McGarr, Patricia L. et al. (2021), *Real Estate Adjacent Property Value Impact Report*, <https://www.linncountyiowa.gov/DocumentCenter/View/18016/Real-Estate-Adjacent-Property-Value-Impact-Report-PDF?bidId=>.

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Based on analysis of other utility-scale solar projects, minimal to moderate property value impacts could occur, but significant negative impacts to property values in the project vicinity are not anticipated. To the extent that negative impacts do occur they are expected to be within one-half mile of the solar facility and to decrease with distance from the project and with time. Aesthetic impacts that might affect property values would be limited to residences and parcels in the project vicinity where the solar panels are easily visible, such as along adjacent roadways where visual screening is not present.

MITIGATION

Impacts to property values can be mitigated by reducing aesthetic impacts and impacts to future land use. Impacts can also be mitigated by Lake Charlotte Solar through individual agreements with neighboring landowners.

- Section 4.3.8 of the DSP is a standard condition that requires the permittee to consider landowner input with respect to visual impacts and to use care to preserve the natural landscape, minimize tree removal and prevent any unnecessary destruction of the natural surroundings in the vicinity of the project during construction and operation.
- Section 5.1 of the Solar DSP is a special condition requiring the applicant to develop visual screening plans along with adjacent landowners. The Permittee shall develop a site-specific Visual Screening Plan. The Visual Screening Plan shall be designed and managed to mitigate visual impacts on adjacent residences and roadsides.

4.3.6 Tourism and Recreation

The ROI for tourism and recreation is the project area. Potential impacts to recreational opportunities and tourism are anticipated to be minimal. During construction, unavoidable short-term impacts will occur as construction equipment and vehicle traffic will create noise, dust, and visual impacts. These impacts will be intermittent and localized. There are no anticipated long term impacts from this project.

In 2023, the leisure and hospitality industry in Martin County accounted for \$48,783,177 in gross sales, and 883 private sector jobs.¹⁶⁸ Tourism near the project area is largely related to recreational activities including fishing, snowmobiling, cross country skiing, golfing, and hunting. Areas within the project area include the Prairieland Trail, which crosses through the project area, and is maintained by the Blizzard Snowmobile Club. The Northrop Softball Field is also located within the town of Northrop, approximately 250 feet north of the Land Control Area. Residences located along 170th St. are present between the softball field and the Land Control Area. A second softball field also exists within the Town of Northrop, associated with Saint James Lutheran Church and the associated St. James Evangelical Lutheran School, and is located about 0.2 mile north of the Land Control Area.¹⁶⁹

There are several recreational opportunities provided in the local area. The project site is not directly within any Wildlife Management Areas (WMAs), Public Water Access (PWA) sites, or federal or state parks. However, there are PWA sites adjacent to the project area associated with the local chain of lakes.

¹⁶⁸ Explore Minnesota (n.d.) *2023 Leisure & Hospitality Industry Data*. https://mn.gov/tourism-industry/assets/2023%20MN%20L%26H%20Data_tcm1135-665060.pdf.

¹⁶⁹ SPA, p. 78.

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Located within 500 feet of the project site on the west border is Lake Charlotte, which has public access. The MDNR PWI Basin Lake Charlotte is located approximately 150 feet west of the Land Control Area, and an unnamed MDNR PWI Basin Wetland is approximately 50 feet west of the Land Control Area.¹⁷⁰

POTENTIAL IMPACTS

Impacts to tourism and recreation can be direct or indirect. Direct impacts are impacts that directly impede the use of a recreational resource, for example, closing of a trail to facilitate project construction. Indirect impacts reduce the enjoyment of recreational resources but do not prevent use, for example, aesthetic impacts visible from a scenic overlook.

Impacts to tourism and recreation from construction and operation of the project are anticipated to be minimal and temporary.

Due to construction, there will be temporary short-term increases in traffic and noise that could potentially impact recreational activities near the project area, such as local hunting opportunities. There could also be a temporary increase in dust and visual impacts from construction equipment for local visitors. However, access to recreational resources, such as public waters, the softball fields and the snowmobile trail, is not likely to be impacted throughout construction and the operation of the project. Public use of the Prairieland Trail is not anticipated to be obstructed by the presence of project facilities. However, it is recommended that Lake Charlotte Solar coordinate with the Blizzard Snowmobile Club to ensure any potential impacts are minimized or avoided. Lake Charlotte Solar states that as part of this coordination, Lake Charlotte will provide the locations of the new access points from County Highway 143 to the trail manager in advance of construction.¹⁷¹

Construction of the Project is likely to overlap with various Minnesota hunting seasons. Lake Charlotte Solar states that the timing of construction will be communicated to landowners within and adjacent to the Land Control Area in advance, and the Land Control Area would be off limits to hunting during active construction. After construction is complete, hunting in areas adjacent to the Project would be allowed to continue as before, but no hunting would be allowed within the project fencelines.¹⁷²

No significant long-term impacts to recreational activities are anticipated.

MITIGATION

Impacts to recreational activities are anticipated to be minimal and temporary.

Section 5.8 of the Solar DSP requires the permittee to work with the Blizzard Snowmobile Club and associated snowmobile clubs responsible for maintaining Segment 161 of the Prairieland Trail to identify alternative routes and interconnection to trails in the area and develop a plan for rerouting portions of Segment 161 that may fall within the project area. The permittee will be responsible for sponsoring the reroute efforts.

¹⁷⁰ SPA, p. 105.

¹⁷¹ SPA, p. 79.

¹⁷² SPA, p. 79.

Lake Charlotte Solar states that it will employ dust control techniques as needed during construction of the project to minimize or avoid fugitive dust.¹⁷³ Continued coordination with locally affected community members and organizations, such as the Blizzard Snowmobile Club and landowners who may use the area for hunting, may minimize interruption to recreational activities.

4.3.7 Transportation and Public Services

The ROI for transportation and public services is the project area. Potential impacts to the electrical grid, roads, and other utilities are anticipated to be short-term, intermittent, and localized during construction. Impacts to water (wells and septic systems), railroads, pipelines, and airports are not expected to occur. Overall, construction-related impacts are expected to be minimal and are associated with possible traffic increases. During operation, negligible traffic increases would occur for maintenance. Impacts are unavoidable but can be minimized.

Public services are services provided by a governmental entity or by a regulated private entity to provide for public health, safety, and welfare.

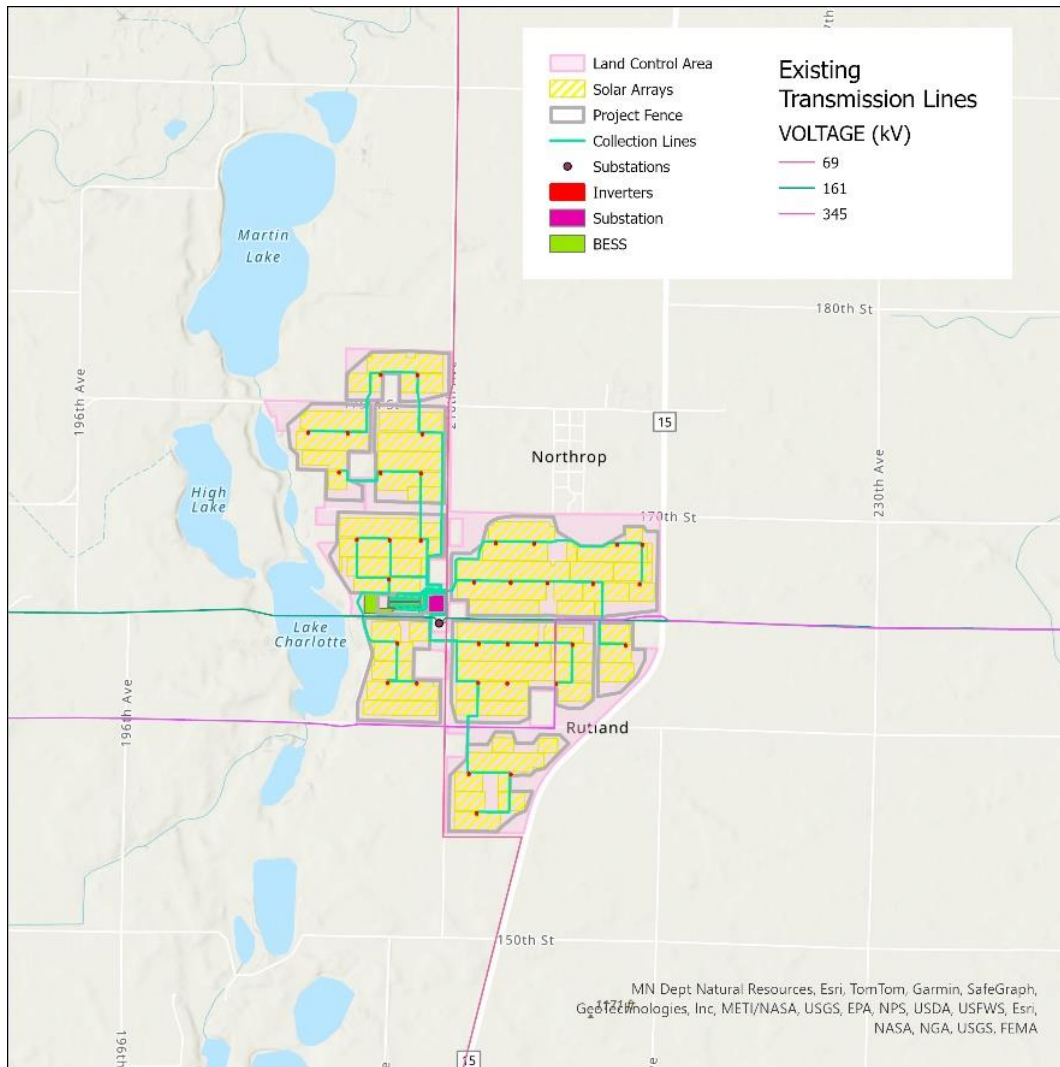
Water and Wastewater In Martin County, water is supplied by surface water and ground water and is serviced by Red Rock Rural Water System and Fairmont Public Utilities.¹⁷⁴ Most residents in the surrounding area have private septic systems and/or drain fields.

Electric Utilities The project area includes existing transmission and electric utility infrastructure. The project is located adjacent to the Southern Minnesota Municipal Power Agency (SMMPA) Rutland Substation, which is the POI for the project. Six transmission lines are partially within the Land Control Area, three of which run from east to west, and three running from north to south, several of which interconnect to the SMMPA Rutland Substation (**Figure 13**).

¹⁷³ SPA, p. 79.

¹⁷⁴ SPA, p. 70.

Figure 13: Electric Utilities Map



Pipelines There are no known pipelines within the project area. The nearest natural gas transmission pipelines are mapped approximately 2 miles northwest of the Land Control Area, running generally southwest to northeast, and 2.4 miles southwest of the Land Control Area running generally northwest to southeast.¹⁷⁵

Roads The major roadways within and near the project site include roads that border or intersect the Land Control Areas, including: 160th Street, 170th Street, 175th Street, 210th Avenue, 220th Avenue/ Minnesota State Highway 15, and Charlotte Oak Drive. Roads within a mile of the Land Control Area include: 230th Avenue, Park Street, South Judson Street, North Judson Street, South James Street, North James Street, South Bridgeman Street, Inness Street, Freund Street, Von Holst Street, Harper Street, State

¹⁷⁵ SPA. p. 72.

Street (County State Aid Highway 38), Martin Luther Drive, 190th Street, Ranch Road, 196th Avenue, 150th Street, and 208th Avenue.¹⁷⁶

Table 11 shows traffic data from the Minnesota Department of Transportation of roads that surround or bisect the Land Control Area.

Table 11: Annual Average Daily Traffic in Project Vicinity (2022-2023)

Roadway	AADT Traffic Volume Total
Minnesota State Highway 15/220th Avenue (South of South Junction County State Aid Highway 38)	5,141
Minnesota State Highway 15/220th Avenue (North of County State Aid Highway 44)	3,495
County State Aid Highway 145/Bridgeman Street	228
County Road 143/210th Avenue	57
Interstate 90 (West of Minnesota State Highway 15)	6,417
Interstate 90 (West of County State Aid Highway 53)	7,755
County State Aid Highway 38/170th Street	791
County State Aid Highway 38/175th Street (West of County Road 145)	528
County State Aid Highway 38/175th Street (East James Street)	550
County State Aid Highway 39/North Bixby Road (North of Interstate 90)	2,149
County State Aid Highway 39/190th Avenue (South of County State Aid Highway 44)	1,153
County Road 142/190th Street	183
County State Aid Highway 143/150th Street	115
County State Aid Highway 143/208th Avenue	98

Railroads There are no railroads within one mile of the project. The closest railroads to the project include a Dakota, Minnesota & Eastern Railroad 2.8 miles southeast of the Land Control Area that runs generally east-west and a Union Pacific Railroad approximately 3.5 miles south of the Land Control Area that runs generally east-west.¹⁷⁷

Airports There are no FAA-registered airports located in the project area. The nearest Federal Aviation Administration (FAA)-registered airport to the Lake Charlotte Project is the Fairmont Municipal Airport located approximately 4.2 miles southeast of the Land Control Area. This airport operates two asphalt runways and is used primarily for transient and local general aviation. Lake Charlotte Solar states that

¹⁷⁶ SPA, pp. 70-72.

¹⁷⁷ SPA, p. 71.

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aerial imagery was reviewed to identify any private landing strips within a mile of the Land Control Area, and none were identified.¹⁷⁸ In order to assure safety, both the FAA and MnDOT office of Aeronautics have established guidelines for the location of structures near airports. The FAA has height restrictions for development near public airports and guidelines for placement of buildings and other structures near high frequency omnidirectional range navigation systems. MnDOT has zoning areas around public airports that restrict the area where buildings and other structures can be placed.

POTENTIAL IMPACTS

Large energy projects can impact public services, such as buried utilities or roads. These impacts are usually temporary, for example, road congestion associated with material deliveries. Impacts can be long-term if they change the area in a way that precludes or limits public services.

Water and Wastewater Impacts to water and wastewater systems, are not anticipated. There are no wells located within the preliminary development area. However, there are several wells near and within the project area, including one active domestic use well and three sealed, environmental bore wells existing within the Land Control Area. Lake Charlotte Solar states that it has reviewed publicly available GIS data to identify EPA-designated sole source aquifers, wells listed on the County Well Index, Drinking Water Supply Management Areas, and MDH Wellhead Protection Areas, to verify that none of these exist in the Land Control Area.¹⁷⁹ Lake Charlotte Solar shall continue to assess any wells identified prior to and during construction to determine if they are open, and seal them, if necessary, in accordance with MDH requirements.

Lake Charlotte Solar indicates that a subsurface sewage treatment system, permit will be obtained prior to the installation of any septic system during construction.¹⁸⁰

Roads Throughout the project, access to the site will be from the existing state, county, and township road systems, with the possibility of minor field access or driveway changes depending on final design. Lake Charlotte Solar indicates that no changes to existing roadways are anticipated.¹⁸¹ Currently, there are no planned project access points or areas of collection affecting MnDOT roads. However, due to the proximity of Trunk Highway (TH) 15, Lake Charlotte Solar is expected to notify MnDOT in a timely manner should this change, in order provide MnDOT an opportunity to review and conduct the appropriate district and resource group staff coordination for any potential change(s) to TH impacts.¹⁸²

Temporary, infrequent localized traffic delays may occur when heavy equipment enters and exists local roadways near the project, or equipment and materials are delivered to the project site. Slow-moving vehicles during construction have the potential to cause some delays, however these are anticipated to be minimal and short in duration.

During the construction phase, temporary traffic impacts are anticipated on some public roads near the Preliminary Development Area, primarily from construction personnel traveling to and from the Project

¹⁷⁸ SPA, p 71.; US FAA, *Airport Data and Information Portal* <https://adip.faa.gov/agis/public/#/public>.

¹⁷⁹ SPA, p. 95.

¹⁸⁰ SPA, p. 9.

¹⁸¹ SPA, p. 57.

¹⁸² MnDOT, *Scoping Comments*. September 16, 2025. eDocket no. [20259-223056-01](#).

and slow-moving construction vehicles.¹⁸³ The number of vehicles traveling to and from the project site will vary by day and fluctuate throughout the construction period. Construction traffic will use the existing county roadway system to access the Preliminary Development Area and deliver construction materials and personnel. Lake Charlotte Solar stated that overweight or oversized loads are unlikely, however, if they are required, Lake Charlotte Solar will obtain the appropriate approvals prior to construction. Traffic during construction is estimated to average approximately 150-160 people at the site, consisting of pickup trucks, cars, and other types of employee vehicles onsite for most of construction. It is also estimated that approximately 18-48 semi-trucks per day depending on stage of construction and delivery timeline.¹⁸⁴

This increase in traffic will be perceptible to area residents, but because the average daily traffic in the area is relatively low, this increased traffic is not expected to affect traffic function. Slow-moving construction vehicles may also cause delays on smaller roads, similar to the impact of farm equipment during planting or harvest. However, these delays should be minimal for the relatively short construction delivery period. While construction will create an increase in local traffic, the increase is not expected to have an impact on the functional capacity of the local roads. The functional capacity of a two-lane paved rural highway is more than 5,000 vehicles per day; therefore, this traffic may be perceptible to area residents, but the increase in volume is not expected to affect traffic function, as the surrounding roads will continue to be below capacity.¹⁸⁵ Except for the temporary increased use of existing state, county and township roads for access to and construction of the project, no changes to the existing public roads are anticipated.

Once construction is complete, traffic impacts will be negligible. During the operations phase a small maintenance crew will use pickup trucks on a regular basis to monitor and maintain the facilities as needed, but traffic will not likely be impacted as a result.¹⁸⁶

Railroads There are no railroads within a mile of the project. Impacts to railroads are not anticipated.

Electric Utilities Lake Charlotte Solar will coordinate with Gopher State One Call before and during construction to fully understand infrastructure locations and safety concerns and to avoid possible structural conflicts. Lake Charlotte Solar states that it will also conduct an American Land Title Association survey to identify the locations of underground utilities. The project's final design will minimize and avoid impacts to underground utilities; however, if conflicts are unavoidable, Lake Charlotte will coordinate with the utility to develop an approach to reroute or otherwise protect the utility. Underground utilities will be marked prior to construction start.¹⁸⁷

Pipelines The project area does not contain any pipeline corridors. No impacts to pipelines are anticipated.

¹⁸³ SPA, p. 73.

¹⁸⁴ Id.

¹⁸⁵ Id.

¹⁸⁶ SPA, p 74.

¹⁸⁷ SPA, p. 73.

Air Safety The FAA's Obstruction Evaluation/Airport Airspace Analysis (OE/AAA) Notice Criteria Tool was used to determine if further aeronautical study or FAA notice filing is needed for the project.¹⁸⁸ The tool generated a "no notice required" result for project facilities.¹⁸⁹ Therefore, no impacts to the local air traffic or the Fairmont Municipal Airport are anticipated.

MITIGATION

Water and Wastewater Lake Charlotte Solar should assess any wells identified prior to and during construction to determine if they are open, and seal them, if necessary, in accordance with MDH requirements. A well construction permit from the Minnesota Department of Health (MDH) would be required if a well is installed at the facility for use in the future. In addition, an approved well drilling contractor should be hired prior to well construction.

Utilities Section 4.3.5 of the DSP (**Appendix C**) is a standard permit condition that requires the permittee to minimize disruptions to public utilities. Impacts to electrical infrastructure that cross the project can be mitigated by appropriate coordination with the owners of the existing infrastructure and following industry best practices.

The location of underground utilities can be identified using the Gopher State One Call system during engineering surveys and marking the underground utility locations prior to construction. Lake Charlotte Solar will coordinate with Gopher State One Call to confirm buried utility locations prior to construction. If a utility is identified, the project component or the utility itself might need to be relocated if it cannot be successfully crossed. Relocation, as well as any necessary crossing, would need to be coordinated with the affected utility.

Roads Changes or additions to driveways from county roads will require permits from the county. Project entrances on State Highways are not guaranteed by MnDOT.

- Section 4.3.22 of the Solar DSP requires permittees to inform road authorities of roads that will be used during construction and acquire necessary permits and approvals for oversize and overweight loads. Permitted fencing and vegetative screening cannot interfere with road maintenance activities, and the least number of access roads shall be constructed.
- Section 5.5 of the Solar DSP is a special condition requiring the permittee to coordinate with Martin County and Rutland Township to create a road use agreement. The road use agreement shall include requirements for maintenance and repair as necessary to ensure the safe operation of local roads within Martin County and Rutland Township.

In addition to permit requirements for driveway access and the conditions of the draft site permit, the following practices can mitigate potential impacts:

- Pilot vehicles can accompany movement of heavy equipment.

¹⁸⁸ SPA, pp. 57-58; Federal Aviation Administration (FAA) Notice Criteria Tool, 2023. Retrieved from: <https://oeaaa.faa.gov/oeaaa/external/gisTools/gisAction.jsp>.

¹⁸⁹ SPA, p. 74.

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- Deliveries can be timed to avoid traffic congestion and dangerous situations on the roadway.
- Traffic control barriers and warning devices can be used as necessary.
- Photographs can be taken prior to construction to identify pre-existing conditions. Permittees would be required to repair any damaged roads to preconstruction conditions.

Lake Charlotte Solar indicates that it will coordinate with Martin County and the township on a road use agreement to protect local roads.¹⁹⁰

Pipelines There are no pipelines within the project site or ROW, therefore no mitigation is proposed.

4.3.8 Socioeconomics

The ROI for socioeconomics is the region. The impact intensity level is anticipated to be minimal to significant and positive. Effects associated with construction will, overall, be short-term and minimal. Significant positive effects may occur for individuals. Impacts from operation will be long-term and significant. Adverse impacts are not anticipated.

Martin County is within Minnesota Department of Employment and Economic Development (DEED) Economic Development Region (EDR) 9, the South Central region. In 2024, the sectors with the largest employment in Region 9 were Office & Administrative Support (11.4%), Production (10.6%), Transportation and Material Moving (9.5%) Food Preparation & Serving Related (9.0%), and sales (8.5%).¹⁹¹

Unemployment rates fluctuate with the economy, but the unemployment rate for Region 9 has typically been close, but slightly under Minnesota's unemployment rate.¹⁹² In 2024, Martin County had a similar unemployment rate (2.8%) as the state average (3.0%).¹⁹³ The county also has a fluctuating labor force participation. Labor force growth has slowed in recent years, although there has been a loss of fewer workers since 2010. Moving forward, Martin County is expected to see a labor force decline from 2025 to 2035.¹⁹⁴ The cost of living in Martin County has also increased over the past 2 years, with costs up in many areas, however it had a lower cost of living than the state overall.¹⁹⁵

Martin County is growing slower than Minnesota as a whole; between 2020 and 2024, the population in Martin County decreased by 2.3 percent, compared to a growth of 2.4 percent for the population of the State of Minnesota since 2020. This decrease in population partially comes from a negative natural increase, that is, more deaths than births occurring in the county, as well as net out-migration of people who have lived in Martin County moving to other areas. Despite suffering domestic out-migration, Martin County also welcomed net international immigration – gaining new Minnesotans from foreign

¹⁹⁰ SPA, p. 76.

¹⁹¹ Minnesota Department of Economic Employment and Development (DEED), *Economic Development Region 9: South Central Minnesota 2024 Regional Profile*. (2025), https://mn.gov/deed/assets/2024_Region9_tcm1045-133261.pdf.

¹⁹² Id.

¹⁹³ MN DEED, *Employment and Economic Development 2024 County Profile: Martin County*. (2025). https://mn.gov/deed/assets/052725_martin_tcm1045-407664.pdf.

¹⁹⁴ Id.

¹⁹⁵ Id.

countries.¹⁹⁶ The median age of Martin County is also higher than the State, with median ages of 44.5 and 38.6 years, respectively, as the County has a larger percentage the population between 55 and 75 years old.¹⁹⁷

Table 12. Population Characteristics¹

	2010 Census*	2020 Census*	% Change 2010 - 2020	2023 Estimate	% Minority‡	Median Household Income (\$)	% Below Poverty Level
Minnesota	5,303,925	5,706,494	7.6	5,713,716	22	87,556	9.2
Martin County	20,840	20,025	-3.9	19,864	7	62,969	11.1
Rutland Township	437	366	-16.2	310	2.6	95,208	12.6
Northrop	227	223	-1.7	212	6.6	63,750	13.2
Fairmont	10,666	10,487	-1.7	10,348	7.7	59,228	12.4

* U.S. Census Bureau, <https://data.census.gov/>

¹2023 American Community Survey 5-year estimates

‡ Minority population includes all persons who do not self-identify as white alone.

From 2010 to 2020, the population of Martin County decreased by 3.9 percent, the population of Rutland Township decreased by 16.2 percent, and the population of Northrop decreased by 1.7 percent, compared to a growth of 7.6 percent for the state.¹⁹⁸ Martin County, Rutland Township and the city of Northrop have lower minority populations than the state. Martin County and Northrop have a lower median household income than the state. However, Rutland Township has a higher median household income compared to the state. Martin County, Rutland Township, and the city of Northrop all have a higher percentage of people living below the poverty level than Minnesota as a whole.¹⁹⁹ (Table 12).

POTENTIAL IMPACTS

The impact intensity level is anticipated to be moderately positive. Potential impacts associated with construction will be positive, but minimal and short-term. Lake Charlotte Solar states that the project is designed to be socioeconomically beneficial to the landowners, local governments, and communities.²⁰⁰ Significant positive effects might occur for individuals.

Construction of the project is likely to result in temporary increased expenditures for lodging, food and fuel, transportation, and general supplies at local businesses. This includes Rutland township, as well as

¹⁹⁶ Id.

¹⁹⁷ Id.

¹⁹⁸ U.S. Census Bureau, *2023 American Community Survey 5-year estimates*. Retrieved from: https://data.census.gov/all?g=040XX00US27_050XX00US27061_060XX00US2706112412,2706115277_2500000US1940_2800000US271940&y=2023&d=ACS+5-Year+Estimates+Data+Profiles.

¹⁹⁹ Id.

²⁰⁰ SPA, p. 81.

the cities of Northrop and Fairmont, which may offer other options for restaurant and lodging choices. Construction of the project will also create local job opportunities for various trade professionals and will generate and circulate income throughout the community by investing in local business expenditures as well as state and local taxes. Lake Charlotte Solar estimates that during construction, 200 construction and service-related jobs will be created.²⁰¹

Lake Charlotte Solar anticipates general skilled labor to be available in Martin County or Minnesota to serve for the project's basic infrastructure and site development needs. However, Lake Charlotte Solar notes that specialized labor will be required for certain portions of the project, and it may be necessary to import specialized labor from other areas of Minnesota or neighboring states. Lake Charlotte Solar also notes much of the workforce needed to construct a Solar Facility and BESS must be comprised of Minnesota licensed electricians because most of the assembly and wiring work for solar installations is considered electrical work under the Minnesota State Electrical Code.²⁰² Lake Charlotte Solar states that it will issue a request for proposals to find contractors that will include a preference for contractor bids that propose to use local personnel to the greatest extent feasible while also aligning with the project's budget, timeline, industry standards, and corporate safety policies. Lake Charlotte Solar will also include language clarifying that contractor bids must comply with Minnesota's prevailing wage requirements as outlined in Minn. Stat. § 177.42.²⁰³

Minnesota's Renewable Energy Objectives²⁰⁴ and Renewable Energy Initiatives²⁰⁵ establish several Commission priorities relating to renewable energy project construction including:

- Creation of jobs that support Minnesota families
- Employing local workers for project construction
- Recognition of the rights of workers to organize and unionize

The location of the proposed project gives Lake Charlotte Solar the potential to meet Commission priorities by providing significant socioeconomic benefits to local, union construction workers. "Local workers" are defined as Minnesota residents and/or permanent residents who live within 150 miles of a proposed energy facility.²⁰⁶

Ensuring that the workforce developing this project includes local labor is a potential way to maximize community benefit. Hiring local labor can be beneficial for the area and those who reside there. Local workers are found to generate approximately three times more local economic activity through spending

²⁰¹ SPA, p. 82.

