Appendix E

Environmental Report

Subsequent License Renewal Application

Monticello Nuclear Generating Plant Unit 1

January 2023

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Abbreviations, Acronyms, and Symbols

§	Section
°C	degrees Celsius
°F	degrees Fahrenheit
µg/L	micrograms per liter
AADT	average annual daily traffic
AC	alternating current
ACS	American Community Survey
ADS	automatic depressurization system
ALARA	as low as reasonably achievable
AMA	aquatic management area
APE	area of potential effect
AQCR	air quality control region
AREOR	annual radiological environmental operating report
ARERR	annual radioactive effluent release report
ASDS	alternate shutdown system
ATWS	anticipated transient without scram
BEIR	biological effects of ionizing radiation
BGEPA	Bald and Golden Eagle Protection Act
BMP	best management practice
BTA	best technology available
BWR	boiling water reactor
CAA	Clean Air Act
CDF	core damage frequencies
CEF	certified eligible findings
CFR	Code of Federal Regulations
cfs	cubic feet per second
CN	Certificate of Need
CND/FW	condensate and feedwater systems
CO	carbon monoxide
CO_2e	carbon dioxide equivalent
CPUE	catch per unit effort
CT	combustion turbine
CWA	Clean Water Act

CWIS	cooling water intake structure
CZMP	Coastal Zone Management Program
dBA	A-weighted decibel
DBA	design-basis accidents
DC	direct current
DIF	design intake flow
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
DSM	demand-side management
EAB	exclusion area boundary
ECCS	emergency core cooling system
EDA	Economic Development Authority
EDG	emergency diesel generator
EFH	essential fish habitat
EI	exposure index
ELAP	extended loss of alternating current power
EMF	electromagnetic field
EPA	U.S. Environmental Protection Agency
EPU	extended power uprate
ER	environmental report
ESA	Endangered Species Act
ESW	emergency service water
FAA	Federal Aviation Administration
FEMA	Federal Emergency Management Agency
FLEX	flexible coping strategies
FPPA	Farmland Protection Policy Act
ft^3	cubic feet
FY	fiscal year
GEIS	NUREG-1437, Generic Environmental Impact Statement for License Renewal of Nuclear Plants
GHG	greenhouse gas
GPI	Groundwater Protection Initiative
gpm	gallons per minute
gpy	gallons per year
GWd/MTU	gigawatt-days per metric ton of uranium

GWPP	Ground Water Protection Program
HAPC	habitat areas of particular concern
Gy/d	Gray per day
HEPA	high efficiency particulate absorbing
HPCI	high pressure coolant injection
HPV	Hard Pipe Vent
HVAC	heating, ventilation, and air conditioning
I-94	Interstate 94
IPA	integrated plant assessment
IRP	integrated resource plan
ISD	Independent School District
ISFSI	independent spent fuel storage installation
ISLOCA	interfacing system loss-of-coolant accidents
km	kilometer
KMSP	Minneapolis Airport
KSTC	St. Cloud Re gional Airport
kV	kilovolt
Ldn	day-night 24-hour average (noise)
lg	magnitude short period surface wave (earthquakes)
LERF	large early release frequency
LLD	lower limit of detection
LLRF	large, late release frequency
LLRW	low-level radioactive waste
LLW	low-level waste
LOCA	loss of coolant accident
LOS	level of service
LPCS	low-pressure core spray
m	meter
m^3	cubic meters
MB	maximum benefit
mb	short-period body wave magnitude (earthquakes)
mblg; mb_lg, lg	short-period surface wave magnitude (earthquakes)
MBTA	Migratory Bird Treaty Act
MDCT	mechanical draft cooling tower
MDH	Minnesota Department of Health

MDNR	Minnesota Department of Natural Resources
MEI	maximum exposed individual
MERF	medium early release frequency
MET	meteorological monitoring
mg/L	milligram per liter
MGD	million gallons per day
mgy	million gallons of water per year
MHRA	Monticello Housing Redevelopment Authority
MIRF	medium intermediate release frequency
ml	local magnitude (earthquakes)
MLRF	medium late release frequency
MM	modified Mercalli intensity (seismic intensity scale)
MMBtu	1 million British thermal units
MNGP	Monticello Nuclear Generating Plant Unit 1
MOSAP	Minnesota Office of the State Archaeologist Portal
MPCA	Minnesota Pollution Control Agency
mph	miles per hour
MPUC	Minnesota Public Utilities Commission
mrem	millirem
msl	mean sea level
mSv	millisieverts
MW	megawatt
MWD/MTU	megawatt days per metric ton uranium
MWe	megawatts electric
MWh	megawatt hour
MWt	megawatts thermal
NAAQS	national ambient air quality standards
NCEI	National Centers for Environmental Information
NEI	Nuclear Energy Institute
NEPA	National Environmental Policy Act
NEQ	northeast quadrant
NESC	National Electrical Safety Code
NETL	National Energy Technology Laboratory
NHI	Natural Heritage Inventory
NHPA	National Historic Preservation Act

NO_2	nitrogen dioxide
NOAA	National Oceanic and Atmospheric Administration
NOV	notice of violation
NPDES	National Pollutant Discharge Elimination System
NRC	U.S. Nuclear Regulatory Commission
NPSH	net positive suction head
NRHP	National Register of Historic Places
NSPM	Northern States Power Company–Minnesota
NTTF	Near Term Task Force (Fukushima Dai-ichi)
NUREG	U.S. Nuclear Regulatory Commission Regulation
NWI	National Wetlands Inventory
ODCM	offsite dose calculation manual
OL	operating license
OSHA	U.S. Occupational Safety and Health Administration
Pb	lead
pc/h	passenger cars per hour
PCB	polychlorinated biphenyl
pCi/l	picoCuries per liter
PILOT	payment in lieu of tax
PM	particulate matter
$PM_{2.5}$	particulate matter less than 2.5 micrometers in diameter
PM_{10}	particulate matter less than 10 micrometers in diameter
PRA	probabilistic risk assessment
PSD	Public School District
PV	photovoltaic
PVSC	present value of societal cost
rad/d	rad per day
RCA	Radiologically Controlled Area
RCRA	Resource Conservation and Recovery Act
rem	roentgen equivalent man
REMP	radiological environmental monitoring program
RHR	residual heat removal
RM	River Mile
ROW	right-of-way
SAB	site administration building

SAF	security access facility
SAMA	severe accident mitigation alternatives
SCDF	seismic core damage frequency
SEIS	supplemental environmental impact statement
SFP	spent fuel pool
SHPO	state historic preservation officer
SLR	subsequent license renewal
SLRA	subsequent license renewal application
SMITTR	surveillance, monitoring, inspections, testing, trending, and recordkeeping
SMR	small modular reactor
SNF	spent nuclear fuel
SO_2	sulfur dioxide
SOARCA	state-of-art-reactor consequence analysis
SPCC	spill prevention, control, and countermeasure
SPEO	subsequent period of extended operation
SSA	sole source aquifer
SSC	systems, structures, and components
STC	source term categories
SWPPP	stormwater pollution prevention plan
TDEC	Tennessee Department of Environment and Conservation
TEDE	total effective dose equivalent
TMDL	total maximum daily load
TN	Tennessee
UDEQ	Utah Department of Environmental Quality
UPS	uninterrupted power supply
USACE	U.S. Army Corps of Engineers
USCB	U.S. Census Bureau
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UT	Utah
VSQG	very small quantity generator
WMA	wildlife management area
Xcel Energy	Xcel Energy Corporation

YOY	young-of-the-year

1.0 INTRODUCTION

1.1 Purpose of and Need for Action

The U.S. Nuclear Regulatory Commission (NRC) licenses the operation of domestic nuclear power plants in accordance with the Atomic Energy Act of 1954, as amended, and NRC implementing regulations. Xcel Energy Corporation (Xcel Energy) owns Monticello Nuclear Generating Plant Unit 1 (MNGP), and Northern States Power Company–Minnesota (NSPM) operates the MNGP pursuant to NRC operating license (OL) DPR-22. The initial renewed OL shall expire at midnight on September 8, 2030 (NRC 2006a). MNGP is located in central Minnesota on the banks of the Mississippi River in Sherburne and Wright counties, approximately 38 miles northwest of Minneapolis, Minnesota (USDOT 2021b).