²⁰² SPA, p. 81.

²⁰³ Id.

²⁰⁴ Minnesota Statute [216B.1691, Subd. 9.](#)

²⁰⁵ Minnesota Statute [216B.2422.](#)

²⁰⁶ Minnesota Statute [216B.2422, Subd. 1.](#)

than a non-local worker at the individual level,^{207, 208} and a largely local workforce can generate up to double the economic impact of a largely non-local workforce.²⁰⁹

The use of local workers who reside in Martin County could have significant positive impacts, not only through providing employment, but by developing employment opportunities, offering living wage jobs that attract young people and support families, and providing experience for the local labor force tailored to industry needs. Employment in the renewable energy sector provides workers the opportunity to develop the required technical skills to work in the green economy,²¹⁰ which can increase opportunities for future employment. Minnesota is anticipated to continue to expand renewable energy development in the coming years,²¹¹ and the state's investments in the development and incentivization of clean energy will enable future renewable projects.

Once the project is operational, Lake Charlotte Solar will pay property tax and production taxes on the land and energy production to local governments. Property taxes are calculated on the land underlying the facility. Because the land for the solar generating facility is used primarily for solar generation, the land is classified as Class 3a (commercial/industrial/public utility) which is taxed at a higher rate than land used primarily for homestead or agriculture. The value of the generation equipment is exempted from the property tax.²¹²

Minnesota has adopted a production tax of \$1.20/MWh paid 80 percent to counties and 20 percent to the cities and townships.²¹³ Lake Charlotte Solar estimates that the project will generate an annual county and local benefit of approximately \$358,000 in solar energy production and property tax revenue over 30 years, including an estimated \$287,000 to Martin County, and \$71,700 to Rutland Township. In addition,

²⁰⁷ Franco, L. 2020 *A Transformative Investment: Maximizing the Socioeconomic Benefits of the Fargo-Moorhead Diversion Project*. Retrieved from: <https://d3ciwvs59ifrt8.cloudfront.net/272d7204-1f87-45d8-a9dc-744c9333acc6/e6f95bb7-5559-4dd9-a0bd-21c636c5b778.pdf>

²⁰⁸ Franco, L. 2019. *Catching the Wind 3.0: The impact of local versus non-local hiring practices on wind farms in North Dakota*. Retrieved from: https://ndlegis.gov/assembly/67-2021/testimony/SNATRES-2301-20210204-5243-F-FRANCO_LUCAS_A.pdf

²⁰⁹ Franco, L. 2020. *Maximizing The Benefits of Wind Energy Development Through Local Construction Hiring: The Northern Divide Wind Energy Project Case Study*. Retrieved from: <https://d3ciwvs59ifrt8.cloudfront.net/272d7204-1f87-45d8-a9dc-744c9333acc6/b5b7e911-3d92-4eab-bbaa-799e0db0ac86.pdf>.

²¹⁰ Grima, S., Sood, K., Özen, E., & Dalli Gonzí, R.E. (Eds.). (2024). *Greening our economy for a sustainable future*, retrieved from: <https://www.sciencedirect.com/book/9780443236037/greening-our-economy-for-a-sustainable-future>

²¹¹ The Business Council for Sustainable Energy, *2024 Minnesota Energy Factsheet*, retrieved from: <https://www.cleanenergyeconomymn.org/wp-content/uploads/2024/04/2024-Minnesota-Energy-Factsheet.pdf>

²¹² Minnesota Statutes [272.02](#), subdivision 24; Minnesota House Research, *Property Tax 101: Property Tax Variation by Property Type*, October 2024, <https://www.house.leg.state.mn.us/hrd/pubs/ss/ssptvart.pdf>.

²¹³ Minnesota Department of Revenue, *Solar Energy Production Tax*. 2023. <https://www.revenue.state.mn.us/solar-energy-production-tax#:~:text=The%20Solar%20Energy%20Production%20Tax%20rate%20is%20%241.20%20per%20megawatt,nameplate%20capacity%20exceeding%201%20megawatt>

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lease and purchase payments paid to the landowners will offset potential financial losses associated with removing a portion of their land from agricultural production.²¹⁴

The project area is largely situated on land that is used for agricultural production. This is also accurate for the region, as Martin County is comprised of 97 percent cultivated farmland, and 454,000 acres of the 467,000 acres in the county are actively used as pastureland, or cropland to produce corn, soybeans, and other crops. The market value of agricultural production in Martin County was approximately \$943 million in 2022.²¹⁵ If the project is constructed, approximately 997 acres of agricultural land could be removed from production that is currently used for agricultural production.²¹⁶ The removal of cultivated land is likely to result in an incremental decrease to agricultural-related businesses, such as farm dealerships, seed dealers, and dealers of agricultural inputs such as fertilizer and pesticides, in the area. The extent of any decrease in sales is difficult to determine, but the project will cause removal of approximately 0.22 percent of the approximately 454,025 acres of farmland in Martin County, which is not anticipated to have a significant impact.²¹⁷

MITIGATION

Socioeconomic impacts are anticipated to be positive overall. Adverse socioeconomic impacts will be limited to the temporary loss of agricultural production on the land currently farmed; however, Lake Charlotte Solar indicates that these adverse impacts associated with the loss of agricultural land and agricultural production will be mitigated through lease, easement, or purchase payments to landowners.²¹⁸

Several sections of the Draft Site Permits (DSP's) address socioeconomic impacts, including employment:

- Section 4.5.3 of the Solar DSP requires the permittee, as well as its construction contractors and subcontractors, to pay no less than the prevailing wage rate.
- Section 8.5 of the DSP requires quarterly reports concerning efforts to hire Minnesota workers.
- Section 8.6 of the DSP requires the permittee, as well as its construction contractors and subcontractors, to pay no less than the prevailing wage rate.

4.3.9 Environmental Justice

The ROI for environmental justice analysis is the region. The project is not within an environmental justice (EJ) community as defined by Minnesota Statute. It will not have disproportionately high and adverse human health or environmental effects on low-income, minority, or tribal populations.

²¹⁴ SPA, pp. 82.

²¹⁵ USDA, *Census of Agriculture County Profile, Martin County Minnesota* (2022).
https://www.nass.usda.gov/Publications/AgCensus/2022/Online_Resources/County_Profiles/Minnesota/cp27091.pdf.

²¹⁶ SPA, p. 83.

²¹⁷ USDA, *Census of Agriculture County Profile, Martin County Minnesota* (2022).
https://www.nass.usda.gov/Publications/AgCensus/2022/Online_Resources/County_Profiles/Minnesota/cp27091.pdf.

²¹⁸ SPA, pp. 82.

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Environmental justice is “the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies.”²¹⁹ The goal of this “fair treatment” is not to shift risks among populations, but to identify potential disproportionately high and adverse effects and identify alternatives that may mitigate these impacts.²²⁰

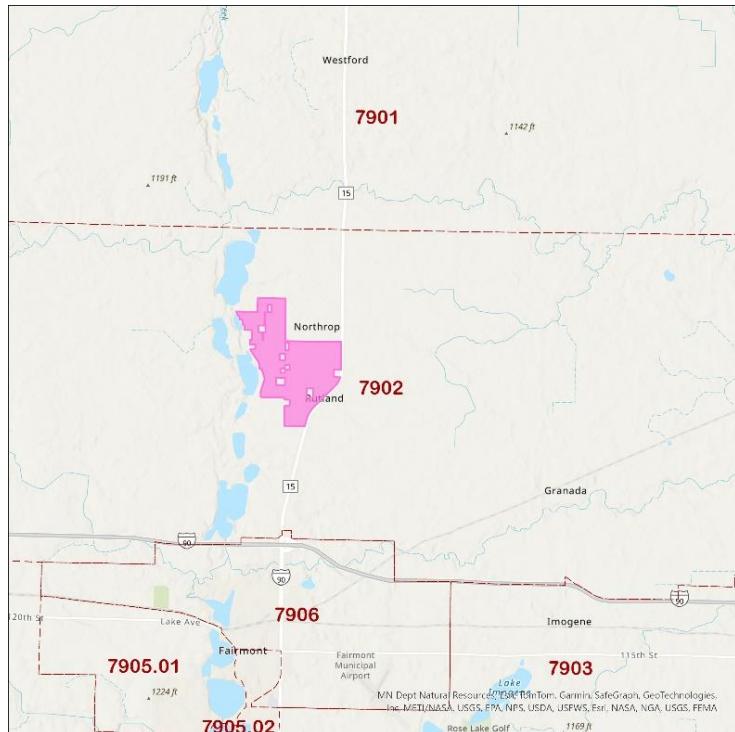
As defined by Minnesota Statute 216B.1691, subd. 1(e), “Environmental justice area” means an area in Minnesota that, based on the most recent data published by the United States Census Bureau, meets one or more of the following criteria:

- (a) 40 percent or more of the area's total population is nonwhite;
- (b) 35 percent or more of households in the area have an income that is at or below 200 percent of the federal poverty level;
- (c) 40 percent or more of residents over the age of five have limited English proficiency; or
- (d) the area is located within Indian country, as defined in United States Code, title 18, section 1151.

Figure 14 shows the census tract used to compare the project area with Martin County and Minnesota as a whole.

MPCA’s “Understanding Environmental Justice in Minnesota” web-based mapping tool was used to determine whether the project intersects any census tracts with EJ populations based on the definitions above.²²¹ **Table 13** provides data from the MPCA mapping tool to identify EJ communities in the project area. This tool uses information from the U.S. Census Bureau's five-year 2018-2022 American Community Survey data and tribal areas derived from the U.S. Census Bureau's 2023 Cartographic Boundary File and Minnesota Department of Transportation's Tribal Government in Minnesota.

Figure 14: Census Tracts near Project Site



²¹⁹ US EPA, *Environmental Justice* (2024 archive), <https://www.epa.gov/environmentaljustice>.

²²⁰ US EPA (2024 archive), [Guidance for Incorporating Environmental Justice Concern in EPA's NEPA Compliance Analyses \(pdf\)](#),

²²¹ MPCA, (2023) *Understanding environmental justice in Minnesota Mapping Tool*.
<https://experience.arcgis.com/experience/bff19459422443d0816b632be0c25228/page/Page/?views=EJ-areas>.

The MPCA defines “Environmental justice” as the right of communities of color, Indigenous communities, and low-income communities, to the enjoyment of a healthy environment and to fair treatment with respect to the development, adoption, implementation, and enforcement of environmental laws, regulations, and policies. “Environmental justice community” or “EJ community” means a people group or geographic location that experiences environmental justice related harms and risks.

Table 13. Environmental Justice Population Data

Area	% of the population that is nonwhite	% of Households at or Below 200% Poverty Level	% Limited English proficiency	Located in Indian Country?
Region of Comparison				
Minnesota	22.5	22.5	2.2	No
Martin County ²²²	6.9	21.4	--	No
Project Census Tract				
Census Tract 2709179020 ²²³	5.8	29.1	0.7	No

POTENTIAL IMPACTS

Utility infrastructure can adversely impact low-income, minority or tribal populations. Based on the MPCA’s mapping tool, as well as the project area population and demographics data (Table 12), the proposed site census tract is not in an area that is considered an EJ community. Census Tract 2709179020 (7902) does not meet the criteria to be considered an EJ community because it is not located within an area with 40 percent or more nonwhite population, an area with 35 percent or more households having an income that is at or below 200 percent of the poverty level, within an area where 40 percent or more residents have limited English proficiency, or within Indian country, as defined in United States Code, title 18, section 1151.

Lake Charlotte Solar does not anticipate adverse, disproportionate impacts to EJ communities resulting from the project, as there are no EJ communities within the area.²²⁴ However, the project has the potential for short-term impacts during construction, such as an increase in traffic, or the creation of fugitive dust, which could interact with neighboring communities. Lake Charlotte Solar notes that the project is expected to have positive socioeconomic impacts and will have positive impacts related to climate change by offsetting emissions compared to those created by coal or natural gas electricity production.²²⁵

²²² U.S. Census Bureau: *Martin County*. <https://data.census.gov/all?q=Martin+County,+Minnesota>.

²²³ MPCA, (2023) *Understanding environmental justice in Minnesota Mapping Tool*. <https://experience.arcgis.com/experience/bff19459422443d0816b632be0c25228/page/Page/?views=EJ-areas>.

²²⁴ SPA, p. 62.

²²⁵ SPA, p. 81, p. 93.

MITIGATION

This project area is not within EJ community, therefore, negligible impacts to environmental justice areas are anticipated. No additional mitigation is proposed.

4.4 Human Health and Safety

Construction and operation of a solar facility has the potential to impact human health and safety.

4.4.1 Electric and Magnetic Fields

The ROI for EMF is the project area. Impacts to human health from possible exposure to EMFs are not anticipated.

Electric and magnetic fields (EMFs) are invisible forces that result from the presence of electricity. They occur naturally and are caused by weather or the geomagnetic field. They are also caused by all electrical devices and found wherever people use electricity. EMFs are characterized and distinguished by their frequency, that is, the rate at which the field changes direction each second. Electrical lines in the United States have a frequency of 60 cycles per second or 60 hertz, which is extremely low frequency EMF (“ELF-EMF”). The strength of an electric field decreases rapidly as it travels from the conductor and is easily shielded or weakened by most objects and materials.

Voltage on a conductor creates an electric field that surrounds and extends from the wire. Using water moving through a pipe as an analogy, voltage is equivalent to the pressure of the water moving through the pipe. The strength of the electric field is measured in kilovolts per meter (kV/m). Electric fields decrease rapidly as they travel from the conductor and are easily shielded or weakened by most objects and materials.

Current moving through a conductor creates a magnetic field that surrounds and extends from the wire. Using the same analogy, current is equivalent to the amount of water moving through the pipe. The strength of a magnetic field is measured in milliGauss (mG). Like electric fields, the strength of a magnetic field decreases rapidly as the distance from the source increases; however, unlike electric fields, magnetic fields are not easily shielded or weakened.

Table 14. Electric and Magnetic Field Strength of Common Household Objects provides examples of electric and magnetic fields associated with common household items. “The strongest electric fields that are ordinarily encountered in the environment exist beneath high voltage transmission lines. In contrast, the strongest magnetic fields are normally found very close to motors and other electrical appliances, as well as in specialized equipment such as magnetic resonance scanners used for medical imaging.”²²⁶

²²⁶ World Health Organization. *Radiation: Electromagnetic Fields, What are typical exposure levels at home and in the environment?* (2016). <https://www.who.int/news-room/questions-and-answers/item/radiation-electromagnetic-fields>.

Table 14. Electric and Magnetic Field Strength of Common Household Objects²²⁷

Electric Field*		Magnetic Field**			
Appliance	kV/m	Appliance	mG		
	1 foot		1 inch	1 foot	3 feet
Stereo	0.18	Circular saw	2,100 to 10,000	9 to 210	0.2 to 10
Iron	0.12	Drill	4,000 to 8,000	22 to 31	0.8 to 2
Refrigerator	0.12	Microwave	750 to 2,000	40 to 80	3 to 8
Mixer	0.10	Blender	200 to 1,200	5.2 to 17	0.3 to 1.1
Toaster	0.08	Toaster	70 to 150	0.6 to 7	< 0.1 to 0.11
Hair Dryer	0.08	Hair dryer	60 to 200	< 0.1 to 1.5	< 0.1
Television	0.06	Television	25 to 500	0.4 to 20	< 0.1 to 1.5
Vacuum	0.05	Coffee maker	15 to 250	0.9 to 1.2	< 0.1

* German Federal Office for Radiation Safety

** Long Island Power Institute

Health Studies In the late-1970s, epidemiological studies indicated a weak association between childhood leukemia and ELF-EMF levels. “Epidemiologists observe and compare groups of people who have had or have not had certain diseases and exposures to see if the risk of disease is different between the exposed and unexposed groups but does not control the exposure and cannot experimentally control all the factors that might affect the risk of disease.”²²⁸

Ever since, researchers have examined possible links between ELF-EMF exposure and health effects through epidemiological, animal, clinical, and cellular studies. To date, “no mechanism by which ELF-EMFs or radiofrequency radiation could cause cancer has been identified. Unlike high-energy (ionizing) radiation, EMFs in the non-ionizing part of the electromagnetic spectrum cannot damage DNA or cells directly,” that is, the ELF-EMF that is emitted from HVTLS does not have the energy to ionize molecules or to heat them.²²⁹ Nevertheless, they are fields of energy and thus have the potential to produce effects.

“The few studies that have been conducted on adults show no evidence of a link between EMF exposure and adult cancers, such as leukemia, brain cancer, and breast cancer.”²³⁰

²²⁷ Id.

²²⁸ National Institute of Environmental Health Sciences. *EMF: Electric and Magnetic Fields Associated with the Use of Electric Power*. (2002).

https://www.niehs.nih.gov/health/materials/electric_and_magnetic_fields_associated_with_the_use_of_electric_power_questions_and_answers_english_508.pdf

²²⁹ National Cancer Institute. *Magnetic Field Exposure and Cancer*. (2016). <http://www.cancer.gov/about-cancer/causes-prevention/risk/radiation/magnetic-fields-fact-sheet>.

²³⁰ National Institute of Environmental Health Sciences. *Electric and Magnetic Fields*, (2024). <http://www.niehs.nih.gov/health/topics/agents/emf/index.cfm>.

“Overall there is no evidence that exposure to ELF magnetic fields alone causes tumors. The evidence that ELF magnetic field exposure can enhance tumor development in combination with carcinogens is inadequate.”²³¹

“A number of scientific panels convened by national and international health agencies and the U.S. Congress have reviewed the research carried out to date. Most concluded that there is insufficient evidence to prove an association between EMF and health effects; however, many of them also concluded that there is insufficient evidence to prove that EMF exposure is safe.”²³²

The Minnesota State Interagency Working Group on EMF Issues, comprised of staff from state agencies, boards, and Commission, was tasked to study issues related to EMF. In 2002, the group published *A White Paper on Electric and Magnetic Field Policy and Mitigation Options*, and concluded the following:

“Some epidemiological results do show a weak but consistent association between childhood leukemia and increasing exposure to EMF.... However, epidemiological studies alone are considered insufficient for concluding that a cause and effect relationship exists, and the association must be supported by data from laboratory studies. Existing laboratory studies have not substantiated this relationship..., nor have scientists been able to understand the biological mechanism of how EMF could cause adverse effects. In addition, epidemiological studies of various other diseases, in both children and adults, have failed to show any consistent pattern of harm from EMF.

The Department of Health concludes that the current body of evidence is insufficient to establish a cause and effect relationship between EMF and adverse health effects. However, as with many other environmental health issues, the possibility of a health risk cannot be dismissed.”²³³

Regulations and Guidelines Currently, there are no federal regulations regarding allowable ELF-EMF produced by power lines in the United States; however, state governments have developed state-specific regulations. For example, Florida limits electric fields to 2.0 kV/m and magnetic fields to 150 mG at the edge of the ROW for 161 kV transmission lines.²³⁴ Additionally, international organizations have adopted standards for exposure to electric and magnetic fields (**Table 15**).

²³¹ World Health Organization. *Extremely Low Frequency Fields*. (2007). http://www.who.int/peh-emf/publications/Comple DEC_2007.pdf?ua=1, page 10.

²³² State of Minnesota, State Interagency Working Group on EMF Issues (2002) *A White Paper on Electric and Magnetic Field (EMF) Policy and Mitigation Options*, <https://apps.commerce.state.mn.us/eera/web/project-file?legacyPath=/opt/documents/EMF%20White%20Paper%20-%20MN%20Workgroup%20Sep%202002.pdf>: page 1.

²³³ Id., page 36.

²³⁴ Florida Department of State. *Rule 62-814.450 Electric and Magnetic Field Standards*. (2008). <https://www.flrules.org/gateway/ruleNo.asp?id=62-814.450>.

Table 15. International Electric and Magnetic Field Guidelines

Organization	Electric Field (kV/m)		Magnetic Field (mG)	
	Public	Occupational	Public	Occupational
Institute of Electrical and Electronics Engineers	5.0	20.0	9,040	27,100
International Commission on Non-Ionizing Radiation Protection	4.2	8.3	2,000	4,200
American Conference of Industrial Hygienists	—	25.0	—	10,000/ 1,000 ^a
National Radiological Protection Board	4.2	—	830	4,200

^a For persons with cardiac pacemakers or other medical electronic devices

POTENTIAL IMPACTS

Potential impacts are anticipated to be negligible and are not expected to negatively affect human health. Impacts will be long-term and localized but can be minimized. The primary sources of EMF from the generating facility will be from the solar arrays, buried electrical collection lines, the gen-tie line, and the transformers installed at each inverter. The EMF generated by solar arrays is at the level generally experienced near common household appliances. Measured magnetic fields at utility-scale PV projects drop to very low levels of 0.5 mG or less at distances of 150 feet from inverters.²³⁵ For electrical collection lines, a study found that at 27.5 kV that magnetic fields are within background levels at 1 meter above ground.²³⁶ The project gen-tie line is planned as a 161 kV overhead line. Although Lake Charlotte Solar did not model the magnetic field for the electrical collection lines, the gen-tie line, or the inverters or transformers, they note that higher voltage transmission lines have reported magnetic and electric fields dissipating at distances such as 50 feet for 230 kV, and 65 feet for 500 kV.²³⁷

There are several residences that are in proximity to the project, including 149 residences within one mile of the Land Control Area (**Table 16**). Some residences are located as close as 50 to 70 feet from the Land Control Area. However, no residences are located closer than 50 feet to project facility components within the Preliminary Development Area, or closer than 150 feet from solar arrays.

²³⁵ Flowers, George; Cleveland, Tommy. *Health and Safety Impacts of Solar Photovoltaics*, (2017). North Carolina Clean Energy Technology Center. Retrieved from: <https://content.ces.ncsu.edu/health-and-safety-impacts-of-solar-photovoltaics>. at p. 13

²³⁶ McCallum L.C., Whitefield Aslund M.L., Knopper L.D., Ferguson G.M., & Ollson C.A. (2014). *Measuring electromagnetic fields (EMF) around wind turbines in Canada: is there a human health concern?* DOI: [10.1186/1476-069X-13-9](https://doi.org/10.1186/1476-069X-13-9)

²³⁷ SPA, p. 66.

Table 16: Residences Near Project Site²³⁸

Distance	Preliminary Development Area	Solar Arrays	BESS facility
≤ 50 feet	0	0	0
51 feet to 150 feet	2	0	0
151 feet to 300 feet	13	8	0
301 feet to 500 feet	6	7	0
501 feet to 1,000 feet	22	22	1
1,001 feet to 5,280 feet	105	110	84
> 5,280 (1.0 mile)	1	2	64
TOTAL	149	149	149

Based on digital mapping, the nearest solar array is estimated to be approximately 197 feet from the closest residence. The nearest inverter is estimated to be approximately 352 feet from the nearest residence. The nearest residence to the BESS is 815 feet away.²³⁹ At this distance, both electric and magnetic fields would have dissipated to background levels before reaching the residence.²⁴⁰ Therefore, due to the distances between the solar facility equipment and residences, impacts from EMF to residences or human health due to the project are not anticipated.

Stray Voltage

In general terms, stray voltage is voltage caused by an electric current in the earth resulting from the grounding of electrical equipment or an electrical distribution system. Stray voltage encompasses two phenomena: neutral-to-earth voltage (NEV) and induced voltage.

NEV is a type of stray voltage that can occur where distribution lines enter structures. “Electrical systems—farm systems and utility distribution systems—are grounded to the earth to ensure safety and reliability.... Inevitably, some current flows through the earth at each point where the electrical system is grounded, and a small voltage develops.”²⁴¹ This extraneous voltage appears on metal surfaces in buildings, barns, and other structures. NEV is typically experienced by livestock that contact one or more metal objects on a farm, for example, feeders, waterers, or stalls. Metal objects on a farm are grounded to earth through electrical connections. Livestock, by virtue of standing on the ground, are also grounded to earth. If an animal touches two points at different voltages (one at neutral voltage and the other near true ground), a small current will flow through the livestock to the ground because the animal completes the electrical circuit.²⁴²

²³⁸ SPA, p. 58, Table 5.2.1-1: Residences with One Mile of the Land Control Area.

²³⁹ SPA, p. 66.

²⁴⁰ SPA, pp. 31-32.

²⁴¹ Wisconsin Public Service Corporation, *Answers to Your Stray Voltage Questions: Backed by Research*, (2011), http://www.wisconsinpublicservice.com/business/pdf/farm_voltage.pdf.

²⁴² Michigan Agricultural Electric Council, *Stray Voltage: Questions and Answers*, (October 2008), https://www.maec.msu.edu/application/files/4216/4555/7484/Stray_Voltage_Q_A.pdf.

Induced voltage can occur when the electric field from a transmission line can extend to nearby conductive objects, for example, farm equipment, and induce a voltage upon them. This phenomenon is dependent on many factors, including the shape, size, orientation, capacitance, and location of the object. The primary concern with induced voltage is not the voltage, but rather the current that flows through a person to the ground when touching the object. To ensure safety in the proximity of transmission lines, the NESC requires that any discharge be less than five milliamperes. In addition, the Commission's electric field limit of 8 kV/m is designed to prevent serious shock hazards due to induced voltage. Proper grounding of metal objects under and adjacent to HVTLs is the best method of avoiding these shocks.

Lake Charlotte Solar states that all electrical components in the Project, including inverters and transformers, will be grounded in accordance with NESC. Soil resistivity measurements will be taken on site as part of the Project's geotechnical analysis, and that data will be used to help design grounding systems.²⁴³ Adverse impacts are not anticipated.

MITIGATION

No health impacts from EMF or stray voltage are anticipated. EMF diminishes with distance from a conductor or inverter. There are no residences mapped at a distance that will create an impact from EMF from the solar facility, or the BESS. At the distance of all residences, both electric and magnetic fields will dissipate to background levels. Lake Charlotte Solar indicates that the project will be grounded in accordance with regulations, and should a fault occur during operation of the Project, it will be quickly identified by project monitoring systems and corrected.²⁴⁴ No additional mitigation is proposed.

4.4.2 Public Safety and Emergency Services

The ROI for public and work safety is the land control area. Like any construction project, there are risks. These include potential injury from falls, equipment and vehicle use, electrical accidents, etc. Public risks involve electrocution. Electrocution risks could also result from unauthorized entry into the fenced area. The project is designed to meet all applicable federal, state, and local safety standards. Several standard permit conditions mitigate the potential for public safety impacts related to the project.

Like any construction project, there are risks. These include potential injury from falls, equipment and vehicle use, electrical accidents, etc. Construction might disturb existing environmental hazards on-site, for example, contaminated soils. During operation, there are occupational risks similar to those associated with construction. Other potential health and safety concerns include hazardous materials, electric shock and arc flash, and fire safety. Public risks would result from unauthorized entry into the facility.

Construction crews must comply with local, state, and federal regulations when installing the project. This includes standard construction-related health and safety practices. This generally includes safety orientation and training, as well as daily/weekly safety meetings.

Emergency services in the project area are provided by several local law enforcement and emergency response agencies in nearby communities. The nearest law enforcement in the project area is provided by the Martin County Sheriff's office located approximately 4 miles south of the project. Fire service is provided by the Fairmont Fire Department, located approximately 4 miles south of the project. The closest

²⁴³ SPA, p. 32.

²⁴⁴ SPA, p. 66.

emergency room is at the Mayo Clinic Health System and Ambulance Service in Fairmont, located less than 5 miles from the project.²⁴⁵

The Allied Radio Matrix for Emergency Response (ARMER) system is a part of Minnesota's Statewide Communication Interoperability Plan, which aims to improve communication for emergency responders. The ARMER radio system operates by line of sight, and to operate effectively, multiple towers are necessary. System interruption can occur if tall objects are within the line-of-sight, typically at or near the top of a tower over 150-feet tall. There are no ARMER towers within one mile of the project, with the nearest ARMER tower located in the town of Welcome, approximately 8.5 miles southwest of the Land Control Area.²⁴⁶

POTENTIAL IMPACTS

Worker safety issues are primarily associated with construction. Public safety concerns would be most associated with unauthorized entry to the project.

The inflow of temporary construction personnel could increase demand for emergency and public health services. On the job injuries of construction workers requiring assistance due to slips, trips or falls, equipment use, or electrocution can create a demand for emergency, public health, or safety services that would not exist if the project were not to be built. Although no road closures are anticipated during construction, any temporary closures could impede police, fire, and other rescue vehicles access to the site of an emergency.

The closest ARMER tower is located approximately 8.5 miles south of the project site. The project design does not include features that will be within the line-of-sight near the top of these towers, or greater than 150 ft tall. Thus, no impacts to the ARMER system are anticipated.²⁴⁷

Fire Risk

During public scoping meetings, potential fire risk was brought up. Like any electrical system, solar panels do represent a potential fire risk. Research on fire risk in PV systems indicates that electrical arcing is a main cause of fires, arising due to the use of faulty products, installation errors, or irregular maintenance failing to identify issues with system components.²⁴⁸ Research investigating the causes of fire in PV systems has mainly focused on rooftop installations; considering that ground-mounted PV systems contain similar electrical components as rooftop systems, they likely experience similar fire causes as well. BESS systems also pose a fire risk. Events can occur from damage, exterior fire, or a malfunction. Smoke or suspicious odor from a BESS system can be an indication of a hazardous condition.²⁴⁹

The non-impervious portions of the project area will contain native vegetation, which could increase the fire hazard if improperly managed. Law enforcement, fire services, and ambulances may need to enter

²⁴⁵ SPA, pp. 62-63.

²⁴⁶ SPA, p. 63.

²⁴⁷ Id.

²⁴⁸ Ong, N., Sadiq, M., Said, M., Jomaas, G., Tohir, M., & Kristensen, J. (2022). *Fault tree analysis of fires on rooftops with photovoltaic systems*. DOI: <https://doi.org/10.1016/j.jobe.2021.103752>

²⁴⁹ International Association of Fire Chiefs (2022), *Recommended Fire Department Response to Energy Storage Systems (ESS) Part 1*. <https://www.iafc.org/docs/default-source/1fire-prev/iafcresponseessfires.pdf>.

the site in an emergency. If site access or maneuverability is hindered, this may delay their response time. The applicant can work with local emergency services, including fire departments, to ensure proper training and preparation for fire risk.

Hazardous Materials

Lake Charlotte Solar contracted with Tetra Tech Inc. to conduct a Phase I Environmental Site Assessment in October of 2024 of the Land Control Area. Although no Historical Recognized Environmental Conditions, Controlled Recognized Environmental Conditions, or Business Environmental Risks were identified, the Phase I ESA did reveal two Recognized Environmental Conditions (RECs) with the subject property (Tetra Tech, 2025): the Rutland Township Garage and Poppe Oil Bulk Plant and Poppe Oil Co.²⁵⁰

The Rutland Township Garage located at South Bridgeman Street and West Freund Street, approximately 1,500 feet northeast of the subject property and Land Control Area, was listed in the Leaking Underground Storage Tank, Site Remediation Section, Vapor Intrusion and What's In My Neighborhood databases. The release of fuel oil #1 and #2 occurred from a steel underground storage tank reported in July 2021 during the removal of the underground storage tank, and groundwater contamination was reported. A Petroleum Tank Release Site File Closure letter dated January 6, 2023, from the MPCA states that the owner has adequately addressed the petroleum tank release at the site. However, due to the presence of non-petroleum contamination, this site has been referred to the MPCA's Site Assessment Program for potential state and/or federal Superfund oversight. The letter also states that if future development of the property or the surrounding area is planned, it should be assumed that petroleum contamination may still be present.²⁵¹

Poppe Oil Bulk Plant and Poppe Oil Co is located at 111 South Bridgeman Street and mapped approximately 1,500 feet northeast of the subject property and Land Control Area. The site is listed in the Underground Storage Tank, Aboveground Storage Tank, Financial Assurance, Leaking Underground Storage Tank, Sight Remediation Section, and Vapor Intrusion databases and twice in the What's In My Neighborhood database. According to the MPCA Tank and Leak Site Search, eleven tanks are (or were) located at this site.²⁵²

One underground storage tank and four aboveground storage tanks were reported to have been removed from the site. Six active aboveground storage tanks installed in December 2003 were reported to be located at the site. The site is listed in the Leaking Underground Storage Tank database as a leak site and further research on the MPCA Tank and Leak Site Search indicated a release of diesel, fuel oil #1 and #2, and gasoline from a steel aboveground storage tank. Groundwater contamination was reported; however, no additional information was reported on the extent. Soil borings were collected in October 2008, and tank removal occurred in August 2011. A total of 90 cubic yards of soil were taken to a landfill in September 2011. A Petroleum Tank Release Site File Closure letter dated February 8, 2012, issued by the MPCA, indicated that owner has adequately addressed the petroleum tank release at the site. The letter also

²⁵⁰ SPA, pp. 63-64.

²⁵¹ Id.

²⁵² Id.

states that if future development of the property or the surrounding area is planned, it should be assumed that petroleum contamination may still be present.²⁵³

MITIGATION

The project is designed to meet applicable federal, state, and local standards, including during construction. Electrical inspections are required to meet state electrical codes, and will ensure proper installation of all components, and the project will undergo routine inspection. Lake Charlotte Solar states that construction will comply with applicable local, state, and federal safety regulations.²⁵⁴

Proper PV system installation can reduce fire risk resulting from inaccurate construction methods, and proactive maintenance and monitoring of electrical equipment can identify risky system components before a fire occurs. Additionally, site vegetation will be controlled via mowing and/or grazing, preventing the accumulation of biomass and reducing fire hazard. The use of rotating PV arrays alongside vegetation removal techniques such as grazing can reduce fire hazards.²⁵⁵

Lake Charlotte Solar will coordinate with emergency and non-emergency response teams for the project, including fire departments, in addition to law enforcement, ambulance services, and 911 services. The type and number of responding agencies will depend on the incident requiring emergency services. Lake Charlotte Solar states that it will develop an Operations and Emergency Action Plan that outlines local contacts (first responders and internal operation and maintenance staff) and emergency procedures for evacuation, fire response, extreme weather, injury, and criminal behavior. This plan will include annual education, training or drills to be coordinated with local first responders.²⁵⁶

Lake Charlotte Solar indicated that groundwater sampling is recommended for potential contaminants of concern along the subject property boundary closest to the Rutland Township Garage and Poppe Oil Bulk Plant sites, stating that, after additional investigation, if it is determined the Project may encounter contaminated groundwater a Contaminated Sites Management Plan will be developed.²⁵⁷

In its scoping comments, MnDOT noted that the proposed project boundary is located along a high vulnerability snow trap which may trigger a specific set of human and environmental impacts if adjacent land use alterations occur. The project has the potential to aid in the severity of the snow trap; that is, make the risk of snow trapping more intense. MnDOT encouraged the applicant to clarify whether the proposed project will adversely impact these resources, and recommended that the applicant work with MnDOT's Blowing Resources Team to discuss and resolve potential impacts to this area.²⁵⁸

Construction is bound by federal and state Occupational Safety and Health Administration (OSHA) requirements for worker safety, and must comply with local, state, and federal regulations regarding

²⁵³ Id.

²⁵⁴ Id.

²⁵⁵ Vaverková, M., Winkler, J., Uldrijan, D., Ogrodnik, P., Vespalcová, T., Aleksiejuk-Gawron, J., Adamcová, D., & Koda, E. July 2022. *Fire hazard associated with different types of photovoltaic power plants; Effect of vegetation management*. DOI: <https://doi.org/10.1016/j.rser.2022.112491>

²⁵⁶ SPA, pp 64-65.

²⁵⁷ Id.

²⁵⁸ MnDOT, *Scoping Comments*. September 16, 2025. eDockets no. [20259-223056-01](https://edockets.mn.gov/20259-223056-01).

installation of the facilities and qualifications of workers. Established industry safety procedures will be followed during and after construction of the project. Lake Charlotte Solar indicates that these safety procedures include clear signage during all construction activities and fencing of all Project facilities to prevent public access. Hazard mitigation measures will be utilized to avoid BESS fire safety risks including storing lithium-ion batteries in weather-proof enclosures that include fully integrated heating, ventilation, and air conditioning system for temperature control, sensors and controls for remote monitoring, and built-in fire detection and suppression.²⁵⁹

Public safety is addressed in several sections of the DSP's (**Appendix C**):

- Section 4.3.30 of the Solar DSP and 4.3.27 of the BESS DSP requires the permittee to take several public safety measures, including landowner educational materials, appropriate signs and gates, etc.
- Section 5.2 of the Solar DSP is a special condition that requires Lake Charlotte Solar to coordinate with MnDOT's regarding vegetation and snow fence designs to ensure the safe operation of Trunk Highway 15.
- Section 5.3 of the BESS DSP requires the permittee to file a Hazard Mitigation Analysis detailing the results of the equipment testing, and the risks associated with the technology at least 30 days prior to the preconstruction meeting
- Section 5.7 of the Solar DSP is a special condition that requires Lake Charlotte Solar to create a Contaminated Substances Management Plan (CSMP) in the event that contaminated materials are discovered, and to notify and coordinate with MPCA for proper removal and disposal of the contaminated materials and restoration of the land. The CSMP shall be filed with the Commission.
- Section 8.12 of the Solar DSP and 8.11 of the BESS DSP requires the permittee to file an *Emergency Response Plan* with the Commission and local first responders prior to operation.
- Section 8.13 of the Solar DSP and 8.12 of the BESS DSP requires disclosure of extraordinary events, such as fires, etc.
- Section 9.1 requires a decommissioning plan prior to construction and updated every five years. Periodic updates of the plan will address the developing information on end-of-life options for PV panels.

No additional mitigation is proposed.

²⁵⁹ SPA, pp 64-65.

4.5 Land-based Economies

Solar facilities impact land-based economies by precluding or limiting land use for other purposes.

4.5.1 Agriculture

The ROI for agriculture is the anticipated development area. Potential impacts to agricultural producers are anticipated to be minimal to moderate — lost farming revenues will be offset by lease agreements with landowners. A loss of farmland in Martin County would occur for the life of the project. Potential impacts are localized and unavoidable but can be minimized.

Agricultural use dominates the area of anticipated development, with approximately 997.8 acres of agricultural land to be removed from production that is currently used to produce corn, soybeans, and used as pasture.²⁶⁰

In 2022, there were approximately 456,000 acres of farmland in Martin County, comprising approximately 99.6 percent of all land in the county. There are 823 individual farms located in Martin County, with an average farm size of 522 acres. Cropland, which includes grains, beans, vegetables, and nursery greenhouse and woody crops, makes up approximately 49 percent of the total value of agricultural production, with livestock, poultry, and other uses making up the other 51 percent. The market value of agricultural production in Martin County in 2022 was an average of \$1,145,868 per farm, for a total of approximately \$943.05 million. Martin County comprises three percent of state agriculture sales in total. 92 percent of the farms in Martin County are family farms.²⁶¹

Prime farmland is defined by Federal regulation at 7 C.F.R.657.5(a)(1) as “land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is available for these uses.” The Prime Farmland Rule prohibits large energy power generating plants, such as the solar facility, from being sited on more than 0.5 acre of prime farmland per MW of net generating capacity unless there is no feasible and prudent alternative or unless the project meets one of the rule’s exemptions.

Lake Charlotte Solar conducted a Prime Farmland Analysis in March of 2025.²⁶² The majority of the site is classified as prime farmland, including the Land Control Area and the Preliminary Development area. The project would occupy approximately 318.0 acres of “prime farmland” and approximately 658.8 acres of “prime farmland if drained.”²⁶³ The prime farmland impacted would be removed from agricultural production for the 30-year operating life of the project but not permanently removed, as the land could be restored to agricultural use following decommissioning of the project.

Lake Charlotte Solar states that potential constraints were evaluated during site selection to determine whether the Project has avoided constraints to the maximum degree practicable. These include transmission interconnection, willing landowners to sell or lease land for Project facilities, and

²⁶⁰ USDA, *Census of Agriculture County Profile, Martin County Minnesota* (2022).
https://www.nass.usda.gov/Publications/AgCensus/2022/Online_Resources/County_Profiles/Minnesota/cp27091.pdf.

²⁶¹ Id.

²⁶² SPA – Appendix D: Prime Farmland Analysis. eDockets no. [20256-219557-06](#).

²⁶³ Id.

environmental constraints that may prohibit or make development more challenging. Based on the analysis conducted, Lake Charlotte Solar determined there are no feasible or prudent alternatives to the proposed project area.²⁶⁴ Lake Charlotte Solar notes that there is relatively little opportunity to avoid impacts to prime farmland in the state of Minnesota where high solar potential exists. Areas where non-prime farmland is more prevalent are generally associated with steep slopes, forested areas, wetlands and floodplains, and other areas not suitable for solar development. In addition, areas of non-prime farmland that are not constrained by natural resources do not have adequate area available to support a 150 MW solar facility.²⁶⁵

With respect to potential impacts to prime farmland, the applicant indicates that no feasible or prudent alternatives to the project exist.²⁶⁶

POTENTIAL IMPACTS

The impact intensity level will range from minimal to moderate. The intensity of the impact is likely to be subjective. For example, conversion of farmland to solar energy production can be viewed as a conversion from one type of industrial use to another. Conversely, the conversion of farmland to solar energy production can be viewed as a negative impact to agricultural production. Restoring the site with native grasses and forbs will reduce soil erosion, provide pollinator and wildlife benefits, and improve soil health. This EA acknowledges that the perceived impacts to farmland are subjective and may be difficult to assess given the trade-offs associated with utility scale solar projects.

The project will cause removal of approximately 0.22 percent of the approximately 456,000 acres of farmland in Martin County, which is not anticipated to have a significant impact. Lake Charlotte Solar indicates that adverse impacts associated with the loss of agricultural land and agricultural production will be mitigated through lease, easement, or purchase options to landowners.

Rural areas, with large parcels of relatively flat, open land, are ideal for solar development, which requires six to eight acres of land to generate one MW of electricity. The project will result in up to 997.8 acres of farmland being removed from agricultural production for the life of the project. This change in land use would take productive farmland out of production for the life of the project. However, the applicant indicates that the land could be returned to pre-construction conditions and uses after the project is decommissioned and the site is restored.²⁶⁷

Construction of the project has the potential to damage agricultural soils through compaction or erosion if BMPs are not implemented to minimize damage.

MITIGATION

Several sections of the DSP's (**Appendix C**) address agricultural mitigation and soil-related impacts:

- Section 4.3.9 requires protection and segregation of topsoil.

²⁶⁴ Id.

²⁶⁵ SPA, p. 20.

²⁶⁶ SPA – Appendix D: Prime Farmland Analysis. eDockets no. [20256-219557-06](#).; SPA, p. 20.

²⁶⁷ SPA, p. 83.

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- Section 4.3.10 requires measures to minimize soil compaction.
- Section 4.3.11 requires the permittee to “implement erosion prevention and sediment control practices recommended by the [MPCA]” and to “obtain a [CSW Permit].” A CSW Permit requires both temporary and permanent stormwater controls to ensure that stormwater does not become a problem on or off-site.
- Section 4.3.16 of the Solar DSP requires the permittee to implement “site restoration and management” practices enhance “soil water retention and reduces storm water runoff and erosion”.
- Section 4.3.17 of the Solar DSP requires the permittee to develop a VMP that defines how the land control area will be revegetated and monitored over the life of the project. Appropriate seeding rates and timing of revegetation will stabilize soils and improve overall soil health. Lake Charlotte has included a draft VMP as Appendix C of its joint site permit application.²⁶⁸
- Section 4.3.18 of the Solar DSP requires the permittee to develop an AIMP with MDA. Lake Charlotte Solar’s draft AIMP (Appendix E of its joint site permit application) details methods to minimize soil compaction, preserve topsoil, control noxious weeds and invasive species, maintain the existing drainage conditions through appropriate maintenance and repair of existing drain tile, and establish and maintain appropriate vegetation to ensure the project is designed, constructed, operated and ultimately restored in a manner that would preserve soils to allow for the land to be returned to agricultural use.
- Section 4.3.20 of the Solar DSP and 4.3.17 of the BESS DSP requires the permittee to develop an Invasive Species Management Plan to prevent introduction and spread of invasive species during construction of the project.
- Section 4.3.21 of the Solar DSP and 4.3.18 of the BESS DSP requires the permittee to take reasonable precautions against the spread of noxious weeds.
- Section 4.3.29 of the Solar DSP and 4.3.26 of the BESS DSP requires the permittee to fairly restore or compensate landowners for damages to crops, fences, drain tile, etc. during construction.

Lake Charlotte Solar states that a project AIMP has been developed in coordination with MDA. The project AIMP incorporates best management practices (BMPs) for siting; pre-construction, construction, and post construction methods; operational procedures; and decommissioning and restoration procedures that will be used to avoid and minimize impacts on soil and site productivity such that pre-construction agricultural productivity is rapidly returned to the site following Project decommissioning.²⁶⁹ Lake Charlotte Solar will maintain the land throughout the life of the project according to strategies and BMPs outlined in project AIMP and VMP. BMPs referenced in these plans include using seed mixes that maintain land cover and habitat, having a third party environmental monitor on site, developing methods for erosion and sediment control, separating topsoil during earth moving activities, and more.²⁷⁰

²⁶⁸ SPA, Appendix C – VMP. eDockets no. [20256-219557-05](#).

²⁶⁹ SPA, p. 77.

²⁷⁰ SPA, Appendix E – AIMP. eDockets no. [20256-219557-07](#).

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4.5.2 Forestry

Although portions of the project site contain wooded land, there are no commercial forestry operations in the project area. Woody vegetation is further discussed in [Section 4.7.6: Vegetation](#).

4.5.3 Tourism

The ROI for tourism is the project area. Impact intensity is expected to be minimal, and short-term in duration. There may be potential for impacts to local recreational activities during construction, however, impacts will be temporary.

Tourism in the local area is primarily centered around outdoor recreational activities, as described in [Section 4.3.6: Tourism and Recreation](#). There are no tourist activities held directly within the Land Control Area, due to it largely being agricultural land. Tourist attractions in the local area are largely associated with nearby natural resources, recreational activities, and cultural and community events. Nearby local attractions include the city of Fairmont, which is known as the “City of Lakes” for its beautiful chain of lakes located in town. This area also includes lakeside restaurants, shopping, and outdoor activities such as golf.²⁷¹ The region of Martin County includes several local parks, spanning over 230 acres of county land. Areas to highlight include developed parks such as Perch Lake Park and Cedar Hanson Park, natural and primitive parks including Bright Lake Park and Timberlane Park, all of which are adjacent to a lake. The county also contains several DNR Wildlife Management Areas (WMAs) scattered throughout the landscape, which can include remnants of native prairies.²⁷² In addition, segment #161 of the Prairieland Trail snowmobile trail crosses through the Land Control Area and is maintained by the Blizzard Snowmobile Club.

POTENTIAL IMPACTS

Impacts to tourism and recreation are anticipated to be minimal. There are no specific tourism opportunities within the project area. Local community events occur in areas within local city boundaries, such as in Fairmont or Northrop, and not within the project site. Short-term impacts to outdoor recreational activities could occur during construction due to noise and traffic increases, however, these impacts will be temporary and short-term in duration.

MITIGATION

- Section 5.8 of the Solar DSP is a special condition that requires the permittee to work with the local snowmobile association and associated clubs responsible for maintaining Segment #161 of the Prairieland Trail snowmobile trail to identify alternative routes and interconnections to trails in the area and develop a plan for rerouting portions of Segment #161 that falls within the project area. The permittee will be responsible for sponsoring the reroute efforts.

4.6 Archeological, Cultural, and Historic Resources

The ROI for archeological and historic resources is the project area. The impact intensity level is anticipated to be negligible to minimal. Impacts would be localized. Impacts can be mitigated through prudent siting.

²⁷¹ Explore Minnesota (n.d.), *Visit Fairmont*. <https://www.exploreminnesota.com/profile/visit-fairmont/2032>.

²⁷² Martin County (n.d.), *Parks*. <https://www.co.martin.mn.us/community/parks/index.php>.

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Archeological resources include mounds and earthworks, ancient burial grounds, prehistoric ruins, or historical remains.²⁷³ Historic resources are sites, buildings, structures, or other antiquities of state or national significance.²⁷⁴

Lake Charlotte Solar contracted with Tetra Tech to conduct a Phase I survey for archaeological sites and historic structures that could be affected by the project. A records check of previously recorded cultural resources identified two previous investigations that have been conducted within the study area. Four additional previously documented archaeological sites were identified within the study area, all four are unevaluated for listing in the NRHP. All of the previously recorded sites that were identified in the background literature review are outside of the current Land Control Area.²⁷⁵

Lake Charlotte Solar indicates that no previously inventoried architectural resources were identified within the Land Control Area, however six previously inventoried architectural resources were identified within the broader study area.²⁷⁶ In addition, a historical document review was conducted and identified six former structures and one former railroad within the study area, five of which were within the Land Control Area. The background literature review did not identify previously documented archaeological sites or previously inventoried architectural resources within the Land Control Area, and the structures identified during the historic map review are no longer present.²⁷⁷

Lake Charlotte Solar also conducted a Phase I pedestrian survey from 2022 to 2023 focusing on a study area that fully encompasses the Land Control Area and includes additional land that will not be used for the project. Land use at the time of the survey was primarily agricultural cropland with the exception of two non-cultivated areas near Lake Charlotte and the isthmus between Lake Charlotte and a channel that connects Lake Charlotte and Martin Lake, both areas west of the Land Control Area, and will not be affected by current project design.²⁷⁸ In addition, 25 previously undocumented archaeological resources were identified in the study area, however, 17 of these are outside the current Land Control Area. The final determination was the recommendation that these sites have low potential to yield significant information to Precontact history and are not eligible for listing in the NRHP.²⁷⁹

Lake Charlotte Solar and Tetra Tech coordinated with the Minnesota State Historic Preservation Office (SHPO) to review the Phase I archaeological survey that was conducted. The purpose of the Historic Preservation Office is to preserve and protect the state's historic resources. SHPOs consult with project proposers and state agencies to identify historic resources to avoid and minimize impacts to both state and tribal resources. Lake Charlotte Solar notes that it will provide the results of the SHPO review in a supplemental filing when available.²⁸⁰

²⁷³ Minnesota Statutes, Section. [138.31](#), subd. 14.

²⁷⁴ Minnesota. Statutes, Section [138.51](#).

²⁷⁵ Id.

²⁷⁶ Id.

²⁷⁷ SPA, pp. 86-87.

²⁷⁸ Id.

²⁷⁹ SPA, pp. 87-88.

²⁸⁰ Id.

POTENTIAL IMPACTS

Lake Charlotte Solar worked with Tetra Tech to complete a Phase I literature review (Phase Ia) in 2022 and 2023 of an approximately 1,508-acre area that fully encompassed the current Land Control Area and extended further to the west, encompassing portions of the wetland complex that is present along the current western edge of the Land Control Area, and one mile outside of the 1508-acre area, referred to as the study area. This literature review consisted of file reviews received from the State Historic Preservation Office (SHPO); the Office of the State Archaeologist (OSA) Portal; the National Register of Historic Places (NRHP) Database; and also included a review of historical resources including county history, U.S. Department of the Interior General Land Office plats, county atlases, topographic maps, and aerial photographs. Within the 1-mile study area, the Phase Ia identified two previous investigations, and four previously recorded archaeological sites, all located outside the current Land Control Area. No previously inventoried architectural resources were identified within the 1,508-acre area; however, six previously inventoried architectural resources were identified within the broader study area. Historical document reviews identified six former structures and one former railroad within the 1,508-acre area, however none of the structures are currently present, and no linear signature of the former railroad can be observed presently within the Land Control Area.²⁸¹

In addition to the literature review, Tetra Tech completed a Phase I pedestrian for the project in October of 2022 and May of 2023. The survey focused on the 1,508-acre area that includes the current Land Control Area, and additional land that will not be used for the project. The survey identified two archaeological resources, and 25 previously undocumented archaeological resources within the study area. However, both resources, and 17 of the 25 documented sites, are outside of the Land Control Area and are not anticipated to be impacted by project design. Archaeological sites within the Land Control Area include a post-contact artifact scatter from Railroads and Agricultural Development (21MR0111), which is recommended to be avoided by the project design, as well as four temporally non-diagnostic precontact lithic scatters (21MR0112, 21MR0113, 21MR0116, 21MR0118), and three temporally non-diagnostic precontact isolated finds (21MR0114, 21MR0115, 21MR0117). With the exception of Site 21MR0111, Tetra Tech recommended that all sites be considered Not Eligible for listing on the National Register of Historic Places. Based on Tetra Tech's recommendations for avoidance, Lake Charlotte Solar has stated that it has designed the Project to avoid impacting Site 21MR0111.²⁸²

Lake Charlotte Solar and Tetra Tech coordinated with SHPO to review the results of the survey. Lake Charlotte Solar will file the results of the review and any further correspondence with SHPO with the Commission in the project docket.²⁸³

Impacts to archeological and historic resources are not anticipated for this project.

MITIGATION

Prudent siting to avoid impacts to archaeological and historic resources is the preferred mitigation.

²⁸¹ SPA, pp. 85-87.

²⁸² SPA, p. 88.

²⁸³ Id.

- Section 4.3.23 of the Solar DSP and 4.3.20 of the BESS DSP (**Appendix C**) address archeological resources and require the permittee to avoid impacts to archaeological and historic resources where possible and to mitigate impacts where avoidance is not possible. If previously unidentified archaeological sites are found during construction, the permit requires the permittee to stop construction and contact SHPO to determine how best to proceed. Ground disturbing activity will stop, and local law enforcement will be notified should human remains be discovered.
- Section 5.4 of the Solar DSP is a special condition requiring the permittee to work with the appropriate LGU regarding cultural discoveries during construction. This includes MnDOT coordination if there are discoveries within MnDOT Right of Way, and coordination with the Tribal Nations if there are cultural discoveries within the project site or anticipated impacts to culturally relevant resources.
- Section 5.6 of the Solar DSP is a special condition requiring the permittee to develop an Unanticipated Discoveries Plan (UDP) to identify guidelines to be used in the event previously unrecorded archeological or historic properties, or human remains, are encountered during construction, or if unanticipated effects to previously identified archaeological or historic properties occur during construction.

Lake Charlotte Solar indicated in their joint site permits application that an Unanticipated Discoveries Plan will be prepared to describe procedures that will be implemented during construction if outline the steps to be taken if previously unrecorded cultural resources or human remains are encountered during construction.²⁸⁴

4.7 Natural Resources

Solar facilities can impact the natural environment. Impacts are dependent upon many factors, such as how the project is designed, constructed, maintained, and decommissioned. Other factors, for example, the environmental setting, influence potential impacts. Impacts can and do vary significantly both within, and across, projects.

4.7.1 Air Quality

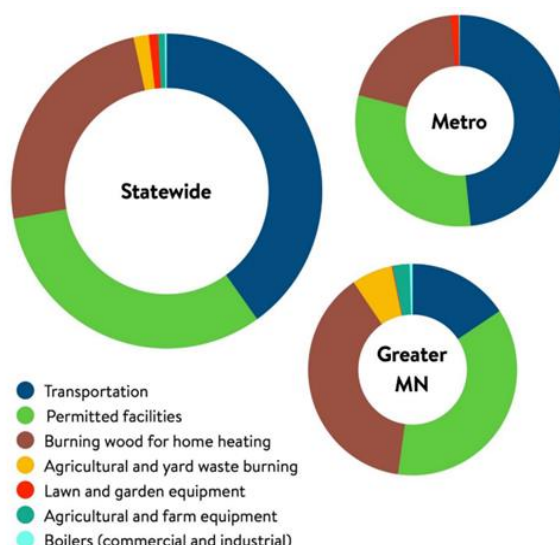
The ROI for air quality is the region. Potential impacts to air quality during construction would be intermittent, localized, short-term, and minimal. Impacts are associated with fugitive dust and exhaust. Impacts can be mitigated. Once operational, the solar array will not generate air pollutants. Negligible fugitive dust and exhaust emissions would occur as part of routine maintenance activities. Impacts are unavoidable and do not affect a unique resource. Impacts can be minimized.