Xcel Energy has prepared this environmental report (ER) in conjunction with its application to the NRC for a subsequent renewal of the MNGP OL, as provided by the following NRC regulations and guidance:

- Title 10, Energy, Code of Federal Regulations (CFR), Part 54, Requirements for Renewal of Operating Licenses for Nuclear Power Plants, Section 54.23, Contents of Application—Environmental Information [10 CFR 54.23], and
- Title 10, Energy, CFR, Part 51, Environmental Protection Requirements for Domestic Licensing and Related Regulatory Functions, Section 51.53, Postconstruction Environmental Reports, Subsection 51.53(c), Operating License Renewal Stage [10 CFR 51.53(c)(1)-(2)]
- NUREG-1555, Supplement 1, Revision 1, Standard Review Plans for Environmental Reviews for Nuclear Power Plants, Supplement 1: Operating License Renewal
- RG 4.2, Regulatory Guide 4.2, Supplement 1, Revision 1, Preparation of Environmental Reports for Nuclear Power Plant License Renewal Applications

The NRC has defined the purpose and need for the proposed action, renewal of the OLs for nuclear power plants such as MNGP, as follows (NRC 2013a):

> *The purpose and need for the proposed action is to provide an option that allows for baseload power generation capability beyond the term of the current nuclear power plant operating license to meet future system generating needs. Such needs may be determined by other energy-planning decision-makers, such as state, utility, and, where authorized, federal agencies (other than the NRC). Unless there are findings in the safety review required by the Atomic Energy Act or the National Environmental Policy Act (NEPA) environmental review that would lead the NRC to reject a license renewal application, the NRC does not have a role in the energy-planning decisions of whether a particular nuclear power plant should continue to operate.*

The subsequently renewed OL would allow an additional 20 years of operation of MNGP beyond its current licensed operating term. The subsequent renewed license for MNGP would expire at midnight on September 8, 2050.

Xcel Energy has prepared Table 1.1-1 to verify conformance with regulatory requirements. Table 1.1-1 indicates the sections in the MNGP subsequent license renewal (SLR) ER that respond to each requirement of 10 CFR 51.53(c) and 10 CFR 51.45.

Table 1.1-1 Environmental Report Compliance with License Renewal Environmental Regulatory Requirements

Description	Requirement	ER Section(s)
Environmental Report—General Requirements [10 CFR 51.45]		
Description of the proposed action	10 CFR 51.45(b)	2.1
Statement of the purposes of the proposed action	10 CFR 51.45(b)	1.0
Description of the environment affected	10 CFR 51.45(b)	3.0
Impact of the proposed action on the environment	10 CFR 51.45(b)(1)	4.0
Adverse environmental effects which cannot be avoided should the proposal be implemented	10 CFR 51.45(b)(2)	6.3
Alternatives to the proposed action	10 CFR 51.45(b)(3)	2.6, 7.0, and 8.0
Relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity	10 CFR 51.45(b)(4)	6.5
Irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented	10 CFR 51.45(b)(5)	6.4
Analysis that considers and balances the environmental effects of the proposed action, the environmental impacts of alternatives to the proposed action, and alternatives available for reducing or avoiding adverse environmental effects	10 CFR 51.45(c)	2.6, 4.0, 7.0, and 8.0
Federal permits, licenses, approvals, and other entitlements which must be obtained in connection with the proposed action and description of the status of compliance with these requirements	10 CFR 51.45(d)	9.1
Status of compliance with applicable environmental quality standards and requirements which have been imposed by federal, state, regional, and local agencies having responsibility for environmental protection, including, but not limited to, applicable zoning and land-use regulations, and thermal and other water pollution limitations or requirements	10 CFR 51.45(d)	9.5
Alternatives in the report including a discussion of whether the alternatives will comply with such applicable environmental quality standards and requirements	10 CFR 51.45(d)	9.7
Information submitted pursuant to 10 CFR 51.45(b) through (d) and not confined to information supporting the proposed action but also including adverse information	10 CFR 51.45(e)	4.0, 6.3, 7.0, 9.3, and 9.5

1.2 Environmental Report Scope and Methodology

NRC regulations for domestic licensing of nuclear power plants require reviews of environmental impacts from renewing an OL. NRC regulation 10 CFR 51.53(c)(1) requires that an applicant for license renewal submit with its application a separate document (Appendix E of the application) entitled, "Applicant's Environmental Report—Operating License Renewal Stage." In determining what information to include in the MNGP SLR applicant's ER, Xcel Energy has relied on NRC regulations and the following supporting documents to provide additional insight in the regulatory requirements:

- NUREG-1437, *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS), Revision 1 (NRC 2013a), and referenced information specific to transportation (NRC 1999).
- NRC supplemental information in the *Federal Register* notice for the 2013 final rule updating 10 CFR Part 51 (78 FR 37282 and 79 FR 56238) *Regulatory Analysis for Amendments to Regulations for the Environmental Review for the Renewal of Nuclear Power Plant Operating Licenses* (NRC 1996a).
- Regulatory Guide 4.2, Supplement 1, Revision 1, *Preparation of Environmental Reports for Nuclear Power Plant License Renewal Applications* (NRC 2013b).

The NRC included in 10 CFR Part 51 the list of 78 NEPA issues for license renewal of nuclear power plants that were identified in the 2013 GEIS (Appendix B to subpart A of 10 CFR Part 51, Table B-1). Table 4.0-1 lists the 78 issues from 10 CFR Part 51, Subpart A, Appendix B, Table B-1 and identifies the section in this ER in which Xcel Energy addresses each applicable issue.

1.3 Monticello Nuclear Generating Plant Licensee and Ownership

Xcel Energy, the owner-licensee for MNGP, submitted this application on behalf of itself and NSPM, the operator-licensee, for MNGP. NSPM was incorporated as a wholly-owned subsidiary of Xcel Energy, Inc. effective August 18, 2000. Xcel Energy provides electricity across its eight-state service area producing more than 20,100 megawatts (MWs) of electricity. (Xcel 2021a)

2.0 PROPOSED ACTION AND DESCRIPTION OF ALTERNATIVES

2.1 The Proposed Action

In accordance with 10 CFR 51.53(c)(2) a license renewal applicant's ER must contain a description of the proposed action. The proposed action is to subsequently renew the OL for MNGP Unit 1 for an additional 20-year period. This preserves the option for NSPM to continue operating MNGP to provide reliable baseload power for the proposed subsequent period of extended operation (SPEO). For MNGP Unit 1, the proposed action would extend the OL from September 8, 2030, to September 8, 2050.

NSPM does not anticipate any SLR-related refurbishment as a result of the technical and aging management program information that will be submitted in accordance with the NRC license renewal process. The relationship of refurbishment to SLR is described in Section 2.3.

Changes to surveillance, monitoring, inspections, testing, trending, and recordkeeping (SMITTR) would be implemented as a result of the 10 CFR Part 54 aging management review for MNGP. Potential SMITTR activities are described in Section 2.4. No plant upgrades to support extended operations that could directly affect the environment or plant effluents are planned to occur during the proposed SPEO with the exception of the expansion of the existing independent spent fuel storage installation (ISFSI), which is under a separate NRC license. MNGP's ISFSI is operated under the plant's NRC general license, but its use to store spent nuclear fuel (SNF) is subject to approval from the State of Minnesota. MNGP will exhaust its current state-approved SNF dry storage capacity in 2030 and must receive a certificate of need (CN) from the State of Minnesota prior to placing additional dry storage modules on the onsite ISFSI. Absent the additional storage that would be provided by the CN, MNGP would need to close in 2030 without regard to its OL expiration. A CN application was submitted in September of 2021 and is currently under review. The CN, if granted, would have a term of 10 years. The expansion would be construction of a second pad within the existing ISFSI fenced area, so no expansion of the ISFSI footprint would be needed. (Xcel 2021b)

2.2 General Plant Information

The ER must contain a description of the proposed action, including the applicant's plans to modify the facility or its administrative control procedures. This report must describe in detail the affected environment around the plant and the modifications directly affecting the environment or any plant effluents. [10 CFR 51.53(c)(2)]

The MNGP site is located in the City of Monticello, Wright County, Minnesota, on the southern bank of Mississippi River approximately 22 miles southeast of St. Cloud and approximately 30 miles northwest of the Twin Cities area of Minneapolis, St. Paul, and their surrounding suburbs. (NMC 2005). The principal structures within the power block at MNGP include a reactor building, a turbine building, a radioactive waste building, an off-gas stack, and a diesel emergency generator building (NRC 2006b). Prominent features beyond the power block area include intake and discharge structures, two mechanical draft cooling towers (MDCTs), the MNGP training and conference center, technical and administrative support facilities, a firing range, meteorological towers, and the MNGP substation which includes 345-, 230-, 115-, and 13.8-kilovolt (kV) switchyards. Figure 3.1-1 shows the general features of the facility and the exclusion area boundary (EAB).