Air quality is a measure of how pollution-free the ambient air is and how healthy it is for humans, other animals, and plants. Emissions of air pollutants will occur during construction and operation of the project. Regulation and voluntary action throughout Minnesota has led to a reduction in air pollution over time. As a result, overall air quality in Minnesota has improved over the last 20 years, and the state has generally

²⁸⁴ SPA, p. 88.

remained in compliance with tighter national ambient air quality standards (NAAQS).²⁸⁵ However, current levels of air pollution still contribute to health impacts, and environmental justice communities are still disproportionately affected by air pollution. As illustrated in **Figure 15**, today, most of our air pollution comes from smaller, widespread sources such as our vehicles, local businesses, heating and cooling, and yard and recreational equipment.²⁸⁶

Figure 15. Air Pollution Sources by Type



In Minnesota, air quality is tracked using air quality monitoring stations at 59 sites across the State. The MPCA uses data from these monitors to calculate the Air Quality Index (AQI) on an hourly basis, for ozone (O₃), particulate matter (PM₁₀/PM_{2.5}), sulfur dioxide (SO₂), nitrogen dioxide (NO₂), and carbon monoxide (CO). The AQI is used to categorize the air quality of a region as one of five levels: good, moderate, unhealthy for sensitive groups, unhealthy, or very unhealthy.²⁸⁷

The nearest air quality monitor to the project is in Marshall, Minnesota, located over 80 miles northwest of the project area. Air quality in the area has been considered “good” between 206 and 309 days of the year from 2019-2023. During the same time period, the number of days classified as

moderate varied between 51 and 142. Air quality was considered unhealthy for sensitive groups for three days in 2021, and ten days in 2023. Air quality was classified as unhealthy for two days in 2021, two days in 2022, and 3 days in 2023. There were no days classified as very unhealthy.²⁸⁸

The MPCA describes a large increase in the number of days with air quality alerts due to unhealthy air quality in 2021 and 2023 as largely attributed to drought conditions in the upper Midwest. Ozone formation is typically more robust during drought conditions due to less precipitation and cloud cover. The drought conditions also contributed to wildfire activity in central Canada. Smoke from these fires made frequent movements into Minnesota, in addition to smaller but closer fires in Minnesota and Ontario, leading to several alert days. Wildfire smoke from Canada and the western U.S. has become increasingly common in Minnesota as wildfires get bigger, hotter, more frequent, and have a longer

²⁸⁵ USEPA, *National Ambient Air Quality Standards (NAAQS) Table*. (2024).: <https://www.epa.gov/criteria-air-pollutants/naaqs-table>.

²⁸⁶ MPCA *The State of Minnesota’s Air Quality, January 2023 Report to the Legislature*, <https://www.lrl.mn.gov/docs/2022/mandated/221697.pdf>

²⁸⁷ MPA, *2025 Air Monitoring Network Plan for Minnesota*. <https://www.pca.state.mn.us/sites/default/files/aq10-24a.pdf>

²⁸⁸ MPCA. *Annual AQI Days by Reporting Region*, <https://data.pca.state.mn.us/views/Minnesotaairqualityindex/AQIExternal?%3Aembed=y&%3AisGuestRedirectFromVizportal=y>.

burning season. This trend is expected to continue in the future due to climate change and past practices of putting out fires as soon as they start, which has allowed fuel to build up.²⁸⁹

POTENTIAL IMPACTS

Minimal intermittent air emissions are expected during construction of the project. Air emissions associated with construction are highly dependent upon weather conditions and the specific activity occurring. For example, traveling to a construction site on a dry gravel road will result in more fugitive dust than traveling the same road when wet. Other factors that influence the amount of fugitive dust released include the level soil type and moisture content, wind speed, precipitation, and vehicle characteristics like weight and speed.

Air emissions from project construction activities would primarily consist of emissions from construction equipment, and would include carbon dioxide (CO₂), nitrogen oxides (NO_x) and other particulate matter. Dust from earthmoving activities would also contribute to particulate matter emissions.²⁹⁰

Motorized equipment from off-road engines will emit exhaust. Exhaust emissions, primarily from diesel and other carbon-based fueled equipment, would vary according to the phase of construction. Other particulate matter emissions would likely come from unpaved roads, and earthmoving activities.²⁹¹

All projects that involve movement of soil, or exposure of erodible surfaces, generate some type of fugitive dust emissions. The project would generate fugitive dust from activities such as travel on unpaved roads, grading, and excavation. Dust emissions would be greater during dry periods and in areas where fine-textured soils are subject to surface activity.

During operation, the project may generate direct air emissions from operation of the emergency generator (s) and fuel storage tank (s). Lake Charlotte Solar stated that once the final engineering design is complete, Lake Charlotte Solar will submit that, if necessary, an applicability determination request with the MPCA air quality permitting program to secure the appropriate level of air permit prior to beginning construction. Other emissions will be generated from commuter and maintenance vehicles during project operation; however, mobile sources of emissions are not regulated by the MPCA air permitting program.²⁹²

MITIGATION

Exhaust emissions can be minimized by keeping vehicles and equipment in good working order and not running equipment unless necessary. Lake Charlotte Solar states that it will minimize emissions from construction vehicles keeping construction equipment in good working order.²⁹³

²⁸⁹ MPCA. *The Air We Breathe: The State of Minnesota's Air Quality* (2025), p. 12., <https://www.pca.state.mn.us/sites/default/files/lraq-1sy25.pdf>.

²⁹⁰ SPA, p. 90.

²⁹¹ Id.

²⁹² SPA, pp. 90-91.

²⁹³ Id.

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To minimize fugitive or avoid dust generation from construction, Lake Charlotte Solar states that it will employ dust control techniques, as needed, during construction.²⁹⁴

Construction of the project will disturb more than 50 acres of soil. As a result, Lake Charlotte Solar will prepare and submit a National Pollutant Discharge Elimination System (NPDES) / State Disposal System (SDS) Construction Stormwater (CSW) Permit application and Storm Water Pollution Prevention Plan (SWPPP) to MPCA for review and approval prior to construction in order to obtain coverage under the General Construction Stormwater Permit Program. Implementing this plan prior to construction can minimize the potential for fugitive dust emissions.

In addition, the project AIMP identifies construction best management practices related to soils and vegetation that will help to avoid, minimize, mitigate, and/or repair potential negative agricultural impacts that may result from the construction, operation, and eventual decommissioning of the project. Several sections of the draft plan indirectly mitigate impacts to air quality, including sections related to construction, clearing and vegetation removal, soils, erosion and sediment control, and restoration of the site to pre-construction conditions.²⁹⁵

4.7.2 Geology and Groundwater

The ROI for geology and groundwater is the land control area. Impacts to domestic water supplies are not expected. Impacts to geology are not anticipated. Localized impacts to groundwater resources, should they occur, would be intermittent, but have the potential to occur over the long-term. Indirect impacts from surface waters might occur during construction. Impacts can be mitigated through use of BMPs for stormwater management.

Geology

The geology of a project area can influence the anticipated impacts of construction and operation. The project Land Control Area is located in the Minnesota River Prairie subsection of the North Central Glaciated Plains section of the Prairie Parkland Province of the DNR's Ecological Classification System. Most of this subsection is covered by 100 to 400 feet of glacial drift. Bedrock geology features include cretaceous shales, sandstones, and clays.²⁹⁶ Approximately 100 to 400 feet of glacial till sits over Paleozoic-aged bedrock.

Areas of Paleozoic Cambrian upper, sandstone, siltstone, shale, and dolostone from the Tunnel City and Prairie du Chien groups comprise the bedrock within the Land Control Area. Depth to bedrock varies from approximately 132 feet to 393 feet, with an average of 245 feet deep.²⁹⁷

Karst Landscapes can develop where limestone and dolostone are at or near the surface. Over time, minerals in these landscapes can be dissolved by rain and groundwater, creating karst topography. Karst terrain is characterized by sinkholes, caves, springs, and underground drainage. In karst, water dissolves fractures and joints in the bedrock, forming a network of interconnected underground conduits that can

²⁹⁴ SPA, p. 79.

²⁹⁵ SPA - Appendix E: AIMP. eDockets no. [20256-219557-07](https://mnatlas.org/gis-tool/).

²⁹⁶ SPA, p. 94.; *Minnesota Geological Survey: Bedrock Geology (2018, 2022)*. Retrieved from: <https://mnatlas.org/gis-tool/>.

²⁹⁷ Id.

carry groundwater long distances at speeds up to miles per day. Karst features, such as sinkholes, blind valleys, karst windows and springs are found on the land surface above underground karst systems. Karst also occurs without these visible land surface features.²⁹⁸ The Minnesota DNR and the University of Minnesota developed a dataset of karst features mapped over the last 25 years. In addition, the Minnesota Geological Survey has prepared maps that identify regions prone to surface karst feature development. Currently, no karst features or regions are located within the project Land Control Area. The closest surface karst feature is a spring located in the Krahmer Wildlife Management Area, located approximately 10 miles southeast of the Land Control Area.²⁹⁹

Groundwater

Groundwater in Minnesota is largely a function of local geological conditions that determine the type and properties of aquifers. Minnesota is divided into six groundwater provinces based on bedrock and glacial geology. Aquifers within these provinces occur in two general geologic settings: unconsolidated sediment (e.g., clay, sand, gravel) deposited by glaciers, streams, and lakes; and bedrock (e.g., limestone, granite) comprising a wide range of rock types and ages. Combining these settings creates the groundwater provinces. The project site is within the DNR's Groundwater Province 2, the South Central Province, and is characterized by thick loam and clay loam glacial sediment. The glacial sediment in these provinces is typically fine-grained (e.g., clay and silt) and may contain only limited extents of surficial and buried sand aquifers. Province 2 contains sedimentary bedrock aquifers that are commonly used.³⁰⁰

Currently, the project area is primarily used for row crop agricultural production, predominantly consisting of corn. In Minnesota, corn is grown on more acres than any other crop, and general fertilizer use is common to substantially yield increases in production. However, fertilizer management and nutrient optimization is often necessary to increase production of corn, including the use of nitrogen fertilizers.³⁰¹ The Minnesota Department of Agriculture has developed the Minnesota Nitrogen Fertilizer Management Plan (NFMP) and the associated Groundwater Protection Rule, which recommends steps for the prevention and minimization of the impacts of nitrogen fertilizer on groundwater, emphasizing involving the local agricultural community in problem solving for local groundwater concerns. Nitrate is described as one of the most common contaminants in Minnesota's Groundwater. While elevated levels of nitrate in groundwater can result from several factors, a major contributor in rural Minnesota is nitrogen fertilizer that leaches past the crop root zone.³⁰²

The sensitivity to pollution of near-surface materials is an estimate of the time it takes for water to travel through the unsaturated zone to reach the water table, which for the purposes of the model was assumed

²⁹⁸ SPA, p. 94; MNDNR, (n.d.), *Springs, springsheds, and karst*.

https://www.dnr.state.mn.us/waters/groundwater_section/mapping/springs.html#:~:text=It%20is%20characterized%20by%20sinkholes,up%20to%20miles%20per%20day.

²⁹⁹ SPA, p. 94; University of Minnesota, Minnesota Department of Natural Resources, *Karst Feature Inventory Points* (Minnesota Natural Resource Atlas), retrieved from <https://mnatlas.org/gis-tool/>.

³⁰⁰ MNDNR, *Minnesota Groundwater Provinces* (2021)

https://www.dnr.state.mn.us/waters/groundwater_section/mapping/provinces.html

³⁰¹ University of Minnesota Extension (2024), *Fertilizing corn in Minnesota*. <https://extension.umn.edu/crop-specific-needs/fertilizing-corn-minnesota>.

³⁰² MDA (2025), *Minnesota Nitrogen Fertilizer Management Plan*. <https://www.mda.state.mn.us/pesticide-fertilizer/minnesota-nitrogen-fertilizer-management-plan>.

to be 10 feet below the land surface.³⁰³ Pollution sensitivity of near-surface materials in the project area is classified as low.³⁰⁴ This means that the project area is generally expected to have little groundwater pollution sensitivity. Low sensitivity indicates that contaminants from the land surface would not reach groundwater for months to a year, whereas high sensitivity indicates that contaminants could travel within hours to a week.³⁰⁵ Low sensitivity does not guarantee protection. Leakage from an unsealed well, for example, may bypass the natural protection, allowing contamination to directly enter an aquifer. Depth to water table in the project area ranges from just below the surface up to 10 feet, with areas closer to 20 feet along the edges of Lake Charlotte, depending on the soil type.³⁰⁶ Domestic well data indicate that the depth to groundwater in the land control area is approximately 45 feet.³⁰⁷

The project area was reviewed for EPA designated sole source aquifers (SSAs), wells listed on the Minnesota Well Index (MWI), Drinking Water Supply Management Areas, and MDH Wellhead Protection Areas (WHPAs).³⁰⁸ The MDH maintains the Minnesota Well Index (MWI), which provides basic information (e.g., location, depth, geology, construction, and static water level) for wells and borings drilled in Minnesota. According to the EPA, there are no EPA designated sole source aquifers within the Land Control Area.³⁰⁹ The MWI identified one active domestic water well, and three sealed, environmental bore wells within the project area.³¹⁰ The wells within the project site and their respective differences are documented in **Table 17**. In addition, multiple active domestic wells and inactive sealed wells are located near and around the project area.³¹¹

³⁰³ Adams, R. (June 2016) *Pollution Sensitivity of Near-Surface Materials*, retrieved from: <https://www.leg.state.mn.us/docs/2017/other/170839.pdf> , page 3.

³⁰⁴ MNDNR, *Pollution Sensitivity – Near Surface Materials* (Minnesota Natural Resource Atlas), retrived from <https://mnatlas.org/gis-tool/>.

³⁰⁵ MNDNR (2016), *Methods to Estimate Near-Surface Pollution Sensitivity*, retrieved from: https://files.dnr.state.mn.us/waters/groundwater_section/mapping/gw/gw03_ps-ns.pdf .

³⁰⁶ USDA *Web Soil Survey*, retrieved from: <https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx>; MNDNR *Water Table – Depth* (Minnesota Natural Resource Atlas), retrived from <https://mnatlas.org/gis-tool/>.

³⁰⁷ SPA, p. 95.

³⁰⁸ Id.; EPA, *Sole Source Aquifers*, <https://www.epa.gov/dwssa/>; MPCA, *Minnesota Wellhead Protection Areas (WHPA)*, (2019), <https://gisdata.mn.gov/dataset/water-wellhead-protection-areas>.

³⁰⁹ SPA, p. 95.

³¹⁰ Id; MDH (2025) *Minnesota Well Index* <https://www.health.state.mn.us/communities/environment/water/mwi/index.html>.

³¹¹ SPA, pp. 95-96.

Table 17: Minnesota Well Index¹

Unique Well ID	Well name	Location in Site	Drilled Depth (ft)	Static Water Depth	Well Use	Status
580170	L.B. PORK	Northwest	110	45 feet	Domestic	Active
342474	TERRACON	East	100	5 feet	Environmental Boring	Sealed
342475	TERRACON	Southeast	44	6 feet	Environmental Boring	Sealed
342475	TERRACON	Southeast	71	16.5 feet	Environmental Boring	Sealed

Under the Safe Drinking Water Act, each state is required to develop and implement a Wellhead Protection Program to identify the land and recharge areas contributing to public supply wells and prevent the contamination of drinking water supplies. Wellhead Protection Areas (WHPAs) encompass the area around a drinking water well where contaminants could enter and pollute the well. Public and non-public community water supply source-water protection in Minnesota is administered by the MDH through the Wellhead Protection program. WHPAs for public and community water-supply wells are delineated based on a zone of capture for 10-year groundwater time-of-travel to the well and are available through a database and mapping layer maintained by MDH.

A search for WHPAs in the MDH database indicated that the project area is located entirely outside of any WHPA. The nearest WHPA and associated Drinking Water Supply Management Area (DWSMA), the Northrop WHPA and DWSMA, is located in the Town of Northrop and adjacent to the project site on the east and north sides. MDH assesses the vulnerability of WHPAs and DWSMAs based on the perceived risk of a well. This perceived risk is informed by a variety of factors, including geologic sensitivity, well construction, maintenance and use, water chemistry and isotopic composition.³¹² The Northrop DWSMA is ranked as having low vulnerability.³¹³ In addition, MDH designates Special Well and Boring Construction Areas, that of which there are currently none identified within Martin County, or within the project area.³¹⁴

³¹² MDH (2018), *Wellhead Protection Vulnerability Fact Sheet*.

<https://www.health.state.mn.us/communities/environment/water/docs/swp/vulnerability.pdf>.

³¹³ MDH (2019), *Drinking Water Supply Management Areas (DWSMAs)*. <https://gisdata.mn.gov/dataset/water-drinking-water-supply>.

³¹⁴ MDH (2025) *Special Well and Boring Construction Areas*.

<https://www.health.state.mn.us/communities/environment/water/wells/swbca/index.html>.

Minnesota Well Index <https://www.health.state.mn.us/communities/environment/water/mwi/index.html>.

POTENTIAL IMPACTS

Potential impacts to geology and groundwater can occur directly or indirectly. Impacts to geological resources are likely to be minimal, due to the anticipated depth of construction being relatively shallow, and the absence of karst features. There are no identified SSAs, WHPAs, or DWSMAs within the project site. Located adjacent to the project is the Northrop DWSMA, which is ranked as low vulnerability, suggesting there is a low likelihood that activities at the land surface, such as construction may degrade drinking water quality at a public water supply well.³¹⁵

Direct impacts to groundwater are generally associated with construction, for example, structure foundations that could penetrate shallow water tables or groundwater usage. Indirect impacts could occur through spills or leaks of petroleum fluids or other contaminants that contaminate surface waters, which could ultimately contaminate groundwater. The disturbance of soil and vegetative cover could affect water quality in groundwater resources. Impacts to groundwater resources, including aquifers, are not anticipated as water supply needs will be limited and sole source aquifers are not common in the area.³¹⁶

There are four documented water wells within the project site, ranging in depth from 44 to 110 feet. The closest verified active, domestic use well is located approximately 110 west of the Preliminary Development Area. There is also the presence of one active, domestic use well with an unverified location within the Preliminary Development Area, within the area where the project substation is proposed. This location appears to correspond with property to the north of the proposed substation area, approximately 150 feet west of the Preliminary Development Area and approximately 90 feet west of the Land Control Area.³¹⁷ Domestic well data shows depth to groundwater occurring at approximately 45 feet within the Land Control Area, and nearby wells indicate an average static water level of 50 feet. Lake Charlotte Solar indicates that the project design includes piers that will only reach a depth of 15 feet, decreasing the likelihood of encountering groundwater during construction. Lake Charlotte Solar will complete a geotechnical analysis prior to pier installation to determine soil characteristics.³¹⁸

Dewatering may occur during construction. Lake Charlotte Solar states that any required dewatering during construction will be discharged to the surrounding upland surface areas to allow it to infiltrate back into the ground to minimize potential impacts. Dewatering filter bags, straw structures or similar best management practices may be used when dewatering, and any areas affected by dewatering or associated materials will be restored. If dewatering is necessary, Lake Charlotte Solar will obtain a Water Appropriation Permit from the DNR.³¹⁹ Lake Charlotte Solar may require a well for the project. O&M building and BESS water requirements will be satisfied with a single domestic-sized water well or via a tie in with rural water lines where available. Lake Charlotte Solar notes that if a well is required to be drilled, applicable permits related to construction and operation will be obtained.³²⁰

³¹⁵ MDH (2018), *Wellhead Protection Vulnerability Fact Sheet*.

<https://www.health.state.mn.us/communities/environment/water/docs/swp/vulnerability.pdf>.

³¹⁶ USEPA (2025), *Sole Source Aquifers For Drinking Water*. <https://www.epa.gov/dwssa>.

³¹⁷ SPA, pp. 96-96.

³¹⁸ SPA, pp. 97.

³¹⁹ Id.

³²⁰ Id.

Solar panels, roads, and gravel surfaces associated with the project are considered impervious surfaces by MPCA. This project will create a small increase of impervious surface in the area, estimated to be 21.4 acres for the solar facility and 15.9 acres for the BESS.³²¹ Therefore, the project will increase the amount of impervious surface in the area, potentially impacting groundwater recharge, however this will likely be minimal. In addition, concrete foundations may be required for some project components, the final installation process to be determined by geotechnical soil testing. Lake Charlotte Solar states that if concrete is needed, it will be locally sourced, and an on-site concrete batch plant will not be required for the project. Concrete foundations have the potential to impact aquifers or impede groundwater movement, however, given the limited depth and size of potential foundations, it is unlikely that this increase will have a significant impact on groundwater.³²² Surface water that flows or falls onto impervious surfaces will be managed by utilizing best management practices (BMPs) in accordance with National Pollutant Discharge Elimination System (NPDES) stormwater permits. BMPs may include silt fence, erosion control blanket, straw bales or temporary seeding.³²³

In addition, the Preliminary Development Area will be vegetated and managed in accordance with the project VMP, reducing exposed soils. This plan includes strategies that can reduce stormwater runoff and accumulation by providing deeply rooted vegetation that provides filtration of groundwater, reducing sedimentation and aiding in the reduction of contaminants into the ground.³²⁴ The VMP includes seed mixes designed to be native to allow for successful operation of the solar facility, promote pollinator habitat, establish stable ground cover successfully, reduce erosion, reduce runoff, and improve infiltration.³²⁵ This planned change of land use from agricultural cropland, to solar energy production alongside perennial vegetation, could create environmental benefits. Unlike agricultural production, solar facilities can be designed and managed to simultaneously restore perennial vegetation at scale, and therefore, deliver key ecosystem services in agricultural landscapes. Excessive fertilizer applications have been documented to create downstream impacts for surface and groundwater quality. Research in locations along the Mississippi River System, including areas in Minnesota, has identified locations where nitrogen and phosphorus transport is high. These located largely occur in areas where corn is grown in high density. Results of establishing solar facilities coupled with perennial vegetation in these locations have been shown to stabilize soils, retain sediments, and reduce nutrient runoff by as much as 85 percent.³²⁶ Establishing perennial native vegetation within the Lake Charlotte Solar project would have the potential to reduce nutrient leaching into groundwater, as well as decrease downstream impacts to local surface waters.

The storage of large quantities of hazardous material creates the potential for spills or leaks into groundwater. Lake Charlotte Solar will prepare and implement a Spill Prevention, Countermeasures and

³²¹ SPA, p. 97.

³²² Id.

³²³ Id.

³²⁴ Id.

³²⁵ SPA, p. 103.

³²⁶ Sturichio, et al., (2025) *Ecologically informed solar enables a sustainable energy transition in US croplands*. <https://doi.org/10.1073/pnas.2501605122>.

Control (SPCC) plan for the main power transformers for the project to prevent spills or leaks in accordance with USEPA regulations.³²⁷

Some solar panels can be considered hazardous waste if they exhibit toxicity, ignitability, reactivity, or corrosivity, or leach heavy metals. Final solar panel selections have not been made for the project; however, it is anticipated that the project will likely utilize thin film photovoltaic panels with tempered glass, generally four to seven feet long by two to four feet wide and one to two inches thick. The photovoltaic panels will have a silicon and weatherized plastic backing, a side-mount or under-mount aluminum frame, heat strengthened front glass, and laminate material encapsulation for weather protection. The main protection built into the module is from wind, dust, sand and precipitation. Tracker technology helps prevent hail and wind damage to the modules by safely stowing the modules in a way that limits/reduces the risk of damage to the modules.³²⁸

MITIGATION

Stormwater management is important to ensure that structure foundations maintain their integrity and that rainwater and surface runoff drain away from the project structures and roads in a way that does not adversely affect existing drainage systems, roads, or nearby properties. Appropriate permanent stormwater management measures, including minimizing the area of impervious surfaces at the site to reduce the volume and velocity of the stormwater runoff and the establishment of stormwater ponds, can address drainage from the newly established impervious areas. Lake Charlotte Solar included permanent stormwater basins in the project design, which can help release stormwater runoff at the existing or a reduced rate and create natural infiltration. Storm basins will be vegetated with a wet seed mix in accordance with the project VMP, and maintained in a herbaceous state for the life of the project.³²⁹

Construction of the project will disturb more than 50 acres of soil. Lake Charlotte Solar must obtain coverage under the General Construction Stormwater Permit Program and prepare and submit a National Pollutant Discharge Elimination System (NPDES) / State Disposal System (SDS) Construction Stormwater (CSW) Permit and Stormwater Pollution Prevention Plan (SWPPP) to the MPCA. The CSW Permit will identify BMPs for erosion prevention and sediment control. The SWPPP describes construction activity, temporary and permanent erosion and sediment controls, BMPs, permanent stormwater management that will be implemented during construction and through the life of the project. Implementation of the protocols outlined in the SWPPP will minimize the potential for soil erosion and detail stormwater management methods during construction and operation of the facility.

Section 4.3.11 of DSP (**Appendix C**) requires the permittee to obtain a MPCA CSW Permit and implement the BMPs within for erosion prevention and sediment control. Impacts to groundwater can also be minimized by mitigating impacts to and soils and surface waters as discussed in Sections **0** and **0**.

Lake Charlotte Solar indicates that it will prepare and implement a Stormwater Pollution Prevention Plan (SWPPP) in accordance with Minnesota Pollution Control Agency (MPCA). The SWPPP will include erosion and sediment control best management practices (BMPs) such as silt fencing (or other erosion control devices), revegetation plans, and management of exposed soils to prevent sediment from entering into

³²⁷ SPA, p. 33.

³²⁸ SPA, p. 23.

³²⁹ SPA, p. 107.

adjacent surface waters.³³⁰ The implementation of the SWPPP and associated BMPs will minimize the potential for downstream water quality impacts throughout the duration of construction and operation of the project.

Any dewatering required during construction will be managed in accordance with the SWPPP and DNR temporary dewatering permit by discharging to the surrounding surface. If dewatering of more than 10,000 gallons per day or 1,000,000 gallons per year, a Water Appropriations Permit from DNR is required. Lake Charlotte Solar indicates that it will obtain a Water Appropriation/Dewatering Permit from the DNR if dewatering is necessary during construction. Lake Charlotte Solar states that construction dewatering will be discharged to the surrounding upland surface areas minimize erosion and allow the water to infiltrate back into the ground in accordance with applicable permits (SWPPP, etc.).³³¹

Lake Charlotte Solar states that if required, a Spill Prevention, Control, and Countermeasures Plan will be prepared prior to the start of commercial operation.³³² In addition, Lake Charlotte Solar's Spill Prevention, Control, and Countermeasure (SPCC) Plan can be developed to address releases, should panels break or become damaged, in congruence with the plan to prevent spills and leaks at the project substation.

4.7.3 Soils

The ROI for soils is the land control area. Impacts to soils will occur during the construction and decommissioning of the project. The impact intensity level is expected to be minimal. Potential impacts will be both positive and negative, and short- and long-term. Isolated moderate to significant negative impacts associated with high rainfall events could occur. Because the soil at the solar facility will be maintained with native perennials and other beneficial vegetation for the life of the project, soil health is likely to improve.

Soil characteristics can influence several other key components of land composition and hydrology, influencing the suitability and limitations for construction and restoration. The soils in the project area are made up of fine loamy soils, with medium-textured soils in the loam and silt fractions, and fewer particles in the clay and sand fractions. Medium-textured soils typically have good physical and available water characteristics to support plant growth if not in excessively steep or wet conditions. They have high water-holding capacity, with most of the water being readily available for plant growth.³³³ Nearly all soils within the Preliminary Development Area are nearly level, with most slopes ranging from 0 to 5 percent. Other slopes include 23.9 acres in the range of 5 to 8 percent and 3.2 acres in the range of 8 to 15 percent (**Table 18. Soil Types in Land Control Area** **Table 18** and). Soils in the Preliminary Development Area are mostly comprised of topsoil with a depth of greater than 12 inches (976 acres, 97.3 percent).³³⁴ The majority of soils in the Preliminary Development Area are low relief, medium-textured soils with intermediate water infiltration characteristics that limit soil erosion. None of the soils within the Land Control Area are considered highly water erodible or highly wind erodible.³³⁵

³³⁰ SPA, p. 107.