2.2.1 Reactor and Containment Systems

MNGP is a single-unit electric generating plant. The NRC issued the construction permit for MNGP on June 19, 1967, and the OL on January 9, 1971. MNGP is a single-cycle, forced circulation, General Electric boiling water reactor (BWR), BWR-3, producing steam for direct use in a steam turbine. General Electric supplied the nuclear steam supply system and Bechtel Corporation originally designed and constructed the rest of the plant. (NRC 2013c)

MNGP was originally designed for operation at power levels up to 1,670 megawatts thermal (MWt) and an electrical output of up to 545 megawatts electric (MWe). Since being placed into commercial operation, an uprate license amendment was submitted and subsequently approved by the NRC on January 21, 1998. This power uprate increased the power output by 6.3 percent to 1,775 MWt and an electrical output of up to 600 MWe. (NRC 2006b, Section 2.1.2; NRC 2013c) MNGP incorporated the effects of the power uprate in 1999 (NRC 2006b).

In addition, an extended power uprate (EPU) was approved in 2013. The EPU increased license reactor thermal power by approximately 13 percent to 2,004 MWt and an electrical output of up to 691 MWe. For EPU, several modifications were made, including, but not limited to, modifications to main steam transmitters and valves, both high- and low-pressure turbines, instrumentation and controls, and the associated steam, condensate, and feedwater paths, reactor feed pump, power range neutron monitoring system, and main generator transformer. (NRC 2006b; NRC 2008; NRC 2013d)

As stated above, MNGP is a BWR-3 with a Mark I pressure suppression type primary containment. The primary containment structure consists of a drywell, which encloses the reactor vessel and recirculation pumps; a pressure suppression chamber, which stores a large volume of water; a connecting vent system between the drywell and the suppression chamber; and isolation valves. The secondary containment consists of (1) the portion of the reactor building which encloses the primary containment, the refueling facilities, and most of the nuclear steam supply system; (2) the standby gas treatment system; and (3) the off-gas dilution subsystem. During periods when the primary containment vessel is open, the secondary containment system provides all containment functions when containment is required. In addition to the reactor building passive barrier, a standby gas treatment system can automatically or manually exhaust the building atmosphere via filters to the off-gas dilution subsystem in the off-gas stack.

The containment design accounts for the pressure stresses and the weight of the massive structures and large equipment. It also includes thermal and hydrodynamic stresses due to the postulated loss-of-coolant accident (LOCA) and safety relief valve operations, simultaneous seismic stresses in accordance with the seismic criteria, and impact loads from missiles and jet forces due to reactions from postulated breaks in pressurized pipes.

The concrete reactor building, which houses the primary containment, serves as a radiation shield, and fulfills a secondary containment function. The reactor building provides primary containment protection when the drywell is opened for maintenance and refueling outages. The reactor building is maintained under a slight negative pressure, with the building exhaust monitored prior to release to the atmosphere through the reactor building ventilation exhaust stack. Radiation monitors on the exhaust stream can isolate the ventilation system in the event of a process upset that could release excess radioactivity to the environment. A standby gas treatment system is provided to filter and hold up exhaust before discharging it to the off-gas stack. The containment is designed to withstand an internal pressure of 56 pounds per square inch above atmospheric pressure. MNGP utilizes low-enriched uranium dioxide fuel with enrichments below 5.0 percent by weight uranium-235, with peak fuel-rod burn-up levels less than 62,000 megawatt-days per metric ton uranium (MWd/MTU). (NMC 2005; NRC 2006b)

Energy generated in the reactor as pressurized saturated steam is converted to electricity by the turbine generator. The turbine utilizes all the steam generated by the reactor (except for a small portion that is used directly by the condenser air ejectors and the off-gas recombiners) but is equipped with automatic pressure-controlled bypass valves that can discharge excess steam directly to the condenser. The system is set to allow 14 percent of the rated steam flow to pass to the condenser before signaling a process disruption. Exhaust steam from the turbine-generator flows from the low-pressure turbines to a single pass, dual-pressure, de-aerating type condenser. (NMC 2005)

MNGP is licensed for low-enriched uranium-dioxide fuel. The uranium-dioxide fuel is in the form of high-density ceramic pellets. Fuel rods used in the reactor consist of Zircaloy tubes with fuel pellets stacked inside and sealed with welded end plugs. The fuel rods are fabricated into assemblies designed for loading into the reactor core. The MNGP reactor core is comprised of 121 core cells, each consisting of a control rod surrounded by 4 fuel assemblies, for a total of 484 fuel assemblies. Refueling of the reactor is performed every 22 to 24 months with approximately 30 percent of the fuel being replaced during each refueling outage. (NMC 2005)

MNGP may use fuel comprised of a variety of designs for any given core load. A reload batch of fuel generally resides in the reactor for up to four fuel cycles. During that time, continuous improvements and changes are made to bundle designs by the plant's fuel supplier(s). The four reload batches present in the core typically differ from each other in at least some manner of material composition or fabrication process. Frequently, there are at least two product lines of fuel in the reactor with differing lattice dimensions, water rod placements, etc. Additionally, a specific pattern of enrichment and burnable absorber distributions is normally custom designed for each reload batch. The core at MNGP contains fuel of the GE14 product line and of the AREVA ATRIUM 10XM line.

Each fuel rod consists of high-density ceramic uranium dioxide fuel pellets stacked within Zircaloy cladding which is evacuated, backfilled with helium, and sealed with Zircaloy end plugs welded in each end. For some designs, the cladding consists of the same Zircaloy base material with the inner-most part of the cladding replaced by a thin zirconium liner. This liner is mechanically bonded to the base Zircaloy material during manufacture.

Water rods are hollow circular Zircaloy tubes with several holes located at each end to facilitate coolant flow through the assembly. Some fuel vendor designs have square water rods (typically known as "water channels"). Fuel assemblies generally contain one or two water rods, and these water rods are generally larger than the fuel rods, each displacing several fuel rods.

The reactor core fuel loading and programming is designed to yield a peak burnup of 62,000 MWD/MTU and maximum fuel enrichment of 4.95 percent. There are no plans to increase the maximum fuel enrichment or peak burnup beyond this percentage during the proposed SPEO.

2.2.2 Maintenance, Inspection, and Refueling Activities

Various programs and activities at the site maintain, inspect, test, and monitor the performance of plant equipment and are detailed throughout the Updated Safety Analysis Report. These programs and activities include, but are not limited to, those implemented to achieve the following:

- Meet the requirements of 10 CFR Part 50, Appendix B (Quality Assurance), Appendices G and H (Reactor Vessel), and Appendix R (Fire Protection).
- Meet the requirements of 10 CFR 50.55a Codes and Standards, which invoke the American Society of Mechanical Engineers, Boiler and Pressure Vessel Code, Section XI, In-service Inspection and Testing Requirements.
- Meet the requirements of 10 CFR 50.65, the maintenance rule.
- Maintain water chemistry in accordance with Electric Power Research Institute guidelines.

Additional programs include those implemented to meet technical specification surveillance requirements; those implemented in response to NRC generic communications; and various periodic maintenance, testing, and inspection procedures necessary to manage the effects of aging on structures and components.

Maintenance activities conducted at MNGP include inspection, testing, and surveillance to maintain the current licensing basis of the plant and ensure compliance with environmental and safety requirements. Certain activities can be performed while the reactor is operating. Others require that the plant be shut down. Scheduled outages typically last less than 30 days for refueling and for certain types of repairs or maintenance. As discussed in Section 2.2.1, MNGP refuels every 22 to 24 months.

2.2.3 Cooling and Auxiliary Water Systems

The cooling system at MNGP consists of two major components: the circulating water system and the plant service water system. Water used at the plant for condenser cooling, service water cooling, screen wash, and fire protection is withdrawn from the Mississippi River. Station surface-water and groundwater withdrawals are governed by water appropriation limits set by the Minnesota Department of Natural Resources (MDNR). Under water appropriations permit No. 66-1172, MNGP may withdraw a maximum of 645 cubic feet per second (cfs) (approximately 290,000 gallons per minute (gpm)) of water from the Mississippi River. Special operating conditions are applicable to the permitted withdrawal volume if the river flow at MNGP is reduced to less than 860 cfs, and further restrictions apply if river flow is reduced to less than 240 cfs. Under water appropriations permit No. 67-0083, MNGP may withdraw up to a total of 20 million gallons per year (an average of 38 gpm) of groundwater via two onsite wells for the domestic water system. (NMC 2005) The typical water balance at MNGP is shown in Figure 2.2-1.

2.2.3.1 Circulating Water System

The purpose of the circulating water system is to remove the heat from the main condenser that is rejected by the turbine or turbine bypass system over the full range of operating loads. Heat is removed from the condenser by the circulating water system, when cooling water is drawn from then discharged to the Mississippi River. MNGP is also equipped with two MDCTs, enabling complete or partial recirculation of the cooling water when conditions require. MNGP utilizes a once-through cooling system and two MDCTs but does not utilize cooling ponds. The principal components of the circulating water and cooling tower systems are the intake structure, circulating water pumps, main condenser, discharge structure, cooling tower pumps, two MDCTs, and discharge canal. (NMC 2005)

The circulating water system is designed to:

- Regulate circulating water flows and temperatures to produce condenser back pressures consistent with plant economy.
- Conform to governmental regulations with respect to limitations placed on (1) river temperature rises due to plant operation, and (2) percentage of river water flow diverted to plant.
- Limit condenser tube flow velocity to seven feet per second to minimize erosion based on original admiralty brass tube material.
- Inject sodium hypochlorite/sodium bromide into the circulating water to minimize marine growth and bacteria in the system.
- Prevent pump cavitation and minimize the effect of pressure surges by means of automatic controls.
- Provide for makeup water during operation of the cooling towers.

River water is withdrawn through an approach channel excavated to elevation 896 feet mean sea level (msl). The approach channel, angled at 81° to the shoreline, is formed by sheet pile structures that are 98 feet apart and extend 59 feet into the river. The width of the approach is reduced to approximately 63 feet, and water enters the intake over a 62.67-foot-wide concrete sill at 899 feet msl, which is equipped with a 12.5-foot-wide stop log section in the center of the sill. The sill serves as a sediment barrier and during very low river levels, the stop log can be removed to allow unobstructed water flow onto a concrete apron at 895.5 feet msl, which extends across the width of the approach and 16 feet upstream of the bar rack. After entering over the sill, the water passes through a bar rack equipped with a motor-operated bar rack rake that prevents large debris from entering the intake structure. The bar rack rake is used to lift debris into a trash hopper located above the bar rack to prevent debris from re-entering the river. Traveling screens (0.375-inch mesh) are positioned approximately 10 feet behind the bar racks to remove fine debris. The traveling screens are normally rotated and rinsed every 12 hours and run continuously when the river temperature is above 50° Fahrenheit (°F) so that fish are not held against the screen for extended periods. The debris is rinsed into a common sluiceway which extends to the river downstream of the intake and returns impinged organisms to the river. (NMC 2005) Periodic monitoring of entrainment and impingement of fish and aquatic species is conducted at MNGP.

After passing through the bar rack, water is divided into two separate streams. Each stream passes through the two parallel traveling screens, the service water pump bay and two parallel motor-operated sluice gates before reaching the circulating water pumps. The plant service water system consists of three 6,000-gpm capacity service water pumps. Under normal operating conditions, two of these pumps supply 10,000 gpm to meet all nonreactor requirements. The center dividing wall permits dewatering of either pump bay. A normally closed gate in the wall can be manually opened during normal operation if a traveling screen is out of service for maintenance. Taking suction from the service pump bay are two 14,000-gpm makeup pumps and pumps for the station cooling, screen wash, and fire protection. Equipment at the intake structure delivers sodium hypochlorite/sodium bromide to the service water pump bay, and the circulating water pump forebay. Circulating water can be automatically chlorinated/brominated at preset intervals. (NMC 2005)

The circulating water system utilizes two half-capacity (140,000-gpm rated at 27.8 feet total discharge head) circulating water pumps, each driven by 1,250 hp synchronous motors, mounted over each suction chamber of the intake structure. These pumps are designed to circulate 292,000 gpm of cooling water through the main condenser. However, intake is limited to 290,000 gpm so as not to exceed the water appropriations permit maximum withdrawal limits. Each pump has a 78-inch diameter motor-operated butterfly valve at its discharge with a 20-second operating time. The discharge from the circulating water pumps passes in series through each shell of a twin shell, single-pass dual pressure condenser with divided water boxes. Normally two pumps deliver water through the twin 90-inch diameter lines to the first shell (low-pressure condenser), but a cross-connection at the pumps permits single pump operation. Effluent from the condenser and the service water system is piped approximately 600 feet via two 108-inch steel pipes to the discharge structure. (NMC 2005)

There are 90-inch diameter motor-operated butterfly valves in the two supply lines to the low-pressure condenser and 78-inch diameter motor-operated valves in the two discharge lines from the high-pressure condenser. Each valve has an operating time of 60 seconds. The valves are used to isolate half of the circulating water side of the condenser for inspection and maintenance. When both circulating water pumps are running, these isolation valves are opened, but if only one pump is in use, the condenser discharge valves are automatically positioned to limit the flow as required to prevent pump cavitation.

The discharge structure is located approximately 700 feet east of the intake structure. It is constructed of reinforced concrete and measures approximately 50 feet by 54 feet, is 38 feet high, and is equipped with two isolation and two sluice gates. The roof of the structure is approximately five feet above grade, and the lower floor (898 feet msl) supports two cooling tower pumps. Motor-operated sluice gates to the discharge canal are provided to isolate the discharge structure from the discharge canal. During open-cycle operation, the sluice gates are open, and the circulating water is returned to the Mississippi River via the discharge canal. The discharge canal abuts the main discharge structure at 900 feet msl. It is laid on a 0.25 percent slope in an easterly direction and extends approximately 1,000 feet where it enters the Mississippi River. The south bank of the canal has provisions to receive discharges from the cooling towers. In 1980, an overflow weir was added to the discharge canal to permit the normal outflow of cooling water, re-establish the previously existing shoreline of the Mississippi River, and prevent fish from entering the canal. The discharge weir consists of an earth-filled dike and a vertical sheet-pile overflow section. The top of the dike (920 feet msl) is 22 feet wide, and the sides of the dike have a 3 to 1 slope. (NMC 2005)

A 36-inch de-icing line runs from the condenser discharge line to the intake structure apron. When temperatures approach the freezing point, relatively warm condenser effluent can be delivered through this line to the intake structure to keep the area free of ice. Steam is also available at the intake structure from 1-inch hose connections. River ice cover is less than lake ice cover due to the erosive action of river flow. However, based on a lake maximum ice thickness of 40 inches at the MNGP intake canal, it would leave at least 2.5 feet of open water available to supply the plant because the bottom of the intake canal is at elevation 898 feet msl, which is six feet below the design low flow stage of 904 feet msl (200 cfs). Since the canal has a bottom width of 62 feet, there is more than adequate area available to supply the necessary water for the engineered safeguards of the plant.

The crest level of the 54-foot-wide weir structure is at 910 feet. The water elevation in the discharge canal is at 912.5 feet msl; therefore, the height of the overflow is 2.5 feet. When the water is at this level, the overflow section discharges at a rate of 645 cfs to the Mississippi River. To prevent scouring below the discharge, a 20-foot-long concrete apron was built on the downstream side of the sheet-pile wall, and a 50-foot-long rip-rap apron was built downstream of the concrete apron. The top of the concrete apron and the rip-rap section are at 897 feet. (NMC 2005)

MNGP utilizes two MDCTs, as needed, to meet surface water appropriation limits and thermal discharge limits. Two half-capacity (each 145,000-gpm rated at 57.5 feet total discharge head) cooling tower pumps, each driven by 2,500 hp synchronous motors located at the discharge structure, are used to divert cooling water to the towers. The pump motor is designed for a maximum reverse speed of 150 percent rated speed for protection in the event that a tripped pump has an open discharge valve when the other pump continues to run. Each pump discharges through a 66-inch diameter motor-operated butterfly valve with a 20-second operating time. Opening (and closing) of the valve is automatically synchronized with pump start (or trip). (NMC 2005)

The pumps are designed to operate in series with the circulating water pumps, delivering 151,000 gpm to each tower. The crossflow mechanical draft towers use 26-foot diameter fans to direct outside air horizontally as heated water falls in a spray of small droplets across the air stream and tower packing. The water loses heat by evaporation (latent heat transfer) and by exposure to cooler air (sensible heat transfer). A single underground steel pipe conveys the water from both pumps to two cooling towers. The pipe is 108 inches in diameter and approximately 200 feet long to the first tower, and 78 inches in diameter and 300 feet long from the first to the second tower. Each tower has two 60-inch diameter risers with manually operated butterfly valves at grade that conveys water to the headers and water distributing system. With the aid of gravity, the water distributors spray hot inlet water evenly over the tower packing. The packing is essentially a series of polyvinyl chloride fill arranged to produce as much wetted surface as possible and maximize heat transfer. (NMC 2005)

Water flows by gravity from each tower basin through an 84-inch diameter steel pipe with a motor-operated control gate. The lines combine in a single 108-inch diameter pipe for conveying water to the intake structure, where the flow diverges to parallel circulating water pump basins. The distance from the far tower to the intake structure is approximately 1,150 feet.