³³¹ SPA, p. 97.

³³² SPA, p. 33.

³³³ SPA, Appendix E: AIMP.

³³⁴ Id.

³³⁵ Id.

Most of the soils within the site are in moderately well drained, somewhat poor, and poor drainage classes. Lake Charlotte Solar states that virtually all the soils in the Preliminary Development Area that are classified as somewhat poor and poor have been drained. Moderately Well and Somewhat Poorly drained soils typically are not droughty or wet and are typically well suited to intensive agriculture. None of the soils are excessively drained that would be subject to drought.³³⁶ There are also areas that are prone to compaction (68.2 percent), and all soils within the site are at risk for severe rutting (**Table 19**). The severe rating indicates that ruts form readily due to the hydric texture of the soil. The degree of soil rutting and compaction corresponds to the soil texture and moisture levels, which worsen when heavy equipment traffic impacts wet soils with fine or medium textures (**Table 20**). Lake Charlotte Solar states that it will develop prescriptions that avoid trafficking soils when wet to avoid and minimize potential compaction and rutting.³³⁷

Nearly of the soils within the solar facility project site are designated as prime farmland.³³⁸

Table 18. Soil Types in Land Control Area³³⁹

Soil Type	Slopes	Drainage Class	Acres	Percent of Project Site (%)
Clarion loam, 2 to 6 percent slopes	0-5%	Moderately well drained	0.4	0.0
Harps clay loam, 0 to 2 percent slopes	0-5%	Poorly drained	6.4	0.5
Crippin loam, 1 to 3 percent slopes	0-5%	Somewhat poorly drained	150.5	11.8
Coland clay loam, 0 to 2 percent slopes, frequently flooded	0-5%	Poorly drained	0.2	0.0
Delft clay loam, 0 to 2 percent slopes	0-5%	Poorly drained	7.7	0.6
Canisteo clay loam, 0 to 2 percent slopes	0-5%	Poorly drained	0.8	0.1
Nicollet-Crippin complex	0-5%	Somewhat poorly drained	16.9	1.3
Clarion-Swanlake complex, 2 to 6 percent slopes	0-5%	Moderately well drained	209.9	16.4
Clarion-Storden complex, 6 to 10 percent slopes, moderately eroded	>5-8%	Well drained	30.2	2.4
Omsrud-Storden complex, 10 to 16 percent slopes, moderately eroded	>8-15%	Well drained	3.4	0.3
Canisteo-Glencoe complex, 0 to 2 percent slopes	0-5%	Poorly drained	815.1	63.8

³³⁶ Id.

³³⁷ Id.

³³⁸ Id.

³³⁹ Soil data gathered from: SPA at p. 99, Table 5.5.4-1; USDA National Cooperative Soil Survey Soil Series *Soil Survey Geographic Database (NRCS SSURGO) Web Soil Survey Map Viewer*. Retrieved from: <https://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx>.

Soil Type	Slopes	Drainage Class	Acres	Percent of Project Site (%)
Glencoe clay loam, 0 to 1 percent slopes	0-5%	Very poorly drained	23.7	1.9
Nicollet clay loam, 1 to 3 percent slopes	0-5%	Very poorly drained	11.4	0.9
Land Control Area Subtotal			1276.7	100%

Table 19: Drainage Class of Soils in Land Control Area

Drainage Class	Acres	Percent of Project Site (%)
Well drained	33.6	2.6
Somewhat poorly drained	167.4	13
Poorly drained	830.2	65
Very poorly drained	35.1	2.8

POTENTIAL IMPACTS

The impact intensity level is expected to be low to moderate. Primary impacts to soils will occur during the construction and decommissioning stages of the project. Construction may require grading to provide a level surface in certain areas for the solar arrays, collector substation, and BESS. Lake Charlotte Solar indicates that since the Preliminary Development Area is relatively level existing agricultural fields, the project will minimize grading to the extent practicable. The final amount of grading will be determined prior to construction.³⁴⁰ Areas of the site that will be graded will have topsoil and organic matter stripped and segregated from the subsoil. Topsoil will have temporary and permanent stabilization measures established in accordance with the project's SWPPP, such as silt fencing on the downside of hills, near waterways, and near drain tile inlets. Check dams and straw wattles also will be used in areas that have the potential for high volume rain flow during rain events. After grading is complete, subsoil will be placed first, followed by topsoil, blending the grade into existing topography. Decompaction will occur for soil preparation in areas proposed for seeding to native grasses, forbs, and pollinator species.³⁴¹

Other soil impacts from construction will occur from the installation of the direct-embedded piers that support the structural framework of the solar arrays, and small areas of foundations for the inverter skids, the collector substation, O&M building, and BESS. Impacts to soil for the electrical configuration will differ, depending on if below-ground or above-ground collection is chosen. If the below-ground collection configuration is used, installation of electrical cables will require trenching the cables to a depth of four feet below grade for installation, creating the potential for more soil impacts. If the hybrid collection

³⁴⁰ SPA, pp. 101-102.

³⁴¹ Id.

system is used, soil impacts will primarily occur between the rows of panels to the inverter/transformer skids, as well as to the collector substation.³⁴²

Construction will take place on approximately 1,276.7 acres of land (Land Control Area).³⁴³ As with any ground disturbance, there is potential for soil compaction and erosion. Heavy rainfall events during construction or prior to the establishment of permanent vegetation increase the risk that significant sedimentation and erosion could occur. The soils within the site are loamy, medium textured soils with varying hydrology, with two thirds of the site poorly or very poorly drained. During wet conditions, most soils within the site are prone to rutting with a severe rating, and two thirds of soils are prone to compaction. Soil compaction modifies the structure and reduces the porosity and moisture-holding capacity of soils. Compaction and rutting are related to moisture content and texture and are worse when medium- and fine-textured soils are subject to heavy equipment traffic when wet.³⁴⁴ None of the soils in the project area are susceptible to drought. Existing drain tiles may be used or new tiles can be installed to ensure proper drainage.

Soil cover and management at the solar facility will change from cultivated cropland to a mixture of pervious areas with native perennial and other beneficial ground cover plantings, and semi-impervious surfaces. Once permanent vegetation is properly established, stormwater management, as well as general soil health, will improve due to the use of native perennial plants. Prairie vegetation and native plants can lead to higher infiltration rates, and more active organic matter, allowing the microorganisms and soil to recover within the site.

Potential impacts over the life of the project will be positive and negative, and short- and long-term. Isolated moderate to significant negative impacts associated with high rainfall events could occur, such as from rutting, and traveling over wet soils. Because the soil at the solar facility would be maintained with native perennials and other beneficial vegetation, soil health would likely improve over the life of the project.

MITIGATION

Lake Charlotte Solar describes measures and best management practices (BMPs) that will be implemented to minimize impacts to soil and designated farmland in their joint site application. This includes strategies outlined in the AIMP, such as methods to minimize soil compaction, preserve topsoil, and establish and maintain appropriate vegetation cover, allowing the land to be returned to its original (agricultural) use after decommissioning. The project VMP also includes methods to plant and stabilize soil during and after construction, outlining methodologies for proper vegetation installation, including guidance for soil preparation, seeding, and seed mixes. Lake Charlotte Solar plans to use a shorter prairie seed mix within the panel footprint, taller prairie plantings in the open spaces between the fence and array, and a wet seed mix for wet areas such as wetlands or stormwater basins. Lake Charlotte solar designed these seed mixes with prairie specialists for successful operation of the solar facility, to promote pollinator habitat, to establish stable ground cover successfully, to reduce erosion and runoff, and to improve infiltration.³⁴⁵

³⁴² Id.

³⁴³ SPA, Appendix E: AIMP.

³⁴⁴ SPA, p. 72.

³⁴⁵ SPA, p. 103.

Prime farmland within the preliminary development will be covered in perennial vegetation according to the seeding and management specifications as described in the VMP to the benefit of wildlife and the soil.³⁴⁶ Although the soil will be taken out of agricultural production, there could be net benefits to groundwater and soil quality from the limiting of nitrogen infiltration into groundwater supply. Lake Charlotte Solar notes several VMPs that will be considered including selecting suitable plants, managing seeding times for optimum moisture, use of mulch, and more. Lake Charlotte Solar will maintain the existing tile drainage system during project operations.³⁴⁷

Additionally, in accordance with MPCA requirements, Lake Charlotte Solar will develop and implement a SWPPP to minimize soil erosion and impacts during construction. Measures in the SWPPP can include BMPs such as silt fencing, temporary seeding/stabilization, permanent stormwater basins, and project phasing.

In addition, several sections of the DSP (**Appendix C**) address soil-related impacts

- Section 4.3.9 requires protection and segregation of topsoil;
- Section 4.3.11 requires the permittee to “implement erosion prevention and sediment control practices recommended by the [MPCA]” and to “obtain a [CSW Permit].” A CSW Permit requires both temporary and permanent stormwater controls. This section also requires implementation of erosion and sediment control measures, contours graded to provide for proper drainage, and all disturbed areas be returned to pre-construction conditions. Lake Charlotte Solar will also develop a SWPPP that complies with MPCA rules and guidelines. The SWPPP describes construction activity, temporary and permanent erosion and sediment controls, BMPs, permanent stormwater management that will be implemented during construction and through the life of the project. Implementation of the protocols outlined in the SWPPP will minimize the potential for soil erosion during construction.
- Section 4.3.16 requires the permittee to implement “site restoration and management” practices enhance “soil water retention and reduces storm water runoff and erosion”.
- Section 4.3.17 requires the permittee to develop a VMP that defines how the land control area will be revegetated and monitored over the life of the project. Appropriate seeding rates and timing of revegetation will stabilize soils and improve overall soil health. Lake Charlotte Solar has included a draft VMP as Appendix C of its joint site permit application.
- Section 4.3.18 requires the permittee to develop an AIMP which details methods to minimize soil compaction, preserve topsoil, and establish and maintain appropriate vegetation to ensure the project is designed, constructed, operated and ultimately restored in a manner that would preserve soils to allow for the land to be returned to agricultural use. Lake Charlotte Solar has included a draft AIMP as Appendix E of its joint site permit application.
- Section 4.3.25 requires the permittee to replace or repair any damaged drain tile for the life of the project, unless otherwise negotiated with the landowner.

³⁴⁶ SPA, p. 104.

³⁴⁷ Id.

4.7.4 Surface Water and Floodplains

The ROI for surface water resources is the project area. The impact intensity level is anticipated to be minimal. Direct impacts to surface waters are not expected. Indirect impacts to surface waters might occur, such as during increased rain events, or from sediment runoff. These impacts will be short-term, of a small size, and localized. Impacts can be mitigated. Significant impacts to floodplains are not anticipated.

Solar farm projects have the potential to impact surface water resources and floodplains. These projects could directly impact water resources and floodplains if these features cannot be avoided through project design. Projects also have the potential to adversely impact surface waters through construction activities that move, remove, or otherwise handle vegetative cover and soils. Changes in vegetative cover and soils can change runoff and water flow patterns.

Surface waters

The project is sited within the Blue Earth River watershed (HUC8: 07020009).³⁴⁸ The Blue Earth River Watershed is located in south central Minnesota and includes part of eight counties, primarily Martin and Faribault. The watershed is approximately 992,034 acres (1,550 square miles).³⁴⁹ The Blue Earth River, named for its deposits of once bluish-green clay along the banks, flows from northern Iowa 108 miles northward. The combination of erodible soils and higher flows has led to greater levels of erosion and a dramatic increase in sediment levels in the river since European settlement in the late 1800s. This sediment makes the water appear cloudy, and can be harmful to aquatic life, such as fish.³⁵⁰

The watershed landscape is characterized as mostly flat, though it includes some hilly areas, ravines, bluffs, natural prairies and forested areas. The vast majority of the watershed is presently farmland.³⁵¹

There are no lakes, ponds, rivers, streams or ditches within the Land Control Area. The nearest mapped lake or pond is Lake Charlotte, located 140 feet west of the Land Control Area.³⁵² There are several wetlands, further discussed in Section 4.7.5. There are no designated as public waterbodies within the project site, however there are two public water wetlands located adjacent to the Land Control Area, Lake Charlotte, High Lake, and Martin Lake. These areas provide wildlife habitat, and community recreational activities. There are no public waters inventory (PWI) basins within the Land Control Area, however the DNR PWI Basin for Lake Charlotte is located approximately 150 feet west of the Land Control Area, and an unnamed DNR PWI Basin Wetland is located approximately 50 feet west of the Land Control Area.³⁵³

Under Section 303(d) of the Clean Water Act, states are required to assess all waters of the state to determine if they meet water quality standards, list waters that do not meet standards and update the list biannually and conduct total maximum daily load studies to set pollutant-reduction goals needed to restore waters to the extent that they meet water quality standards for designated uses. The list, known

³⁴⁸ MNDNR *Minnesota's watershed basins*. <https://www.dnr.state.mn.us/watersheds/map.html>.

³⁴⁹ MPCA, *Blue Earth River*, <https://www.pca.state.mn.us/watershed-information/blue-earth-river>

MPCA (2017),

³⁵⁰ Id.

³⁵¹ Id.

³⁵² SPA, p. 104.

³⁵³ Id.

as the 303(d) list, is based on violations of water quality standards. The MPCA has jurisdiction over determining 303(d) waters in the State of Minnesota.

There are no impaired waterbodies in the Land Control Area, However, impaired streams are located within upstream of the project area. This includes the Elm Creek, located two miles north of the project which was listed as impaired for fecal coliform and turbidity for aquatic life and aquatic recreation.³⁵⁴

Floodplains

Floodplains are flat, or nearly flat, land adjacent to a river or stream that experiences occasional or periodic flooding. It includes the floodway, which consists of the stream channel and adjacent areas that carry flood flows, and the flood fringe, which includes areas covered by the flood, but which do not experience a strong current. Floodplains prevent flood damage by detaining debris, sediment, water, and ice. The Federal Emergency Management Agency (FEMA) delineates floodplains and determines flood risks in areas susceptible to flooding. Within floodplains, FEMA also classifies areas as flood zones, designating areas at risk for minimal or moderate flood hazard, and Special Flood Hazard Areas (SFHA). Flood zones defined as Zone A or AE are identified as a SFHA. SFHA's include areas at risk for a 1-percent annual chance flood, also referred to as the base flood or 100-year flood. The base flood that FEMA uses, known as the 100-year flood, has a one percent chance of occurring during each year. Other flood zones at a moderate or minimal risk of flooding would be classified as Zone X, or Zone C.³⁵⁵

At the state level, the DNR oversees the administration of the state floodplain management program by promoting and ensuring sound land use development in floodplain areas in order to promote the health and safety of the public, minimize loss of life, and reduce economic losses caused by flood damages. The DNR also oversees the national flood insurance program for the state of Minnesota. Floodplains are also regulated at the local level.

According to the FEMA floodplain maps, there are no flood hazard zones within the Land Control Area.³⁵⁶ The Land Control Area is currently classified as an area with minimal flooding hazard. This indicates that it is outside both 100-year and 500-year floodplains. There are, however, floodplains located near the project. This includes a Zone A (100 year) floodplain located approximately 150 feet east of the land control area.³⁵⁷ Due to Minnesota's warmer and wetter climate, there is increased risk for damaging rain events and more frequent flooding. These events could potentially impact the project (Section 0).

POTENTIAL IMPACTS

Surface waters may experience permanent and temporary impacts as a result of the project. Surface waters that are within the water systems connected to and adjacent to the site have the potential to be indirectly impacted, including Lake Charlotte, and Martin Lake and High Lake.

Most of the surface water resources in the Blue Earth River Watershed are not meeting current surface water quality standards, causing impairments that affect recreation, fish, and aquatic insect communities.

³⁵⁴ MPCA, *MPCA Impaired Waters Viewer*. <https://gisdata.mn.gov/dataset/impaired-waters-viewer>.

³⁵⁵ FEMA, *Flood Zones. Glossary*. <https://www.fema.gov/about/glossary/flood-zones>.

³⁵⁶ FEMA, *FEMA Flood Map Service Center*, (n.d.), <https://msc.fema.gov/portal/home>.

³⁵⁷ SPA, p. 105.

MPCA has identified major stressors affecting biological communities in this watershed, including river/stream alterations, connectivity, lack of physical habitat, low oxygen, excessive nutrients (nitrates, phosphorus), and excessive sediment.³⁵⁸ Minnesota has adopted a watershed approach to address the state's 80 major watersheds, looking at the drainage area as a whole, rather than focusing on lakes and streams. For the Blue Earth River watershed, priority restoration and protection strategies are targeted at agricultural land use, as approximately 86 percent of the watershed is in cultivated crops. Strategies to improve water quality and habitat improvements include focusing on phosphorus reduction, ammonia concentration, and primarily nitrate concentration. Reducing pollutants from agricultural sources by implementing best management practices is critical to restoration efforts for this watershed.³⁵⁹

Construction of the project creates potential for indirect impacts if sediment or fugitive dust created by excavation, grading, vegetation removal, and construction traffic reaches nearby surface waters. Overall, and due to the establishment of native perennials and other vegetation at the solar facility, the project is expected to have a long-term positive impact on water quality and surface water features, particularly through the reduction of excessive nutrients through the establishment of perennial and native vegetation.

There is low potential for flood risk at the site. The Land Control Area does not include any areas of FEMA floodplains classified as Zones A or AE, which are special flood hazard areas (SFHA's). The classification of the Land Control Area is an area of minimal flood hazard. However, adjacent to the Land Control Area, located approximately 150 feet to the east, is a Zone A (100 year) floodplain. This nearby area has the potential for an increased risk for 100-year storm events and 100-year flood events under hotter, drier and stormier future conditions. Impacts to the project are anticipated to be minimal. Proper planning and emergency response in the case of a 100-year storm or flood event can be beneficial to ensure additional impacts to floodplains and surface waters do not occur.

MITIGATION

Standard construction management practices, including, but not limited to containment of excavated soils, protection of exposed soils, stabilization of restored soils, and controlling fugitive dust, would minimize the potential for eroded soils to reach surface waters.

During construction of the site, Lake Charlotte Solar will deploy best management practices (BMPs) developed prior to construction to prevent sediment from entering into adjacent surface waters, such as erosion control, revegetation plans, and management of exposed soils. Lake Charlotte Solar will control runoff from the site by utilizing a permanent stormwater system throughout the life of the project. This includes implementing strategies such as installing stormwater basins, installing vegetation beneath solar panels, and preparing and maintaining these areas with seed mixes in accordance with the project VMP.³⁶⁰

In their scoping comments, MnDOT noted that there are several water basins in close proximity to the Trunk Highway (TH) 15 right of way (ROW). MnDOT encourages the applicant to ensure that water basins

³⁵⁸ MPCA (2023), *Water Restoration and Protection Strategy (WRAPS) Report Summary: Blue Earth River Watershed*. <https://www.pca.state.mn.us/sites/default/files/wq-ws4-95b.pdf>.

³⁵⁹ Id; MPCA (2018), *Water Restoration and Protection Strategy (WRAPS)*. <https://www.pca.state.mn.us/sites/default/files/wq-ws4-50b.pdf>.

³⁶⁰ SPA, p. 107.

will not negatively impact existing land and infrastructure in the project area, specifically peak runoff rates to the TH 15 ROW. The proposed locations of stormwater basins may warrant a (modeling) review by MnDOT District 3 Hydraulics Engineer to ensure the proposed work will not change the peak runoff rates. This review may be used to determine if a drainage permit from MnDOT would be required.³⁶¹

The DSP (**Appendix C**) has several standard conditions that address potential impacts to surface waters and floodplains:

- Section 4.3.11 requires the permittee to “implement erosion prevention and sediment control practices recommended by the [MPCA]” and to “obtain a [CSW Permit].” A CSW Permit requires both temporary and permanent stormwater controls. This section also requires implementation of erosion and sediment control measures, contours graded to provide for proper drainage, and all disturbed areas be returned to pre-construction conditions. Lake Charlotte Solar will also develop a Stormwater Pollution Prevention Plan (SWPPP) that complies with MPCA rules and guidelines. The SWPPP describes construction activity, temporary and permanent erosion and sediment controls, BMPs, permanent stormwater management that will be implemented during construction and through the life of the project. Implementation of the protocols outlined in the SWPPP will minimize the potential for soil erosion during construction.
- Section 4.3.16 of the Solar DSP requires the permittee to implement “site restoration and management” practices enhance “soil water retention and reduces storm water runoff and erosion”.
- Section 4.3.17 of the Solar DSP requires the permittee to develop a VMP, which will allow for revegetation of the area with native vegetation, creating deep-rooted systems that allow better ground infiltration of rainfall.
- Section 4.3.25 of the Solar DSP and 4.3.22 of the BESS DSP require the permittee to replace or repair any damaged drain tile for the life of the project, unless otherwise negotiated with the landowner.
- Section 5.9 of the Solar DSP is a special condition that requires the permittee to consult with the MNDNR, the Martin County Soil and Water Conservation District, and the Blue Earth Watershed regarding potential impacts to nearby surface waters due to construction activities, including but not limited to, erosion and sediment control.
- Section 5.10 of the Solar DSP is a special condition that requires the permittee consult with MnDOT and MPCA to conduct a review of stormwater basin plans, ensuring that stormwater basins designs shall not negatively impact existing land and infrastructure in the surrounding area, such as Trunk Highway 15.

4.7.5 Wetlands

The ROI for wetlands is the project area. The impact intensity level is anticipated to be minimal to moderate. Although there is a potential for wetlands to be temporarily affected during construction,

³⁶¹ MnDOT, Scoping Comments. April 28, 2025. eDockets no. [20255-218589-01](#).

direct permanent impacts to wetlands are not expected. Anticipated impacts will be short-term, of a small size, and localized. Impacts can be mitigated.

Wetlands are areas with hydric (wetland) soils, hydrophilic (water-loving) vegetation, and wetland hydrology (inundated or saturated during much of the growing season). Wetland types include marshes, swamps, bogs, and fens. Wetlands vary widely due to differences in soils, topography, climate, hydrology, water chemistry, vegetation, and other factors.³⁶²

Wetlands are important to the health of waterways and communities that are downstream. Wetlands can be one source of hydrology in downstream watercourses and water bodies, detain floodwaters, recharge groundwater supplies, remove pollution, and provide fish and wildlife habitat. Wetland health also has economic impacts because of their key role in fishing, hunting, agriculture, and recreation. Infrastructure projects can temporarily or permanently impact wetlands if these features cannot be avoided through project design. During construction, temporary disturbance of soils and vegetative cover could cause sediment to reach wetlands which could in turn affect wetland functionality.

This EA uses the National Wetland Inventory for Minnesota (NWI-MN) to allow for comparison of wetland types across the solar facility. This includes portions of wetlands that have been delineated for this project, as well as additional wetland areas such as ditches that are mapped within the project area. The NWI-MN is a publicly available GIS database that provides information on the location and characteristics of wetlands in Minnesota. Wetlands listed on the NWI-MN may be inconsistent with local wetland conditions on the ground; however, the NWI-MN provides readily available reference database of wetland resources within the project area that can be used to identify wetlands at the solar facility through desktop review (**Figure 15**). There are approximately 7.9 acres of NWI wetlands mapped in the project area (**Table 20**).

Table 20. NWI-MN Wetlands in Project Footprint³⁶³

Wetland type	Acres
Freshwater Emergent	7.9
Total	7.9

Wetland types in the Land Control Area consist of Freshwater Emergent Wetlands (Seasonally Flooded/Saturated). Nearby wetlands in areas adjacent to the project include Freshwater Forested/Shrub wetlands (Hardwood and Shrub), Freshwater Pond, Lakes and Riverines.

Lake Charlotte Solar completed an onsite wetland delineation in October 2022, delineating wetlands across the project area totaling approximately 21 wetlands consisting of 16.5 acres within the Land Control Area. All existing wetlands are associated with roadways or are located within agricultural fields. All identified wetlands were Cowardin community Palustrine Emergent (PEM) type, and Circular 39 Type

³⁶² USEPA. (2025). *What is a Wetland?* <https://www.epa.gov/wetlands/what-wetland>.

³⁶³ MNDNR. (2019) *National Wetland Inventory of Minnesota*. <https://gisdata.mn.gov/dataset/water-nat-wetlands-inv-2009-2014>.

1, seasonally flooded basins or flood plains.³⁶⁴ **Table 21** summarizes delineated waterbodies within the survey area, using data provided by Lake Charlotte Solar in its application.³⁶⁵

Table 21. Delineated Waterbodies in Project Footprint

Feature Type*	Acres in Land Control Area
PEMAf	10.74
PEMAf/PEMAx	6.11
PEMAx	0.74

*PEM – Palustrine Emergent; f – farmed; x – Excavated; A – Temporarily Flooded.

POTENTIAL IMPACTS

The NWI-MN mapping identified approximately 7.9 acres of Freshwater Emergent, wetland within the project Land Control Area. The majority of these wetlands are associated with roadways or agricultural fields. Outside of these wetlands, there is a diverse chain of wetlands, ponds, lakes, and riverine bordering the site, west of Charlotte Oak Drive. Three of these lakes, Lake Charlotte, High Lake, and Martin Lake, are also public waters.

Lake Charlotte Solar’s wetland delineation report identified approximately 16.5 acres of wetlands within the Land Control Area. All identified wetlands are Palustrine Emergent, or seasonally flooded basins/floodplains.³⁶⁶

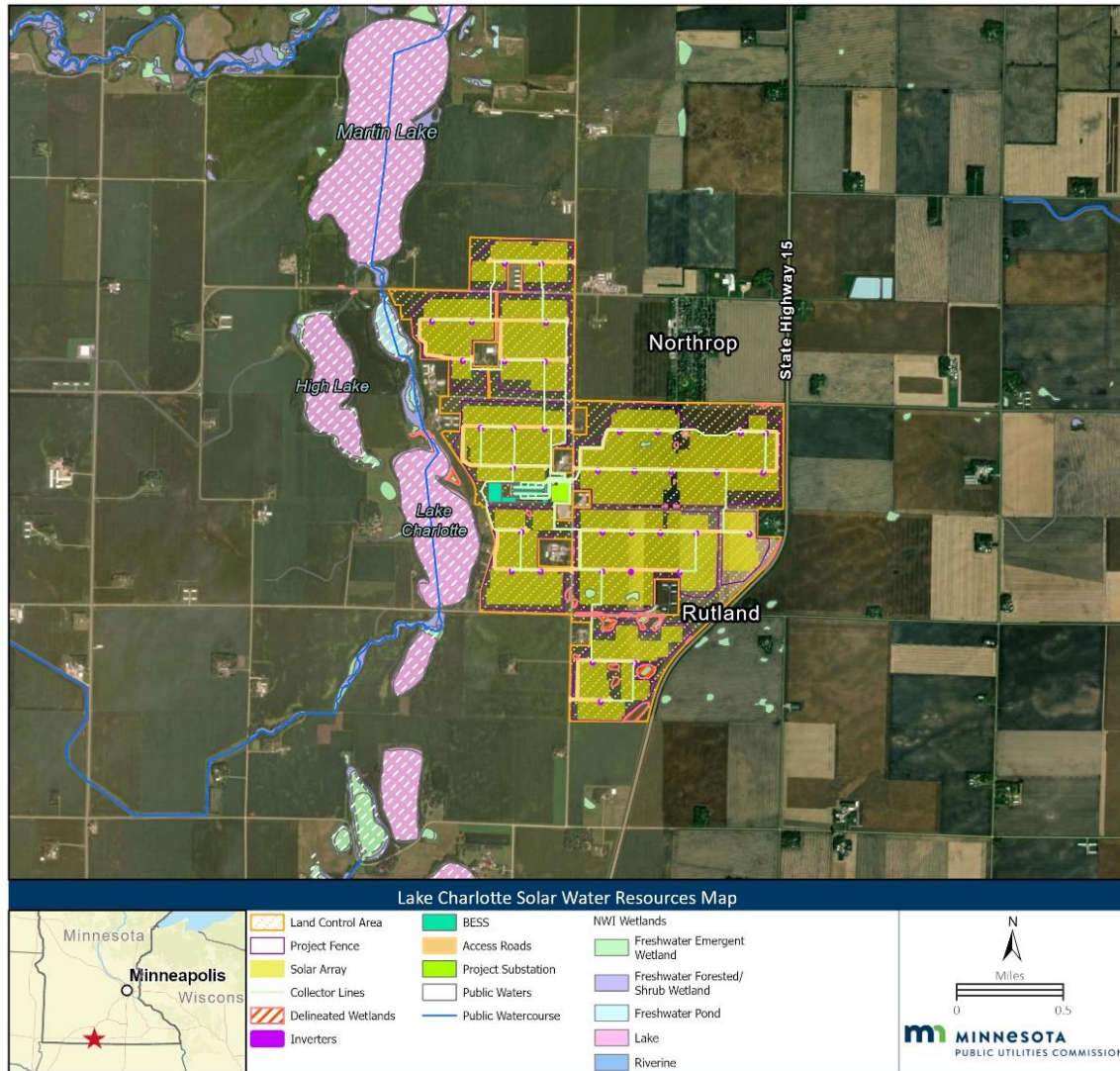
Although wetlands have been identified within the project area, the preliminary site layout for the solar facility avoids locating solar arrays and associated equipment within wetland areas (**Figure 16: Water Resources Map**). There is potential for temporary, short-term impacts to wetlands to occur during construction, including disturbances in wetlands adjacent to the project area, such as the local chain of lakes. Direct impacts to wetlands are not anticipated.