During closed-cycle operation, the river is isolated from the main intake structure and the discharge structure by control gates, and cooled effluent from the towers flows by gravity from the cooling tower basins to the suction chambers of the circulating water pumps. Blowdown overflows through weirs at the cooling tower basins and is piped to the discharge canal. Two 14,000 gpm makeup pumps located at the intake structure deliver makeup water to the circulating water pump basins at the intake structure during closed-cycle operation to replace water lost to evaporation, drift, and blowdown. Approximately 5-6 percent of the total cooling water flow must be replaced with makeup water. (NMC 2005)

Blowdown and overflow from the tower basins flow across a series of parallel weirs to the inlet of corrugated metal pipes for conveyance to the discharge canal leading to the river. The weirs permit measurement of the rate of overflow. Discharge at the canal is through a structure designed to prevent erosion of the canal banks. A final overflow weir structure is located at the end of the discharge canal. The weir structure permits the normal outflow of cooling water while preventing fish from entering the canal. The weir is an earth-fill dike with a vertical sheet-pile overflow. Provision is also made for draining the tower basins through these discharge lines by manual operation of a tower gate. Concrete isolation gates permit continued operation if one cooling tower pump is out of service for repairs.

The circulating water system operational modes include once-through circulation of river water, recirculation in a closed cycle with cooling towers, and several variations of these two basic modes. Operations chooses the optimal operating mode based on prevailing river flow, river temperature, and status of critical plant equipment. This ensures safe and efficient plant operation as well as compliance with state water use permits and the National Pollutant Discharge Elimination System (NPDES) permit discharge limits. Minnesota Pollution Control Agency (MPCA) issued NPDES permit No. MN0000868, on June 29, 2009 (Attachment A). This permit is currently administratively extended. An application for renewal was submitted and received March 29, 2012.

MDNR surface water appropriations permit number 66-1172 (see Table 9.1-1) dictates that cooling towers must be operated in partial recirculation mode when river flow is between 860 and 240 cfs or closed-cycle mode when river flow is less than 240 cfs and in accordance with allowable thermal discharge limits set forth by the MPCA in the NPDES permit. The NPDES permit specifies that the maximum daily average temperature at the end of the discharge canal cannot exceed the limiting temperatures of 95°F between April and October, 85°F for November and March, and 80°F between December and February. (NMC 2005)

However, the NPDES permit does specifically state that discharge of heated effluent in excess of these temperature limits is allowed on a limited basis when required to operate in partial recirculation or closed cycle to meet the surface water appropriations permit limitation. The four operating modes are summarized below.

Open Cycle or Once-Through

In this mode, water is withdrawn from and discharged directly to the Mississippi River. Open cycle operation is used when river flow exceeds 860 cfs and cooling of the circulating water effluent is not required to keep the discharge canal temperature below permitted limits. In this mode of operation, circulating water is taken from the Mississippi River via the intake structure, pumped through the condenser, and returned directly to the Mississippi River via the main discharge line, the discharge structure, and the discharge canal. The gates at both the intake and discharge structures are open, and the cooling tower basin gates are closed. This gate configuration maximizes circulating water flow through the main condenser. (NMC 2005)

Helper Cycle

In this mode, cooling towers are operating, and cooled water is discharged from the towers to the river. Helper cycle operation is used whenever upstream river temperatures are at or above 68°F consistently or when the discharge canal temperature approaches the permitted temperature limits. In this mode of operation, circulating water is taken from the Mississippi River via the intake structure, pumped through the condenser, and conveyed to the discharge structure where water is directed to the discharge canal or pumped to the cooling towers by one or both of the cooling tower pumps. The effluent collects in the tower basins and overflows the side weir into the discharge canal, which conveys the cooled water back to the river. The positioning of the gates at the intake and discharge are open under the helper cycle operation. (NMC 2005)

Partial Recirculation

In this mode, cooling towers are operating, and a portion of the cooled water is recirculated to the intake while the remainder is discharged to the Mississippi River. When river flow is less than 860 cfs, a maximum of 75 percent of the river flow at the intake may be withdrawn in accordance with allowable limits set forth by MDNR. Partial recirculation may be used to comply with this restriction. In this mode of operation, which is a variation of the helper cycle mode, the quantity of water recirculated to the intake structure is controlled by the number of cooling tower pumps in operation and by specific positioning of the gates at the cooling tower basins. The gates permit control of the volume of effluent that is returned to the intake and the volume of effluent allowed to overflow the cooling tower basins and enter the discharge canal. The gates at both the intake and the discharge structures remain fully open throughout this cycle. (NMC 2005)

Closed Cycle

In this mode, cooling towers are operating, and all cooled water is recirculated to the intake except for cooling tower blowdown, evaporation, and drift. Closed cycle operation is employed whenever river flow is at or below 240 cfs or when river temperatures are elevated. In this mode, the gates are closed at the intake structure and in the main discharge structure to isolate the system from the Mississippi River. The gates in the return line from the cooling tower basins to the intake structure are fully open. The circulating pumps and cooling water pumps maintain flow through the system. Blowdown water overflowing the cooling tower basin weirs is routed directly to the discharge canal. Makeup water for replenishing blowdown and operational losses is supplied by two makeup pumps. Cooling towers are normally used from May through September (when river temperatures have historically exceeded 68°F) or during periods of extremely low flow when state minimum flow standards for the Mississippi River limit the plant's cooling water withdrawal. Occasionally, one tower is used during the winter if suspended ice is present in the river. (NMC 2005)

The MNGP circulating water system is primarily operated in a once-through cooling mode. Water supplied by the condenser de-icing line and the intake canal de-icing sparger is not considered recirculation. (NMC 2005). A section view of the circulating water intake structure is shown in Figure 2.2-2.

2.2.3.2 Plant Service Water System

The plant service water system consists of three one-half capacity vertical wet pit service water pumps in the intake structure. The three pumps supplied provide 50 percent excess capacity so normal operation requires only two pumps. The third pump is available for standby operation and starts to maintain system pressure. All three service water pumps are typically operated to provide increased service water capacity in the summer. An automatic self-cleaning strainer is provided in the discharge line to remove suspended matter from the river water. This system supplies strained water to the reactor and turbine building to meet normal startup and shutdown requirements.

The Mississippi River serves as the ultimate heat sink for the plant. The river has sufficient capacity to meet the flow requirements of the safety-related service water systems at a temperature of 90°F or less.

The plant service water system supplies cooling water for the plant main generator, reactor and turbine building air conditioning units, turbine lube oil coolers, reactor building closed cooling water system heat exchangers, various plant motor-generator sets, reactor feedwater system pumps, and the condensate pump motor bearings.

Service water pumps provide normal plant startup and shutdown requirements. The pumps are controlled so if the operating pumps cannot maintain the required system pressure, the standby pump will start automatically.

Both the MNGP circulating water system and service water systems are vulnerable to fouling from microbiological organisms. Through applications at the service water and circulating water pump bays, approved biocides such as sodium hypochlorite and sodium bromide, coupled with a dispersant, are used to control biofouling. During warm summer months, based on the Ryzner Index, application of an anti-scalant is used to control scale build-up in the condenser tubes. Through applications at the service water header, Xcel Energy uses an approved non-oxidizing biocide to control biofouling in several intermittently operated service water systems ((residual heat removal service water, emergency diesel generator (EDG) service water, and fire water protection)). Biocide and scale control chemicals are consumed in accordance with all use and discharge requirements, including provisions of the NPDES permit issued to the MNGP site, as well as provisions established in plant-specific requests that are approved by the MPCA under the NPDES permit. Compliance with NPDES permit limits for discharge of these biocides and associated residuals is ensured through controlled application protocols and monitoring so as to protect riverine aquatic life. (NMC 2005)

2.2.3.3 Thermal Effluent Dispersion

MNGP performed a thermal effluent discharge study of the impact of EPU. The uprate resulted in an increase in temperature at the intake and discharge locations. A conservative estimate of the increase in effluent temperature is 4.5°F in the discharge canal as a result of the uprate. It is estimated that there will be less than a 2°F increase in discharge canal temperature at EPU conditions with cooling towers in helper mode (i.e., not all circulating water flow is passed through the cooling towers). There will be less than a 4.5°F increase in discharge canal temperature at EPU conditions with cooling towers not in service, when river temperatures are below 68°F. This study also assessed the effect of increasing the effluent temperature on the lateral spread of the thermal plume. As effluent temperature changes, the lateral spread remained essentially constant.

Low river flow rates are more critical than high flow rates when considering temperature impacts. The lowest recorded river flow rates for the data used in this analysis were approximately 2,567 cfs and 2,841 cfs. The highest recorded flow rate was 22,288 cfs. Conclusions from the EPU thermal study are applicable to river discharges below 2,500 cfs as long as flow conditions in the river remain similar.