³⁶⁴ SPA, p. 105.

³⁶⁵ SPA, p. 7: Table 4-19.

³⁶⁶ SPA, pp. 105-106.

Figure 16: Water Resources Map



MITIGATION

The project site layout has been designed to avoid placing solar generation facility infrastructure in wetlands, and to minimize impacts to surface waters to the extent practicable by avoiding wetlands. In addition, wetland areas within the Preliminary Development Area will be vegetated with a wet seed mix in accordance with the project VMP, and maintained in a herbaceous state for the life of the project.³⁶⁷

Lake Charlotte Solar has already submitted a Minnesota Wetland Conservation Act (WCA) Notice of Application for Delineation Concurrence to the USACE St. Paul District and the Martin County LGU, and the Martin County Soil and Water Conservation (SWCS) district in 2023. In February 2025, Lake Charlotte

³⁶⁷ SPA, p. 107.

Solar contacted the USACE to notice that the wetland boundary concurrence was received from the Martin County SWCS, and the proposed project is anticipated to avoid wetland impacts.³⁶⁸ If wetland impacts are required for the final layout, Lake Charlotte Solar will further coordinate with the appropriate agency, such as the USACE under Section 404 and 401 of the Federal Clean Water Act (CWA) and Martin County (SWCS) under the WCA. If unavoidable wetland impacts take place, the appropriate permits will be obtained, and impacts should be replaced in accordance with Section 404 of the Federal CWA and the Minnesota WCA.

- Section 4.3.13 of the DSP (**Appendix C**) generally prohibits placement of the solar energy generating system, BESS, or associated facilities in public waters and public waters wetlands. The permit condition does allow for electric collector or feeder lines to cross or be placed in public waters or public waters wetlands subject to permits and approvals by the DNR and the USACE, and local units of government as implementers of the WCA.
- Section 5.9 of the Solar DSP is a special condition that requires the permittee to consult with the MNDNR, the Martin County Soil and Water Conservation District and the Blue Earth Watershed regarding potential impacts to nearby water systems, including Lake Charlotte, High Lake, and Martin Lake due to construction activities, such as erosion and sediment control.

4.7.6 Vegetation

The ROI for vegetation is the project area. The solar facility will convert farmland to perennial vegetation for the life of the project. Potential impacts of the solar facility can be mitigated through the development of a VMP.

The solar facility project area is within the Minnesota River Prairie subsection of the North Central Glaciated Plains section of the Prairie Parkland Province. This subsection consists of a gently rolling loamy ground moraine, with lake plains, and some areas of steep kames and broad slopes. Pre-settlement vegetation was primarily tallgrass prairie and wetlands, with many islands of wet prairie. Forests of silver maple, elm, cottonwood, and willow grew on floodplains along the Minnesota River and other streams. Portions of the Big Stone Moraine supported dry and dry-mesic prairie, and there were also dry gravel prairies on kames.³⁶⁹

Currently, agriculture is one of the most important land uses, dominating the subsection. The subsection is the heart of the Minnesota Cornbelt, and upland prairie species are common throughout most of the area. Remnant stands of tallgrass prairie and floodplain forests are now rare. Fire was the most common natural disturbance before settlement. Fire suppression has allowed woodlands to develop from what were originally oak openings or brush prairies (Wheeler et al. 1992). Other causes of disturbance are floods and tornados.³⁷⁰ A major concern for this subsection is impacts on water quality from intensive agricultural activities, including use of fertilizers and pesticides, expanding use of pattern tiling, and ditching and draining of small wetlands. Continued loss of the small amount of native upland habitat and

³⁶⁸ SPA, pp. 73-74.

³⁶⁹ MNDNR, *Minnesota River Prairie Subsection*. <https://www.dnr.state.mn.us/ecs/251Ba/index.html>.

³⁷⁰ Id.

over-intensive grazing remains a concern.³⁷¹ The present-day land cover within the project site consists predominantly of cultivated cropland/pastureland (1,216.7 acres, 95.3 percent) with small areas of developed land (59.9 acres/4.7 percent) and small woodlots serving as a shelter belt (0.1 acre, less than 0.01 percent).

In Minnesota, native prairie is defined as grass-dominated communities with a diversity of forbs and wildlife. They are grasslands dominated by native prairie vegetation, usually occurring where the sod has never been broken.³⁷² Unbroken pastureland used for livestock grazing can be considered native prairie if it has predominantly native vegetation originating from the site and conservation practices have maintained biological diversity. Pockets of Native Prairie are not uncommonly present in Martin County, however, and there is no native prairie present within the project site.³⁷³

POTENTIAL IMPACTS

Construction of the solar facility will change vegetative cover in the Land Control Area. Tree removal is not anticipated to occur for the project. Construction of the project will also create some additional impermeable surfaces, which could affect water runoff. Removal of vegetative cover exposes soils and could result in soil erosion. Temporary or permanent removal of vegetation also has the potential to affect wildlife habitat. Most of the current land use within the project area is in cultivated, agricultural land, with some areas of developed land and wooded windbreaks.

There are no areas present near the site that are designated as high value resources, representing areas with more vegetation diversity compared to the surrounding agricultural areas. Non-impervious portions of agricultural land within the solar facility would be converted to a native, low-growing perennial vegetative cover in accordance with the project's vegetation management plan (VMP). The solar facility site will utilize a seed mix to promote pollinator habitat, establish stable ground cover, reduce erosion and runoff, and improve infiltration while allowing successful operation of the site.³⁷⁴ The establishment of native vegetation will be compatible with the project's operations and compatible to the site's local ecosystem, resulting in a net benefit in vegetative cover for the life of the project.

Under the arrays, short-statured prairie species will be used. Taller prairie plantings will be established in the open spaces between the fence and array, and a wet seed mix will be used in wet areas, such as within wetlands. Lake Charlotte Solar notes that the seed mixes are designed to be native, and are developed in coordination with a prairie specialist, as well as the Minnesota Interagency Vegetation Management Planning Working Group (VMPWG) to design a mix that will successfully achieve the anticipated outcomes. Establishment of diverse, perennial grassland community vegetation will occur in over 70 percent of the site, anticipating 90 percent native vegetation cover by year 5 of establishment. Lake

³⁷¹ MNDNR (2006), *Tomorrow's Habitat for the Wild and Rare: An Action Plan for Minnesota Wildlife, Comprehensive Wildlife Conservation Strategy*.
https://files.dnr.state.mn.us/assistance/nrplanning/bigpicture/cwcs/profiles/minnesota_river_prairie.pdf.

³⁷² Minnesota Statute [84.02](#) Subd. [5](#). Native Prairie.

³⁷³ SPA, p. 116.

³⁷⁴ SPA, pp. 108-109; Appendix C: VMP.

Charlotte Solar indicates that the project VMP is eligible for the Minnesota Board of Water and Soil Resources (BWSR) Habitat Friendly Solar Project, meeting the habitat friendly standards.³⁷⁵

A variety of species are included in the project seed mix such that species will be flowering during each season (Spring, Summer, Fall).³⁷⁶ Ensuring that seed mixes are diverse, and include a variety of flowering species, can increase the likelihood of successful establishment and ecosystem benefits in the area. A recent Minnesota study found that utility-scale solar habitats with pollinator vegetation increased native bee abundance, resulting in increased pollination visits to bordering agricultural fields.³⁷⁷ In addition, using diverse native plant species will stabilize soil health and carbon sequestration with their deep and varied root structures, in addition to providing benefits to a wide range of pollinators and other wildlife species. Lake Charlotte Solar anticipates establishing six or more species of planted native graminoids, and a dozen or more native forb species across the site, with a final anticipated outcome of at least 90 percent of cover comprised of native species.³⁷⁸

Construction activities at the solar facility could introduce or spread invasive species and noxious weeds and the early phases of site restoration and seeding of native species can result in populations of non-native and invasive species on site. Control of invasive and noxious weeds will be ongoing during the construction and operation of the project by mowing and selectively applying herbicides when applicable.³⁷⁹

MITIGATION

Several sections of the DSP (**Appendix C**) address impacts to vegetation:

- Section 4.3.15 of the Solar DSP requires the permittee to minimize the number of trees removed and to leave existing low growing species in the ROW undisturbed to the extent possible, or to replant to blend in with adjacent areas following construction.
- Section 4.3.17 of the Solar DSP requires the permittee to develop a vegetation management plan (VMP) in coordination the Commission and with state agencies through the Minnesota Interagency Vegetation Management Plan Working Group and to file the VMP prior to construction. The applicant has prepared a draft VMP as Appendix E of the Site Permit application. The VMP must include the following:
 - Management objectives addressing short term (year 0-5, seeding and establishment) and long term (year 5 through the life of the Project) goals;
 - a description of planned restoration and vegetation management activities, including how the site will be prepared, timing of activities, how seeding will occur (e.g., broadcast, drilling, etc.), and the types of seed mixes to be used;
 - a description of how the site will be monitored and evaluated to meet management goals;

³⁷⁵ Appendix C: VMP.

³⁷⁶ Id.

³⁷⁷ Walston, L., Hartmann, H., Fox, L., Macknick, J., McCall, J., Janski, J., & Jenkins, L. (2023). *If you build it, will they come? Insect community responses to habitat establishment at solar energy facilities in Minnesota, USA*, retrieved from: <https://iopscience.iop.org/article/10.1088/1748-9326/ad0f72>

³⁷⁸ Appendix C: VMP.

³⁷⁹ Id; SPA, pp 108-109.

- a description of the management tools used to maintain vegetation (e.g., mowing, spot spraying, hand removal, fire, grazing, etc.), including the timing and frequency of maintenance activities;
- identification of the third-party (e.g., consultant, contractor, site manager, etc.) contracted for restoration, monitoring, and long-term vegetation management of the site;
- identification of on-site noxious weeds and invasive species (native and non-native) and the monitoring and management practices to be utilized; and
- a marked-up copy of the Site Plan showing how the site will be revegetated and that identifies the corresponding seed mixes.

Best management practices should be followed concerning seed mixes, seeding rates, and cover crops.

- Section of the Solar DSP 4.3.18 requires the permittee to develop an AIMP which details methods to minimize soil compaction, preserve topsoil, and establish and maintain appropriate vegetation to ensure the project is designed, constructed, operated, and ultimately restored in a manner that would preserve soils to allow for the land to be returned to agricultural use. Lake Charlotte Solar has included a draft AIMP as Appendix E of its application.
- Section 5.1 of the Solar DSP is a special condition requiring the permittee to develop a Visual Screening Plan (See Section 0 4.3.1 [Aesthetics](#)).
- Section 5.2 of the Solar DSP is a special condition requiring the permittee to consult with the Minnesota Department of Transportation (MnDOT) regarding vegetation alongside Trunk Highway 15.

4.7.7 Wildlife and Habitat

The ROI for non-avian wildlife and their habitats is the Land Control Area, the ROI for birds is the local vicinity. Potential impacts may be positive or negative and are species-dependent. Long-term, minimal positive impacts to small mammals, insects, reptiles, amphibians, etc. would occur. Impacts to large wildlife species will be minimal. Project fence design has the potential to impact deer. Significant negative impacts could occur to individuals during the construction and operation of the project. There are several aquatic ecosystems within the project site that have the potential for downstream impacts from dust or erosion control. Potential impacts can be mitigated by prudent design, and adherence to MNDNR recommendations.

Once restored, the Land Control Area will provide native habitat for the life of the project. The project does not contribute to significant habitat loss or degradation or create new habitat edge effects. The introduction of PV panels, fencing and the BESS creates the potential for bird collisions and funneling wildlife towards roads in certain areas. Potential impacts can be mitigated in part through design and BMPs. The impact intensity level is expected to be minimal.

The project area landscape is primarily made of agriculture land, with adjacent wetland and shelter forested areas. Landscape types and vegetation communities vary throughout the local vicinity. The landscape provides habitat for a variety of resident and migratory wildlife species, primarily in the surrounding edge habitats, created by agricultural buffer strips and forested areas adjacent to farmsteads

and residences. Local species include large and small mammals, songbirds, raptors, fish, amphibians, reptiles, waterfowl, and insects. Wildlife can utilize the edge habitat areas for forage, shelter, breeding, overwintering, and/or stopover during migration. Since the area has a mix of land use, which includes roads, agricultural and residential use, wildlife inhabiting the area would likely be adapted to human disturbance.

Species of mammals may use agricultural and grassland areas within the project area as habitat. Mammal species that are likely to utilize the mosaic of edge habitats include the white-tailed deer, common raccoon, coyote, red fox, gray fox, striped skunk, and the ring-necked pheasant. Reptile and amphibian species may also occur in agricultural lands and grasslands within the project, including the American toad and the common garter snake. Several existing lakes, wetlands, and river streams adjacent to the project area may provide habitat for fish and other aquatic species, including mammals such as the muskrat and beaver, as well as turtle, frog, fish and a variety of waterfowl species.³⁸⁰

The National Audubon designates sites as IBAs when they meet certain criteria related to providing habitat for vulnerable species.³⁸¹ The Land Control Area is not within or near any IBAs. In addition, the USFWS has established Waterfowl Production Areas to protect habitat determined essential to the breeding, resting, and nesting habitat for wildlife. There are no Waterfowl Production Areas within the Land Control Area.³⁸²

The project area is located within the Mississippi Flyway, a crucial migration route for millions of birds that migrate annually between North, Central, and South America to locate nesting habitat and wintering habitat.³⁸³ Migratory birds are protected under the Migratory Bird Treaty Act (MBTA) of 1918 (16 USC 703-712), which prohibits the taking, killing, possession, transportation, and importation of migratory birds, their eggs, parts, and nests. In addition, Bald and golden Eagles are protected under the Bald and Gold Eagle Protection Act (16 USC 668-668d), which prohibits take of an individual bird, chick, egg, or nest, including alternate or inactive nests, and prohibits disturbance that may lead to biologically significant impacts, such as interference with feeding, sheltering, roosting, and breeding, or the abandonment of a nest.³⁸⁴

The USFWS has developed a list of Birds of Conservation Concern, including bird species protected by the Migratory Bird Treat Act, and non-migratory species, to foster proactive conservation actions by federal and state agencies and private parties, by focusing first on species of concern. In order to “facilitate domestic and international cooperation in bird conservation”, the U.S. North American Bird Conservation Initiative has also developed Bird Conservation Regions, listing birds present or possibly present within the region that are considered Birds of Conservation Concern. The project Land Control Area is located within the Prairie Pothole Bird Conservation Region (Region 11). The USFWS has identified 34 species

³⁸⁰ SPA, p. 111.

³⁸¹ Audubon Society, *Important Bird Areas. (Minnesota Natural Resource Atlas)*.
<https://mnatlas.org/resources/birds-important-areas/>.

³⁸² SPA, pp. 109-110.

³⁸³ Id.

³⁸⁴ Id.

considered Birds of Conservation Concern within this region. Species include Baird's Sparrow, Black-billed Cuckoo, Chimney Swift, Golden-winged Warbler, Long-eared Owl, Pectoral Sandpiper, and more.³⁸⁵

POTENTIAL IMPACTS

The impact intensity level is expected to be minimal to moderate. Impacts could be positive or negative and depend on species type. Potential direct and indirect impacts will be short- and long-term and can be mitigated.

Terrestrial Wildlife

Individuals will be displaced to adjacent habitats during construction. Because the Land Control Area does not provide critical habitat, this should not impact life cycle functions, for example, nesting. Direct significant impacts may occur during construction activities because of vehicle movement and ground disturbing activities. Vehicles and other equipment moving within the project site during construction and operations could injure or kill individuals, such as small mammals, amphibians, and reptile species.

The largest impact to wildlife associated with solar facilities is fencing. Although deer can jump many fences, they can become tangled in both smooth and barbed-wire fences, especially if the wires are loose or installed too closely together.³⁸⁶ Predators can use fences to corner and kill prey species.³⁸⁷ Minnesota DNR provides recommendations to design a solar fence that can reduce disruptions to wildlife. In their Solar Facility guidance, the DNR notes that fencing modifications may be critical to avoiding or minimizing negative impacts to threatened or endangered wildlife species. For example, fences can be modified to allow small openings at the bottom of the fence at intervals so small animals, such as Blanding's turtles, can move in and out of the fenced area. In areas with elk populations or moderate to high white-tailed deer populations (which includes much of Minnesota) fencing should be high enough to exclude deer and elk.³⁸⁸

For the Lake Charlotte Solar project, the fence will consist of an agricultural woven wire fence, extending approximately seven feet above grade. The fence will be topped with one foot of three to four strands of smooth wire, creating a total height of eight feet above grade, which is below the height recommended by the DNR. In addition, Lake Charlotte Solar states that it will install high-visibility markers along fencing adjacent to lakes to increase perceptibility of the wire. Gates will be intentionally installed at corners for deer egress.³⁸⁹ In their scoping comments, the DNR recommended the security fence reaches a minimum

³⁸⁵ Id.

³⁸⁶ Colorado Division of Wildlife. *Fencing with Wildlife in Mind*. (2009).

<https://cpw.state.co.us/Documents/LandWater/PrivateLandPrograms/FencingWithWildlifeInMind.pdf>, p.. 3.

³⁸⁷ Huijser, Marcel et al. *Construction Guidelines for Wildlife Fencing and Associated Escape and Lateral Access Control Measures*, (2015). http://onlinepubs.trb.org/onlinepubs/nchrp/docs/NCHRP25-25%2884%29_FR.pdf, page 27.

³⁸⁸ Minnesota DNR. *Commercial Solar Siting Guidance*. (2023). Retrieved from: https://files.dnr.state.mn.us/publications/ewr/commercial_solar_siting_guidance.pdf.

³⁸⁹ SPA, p. 111-112.

height of 10 feet to prevent white-tailed deer and other large wildlife from entering the facility, which is consistent with their guidance.³⁹⁰

The current fence height of eight feet may increase the risk of larger wildlife, such as deer, getting stuck within the facility; the presence of project components may hinder wildlife from reaching the speed necessary to clear the fence from the inside. Fences can act as barriers that block wildlife movement,³⁹¹ interrupt behavior patterns,³⁹² and prevent them from accessing resources. This can be particularly impactful if fences remove or reduce wildlife travel corridors in fragmented landscapes where wildlife must increase movement between habitat patches to obtain adequate resources.³⁹³ Even small animals may need to move between habitat patches in search of food, shelter, and mating opportunities.³⁹⁴

Fences can also direct wildlife onto roads, increasing both wildlife and motorist fatalities where the ends of fence lines provide openings for road crossings. This “fence-end effect” can displace roadkill locations to road sections at fence end points,³⁹⁵ creating high risk collision zones. Mobile wildlife that frequently crossroads between habitats experience increased wildlife-vehicle collision risk, and roads in connected landscapes with suitable wildlife habitat are more dangerous.³⁹⁶ The project is located adjacent to several state, county, and township roads. Wildlife must cross these roads to move between the habitats in the surrounding area. Once project fencing is installed, the travel corridors of medium- and large-sized animals moving between habitat patches will be limited to the passages between fence lines.

The impacts of project fencing on animal movement must be considered in context with the project landscape. There is wildlife habitat near the project in the form of edge patches alongside aquatic resources, farmsteads, and residences. In addition, fencing does not negatively impact all wildlife. Smaller animals who can move through fence openings may be protected within facility fences, giving them a safe refuge for shelter or rearing their young.³⁹⁷ The establishment of native herbaceous cover within the site

³⁹⁰ MNDNR, Scoping Comments, September 16, 2025. eDockets no. [20259-223095-01](#).; Minnesota DNR.

Commercial Solar Siting Guidance. (2023). Retrieved from:

https://files.dnr.state.mn.us/publications/ewr/commercial_solar_siting_guidance.pdf.

³⁹¹ Sawyer, H., Kauffman, M.J., Middleton, A.D., Morrison, T.A., Nielson, R.M., & Wyckoff, T.B. (2012). *A framework for understanding semi-permeable barrier effects on migratory ungulates*. <https://doi.org/10.1111/1365-2664.12013>.

³⁹² Maida, J.R., Bishop, C.A., & Larsen, K.W. (2019). *Migration and disturbance: impact of fencing and development on Western Rattlesnake (Crotalus oreganus) spring movements in British Columbia*. <https://doi.org/10.1139/cjz-2019-0110>.

³⁹³ Marable, K.M., Belant, J.L., Godwin, D., & Wang, G. (2012). *Effects of resource dispersion and site familiarity on movements of translocated wild turkeys on fragmented landscapes*. <https://doi.org/10.1016/j.beproc.2012.06.006>.

³⁹⁴ Nordberg, E., Ashley, J., Hoekstra, A., Kirkpatrick, S., & Cobb, V.A. (2021). *Small nature preserves do not adequately support large-ranging snakes: Movement ecology and site fidelity in a fragmented rural landscape*. <https://doi.org/10.1016/j.gecco.2021.e01715>.

³⁹⁵ Plante, J., Jaeger, J.A.G., & Desrochers, A. (2019). *How do landscape context and fences influence roadkill locations of small and medium-sized mammals?* <https://doi.org/10.1016/j.jenvman.2018.10.093>.

³⁹⁶ Bénard, A., Lengagne, T., & Bonenfant, C. (2024). *Integration of animal movement into wildlife-vehicle collision models*. <https://doi.org/10.1016/j.ecolmodel.2024.110690>

³⁹⁷ Brooks, M.L. 1999. *Effect of protective fencing on birds, lizards, and black-tailed hares in the western Mojave Desert*. DOI: [10.1007/s002679900194](https://doi.org/10.1007/s002679900194)

following construction will likely benefit wildlife species by creating habitat, such as small mammals, ground nesting birds, insects, and pollinators. This includes bird species within the Prairie Pothole Bird Conservation Area, which could be impacted by portions of the project.

Plastic erosion control netting is frequently used for erosion control during construction and landscape projects and can negatively impact wildlife populations. Wildlife entanglement and death from plastic netting and other plastic materials have been documented in birds, fish, mammals, and reptiles, and can lead to injuries, such as lacerations or spinal damage, and even result in death due to strangulation or overheating.³⁹⁸ The DNR recommends using non-plastic netting as a wildlife-friendly erosion control, along with other BMPs.³⁹⁹

Aquatic wildlife

Aquatic wildlife is also present in the project site, with several aquatic species being documented in the wetlands, lakes, and river streams within and adjacent to the site. Water resources that connect to the site include important aquatic ecosystems for local wildlife including mammals, amphibians, reptiles, fish, and a variety of migrating and local waterfowl.⁴⁰⁰ Construction and operation of the facility can create fugitive dust from soil movement or transportation on unpaved roads. Lake Charlotte solar has indicated they plan to use water or other dust control agents to suppress fugitive dust. Dust control agents used during construction frequently contain chloride, which can persist in the environment and accumulate to toxic levels. Chlorides readily spread through water systems and harm aquatic wildlife. Low concentrations of chloride exposure can impact growth, reproduction, and physiology, while high concentrations can result in death.⁴⁰¹

In addition, ground disturbing activities, particularly near waterways, can increase sedimentation that can impact macroinvertebrate abundance by filling in interstitial spaces, subsequently reducing available habitat. Fish consume macroinvertebrates as part of their diet during multiple life stages, especially during development as fry. Therefore, a reduction in macroinvertebrate abundance can have a direct impact on food availability for fish and can cause a local decline in recruitment. Increased fine sediment can also affect fish by obstructing their feeding patterns with increased turbidity and reducing available spawning habitats. Boring, particularly directional boring within wetlands, could have the potential to introduce sediment into nearby aquatic areas. If appropriate erosion control measures and site rehabilitation are not implemented during and after boring, increased sedimentation could occur, augmenting or further impairing the aquatic ecosystem in the long-term.

³⁹⁸ Stuart, J.N., Watson, M.L., Brown, T.L., & Eustice, C. (2001). *Plastic netting: An entanglement hazard to snakes and other wildlife*, retrieved from: https://www.researchgate.net/publication/286280488_Plastic_netting_An_entanglement_hazard_to_snakes_and_other_wildlife.

³⁹⁹ MNDNR. *Wildlife-friendly Erosion Control*. (2013). <http://files.dnr.state.mn.us/eco/nongame/wildlife-friendly-erosion-control.pdf>.

⁴⁰⁰ SPA, pp. 111.

⁴⁰¹ Southeastern Wisconsin Regional Planning Commission. 2024. *Impacts of Chloride on Biological Systems*. Retrieved from: <https://www.sewrpc.org/SEWRPCFiles/Environment/ChlorideImpactStudy/TR-62-Chapter3PreliminaryDraft.PDF>.

Aquatic wildlife can be injured or killed by entanglement in plastic erosion control netting. Additionally, the use of erosion control methods containing plastic, such as plastic erosion control netting or hydro-mulch products with synthetic plastic fibers, can result in macro- or micro-plastic drainage into aquatic systems. Plastic pollution has consequences across aquatic trophic levels; it can be ingested by a variety of aquatic wildlife, impacting their growth and survival.⁴⁰² Malachite green dye is commonly used in hydro-mulch erosion control products, and it can easily drain into aquatic systems. Malachite green dye has a wide range of negative toxicological effects on aquatic wildlife, including, but not limited to, carcinogenesis, mutagenesis, respiratory toxicity, multi-organ tissue injury, and developmental abnormalities.⁴⁰³

Birds

Bird injuries or mortality may occur due to lack of fencing visibility. Raptors in pursuit of prey may be vulnerable to the nearly invisible wire strands, although other low flying birds such as grouse and owls are also vulnerable to fence collisions. Risks to birds have been identified near PV solar facilities. Preliminary findings in one report, based on limited data, suspect the danger is this appearance of water causing migrating birds to attempt to land, consequently incurring trauma and related predation.⁴⁰⁴ This is known as the “Lake Effect”. A separate study proposes that the lake effect is a much more nuanced process; rather than a solar facility always providing a signal of a lake to all aquatic birds, only certain aquatic bird species are attracted to solar facilities, and this attraction is likely context dependent. Water-obligate bird species in arid environments that lack water may be most susceptible to this “Lake Effect,” as these species rely heavily on aquatic habitat to survive and reproduce.⁴⁰⁵

In early coordination with Lake Charlotte Solar, the MNDNR noted birds may be impacted if they attempt to land on or between the panels of the array. Impacts can be minimized by using less reflective panels or non-polarizing white grids between the panels to break up the polarized reflection of light. The MDNR notes that this is particularly important given the proximity to Charlotte, High, and Martin Lakes, and neighboring wetlands. Lake Charlotte Solar states that it will install panels with anti-reflective coating and will report unusual wildlife events at the site to the permitting authority and the DNR Regional Environmental Assessment Ecologist.⁴⁰⁶

Birds are also susceptible to electrocution from transmission lines. Electrocution is a risk if the conductors or ground wires are close enough together that a bird can touch two conductors simultaneously with its wings or other body parts. Independent of the risk of electrocution, birds might be injured or killed by colliding with transmission line structures and conductors. The risk of collision is influenced by several factors including habitat, flyways, foraging areas, and bird size. Waterfowl, especially larger waterfowl

⁴⁰² Ali, N., Khan, M.H., Ali, M., Sidra, Ahmad, S., Khan, A., Nabi, G., Ali, F., & B, M. (2024). *Insight into microplastics in the aquatic ecosystem: Properties, sources, threats, and mitigation strategies*.

DOI: [10.1016/j.scitotenv.2023.169489](https://doi.org/10.1016/j.scitotenv.2023.169489)

⁴⁰³ Srivastava, S., Sinha, R., & Roy, D. (2004). *Toxicological effects of malachite green*. DOI:

[10.1016/j.aquatox.2003.09.008](https://doi.org/10.1016/j.aquatox.2003.09.008).

⁴⁰⁴ USFWS Forensics Lab. *Avian Mortality at Solar Energy Facilities in Southern California*. (2014).

<http://www.ourenergypolicy.org/wp-content/uploads/2014/04/avian-mortality.pdf>

⁴⁰⁵ Kosciuch, K., Riser-Espinoza, D., Moqtaderi, C., & Erickson, W. (2021). Aquatic habitat bird occurrences at photovoltaic solar energy development in Southern California, USA. DOI: <https://doi.org/10.3390/d13110524>.

⁴⁰⁶ SPA, p. 112.

such as swans and geese, are more likely to collide with transmission lines. Once the project is operational, there will be a potential risk of avian collision and electrocution with transmission conductors and equipment associated with the Gen-Tie Line, which could result in injury or death of individuals. Avian collision risk may be greater for certain at-risk species (e.g., waterfowl, waterbirds) during certain behaviors such as flushing, courtship displays, and aerial displays, potentially increasing risk if birds are distracted. To minimize potential impacts to avian species, Lake Charlotte Solar can incorporate diverting measures such as avian diverters on overhead lines.

Nocturnal Wildlife

The presence of facility lighting has the potential to interrupt the daily cycle of light and dark for animals in the surrounding area. Exposure to artificial light at night impacts the physiology, behavior, and survival of a variety of wildlife: restricting their movement, impairing their foraging, inhibiting their communication, and even leading them to their death.⁴⁰⁷ Light color can influence the impacts of nighttime artificial light exposure, with blue- and white-rich lighting having greater negative effects on wildlife, particularly to highly sensitive groups such as insects.⁴⁰⁸ For this project, Lake Charlotte Solar indicates that security lighting will be installed at the entrances to the solar facility, project substation, and BESS, and will be shielded and downlit in accordance with MDNR preferences for facility lighting. In addition, LED lighting will be designed to limit the maximum nominal color temperature to 4000K. The typical pole height for security lighting will be 10 feet and the lighting will be manually operated by switch as well as motion activated.⁴⁰⁹

Noise pollution

The noise pollution emitted by human activities can impact the health and behavior of wildlife. Over prolonged periods, extremely high noise levels can physically harm wildlife, while lower noise levels may increase stress or impair wildlife communication, which can impact foraging ability, predator avoidance, and mating success.⁴¹⁰

As discussed in Section 4.3.2 (Noise), noise produced during construction and operation would become less the farther from the source. Wildlife utilizing habitats at the nearby habitats described above may experience some reaction to noise produced by project activities. It is difficult to determine the full extent to which project-generated noise may impact wildlife in the local vicinity. Unlike human residences which are fixed in location as noise receptors, wildlife move throughout their habitat, bringing them closer to or further away from generated noise. Additionally, the noise standards used to evaluate project noise impacts are set with respect to human perception, not wildlife, so the dBA at which each species would

⁴⁰⁷ McNaughton, E.J., Beggs, J.R., Gaston, K.J., Jones, D.N., & Stanley, M.C. (2021). Retrofitting streetlights with LEDs has limited impacts on urban wildlife. DOI: <https://doi.org/10.1016/J.BIOCON.2020.108944>.

⁴⁰⁸ Longcore, T., Rodríguez, A., Witherington, B., Penniman, J.F., Herf, L., & Herf, M. (2018). Rapid assessment of lamp spectrum to quantify ecological effects of light at night. DOI: <https://doi.org/10.1002/jez.2184>.

⁴⁰⁹ SPA, p. 33.

⁴¹⁰ McNaughton, E.J., Beggs, J.R., Gaston, K.J., Jones, D.N., & Stanley, M.C. (2021). Retrofitting streetlights with LEDs has limited impacts on urban wildlife. DOI: <https://doi.org/10.1016/J.BIOCON.2020.108944>; Longcore, T., Rodríguez, A., Witherington, B., Penniman, J.F., Herf, L., & Herf, M. (2018). Rapid assessment of lamp spectrum to quantify ecological effects of light at night. DOI: <https://doi.org/10.1002/jez.2184>

be impacted is unknown. As wildlife move further from the project into the habitat patch, noise would continue to dissipate.

The highest levels of noise will be generated during project construction, with pile-driving identified as the most significant source of noise. The noise generated by pile-driving during renewable energy project construction has been shown to impact foraging success⁴¹¹ deter animals,⁴¹² and alter behavior.⁴¹³ While construction noise may reach significant levels, similar to what is anticipated at some surrounding human receptors, any impacts will be short-term, intermittent, and will occur during daylight hours to the extent practicable. Wildlife within the analyzed habitats may be stressed or frightened by construction noise, and it may act as a distracting stimulus when they are foraging or communicating. Mobile wildlife species may avoid certain louder habitat patches during peak construction activity.

Both the trackers and inverters will create noise during the operation of the project. The noise generated by the rotation of the trackers following the sun will be short in duration and intermittent. Wildlife may occasionally be startled by the rotational noise. The primary noise levels during operation of the project derive from the inverters. These levels are expected to be constant throughout the day and sound akin to a humming or buzzing sound. Chronic noise in wildlife habitat may impact wildlife by masking their auditory processing abilities or prompting them to avoid areas altogether.

There is little established data on the dBA ranges at which wildlife species are impacted by ambient noise. Certain acoustically specialized predators, such as owls, appear to be highly sensitive to chronic noise even at low ranges.⁴¹⁴ In general, bird reproductive success does decline in chronically noisy habitats.⁴¹⁵ These trends have been documented in habitats along roadsides and in proximity to other types of energy infrastructure, but thus far there is no research documenting how chronic noise from solar facilities impacts wildlife. The available literature indicates that is not only the intensity of the sound that matters; the frequency can also interfere with wildlife perception. Given the available research on this subject, it is difficult to make any determination about the impacts of facility sound on wildlife.

Habitat

There are no Important Bird Areas (IBA) designated by the National Audubon Society within the Land Control Area, or near the site. There are also no DNR Wildlife Management Areas (WMAs) or USFWS Waterfowl Production areas within Land Control Area. However, there are several WMAs in the local region, such as the Armbrust WMA, located approximately 3 miles northwest of the project, and the

⁴¹¹ Jones, I.T., Peyla, J.F., Clark, H., Song, Z., Stanley, J., & Mooney, T. (2021). *Changes in feeding behavior of longfin squid (Doryteuthis pealeii) during laboratory exposure to pile driving noise.*

<https://doi.org/10.1016/j.marenvres.2020.105250>.

⁴¹² van der Knaap, I., Slabbekoorn, H., Moens, T., Van den Eynde, D., & Reubens, J. (2022). *Effects of pile driving sound on local movement of free-ranging Atlantic cod in the Belgian North Sea.*

<https://doi.org/10.1016/j.envpol.2022.118913>.

⁴¹³ Bailey, H., Senior, B., Simmons, D., Rusin, J., Pick, G., & Thompson, P.M. (2010). *Assessing underwater noise levels during pile-driving at an offshore windfarm and its potential effects on marine mammals.*

<https://doi.org/10.1016/j.marpolbul.2010.01.003>.

⁴¹⁴ Mason, J.T., McClure, C.J.W., & Barber, J.R. (2016). *Anthropogenic noise impairs owl hunting behavior.*

<https://doi.org/10.1016/j.biocon.2016.04.009>.

⁴¹⁵ Francis, C.D., Ortega, C. P., & Cruz, A. (2009). *Noise Pollution Changes Avian Communities and Species Interactions.* <https://doi.org/10.1016/j.cub.2009.06.052>.

Gruvan WMA, located less than four miles south and east of the project. Other nearby ecological resources include Wildlife Action Networks (WAN's) located along the west border of the project, adjacent to Lake Charlotte, and two miles north of the project, following the course of the Elm Creek. These resources are not anticipated to be impacted by the construction or operation of the project.

Wildlife habitat is currently present in the project area, although it is highly fragmented, due to the landscape being comprised of agriculturally managed lands with small blocks of forested area along edges. The row crop habitat at the solar facility being converted is not crucial to wildlife populations, although the land control area may be used as a travel corridor or, occasionally, as a food source (for example, standing corn). Adjacent to the land control are several lakes, wetlands, and river streams. Although project fencing may alter movement of wildlife through the project, these adjacent habitats will not be fenced and will still remain accessible.

Once restored, the developed area within the solar facility will provide cover and habitat for the life of the project. The extent and quality of this habitat will depend on the relative abundance of perennial native species that provide forage and nesting resources. Fencing will restrict ingress and egress of larger wildlife, and habitat benefits will be limited to small-sized mammals, birds, and reptiles who can successfully cross the fence. Lake Charlotte solar plans to use plant species that provide habitat and nectar sources throughout the growing season to support native pollinators. If established and managed appropriately, this herbaceous cover within the site following construction will likely benefit wildlife species, such as small mammals, ground nesting birds, insects, and pollinators.⁴¹⁶

A recent Minnesota study found that utility scale solar habitats with pollinator vegetation increased native bee abundance, resulting in increased pollination visits to bordering agricultural fields.⁴¹⁷ Solar habitat can also enhance bird species richness and diversity in agricultural landscapes,⁴¹⁸ likely because these sites provide beneficial foraging and nesting habitat in a resource-limited landscape. The magnitude of these benefits is determined by the extent of habitat restoration within the solar facility. Choosing a diverse, native seed mix that is well suited for the site can increase the benefits. Reduced pesticide use, as compared to agricultural production, has the potential to benefit insects, including pollinators, and smaller wildlife such as rodents, birds, insects, and reptiles. Revegetating the site with pollinator friendly species will also benefit these species by creating habitat for mating, nesting, and nectar-providing sources. The conversion of agricultural land within the project area to perennial vegetation will positively impact terrestrial wildlife within the Land Control Area, as well as aquatic wildlife in nearby lakes, such as the nearby chain of lakes, including Lake Charlotte, High Lake, and Martin Lake, by reducing pesticide use.

Potential indirect impacts to wildlife may occur due to temporary and permanent habitat loss and displacement. During construction, indirect impacts to wildlife species could occur from habitat alteration and increased noise and human activity which could disrupt wildlife species in the vicinity of the project

⁴¹⁶ SPA, p. 112.

⁴¹⁷ Walston, L., Hartmann, H., Fox, L., Macknick, J., McCall, J., Janski, J., & Jenkins, L. (2023). *If you build it, will they come? Insect community responses to habitat establishment at solar energy facilities in Minnesota, USA*, retrieved from: <https://iopscience.iop.org/article/10.1088/1748-9326/ad0f72>

⁴¹⁸ Jarčuška, B., Gálffyóá, M., Schnürmacher, R., Baláz, M., Mišík, M., Repel, M., Fulín, M., Kerestúr, D., Lackovičova, Z., Mojžiš, J., Zámečník, M., Kaňuch, P., & Krištín, A. (2024). *Solar parks can enhance bird diversity in agricultural landscape*. DOI: <https://doi.org/10.1016/j.jenvman.2023.119902>.

site, causing them to abandon habitat. Population level impacts are not anticipated. Overall, the project is not anticipated to contribute to significant habitat loss or degradation, or create new habitat edge effects, and can result in higher quality of habitat for wildlife, including pollinator species, with proper vegetation establishment and management.

MITIGATION

Impacts to wildlife can be mitigated if the project adopts wildlife-impact mitigation measures where applicable in the project's design, and BMPs throughout construction. Lake Charlotte Solar indicates that the project SWPPP will include erosion and sediment control best practices, including vegetated stormwater basins, and erosion control measures such as silt fence, sediment control logs, temporary seeding, and mulching as needed until permanent vegetation has been established. Additionally, a temporary cover crop will be planted with the perennial seed mixes to stabilize the soil and prevent erosion during the time it takes for the seeds to establish.⁴¹⁹

All streams must be buffered by 16.5 feet per the Minnesota Buffer Law administered by BWSR.⁴²⁰ This buffer will manage run-off and erosion to reduce the amounts of pollutants that enter nearby streams, such as phosphorus, nitrogen, and sediment, further benefitting aquatic wildlife.

Several sections of the DSP for the Solar and BESS Facility (**Appendix C**) specify measures that will minimize impacts to wildlife:

- Section 4.3.16 requires the permittee to implement “site restoration and management practices that provide for native perennial vegetation and foraging habitat beneficial to gamebirds, songbirds, and pollinators”.
- Section 4.3.28 in the BESS DSP and Special Condition Section 5.10 in the Solar DSP require the permittee to use shielded and downward facing lighting and LED lighting that minimizes blue hue at the project substation and operations and maintenance facility. Downward facing lighting must be clearly visible on the site plan submitted for the project.
- Section 4.3.29 in the BESS DSP and Special Condition 5.11 in the Solar DSP require the permittee to utilize non-chloride products for onsite dust control during construction.
- Section 4.3.30 in the BESS DSP and Special Condition 5.12 in the Solar DSP require the permittee to use only “bio-netting” or “natural netting” types of erosion control materials and mulch products without synthetic (plastic) fiber additives or malachite green dye
- Section 4.3.32 in the BESS DSP and the Solar DSP requires the permittee to coordinate with the DNR to ensure that the fence used in the project minimizes impacts to wildlife
- Section 5.8 in the Solar DSP is a special condition that requires the permittee to consult with the MNDNR, the Martin County SWCD, and the Blue Earth Watershed regarding potential impacts to the local aquatic resources due to construction activities, including erosion and sediment control.
- Section 8.14 requires permittees to report “any wildlife injuries and fatalities” to the Commission on a quarterly basis.

⁴¹⁹ SPA, pp. 44-45.

⁴²⁰ Minnesota Statute [103F.48](#).

Other potential mitigation measures include:

- Siting facilities away from wildlife movement corridors can avoid or minimize impacts to wildlife movement.
- Checking open trenches and removing any wildlife caught in trenches before backfilling mitigates impacts.
- Installing high visibility markers on fences to increase perceptibility for birds and other wildlife.
- Incorporating fencing modifications, such as small openings along the bottom or wildlife escape ramps, that allow wildlife to move in and out of the fenced area.
- Using luminaries with the lowest levels of blue hue, backlight, and glare possible to minimize impacts to nocturnal wildlife.
- Once permanent vegetation is established, restricting mowing from April 15 to August 15 to improve the potential for ground nesting habitat.

4.7.8 Rare and Unique Resources

The ROI for rare and unique resources is the local vicinity. The impact intensity level is anticipated to be minimal to moderate during construction, and minimal during operation. Impacts could be both short and long term and could be positive (e.g., through introduction of habitat), or negative (e.g., by removing trees during nesting season). Impacts can be mitigated.

Construction and operation of solar facilities may adversely impact rare and unique resources through the taking or displacement of individual plants or animals, invasive species introduction, and habitat loss. Conversely, in some cases solar sites can be managed to provide habitat. For example, the introduction of native vegetation into a landscape otherwise dominated by cultivated row crops could create habitat for pollinators, such as the rusty patched bumble bee.

The Minnesota DNR classifies rare plant or animal communities across the state. These include Scientific and Natural Areas, High Conservation Value Forest, Minnesota Biological Survey (MBS) Native Plant Communities, and MBS Sites of Biodiversity Significance

The Division of Ecological and Water Resources within DNR manages the Natural Heritage Information System (NHIS). The NHIS “provides information on Minnesota's rare plants, animals, native plant communities, and other rare features. The NHIS is continually updated as new information becomes available and is the most complete source of data on Minnesota's rare or otherwise significant species, native plant communities, and other natural features. Its purpose is to foster better understanding and conservation of these features.”⁴²¹ NHIS data includes federally endangered, threatened, or candidate plant species, and endangered or threatened animal species. The system also includes state endangered, threatened, or special concern species.

⁴²¹ Minnesota Department of Natural Resources (n.d.) *Natural Heritage Information System*, <http://www.dnr.state.mn.us/nhnrp/nhis.html>.

The Minnesota DNR and the Minnesota Board of Water and Soil Resources (BWSR) administer conservation easements for the state. The purpose of a conservation easement is to protect critical natural resource land throughout Minnesota, allowing landowners to participate by stopping crop/grazing of the land, and establishing conservation practices such as native grass and forbs, trees, or wetland restorations.⁴²² The Minnesota Conservation Reserve Enhancement Program (CREP) is a voluntary, federal-state funded natural resource conservation program that places land into conservation easements, targeting environmentally sensitive land such as riparian areas and marginal agricultural land.⁴²³ Minnesota's Reinvest in Minnesota (RIM) reserve program accomplishes conservation goals by placing lands in perpetual conservation easements, restoring certain marginal and environmentally sensitive agricultural land to protect soil and water quality and support fish and wildlife habitat.⁴²⁴

This EA does not map federal- or state-listed species found in the NHIS database, because DNR requires that public display of NHIS data either mask the identity or location of rare features due to the vulnerability of some species to exploitation. Moreover, the NHIS database masks the occurrence of rare species of by randomly incorporating their location into a larger map polygon.

POTENTIAL IMPACTS

Construction of the project has the potential to impact rare and natural resources, including areas of biological significance, and wildlife habitat. Impacts will likely be indirect, short-term, and temporary.

Natural Communities

The Minnesota Biological Survey (MBS) systematically collects, interprets, and provides baseline data on the distribution and ecology of rare plants, rare animals and native plant communities.⁴²⁵ The MBS uses four classifications denoting the level of biological diversity to rank sites:⁴²⁶

- **Below.** Sites lack occurrences of rare species and natural features or do not meet MBS standards for outstanding, high, or moderate rank. These sites may include areas of conservation value at the local level, such as habitat for native plants and animals, corridors for animal movement, buffers surrounding higher- quality natural areas, areas with high potential for restoration of native habitat, or open space.
- **Moderate.** Sites contain occurrences of rare species, moderately disturbed native plant communities, and/or landscapes that have strong potential for recovery of native plant communities and characteristic ecological processes.
- **High.** Sites contain very good quality occurrences of the rarest species, high-quality examples of rare native plant communities, and/or important functional landscapes.
- **Outstanding.** Sites contain the best occurrences of the rarest species, the most outstanding examples of the rarest native plant communities, and/or the largest, most ecologically intact

⁴²² BWSR, What are Conservation Easements? <https://bwsr.state.mn.us/what-are-conservation-easements>.

⁴²³ BWSR, MN CREP, <https://bwsr.state.mn.us/mn-crep-landowners>.

⁴²⁴ BWSR, Reinvest In Minnesota Reserve, https://bwsr.state.mn.us/sites/default/files/2019-01/RIM_overview_0.pdf.

⁴²⁵ MNDNR, *Minnesota County Biological Surveys*, <http://www.dnr.state.mn.us/eco/mcbs/index.html>.

⁴²⁶ MNDNR, *Minnesota Biological Survey*, MBS Site Biodiversity Significance Ranks, https://www.dnr.state.mn.us/eco/mcbs/biodiversity_guidelines.html.

or functional landscapes.

There are no MBS sites within the Land Control Area. However, Elm Creek, located less than four miles north of the project, is ranked as moderate for biodiversity significance.

The closest Wildlife Action Network (WAN) corridor is located directly adjacent to the site, and includes a WAN associated with Lake Charlotte, High Lake, and Martin Lake. Approximately 0.26 acre overlaps the area within the fenceline of the Preliminary Development Area.⁴²⁷ Wildlife Action Networks are areas composed of terrestrial and aquatic habitat cores and corridors to support biological diversity and ecosystem resilience with a focus on Species in Greatest Conservation Need.⁴²⁸ The WAN polygons adjacent to the site are ranked as low-medium. North of the site and connected to the adjacent WAN is another WAN associated with Elm Creek, ranked as medium. In their Natural Heritage Review Letter, the DNR notes that the project is not anticipated to negatively affect any known occurrences of rare features.⁴²⁹

Conservation Easements

Currently, there are no mapped Reinvest in Minnesota conservation easements within the Land Control Area. In addition, there are no large block habitats present in the land control area. Construction of a project within large block habitats may increase habitat loss and fragmentation, which is counterproductive to area-sensitive species for feeding, breeding, and sheltering.⁴³⁰

The MDNR defines native prairie as areas dominated by native prairie vegetation including grasses and forbs, as well as wildlife endemic to these areas. Typically, they are found in areas of the state where the sod has never been broken. Currently, there are no mapped areas of native prairie within the Land Control Area.⁴³¹

Calcareous fens are rare wetlands dependent on a persistent source of calcium-rich groundwater. These areas support unique plant communities that are highly sensitive to changes in both groundwater quality and quantity (MDNR, 2025j). Reductions in groundwater upwelling rates changes in surface water can damage fen condition and/or extent, in some cases irreparably. Lake Charlotte solar states that based on review of MDNR's data, there are no calcareous fens within 5 miles of the Land Control Area.⁴³²

Rare Species

Federally Listed Species

Lake Charlotte Solar reviewed the USFWS Information for Planning and Conservation (IPaC) website to identify the potential for federally endangered, threatened, proposed, and candidate species and designated critical habitat to be present within one mile of the Land Control Area. In addition, Lake

⁴²⁷ SPA, pp. 116-117.

⁴²⁸ MNDNR, *Wildlife Action Plan*. https://www.dnr.state.mn.us/mnwap/mnwap_resources.html.

⁴²⁹ MNDNR, Scoping Comments: Natural Heritage Review Letter. September 16, 2025. eDockets no. [20259-223095-02](#).

⁴³⁰ SPA, p. 117.

⁴³¹ SPA, p. 116.

⁴³² Id.

Charlotte Solar conducted a Natural Heritage Information System review for documented occurrences of federally listed species within one mile of the Land Control Area. Two species were identified through the IPaC review as potentially present in the Land Control Area. Designated critical habitat is not present in the Land Control Area.⁴³³

Western regal fritillary

The western regal fritillary (*Argynnis idalia occidentalis*) is a proposed federally threatened species under the Endangered Species Act. Proposed species are not protected under the Endangered Species Act, and as such, a determination of effect is not applicable. However, federal agencies are required to confer with the USFWS on agency actions that may be likely to jeopardize a proposed species.⁴³⁴ The species is known to be a symbol for prairie restoration, largely found in remnant tall-grass prairies from the great plains, and eastward.⁴³⁵

The Western Regal Fritillary has suffered catastrophic declines in the eastern half of its range. The regal fritillary is faring better in the western half of its range, but is considered vulnerable in Minnesota. Kansas is the only state where this species is considered secure. Regal fritillaries are restricted to native prairie habitats; while adults are observed in both upland prairies and wet prairies, larval development may be restricted to upland prairie. With less than 1 percent of Minnesota's native prairie remaining, this limits available habitat to the widely scattered, mostly small fragments of native prairie in the state that are surrounded by agriculture and development. Only a few of these prairie remnants are large enough to maintain persistent populations if the remnant is genetically isolated, and it is unlikely that any prairie remnants are large enough to provide a secure future for a genetically isolated population. The regal fritillaries survival in Minnesota is dependent upon the concentration of prairie remnants within the flight range of adults that can collectively support large populations.

The regal fritillary lays eggs in late summer, which hatch into larvae after a few weeks. The larvae enter dormancy until the following spring when they emerge to feed and grow, pupating in June and emerging as adults from mid-June into July. Regal fritillaries require violet plants for the completion of the immature lifecycle. In Minnesota, the Prairie Bird's-Foot Violet (*Viola palmata* var. *pedatifida*) of upland prairies has been identified as the principal larval host, although Bird's-Foot Violet (*Viola pedate*) is also used in the southeastern portion of the state.⁴³⁶ Due to the agricultural landscape, suitable regal fritillary habitat is generally limited in the land control area. The native seed mixes designed for the project do not include violets; once vegetation has been established the project will provide some foraging habitat for adult regal fritillaries but not for developing larvae.

Monarch Butterfly (*Danaus plexippus*)

The monarch butterfly is a federal candidate species. The species is common throughout Minnesota during summer months and is most frequently found in habitats where milkweed and native plants are

⁴³³ SPA, p. 113.

⁴³⁴ SPA, pp. 113-114.

⁴³⁵ USFWS, *Regal Fritillary*. <https://www.fws.gov/species/regal-fritillary-speyeria-idalia>.

⁴³⁶ MNDNR, *Regal Fritillary Butterfly*. Retrieved from: <https://www.dnr.state.mn.us/rsg/profile.html?action=elementDetail&selectedElement=IILEPJ6040>.

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common, including roadside ditches, open areas, wet areas, and urban gardens. Monarchs require milkweed plants for the completion of the immature lifecycle.⁴³⁷

Monarchs overwinter in Mexico and fly north in the spring, with ensuing generations eventually reaching Minnesota. Several generations of monarchs build up during the summer in Minnesota. The super-generation that returns to the overwintering grounds in Mexico is produced in the fall.⁴³⁸ Due to the agricultural landscape, suitable monarch butterfly habitat is generally limited in the land control area. The native seed mixes designed for the project include at least five milkweed species; once vegetation has been established the project will provide foraging habitat for monarchs.⁴³⁹

State Listed Species

Lake Charlotte Solar coordinated with the Minnesota DNR to identify state-listed species, and determined that there are no known occurrences of state threatened or endangered species within one mile of the Land Control Area.⁴⁴⁰

MITIGATION

The project has the potential to impact rare and natural resources, including areas of biological significance, and wildlife habitat. Impacts will likely be minimal, indirect, short-term, and temporary. Techniques for minimizing impacts to wildlife and vegetation also minimize impacts to rare species. Avoiding identified areas of species occurrence or preferred habitat is a preferred mitigation measure. Construction of the site will not directly impact aquatic resources, such as the Wildlife Action Network adjacent to the site associated with the lake system. Lake Charlotte Solar will develop a SWPPP for the Project that outlines erosion and sediment control measures necessary during construction to minimize the potential for sedimentation to sensitive resources.

Construction and operation of the solar facility are not likely to permanently impact state-threatened, endangered, or special concern species. Lake Charlotte Solar submitted a Natural Heritage Review (NHR) request through the DNR MCE (Project ID 2025-00257) for the March 2025, to which the DNR responded with a letter on March 11, 2025.⁴⁴¹ Construction of the project is not likely to impact state threatened, endangered, or special concern species.

Techniques for minimizing impacts to wildlife and vegetation also minimize impacts to rare species. Avoiding identified areas of species occurrence or preferred habitat is the preferred mitigation measure.

No additional mitigation is proposed.

4.7.9 Climate Change

The project will help to shift energy production in Minnesota and the upper Midwest toward carbon-free sources. Construction emissions will have a short-term negligible increase in greenhouse gases

⁴³⁷ MNDNR, *Monarch Butterfly* <https://www.dnr.state.mn.us/insects/monarchbutterfly.html>

⁴³⁸ Id.

⁴³⁹ SPA, Appendix C: VMP.

⁴⁴⁰ SPA, p. 115.