2.2.3.4 Municipal Water Supply System

The domestic water system provides water for drinking and sanitary purposes. It also provides raw water for the plant make-up demineralizer system and normal supply for the seal water system.

The MNGP domestic water supply relies on groundwater via onsite wells. The surface water and groundwater withdrawals are governed by water appropriation limits set by the MDNR under water appropriations permit No. 66-1172. The domestic water system supplies raw water to the reverse osmosis/make-up demineralizer system used to produce purified water for the plant primary systems and seal water to pumps located at the plant intake structure. The domestic water system also supplies the water for potable use, including drinking water, lavatories, and showers at MNGP. (NMC 2005) Groundwater wells and associated withdrawals are discussed in detail in Section 3.6.3.2.

2.2.3.5 Fire Protection System

The MNGP fire protection system receives its water supply from the Mississippi River. The fire protection system also provides alternate sources of water to other plant systems. The fire protection water supply subsystem can provide water to the service water system (administrative building computer room chillers), residual heat removal (RHR) service water system, and can also provide make-up water to the spent fuel pool if additional makeup is required. The fire system is a standby system during normal plant operation.

The fire protection system consists of a 1,500-gpm diesel-driven vertical centrifugal pump, two 1,500 gpm electrical motor-driven vertical centrifugal pumps, and a 50-gpm electrical motor-driven horizontal centrifugal jockey pump, plus associated piping, valves, strainers, instrumentation, and controls. One of the electric motor-driven pumps supplies the fire system and is known as the fire pump. The second electric motor-driven pump supplies the needs of the screen wash system in addition to being a fire pump and is known as the screen wash/fire pump. The 1,500-gpm pumps each have a duplex basket strainer in their discharge. The jockey pump takes its suction from the service water system header after the auto-strainer.

The three fire pumps and the jockey pump are located in the intake structure with the diesel engine-driven fire pump in a separate room. The fire pumps take suction from the service water suction bay, and the jockey pump takes suction from the service water system header. The screen wash/fire pump connects to the electric fire pump discharge piping just before the basket strainer through a check valve.

2.2.4 Meteorological Monitoring Program

The purpose of the meteorological equipment at MNGP is to provide meteorological and hydrological information for determining dispersion of radioactive materials released from the plant. In the unlikely event of a nuclear incident involving radioactive releases, this information could be used to advise the proper responses. Data are also used to monitor extreme environmental events that could threaten the safe operation of the plant.

MNGP has two meteorological monitoring (MET) towers that measure and record environmental information. Major modifications were made in 2014 to comply with Regulatory Guide 1.23, NUREG-0654, NUREG-1394, Regulatory Guide 1.97, and Nuclear Energy Institute (NEI) 08-09. These modifications replaced the primary meteorological monitoring system to increase performance and capability at MNGP. Data abnormalities occurring in the process computer data stream had no known cause. These abnormalities led to data loss in the MET system. Regulatory Guide 1.23, Revision 1, requires a data recovery of 90 percent (i.e., at most, MET data is accurately recorded 90 percent of the time). MNGP has a goal of 95 percent data recovery, and the abnormalities had the potential to negatively impact this goal. The existing primary tower lacked physical separation between the two redundant trains of instrumentation and to perform maintenance on one train, both trains had to be taken out of service. This resulted in the entire tower being taken out of service for maintenance at least once a year. Additionally, only one set of data was being transmitted to the process computer; thus, a single point failure existed for the dose assessment process. Furthermore, the data source of origination (train "A," "B," or a combination) displayed was not known to the operators in the control room and could only be determined by looking at the jumper position physically located at the primary tower. By replacing the MET tower and its associated equipment, the MET system is more reliable. The addition of both trains of data in the control room recorder allow for more information to be retained should one of the trains of data become unavailable. This allows MNGP to meet associated regulatory guidelines.

This modification also added divisional separation by incorporating physical separation between the two trains installed on the primary tower. The elevator system supplied by the new primary tower allows either train of instruments to be taken out of service for maintenance without impacting the other train. Additionally, each train was modified to have an independent power source and distribution system, independent data processing system, and independent communications system.

The new primary tower is a 100-meter (m) guyed steel tower installed approximately 100 yards northeast of the old tower. The primary tower has six booms at various heights of the tower. Booms are mounted in pairs. At each height, one boom is reserved for A-train instrumentation and the other boom is reserved for B-train instrumentation. Two booms are located at 10 m, two at 43 m, and two at 100 m. Two independent elevator systems are installed on the tower. This allows each division of equipment to operate independently, which allows for maintenance to be performed without taking the full system out of service. The meteorological variables monitored at MNGP are listed in Table 2.2-1.

Redundant instrumentation on the primary tower is installed utilizing two separate trains ("A" and "B") to measure wind speed and direction, temperature, and precipitation. Wind speed and direction sensors are installed at 10 m, 43 m, and 100 m on the tower along with aspirated temperature sensors at each of the locations. One sensor of each type is mounted at each location for each train for a total of six instruments of each type (six wind speed/direction sensors and six temperature monitors). Two precipitation monitors, one for each train, are located at the base of the tower. Two dew point/relative humidity monitors, one for each train, are mounted with the instruments at the 10 m elevation.

A backup self-supported meteorological tower is located within the training center site. Only instrumentation for wind speed and direction are measured at the backup tower. As part of the 2014 modifications, equipment at the backup MET tower was replaced with one train of equipment to match the existing backup MET tower.

The system communicates wirelessly with the plant over a 2.4 gigahertz wireless signal. Communications equipment including the radio and antenna are installed on the tower. Data are sent wirelessly from the MET tower using two wireless transmitters, one for each train. Receiver antennas are mounted on the outside wall of the reactor building. RG-8 coaxial cables connect the antennas to the receiver equipment located in the computer room. The receiver equipment sends the MET data both directly to the WR-4973 recorder via a MODBUS over transmission control protocol/internet protocol connection and to the plant process computer via a digital to analog bridge. Data are sent to the receiver in 5-second intervals matching the existing transmission rate. Redundant backed power feeds are provided to each of the receivers from panels in the computer room.

As a redundant source of MET information, required by Regulatory Guide 1.97, Revision 2, the control room recorder functions to display data from the MET system. The recorder displays wind speed, wind direction, temperature, precipitation, and relative humidity. The MET recorder keeps the data organized and formatted to be readily available for retrieval. The MET recorder may also be used to monitor severe weather conditions by control room operators if the temperature reaches above 105˚F or a high wind speed greater than 100 miles per hour (mph) is detected.

The primary design function of the MET system is to determine the atmospheric dilution and dispersion parameters for both scheduled and unscheduled releases by the plant. Data from the MET tower is sent to a digital paperless recorder in the control room and to the plant process computer. The plant process computer evaluates the data and displays it as required via a safety parameter display system and provides to various other data users.

The primary MET tower is fed from two independent power sources. One source is a 12.5-kV line and the second is a 13.8-kV line. The MET tower requires an uninterrupted power supply (UPS) backup to be provided. The UPS is designed to sustain the equipment for 10 hours, under the worst-case temperature scenario, in the event that both the 13.8-kV and 12.5-kV power feeds are lost. To keep the cabinet cool during high ambient temperatures, the UPS cabinet is fitted with two fans and two vents. During normal operation, these fans produce far more airflow than necessary for the removal of hydrogen. A signal is sent from the data logger into the plant, which monitors UPS cabinet temperature. Should both fans fail, passive ventilation is sufficient to remove hydrogen.

Based on the years 2016–2020, the meteorological data recovery rate at the MNGP has been greater than 95 percent. Meteorology and air quality at MNGP are discussed in detail in Section 3.3.

2.2.5 Power Transmission System

2.2.5.1 In-Scope Transmission Lines

Based on NRC Regulatory Guide 4.2 (NRC 2013b), transmission lines subject to evaluation of environmental impacts for license renewal are those that connect the nuclear power plant to the switchyard where electricity is fed into the regional power distribution system and power lines that feed the plant from the grid during outages. All in-scope transmission lines are located completely within the MNGP site boundary, as shown in Figure 2.2-3.

Output from MNGP is delivered to a 345-, 230-, 115-, 13.8-kV switchyard located on the plant site. The 345-kV portion of the switchyard has positions for connecting the generator output, three transmission lines, a 345-, 230-, 13.8-kV autotransformer, a 345-,13.8-kV transformer, a 345-, 34.5-kV transformer, and a 345-,115-, 13.8-kV autotransformer. The 230 kV portion of the switchyard is provided to establish an interconnection with the transmission system of Great River Energy. An autotransformer connects the 345-kV and 230-kV busses. The 115 kV portion of the switchyard is connected to the 345-kV bus through an autotransformer.