⁴⁴¹ MNDNR, *Scoping Comments: Natural Heritage Review Letter*, April 28, 2025. eDockets no. [20259-223095-02](#).

that contribute to climate change. Overall, the project will generate energy that can be used to displace energy otherwise generated by carbon-fueled sources. The total GHG emissions produced by construction and operation of the project will be minimal when compared to the reduction in GHG emissions long-term. The project's design incorporates design elements that minimize impacts from the increase in extreme weather events such as hail, storms, and wind events that are expected to accompany a warming climate. The project area has the potential for increased flood risk in the case of a warmer, wetter climate due to the large presence of water resources in the area.

Climate change refers to any significant change in measures of climate lasting for an extended period. Greenhouse gases (GHG) are gaseous emissions that trap heat in the atmosphere and contribute to climate change. These emissions occur from natural processes and human activities. The most common GHGs emitted from human activities include carbon dioxide, methane, and nitrous oxide. A change in climate can have a wide range of impacts on living species, as well as infrastructure, and may create compounding weather-related events. An increase of extreme weather events, such as flooding, storms, and heat waves, is expected to accompany a warming climate.

Minnesota Statute 216H.02 sets statewide greenhouse gas emissions goals to reduce emissions from 2005 levels to net zero by 2050.⁴⁴² Minnesota has also set a carbon-free energy standard requiring 100% of the retail energy sales in Minnesota to come from carbon-free energy by 2040. In 2020, the electricity sector was the second largest source of Minnesota GHG emissions at 15.8 million tons of 137 million tons, or 11.5%.⁴⁴³ GHG from electricity generation have decreased by about 60% in Minnesota since 2005 due to a shift in generation to lower- and non-emitting sources and an increase in end-use energy efficiency.⁴⁴⁴

POTENTIAL IMPACTS

General

The DNR Minnesota Climate Explorer Tool was used to determine current climate conditions for Martin County.⁴⁴⁵ This tool uses temperature and precipitation data to provide historical climate projections for various geographical regions across Minnesota. For Martin County, the historic annual average temperature trends show a temperature increase of 0.21 °F per decade from 1895 to present, and 0.21 °F per decade from 1970 to present (2025). For precipitation, total annual precipitation has increased at a rate of 0.34 inches per decade from 1895 to present, and has increased at a rate of 0.73 inches per decade from 1970 to present.⁴⁴⁶

The DNR Minnesota Climate Explorer tool was also used to project climate conditions for Martin County. Temperature models were created to project climate data for two scenarios, Representative Concentration Pathway (RCP) 4.5 and RCP 8.5. RCP is a measure adopted by the Intergovernmental Panel on Climate Change to represent various GHG concentration pathways. The numbers (i.e., 4.5 and 8.5)

⁴⁴² Minn. Statute [216H.02](#)

⁴⁴³ Minnesota Pollution Control Agency, *Greenhouse gas emissions data*. (2025). <https://data.pca.state.mn.us/views/Greenhousegasemissionsdata/TotalGHGemissionsgoals?%3Aembed=y&%3AisGuestRedirectFromVizportal=y>.

⁴⁴⁴ Id.

⁴⁴⁵ MNDNR, *Minnesota Climate Explorer Tool*. <https://climate-explorer.dnr.state.mn.us/main/historical>.

⁴⁴⁶ Id.

represent the amount of net radiative forcing the earth receives in watts per meter squared, where a higher RCP signifies a more intense GHG effect, resulting in a higher level of warming. RCP 4.5 represents an “middle of the road”, or intermediate scenario where emissions begin to decrease around 2040. RCP 8.5 represents a fossil fuel dependent scenario, with no emissions reductions through 2100.⁴⁴⁷

Table 22 shows the results of the climate trend modeling and includes trend predictions under different emissions scenarios for average temperature and precipitation.

The climate models predict that under RCP 4.5, the average mean temperature for Martin County is projected to increase by approximately 3.3 °F by Mid-Century (2040 to 2059) compared to modeled recent trending conditions (1980-1999). Late-Century (2080-2099) air temperature is projected to increase by approximately 6.1 °F for RCP 4.5, and approximately 9.4 °F for RCP 8.5. Mid-century annual precipitation is projected to increase by approximately 0.1 inches for RCP 4.5. Late-Century annual precipitation is projected to increase by approximately 0.6 inches for RCP 4.5, and 4.4 inches for RCP 8.5.⁴⁴⁸

Table 22: Modeled Present and Future Climate Trends

GHG Concentration Pathway Scenario		Climate Factor			
		Average Temperature (°F)	Increase from recent trends (°F)	Average Precipitation (inches)	Increase from recent trends (inches)
Modeled (1980-1999)	Recent	45.5	--	31.2	--
Mid-Century (2040-2059) RCP 4.5		48.8	3.3	31.3	0.1
Late-Century (2080-2099) RCP 4.5		51.6	6.1	31.8	0.6
Late-Century (2080-2099) RCP 8.5		54.9	9.4	35.6	4.4

Greenhouse gases

Construction and operation of the project will release Greenhouse Gases (GHG), contributing to the warming of the planet. The National Renewable Energy Laboratory released a 2012 report on PV solar project life cycles. It is estimated that approximately 60-70 percent of GHG emissions from solar projects are from the upstream process of manufacturing of the PV panels and construction, approximately 21-26 percent are from operational processes of power generation and maintenance, and the remaining 5-20 percent of emissions are from downstream processes of decommissioning and disposal.⁴⁴⁹

⁴⁴⁷ Noe, Ryan R; Keeler, Bonnie L; Twine, Tracy E; Brauman, Kate A; Mayer, Terin; Rogers, Maggie. (2019). *Climate change projections for improved management of infrastructure, industry, and water resources in Minnesota*. Retrieved from the University of Minnesota Digital Conservancy, <https://hdl.handle.net/11299/209130>.

⁴⁴⁸ MNDNR, *Minnesota Climate Explorer Tool*. <https://climate-explorer.dnr.state.mn.us/main/historical>.

⁴⁴⁹ National Renewable Energy Laboratory, *Life Cycle Greenhouse Gas Emissions from Solar Photovoltaics*. <https://www.nrel.gov/docs/fy13osti/56487.pdf>.

For the Lake Charlotte Solar project, construction activities will result in short-term increases in GHG emissions from the combustion of fossil fuels in construction equipment and commuter vehicles. Construction activities for the project are expected to produce a total of 4,602 tons of CO₂e.⁴⁵⁰ Lake Charlotte Solar indicates that GHG emissions from construction vehicles will be minimized by keeping construction equipment in good working order. Upon completion of the construction activities, emissions from heavy equipment, delivery vehicles, and construction personnel will cease. Generally, the project's estimated construction emissions are insignificant relative to Minnesota's overall emissions of approximately 126 million tons in 2022.⁴⁵¹ Potential impacts due to construction GHG emissions are anticipated to be negligible.

Once operational, the project will generate minimal GHG emissions. Emissions that do occur would result from vehicle usage to and from the solar facility and BESS for maintenance and operation. During the operations phase maintenance will require the use of two maintenance trucks per day, generating a minor amount of greenhouse gas emissions.⁴⁵² Total emissions from commuter vehicles and maintenance trucks, and other operational needs, such as electricity, are estimated to be 71.3 tons of CO₂e annually.⁴⁵³ Other emissions generated from the operation of the solar farm will result from land use change. The majority of land-use emissions will occur during construction due to converting approximately 1,004 acres of predominately agricultural land to herbaceous land, however, the establishment of perennial vegetation and prairie can reduce this impact and will likely create a net-benefit for greenhouse gas emissions.

If electrical energy from the project displaces energy that would otherwise be generated by carbon-fueled power plants (e.g., coal, natural gas), the project would reduce overall GHG emissions. Lake Charlotte Solar indicates that the project supports the achievement of Minnesota's carbon-free and renewable energy standards, and notes that the project will ultimately offset a large quantity of greenhouse gas emissions by providing renewable electricity and will increase carbon sequestration through native perennial vegetation.⁴⁵⁴ In addition, the project will beneficially impact the climate through the reduction of more carbon-intensive sources of energy, and temporarily reduce emissions from agricultural activities such as combustion of farm equipment and use of agricultural herbicide and pesticides.

Lake Charlotte Solar states that the average amount of GHG emissions associated with the generation of the amount of energy created by the project is approximately 258,000 tons of carbon dioxide equivalent (CO₂e) annually, enough electricity to service 32,067 homes. This is equivalent to removing nearly 60,294 passenger vehicles from the road annually. In addition, if the land is replaced with native, perennial vegetation, this can act as a carbon sink, with herbaceous lands providing approximately 65 percent higher carbon storage capacity than agricultural lands.⁴⁵⁵ Thus, compared to non-renewable energy generation, the project would be beneficial with respect to total annual GHG emissions. Total GHG emissions resulting

⁴⁵⁰ SPA, pp. 91-92, Table 5.5.2-2.

⁴⁵¹ MPCA (2025), *Greenhouse gas emissions data*, retrieved from <https://data.pca.state.mn.us/views/Greenhousegasemissionsdata/TotalGHGmissionsgoals?%3Aembed=y&%3AisGuestRedirectFromVizportal=y>.

⁴⁵² SPA, p. 92.

⁴⁵³ Id.

⁴⁵⁴ SPA, pp. 91-92.

⁴⁵⁵ Id.

from construction and operation of the project are anticipated to be minimal when compared to the long-term reduction in GHG emissions facilitated by the project.

The generation of carbon-free electricity can reduce harmful particulate matter in the air. Due to the reduction in pollution and greenhouse gas emissions from the decrease of fossil fuels and the increase in solar energy production, the overall impact of solar development on human health can be viewed as positive. However, the entire life cycle of the PV systems must be taken into account. After the end of the project's life, panels must be properly disposed of in a special facility, or recycled if recyclers are available, for the ultimate reduction of net emissions from production.

Climate Resilience and Weather

Assessing climate resilience allows an understanding of the risks related to a warmer, wetter climate on project construction and operation. Tree and vegetation loss from construction eliminates related climate resilience benefits, leading to more intense runoff during storms or flooding (thus increasing erosion and reducing water retention), increased heat extremes, and potential reductions in air quality. Removal of or impacts to wetlands due to construction eliminates the ability for the land to retain and absorb stormwater, leading to more intense stormwater runoff and nutrient loading. Revegetation is expected to offset effects, therefore impacts should be temporary and minimal.

The EPA Streamflow Projections Map anticipates a change in average streamflow of the Elm Creek by a ratio of 1.25 (90th percentile) under wetter projections and a ratio of 0.98 (10th percentile) under drier projections in 2071 to 2100 (RCP 8.5) compared to baseline historical flow (1976 to 2005). The Elm Creek is located less than two miles north of the site, and connects into the chain of lakes adjacent to the project. This includes Martin Lake, High Lake, and Lake Charlotte, located immediately west of the Land Control Area. This indicates a potential risk for increased water intake and flow from the river into the nearby surface waters, and therefore increased risk for flooding in areas along the shore of these areas under projected climate scenarios.⁴⁵⁶ In some areas of the western project border, The Land Control Area is located less than 500 feet from the Lake Charlotte lakeshore. The project site is located on an upland area that is divided by a private road and residential homes between the fence line and the shoreline.

A warming climate is expected to cause increased flooding, storms, and heat wave events. These events, especially an increased number and intensity of storms, could increase risks to the project. Changes in precipitation patterns, particularly greater storm intensities, may generate additional floods associated with high flow events. More extreme events can lead to combined sewer overflows and reduce the capacity of sewer systems already impacted by inflow and infiltration. More extreme storms also mean more frequent heavy rainfall events, which can cause localized soil erosion or flooding. These flooding events may challenge current infrastructure for water management and flood control.⁴⁵⁷ Flooding could damage the project's electrical collection system, including inverters and collection wiring.

⁴⁵⁶ SPA, 84.

⁴⁵⁷ EPA's *Creating Resilient Water Utilities initiative* – <https://www.epa.gov/system/files/documents/2024-08/r9-rtoc-presentation-crwu-factsheet-qr-codes.pdf>; – University of Georgia Extension: *National Climate Assessment (2025 archive)*. <https://site.extension.uga.edu/climate/2025/07/archive-of-national-climate-assessment-documents/>.

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The DNR defines mega-rain events as rainfalls of more than 6 inches over 1,000 square miles in 24 hours or less. Sixteen mega-rain events have been recorded in the past 50 years. Of these, 11 events have occurred since the year 2000.⁴⁵⁸

The project has been sited and designed with resiliency in mind as climate continues to change in Minnesota, including resilience from impacts such as severe weather events, strong winds, and lightning, however, a wetter climate may impact flood size and frequency in the area. The Land Control Area is sited outside of any flood hazard zones, including 100-year and 500-year flood hazard zones. Although the project is in an area at minimal risk to flooding, there are flood hazard zones located adjacent to the project. This includes a Zone A, or 100-year storm flood zone approximately 150 feet east of the project. Flooding events due to climate change could have the potential to impact project operations during heavy rainfall events, specifically the areas that are adjacent to the flood hazard zone and nearby chain of lakes, which also could potentially increase in streamflow. These heavier rainfall events due to climate change could also influence stormwater management for the project.

Over the next 30 years, Martin County is predicted to have minor risk of flooding. Martin County experienced periods of extreme drought in 2004, 2012, 2013 and 2021. Currently, the county is ranked as severe drought by the U.S. Drought Monitor. Lake Charlotte Solar indicates that the project has been designed with consideration of the potential climate changes during the lifetime of the project, including increased heavy rainfalls, stronger wind gusts, and increased temperatures. In an effort to minimize impacts on the facility infrastructure and equipment, Lake Charlotte Solar also states the project location was selected to avoid areas subject to flooding and pooled water during a 100-year rainfall event. Permanent drainage systems and stormwater ponds have been designed to be sized appropriately to store and treat precipitation from more severe storms.⁴⁵⁹

Based on local hydrology and topography, there is high potential for soils to become rutted due to increased rain events.

The FEMA National Risk Index⁴⁶⁰ does not list the project area as having high risk for natural hazards. Martin County is currently ranked as very high for community resilience, showing that this community as a lower risk component, and is adequately prepared to anticipate natural hazards, adapt to changing conditions, and withstand and recover rapidly from disruptions. The county is at relatively moderate risk for tornadoes, and a low risk for wildfires.⁴⁶¹

Lake Charlotte Solar indicates that the project will be designed to comply with all applicable state and local building codes and industry standards. During operation, Lake Charlotte Solar will use industry best practices to reduce the impact of high winds and weather events, including options such as optimized stow regimes to reduce equipment exposure and installing dampening equipment to reduce oscillation

⁴⁵⁸ MNDNR (2024), *Historic mega-rain events in Minnesota*. Retrieved from: https://www.dnr.state.mn.us/climate/summaries_and_publications/mega_rain_events.html.

⁴⁵⁹ SPA, p. 93.

⁴⁶⁰ FEMA *National Risk Index*. <https://hazards.fema.gov/nri/>

⁴⁶¹ FEMA, *Resilience Analysis and Planning Tool*. Retrieved from: https://experience.arcgis.com/experience/0a317e8998534c30a9b2d3861c814d42/page/RAPT-2025#data_s=id%3AdataSource_16-19ae627786e-layer-123%3A1361.

during high winds. Tracking systems can be designed to automatically stow the panels in the safest position based on the weather conditions (wind, hail, flooding, deep snow, etc.). For example, panels can be stowed in a nearly vertical position during hail events by re-orienting the trackers, which limits direct impacts between hailstones and the panels. The system will be also designed so that equipment can be isolated when necessary and includes an appropriate level of redundancy to allow for maintenance, repairs, and potential replacement of equipment damaged by storms. Lighting will be provided throughout the site to allow for adequate visibility during nighttime repairs.⁴⁶² Civil and structural design will include safety factors for increased wind and snow loads, as set by the current standards. The electrical system will be designed for reliability, robustness, and compliance with the current codes and standards.⁴⁶³

MITIGATION

Mitigation to reduce emissions during construction is discussed in the Air Quality section of this EA (Section 4.7.1). Strategies to reduce emissions include keeping vehicles in good working order, which will reduce the amount GHG emissions from diesel or gasoline.

Risk of extreme storm and flood events can be mitigated through planning, project design, and preparedness on how to respond in the case of an event.

- Section 5.11 of the DSP is a special condition that requires the permittee to consult with the MNDNR, the Martin County SWCD, and the Blue Earth Watershed regarding potential impacts to nearby aquatic resources due to construction activities, including erosion and sediment control.
- Section 8.12 of the DSP requires permittees file an *Emergency Response Plan* with the Commission and local first responders prior to operation.

In their joint application, Lake Charlotte Solar indicates that it will develop Project and site-specific Emergency Response Program, requiring bi-annual safety drills and annual safety training with local first responders. The Emergency Response Program will cover possible incidents that could occur at the BESS and include corresponding emergency procedures. Lake Charlotte Solar will coordinate with local emergency responders to develop the Emergency Response Program prior to the commercial operation date for the Project.⁴⁶⁴

Impacts related to increased precipitation and flooding can be mitigated. Lake Charlotte will develop a SWPPP to implement, which includes developing vegetated stormwater basins. In addition, the project AIMP and VMP each provide methods to reduce impacts on wet soils, including soil compaction and rutting. During operation of the project, vegetative cover will minimize potential for impacts to waterways.⁴⁶⁵

⁴⁶² SPA, p. 94.

⁴⁶³ Id.

⁴⁶⁴ SPA, p. 32.

⁴⁶⁵ SPA, Appendix E: AIMP; Appendix C: VMP.

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Project developers can employ location, design, and construction strategies to mitigate impacts resulting from a warmer, wetter, and more energetic climate by:

- Avoiding sites with high probability for extreme weather events to the extent possible.
- Designing solar panels and solar arrays to withstand stronger storms and winds.
- Planning for the potential repair and replacement of solar arrays damaged by storms.
- Designing the project's stormwater system to prevent flooding during heavy rainfall events.
- Designing the project's electrical collection system to be resistant to flooding damage.

4.8 Unavoidable Impacts

Resource impacts are unavoidable when an impact cannot be avoided even with mitigation strategies.

Potential impacts and the possible ways to mitigate against them are discussed in this chapter. However, even with mitigation strategies, certain impacts cannot be avoided. Most adverse unavoidable impacts are associated with construction; therefore, they would be temporary.

Unavoidable adverse effects associated with construction of the project (in some instances a specific phase of construction) would last through construction and include:

- Fugitive dust.
- Noise disturbance to nearby residents and recreationalists.
- Visual disturbance to nearby residents and recreationalists.
- Soil compaction and erosion.
- Vegetative clearing.
- Disturbance and temporary displacement of wildlife, as well as direct impacts to wildlife inadvertently struck or crushed.
- Minor amounts of marginal habitat loss, including temporary wetland impacts.
- Possible traffic delays.
- Minor GHG emissions from construction equipment and workers commuting.

Unavoidable adverse impacts associated with the operation would last as long as the life of the project, and include:

- Visual impacts of the project.
- Cultural impacts due to a change in the sense of place for local residents.
- Loss of land for agricultural purposes.
- Injury or death of birds that collide with PV panels or BESS equipment.
- Injury or death of wildlife from fencing.

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- Infrequent vehicle trips from maintenance vehicles.
- Potential decrease to property values.

4.9 Irretrievable or Irreversible Impacts

Resource commitments are irreversible when it is impossible or very difficult to redirect that resource to a different future use; an irretrievable commitment of resources means the resource is not recoverable for later use by future generations.

Irreversible and irretrievable resource commitments are primarily related to project construction, including the use of water, aggregate, hydrocarbons, steel, concrete, wood, and other consumable resources. Some other impacts, like fossil fuel use, are irretrievable. Others, like water use, are irreversible. Still, others might be recyclable in part, for example, the raw materials used to construct PV panels would be an irretrievable commitment of resources, excluding those materials that may be recycled at the end of the panels' useful life. The commitment of labor and fiscal resources to develop, construct, and operate the project is considered irretrievable. Project infrastructure has been designed to avoid or minimize impacts on residences, the environment, and other sensitive resources. Nearby environmentally sensitive resources include wetlands, streams, and rivers, and the project is not anticipated to cause any irretrievable or irreversible impacts to these resources.

4.10 Resource Topics Receiving Abbreviated Analysis

Resource topics that will have negligible impacts from the project and that do not impact the Commission's site permit decision receive less study and analysis.

Many environmental factors and associated impacts from a project are analyzed during the environmental review process. However, if impacts are negligible and will not impact the permit decision, those resource impacts receive less study and analysis. The following resource topics meet this threshold, which is based on information provided by the applicant, field visits, scoping comments, environmental analysis, and staff experience with similar projects.

4.10.1 Displacement

Displacement can occur when residences or other buildings are located within a proposed site or right-of-way. If the buildings would potentially interfere with the safe operation of a project, they are typically removed from the site or ROW and relocated. Displacements from large energy facilities are rare and are more likely to occur in heavily populated areas where avoiding all residences and businesses is not always feasible than in rural areas where there is more room to adjust site boundaries or ROWs to accommodate the proposed energy facility.

There are no residences, businesses, or structures such as barns or sheds located within the project site that will be displaced by the project. No displacement will occur; therefore, no mitigation is proposed.

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4.10.2 Communications

Electronic interference from the proposed project is not anticipated. The project area is served by about 42 AM and FM radio stations⁴⁶⁶ and 2 digital television channels.⁴⁶⁷ There are no radio, microwave, or television towers located within the boundary of the solar facility. There are no cell phone towers located within one mile of the project site, with the closest tower being located approximately 5 miles south of the site in Fairmont. Cellular phone service in the service area is provided by national operators.⁴⁶⁸

Because the solar facilities are relatively low (less than 20 feet tall), they are well below the line of sight used in many communication system signals. Electronic interference associated with communications infrastructure is related to a phenomenon known as corona. Impacts are not expected, because anticipated electric fields are below levels expected to produce significant levels of corona.

- Section 4.3.24 of the DSP requires the permittee to take whatever action is feasible to restore or provide equivalent reception should interference occur to “radio or television, satellite, wireless internet, GPS-based agriculture navigation systems or other communication devices” as a result of the project. Additional mitigation is not proposed.

4.10.3 Implantable Medical Devices

Electromagnetic fields (EMF) might interfere with implantable electromechanical medical devices, such as pacemakers, defibrillators, neurostimulators, and insulin pumps. Impacts to implantable medical devices and persons using these devices are not expected to occur, but, if they did occur, moving away from the project would return the pacemaker to normal operation.

- Section 4.3.30 of the DSP requires the permittee to provide educational materials about the project to adjacent landowners. Additional mitigation is not proposed.

4.10.4 Mining

There are no mining pits within the area of land control. There are several gravel pits located near the site, however, with nine gravel pits mapped between 0.4 and 2.0 miles north to northwest of the Land Control Area.⁴⁶⁹ Impacts to mining will not occur and no mitigation is proposed.

4.10.5 Topography

While grading will occur, significant impacts to topography, such as the creation of abrupt elevation changes or modifications to natural drainage patterns, are not expected. The project will be graded to natural contours, where possible, and soil will be de-compacted in accordance with the project VMP and

⁴⁶⁶ Theodric Technologies, LLC. Radio Locator, *Fairmont, MN*. Retrieved from: <https://radio-locator.com/cgi-bin/locate?select=city&city=Fairmont&state=MN>.

⁴⁶⁷ Federal Communications Commission. *DTV Reception Maps*. [Online]. [Cited September 23, 2025]. Retrieved from: <https://www.fcc.gov/media/engineering/dtvmaps>.

⁴⁶⁸ Federal Communications Commission. *National Broadband Map*. [Online]. [Cited March 12, 2025]. Retrieved from: https://broadbandmap.fcc.gov/location-summary/mobile?version=jun2024&lon=95.800983&lat=44.227964&addr_full=44.227964%2C+-95.800983&zoom=15.58&env=0&tech=tech4g.

⁴⁶⁹ SPA, p. 84.

SWPPP. Appropriate permanent stormwater management measures will address drainage from the newly established impervious areas. Impacts to topography will be negligible.

4.11 Cumulative Potential Effects

Cumulative potential effects result from the incremental effects of a project in addition to other projects in the environmentally relevant area.

Minnesota Rule 4410.0200, subpart 11a, defines “cumulative potential effects,” in part, as the “effect on the environment that results from the incremental effects of a project in addition to other projects in the environmentally relevant area that might reasonably be expected to affect the same environmental resources, including future projects ... regardless of what person undertakes the other projects or what jurisdictions have authority over the project.”

The “environmentally relevant area” includes locations where the potential effects of the project coincide with the potential effects of other projects to impact the elements studied in this EA.

Consideration of cumulative potential effects is intended to aid decision-makers so that they do not make decisions about a specific project in a vacuum. Effects that may be minimal in the context of a single project may accumulate and become significant when all projects are considered.

4.11.1 Analysis Background

The ROI for cumulative potential effects varies across elements and is consistent with the ROI identified in potential impacts and mitigation throughout this document. Cumulative potential effects—where they coincide—increase or decrease the breadth of the impact to the resources and elements studied in potential impacts and mitigation. This may or may not change the impact intensity level assigned to the resource or element.

Cumulative potential effects are impacts to the environment that results from “the incremental effects of a project in addition to other projects in the environmentally relevant area that might reasonably be expected to affect the same environmental resources, including future projects actually planned or for which a basis of expectation has been laid, regardless of what person undertakes the other projects or what jurisdictions have authority over the projects.”⁴⁷⁰

The “environmentally relevant area” includes locations where the potential effects of the project coincide with the potential effects of other projects to impact the elements studied in this EA. Generally, this area includes the ROI for the different resource elements.

Projects identified

Lake Charlotte Solar reviewed desktop resources including Martin County’s website, the city of Fairmont’s website, the MnDOT’s district projects, and the Environmental Quality Board’s interactive project database to identify foreseeable projects.⁴⁷¹ Projects that are geographically and temporally similar to the

⁴⁷⁰ Minn. R. 4410.0200, subp. 11a

⁴⁷¹ SPA, p. 119.; Minnesota Environmental Quality Board. *Environmental Review Projects Database* (2025). <https://webapp.pca.state.mn.us/eqb-search/search>.

project, and therefore could potentially interact with the environmental effects of the project include the following:

State Highway 93: Based on the MNDOT's District 7 planned projects, Highway 93 is currently under construction near Henderson, Minnesota, approximately 70 miles northeast of the project. This is scheduled for completion in 2026.

US Highway 169: Based on MnDOT's local projects, a proposed reconstruction of Highway 169 will occur in Elmore, approximately 31 miles southeast of the project. This will include improvements such as repaving, and other improvements to the highway from East Polton Street to the Minnesota/Iowa Border. This is tentatively planned for 2028 construction.

Lake Avenue Reconstruction: The city of Fairmont will be reconstructing Lake Avenue from Bixby Road/CSAH39 to Fairlakes Avenue, located approximately 5.8 miles south of the Land Control Area. This project is not anticipated to overlap with the proposed project.

Northern Crescent Solar: The Minnesota Public Utilities Commission recently permitted the Northern Crescent Solar project, a proposed 150 MW solar energy generating facility and 50 MW energy storage facility located in Faribault County, MN. The project is located approximately 15 miles from the Land Control Area.

Big Bend Wind Transmission Line Extension Project: The Minnesota Public Utilities Commission is conducting the analysis for the potential route permitting of the Big Bend Wind 161-kV Transmission Line Extension Project. This is a new 4.5-mile 161 kilovolt (kV) single-circuit transmission line and associated facilities, including new substations, to connect the Big Bend Wind Project to GRE's Lakefield Generating Substation in Martin County. The applicants anticipate construction to begin in July 2026 with an in-service date of March 2028.

These projects have the potential to cumulatively impact transportation in the region, such as increasing traffic. The addition of the Lake Charlotte Solar project will lead to additional traffic, and the potential for traffic delays due to slow-moving construction vehicles in the region. However, Lake Charlotte Solar notes that construction of Highway 93 will be complete by 2026, and project construction for the Northern Crescent Solar Project is anticipated to be complete by late 2026. As the construction of the Lake Charlotte Solar project is not anticipated to begin until 2027; therefore, construction of these two projects will not overlap with the construction of the project. Given the distance between the projects and construction of the solar project in location and time, no significant adverse cumulative effects on the region's overall transportation network are anticipated.

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