The 13.8 kV portion of the switchyard is provided to establish reliable power sources to various plant equipment. These include the plant auxiliary reserve transformer (1AR); discharge structure transformers (X7, X8); cooling tower fan transformers (X50, X60, X70, X80); transformer XP91, which powers the hydrogen water chemistry cryogenic system panel; and an alternate feed to the training center.

Three transformers (primary station auxiliary transformer 2R, reserve transformer 1R, and reserve auxiliary transformer 1AR) supply the plant with offsite power from the substation. All three sources can independently provide adequate power for the plant's safety-related loads.

2.2.5.2 Vegetation Management Practices

The in-scope transmission lines are within the MNGP site boundary, as shown in Figure 2.2-3. The transmission lines cross the MNGP industrial area, where vegetation is sparse and needs minimal vegetation management. Vegetation management for in-scope transmission lines is discussed in detail in Section 3.7.2.6.

2.2.5.3 Avian Protection

Threatened and endangered species potentially occurring near MNGP, or within Sherburne and Wright counties, are described in Section 3.7.8. As discussed in Section 3.7.2.6, Xcel Energy has installed swan flight diverters on its transmission lines in areas where incidents of bird collisions have occurred to minimize this impact. Further, in April 2002, Xcel Energy entered into a memorandum of understanding with the U.S. Fish and Wildlife Service (USFWS) and the MDNR for the purpose of establishing procedures and policies to be employed by the three parties in dealing with migratory birds that may be present, injured, or killed on Xcel Energy's property with the shared goal of the signatories of the memorandum of understanding being the development and implementation of an avian protection plan and elimination of the unlawful take of migratory birds (NMC 2005).

2.2.5.4 Public

As presented in Section 2.2.5.1, all in-scope transmission lines are located completely within MNGP-owned property and controlled by Xcel Energy. Therefore, the public does not have access to this area and, as a result, no induced shock hazards would exist for the public.

2.2.5.5 Plant Workers

Occupational safety and health hazard issues are generic to all types of electrical generating stations, including nuclear power plants, and are of small significance if the workers adhere to safety standards and use protective equipment (NRC 2013a).

As discussed in Section 3.10.2, any work performed on the MNGP site is governed by a comprehensive industrial safety program consisting of a safety handbook, industrial safety directives, and topic and task-specific procedures (e.g., electrical safety and operations tagging procedures). Xcel Energy uses and follows the U.S. Occupational Safety and Health Administration (OSHA) standards for electric power generation, transmission, and distribution (29 CFR 1910.269). The MNGP industrial safety program addresses proper clearances and safe work approaches. Instructions are provided for using ladders, scaffolds, lifts, rigging, and cranes for safe placement and operation. MNGP also has procedures that address grounding of vehicles, equipment, and structures near or adjacent to transmission lines onsite, which include the in-scope transmission lines. MNGP has a workplace hazards identification process and performs jobsite analysis of workplace hazards, focusing on mitigation activities to eliminate risk and potential for both injury and human error.

2.2.6 Radioactive Waste Management System

The MNGP radioactive waste systems are designed to collect, process, and dispose of radioactive and potentially radioactive waste in a controlled and safe manner without limiting plant power output or availability. The design objective for the radioactive waste systems is to provide equipment, instrumentation, and operating procedures such that the discharge of radioactivity from the plant will not exceed the limits set forth in 10 CFR Part 20 and meet the design objectives of 10 CFR Part 50, Appendix I.

Radioactive material produced from fission of uranium-235 and neutron activation of metals in the reactor coolant system is the primary source of liquid, gaseous, and solid radioactive waste. The radioactive fission products build up within the fuel and are contained in the fuel pellets and sealed fuel rods, but small quantities escape from the fuel rods into the reactor coolant. Neutron activation of trace concentrations of metals entrained in reactor coolant such as zirconium, iron, and cobalt create radioactive isotopes of these metals. Both fission and activation products in liquid and gaseous forms are continuously removed from reactor coolant and captured on filter media followed by demineralization. MNGP operates separate liquid, solid, and gaseous radwaste processing systems. (NRC 2006b)

Fuel rods that have exhausted a certain percentage of their fuel and are removed from the reactor core for disposal are called spent fuel. Spent fuel assemblies are stored in a spent fuel pool located on the refueling floor of the reactor building or in dry cask storage containers at the ISFSI, which is designed and licensed in accordance with 10 CFR Part 72. Dry active waste includes contaminated protective clothing, paper, rags, and other trash generated during operation and maintenance activities. Filter media include paper and glass fiber cartridge filters, resin beads or powder, and metallic filters. Class A, B, and C solid waste, as defined in 10 CFR Part 61, may be processed for volume reduction, or shipped to a licensed disposal facility. (NRC 2006b). ISFSI license information, which is separate from this SLR, is provided in Table 9.1-1.

The MNGP offsite dose calculation manual (ODCM) contains the methodology and parameters used in the calculation of offsite doses resulting from radioactive gaseous and liquid effluents, in the calculation of gaseous and liquid effluent monitoring alarm and trip set points, and in the conduct of the radiological environmental monitoring program (REMP). The ODCM also contains the radioactive effluent controls, radiological environmental monitoring activities, and descriptions of the information that should be included in the annual radiological environmental operating program reports and radioactive effluent release reports required by 10 CFR Part 50, Appendix I, and 10 CFR 50.36a. (NRC 2006b)

The quantity of liquid and gaseous effluents released, and amount of solid radioactive waste shipped from MNGP is reported in the annual radioactive effluent release report (ARERR) (Xcel 2022a).

2.2.6.1 Liquid Waste Processing Systems

The MNGP liquid radioactive waste system is designed to collect, process, and dispose of all radioactive liquid wastes generated in the operation of the plant. The system is designed to accommodate the radioactive input resulting from the design basis maximum fuel leakage condition.

Liquid waste from various equipment, floor drains, and discharges from the reactor process and auxiliary systems is processed through the radwaste system. Final disposition of processed liquid may be one of the following:

- Return of the liquid to the condensate system for plant re-use (plant preferred method).
- Solidification of chemical liquid waste and shipment of the resulting solid to an offsite location.
- Release to the Mississippi River in accordance with limitations specified in the ODCM. (Although allowed by the technical specifications of the plant license, there have been no planned releases to the Mississippi River since 1972.) (NRC 1977)

Liquid wastes are collected in sumps and drain tanks in the various buildings and then transferred to the appropriate subsystem collection tanks in the radwaste building for subsequent treatment and re-use.

Radioactive and chemical contaminants are removed from the liquid waste streams by filter/demineralizer followed by mixed deep-bed demineralization. The filter/demineralizers remove soluble and insoluble contaminants while the deep bed demineralizer removes primarily soluble contaminants. The filter/demineralizer and deep bed media and demineralizer sludge are backwashed into receiving tanks, dewatered, and packaged as solid waste for disposal offsite at NRC-approved sites.

Xcel Energy manages the radwaste system at MNGP so that there are no routine releases of liquid radioactive effluents from the plant. Therefore, Xcel Energy states that there are no radioactive liquid effluents during normal operations. However, in some years, the plant may release a small amount of liquid containing radioactive material. Xcel Energy considers these releases as abnormal, but they are monitored, reported, and fall within federal release limits and guidelines. (NRC 2006b)

The radioactive waste effluent radiation monitor was installed for use during release of liquid radioactive waste to the discharge canal. Historically the use of this discharge path has not been required due to the design of the radioactive waste system. Prior to use of this discharge path, the ODCM requirements for the radiation monitoring equipment must be met.

Liquid radioactive waste at MNGP is classified into two major categories: high purity waste and low purity waste. High purity waste consists of low-conductivity (potentially high radioactivity) liquid waste originating from piping and equipment drains collected in the drywell equipment drain sump, the reactor building equipment drain sump tank, and the turbine building equipment drain sump and tank. Low purity waste consists of low radioactivity and high conductivity liquid waste, primarily from floor drains, and is collected in the drywell floor drain sump, the reactor building floor drain sump and tank, the turbine building floor drain sump, and the radwaste building floor drain sump. Waste is transferred from these collection points to the floor drain collector tank.

The treatment of both high purity and low purity wastes is combined into one processing chain. The waste collector tank and floor drain collector tank are cross connected to allow mixing of contents. The mixing is accomplished by recirculating contents with a common pump simultaneously drawing suction from both tanks and processing the wastewater through a filter-demineralizer unit, and then returning the liquid back to the tanks. In this way, an inventory of high purity water is maintained in the collection tanks to serve as a dilutant as fresh sump accumulation is discharged to the tanks. As the tanks are filled, the liquid is processed through a deep bed demineralizer and sent to one of two waste sample tanks. There, the contents are analyzed and, if acceptable, the effluent is reclaimed via the condensate storage tanks. If further processing is needed, the water is recycled back to the collector tanks and the process cycle repeated. The effluents may all be released to the river in accordance with technical specifications. Although allowed, this method of release has not been done since 1972.

Chemical waste is high conductivity waste of variable activity levels originating from laboratory drains and various decontamination operations. This waste is collected in the chemical waste tank in the radwaste building. The waste is sampled and neutralized as required, then processed in one of two ways depending upon the radioactivity level and the chemical nature of the wastes. If the radioactivity and chemical contamination concentrations are low, the waste is sent to the waste sludge tank, floor drain collector tank, or to the transportation liner via the B-centrifuge/B-hopper bypass line for additional processing and re-use. If the radioactivity concentrations in the chemical waste is high and the chemical nature of the waste does not lend itself to the conventional treatment of filtration and demineralization, then the waste is treated using alternative means onsite for re-use or sent to an offsite processor to be prepared for disposal.

Other liquid waste resulting from refueling operations, plant start-up, and equipment maintenance is classified according to conductivity, activity level, and chemical nature of the impurities. Based on the classification, this waste is processed as either high purity or low purity and is treated for re-use accordingly.

Control of the liquid radioactive waste systems is exercised from a local control room situated in the radwaste building. The control room contains the instruments, control switches, and alarms for the operation of the system. Included in the control room are valve position indicator lights and process and sump pump operating lights. A common radwaste trouble alarm is located in the plant main control room.

Protection against accident and/or off-standard discharge of waste is provided by appropriate system interlocks, instrumentation for detection and alarm of off-standard conditions, batch sampling and analysis, and procedural controls. All radwaste tanks, filters, and equipment are contained in concrete cells within the major concrete buildings of the plant to provide a substantial degree of immobility of the waste within the plant. These arrangements are provided to assure that in the event of a failure of the liquid waste systems or errors in operation of the system, the potential for inadvertent release of liquids is small. For example, the storage tanks, filter demineralizers, and other equipment are placed so that leakage is contained within the building. This assures control and containment of any leaks, spills, or overflows from the equipment.

Tritium exists as a gas or combined in water. In the presence of water, the majority of the tritium remains with the water and does not appear as a gas. The tritium release rates in the plant off-gas discharges result in concentrations well below the 10 CFR Part 20 limits. The dose rate to the environment due to tritium is negligible and not considered significant in the radioactive waste systems.

MNGP does not anticipate any liquid waste releases beyond normal operations during the proposed SPEO.

2.2.6.2 Gaseous Waste Processing System

The MNGP gaseous radwaste systems design objective is to process and control the release of gaseous radioactive effluents to the site environs so the offsite radiation dose rate does not exceed the limits specified in 10 CFR Part 20 and the design objectives of Appendix I to 10 CFR Part 50 are met.

Radioactive gases are collected from the following sources:

- Main condenser air ejector effluent
- Steam packing exhaust system effluent
- Plant start-up vacuum pump effluent
- High pressure coolant injection (HPCI) gland seal effluent
- Standby gas treatment system effluent
- Laboratory hood effluents

The condenser air ejector effluent is collected and processed in the air ejector off-gas subsystem. The steam packing exhaust system effluent, the mechanical vacuum pump effluent, and the HPCI gland seal effluent are all collected and processed in the steam packing exhauster off-gas subsystem. The standby gas treatment system is directly associated with the plant building ventilation systems.

Air Ejector Off-gas Subsystem

The air ejector off-gases entering this system are the non-condensables from the main condenser. They consist essentially of hydrogen and oxygen formed in the reactor by radiolytic decomposition of water, excess hydrogen from the hydrogen water chemistry system, air in-leakage to the turbine-condenser, water vapor, and fission gases (which are negligible in terms of volume).

Fission gas may arise from minor amounts of tramp uranium on the surface of the fuel element or from imperfections or perforations which might develop in the fuel cladding. The release rate of activation gases is dependent upon the thermal output of the reactor and the hold-up time provided in the gaseous radwaste system prior to release at the stack.

Steam diluted off-gas from the main condenser is processed through a recombiner subsystem where the hydrogen and oxygen react to form water, reducing by a large factor the original volume of gases that must be processed and temporarily stored. Oxygen is added to the recombiner inlet stream by the Hydrogen Water Chemistry System to permit recombination of excess hydrogen. After removing the water for further treatment, the non-condensable gases pass through charcoal adsorbers and high efficiency particulate absorbing (HEPA) filters and then through the off-gas holdup system where gases are compressed and stored in one of five hold up tanks. Prior to discharge through the main stack, the off gases are passed once again through HEPA filters.

The off-gas exhaust stack filter system consists of two filter assemblies (one operating and the other in standby). Each filter assembly is composed of an integral HEPA filter element with a moisture separator all housed in one pressure vessel. The HEPA filter prevents all but a small fraction of the radioactive particulates from being released to the atmosphere.

These stack filter assemblies are housed in the off-gas stack and are shielded by at least three feet of concrete at the base of the stack. Dilution fans are also provided in the base of the plant stack to maintain suitable exit velocities at the top of the stack.

Turbine and Air Ejector Steam Packing Exhauster Subsystem

The steam packing exhauster subsystem does not require filters. The short hold-up time (1.75 minutes) and the small quantity of fission gases do not produce sufficient solid daughters to warrant filtration of these gases. Hydrogen and oxygen concentrations in this system are well below flammable concentrations and therefore, the system is not designed to withstand explosive forces.

The modified off-gas system includes a compressed gas storage phase to provide an additional delay in effluent gas releases. The effect of this added delay is that a substantially greater fraction of the radioactive material will have decayed prior to release. The air ejector off-gas system is monitored and controlled to ensure that the radiation dose rate limits at the site boundary as prescribed in the technical specifications are not exceeded. Two off-gas pretreatment monitors are provided, and when their trip point is reached cause an automatic termination of air ejector off-gas flow. There is a 30-minute delay before off-gas flow is automatically terminated, during which the reactor operator may take corrective action. Both instruments are required for trip. The trip settings of the instruments are set so that the maximum stack release rate limit allowed by the ODCM is not exceeded.

Radiation monitors are also provided in the plant main stack as a back-up detection of high activity release. Radiation levels, in excess of the allowable "instantaneous" release rate, alarm in the control room and isolate the hold-up line. The plant stack allows atmospheric dispersion of the gas plume before it reaches ground level to reduce direct radiation dose rates. Natural dispersion of the gases into the atmosphere is achieved by a combination of plant stack height, exit velocity and plume buoyancy. Based on this natural dispersion, meteorological characteristics of the site, and the topography of the site environs, it has been determined that an annual average stack release rate of 0.26 Ci/sec can be accommodated without exceeding 500 millirem (mrem)/year at the site boundary. Use of the gaseous radwaste treatment results in a stack release rate of less than 1 percent of this value to meet the design objectives of Appendix I to 10 CFR Part 50.

MNGP does not anticipate any increase in gaseous waste releases beyond normal operations during the proposed SPEO.

2.2.6.3 Solid Waste Management System

The solid radwaste system is designed to process, package, store, monitor, and provide shielded storage facilities for solid waste to allow for radioactive decay and/or temporary storage prior to shipment from the plant for offsite disposal. The solid radioactive waste is shipped offsite in vehicles equipped with adequate shielding to comply with U.S. Department of Transportation (DOT) regulations. Radioactive solid waste generated from the plant includes process waste and spent resins from the liquid processing systems; reactor system spent control rod blades, temporary control curtains, fuel channels, and in-core ion chambers; maintenance waste, contaminated clothing, tools, rags, and small pieces of equipment; operating waste, underwater vacuum cartridge filters, paper, rags, off-gas filters, and ventilation filters; and miscellaneous solidified chemical and liquid waste.

The process waste makes up the largest volume of solid waste processed in the solid radwaste system. Process waste consists of the filter sludge and spent resins from the reactor clean-up, fuel pool, and condensate filter/demineralizer systems and the radwaste filters and spent resins from the radwaste mixed-bed demineralizer. The filter sludge and spent resins are backwashed into their respective receiving tank, dewatered, and processed in the waste solidification system. An initial dewatering step is accomplished on the condensate and clean-up sludge by sedimentation and decantation. This serves the two-fold purpose of providing decay storage of the sludge in the tanks and reduces the processing load on the centrifuges.

The primary method for handling solid radwaste is to send it directly from the radwaste holding tanks to the waste dewatering system. A rapid dewatering system is a waste processing system installed for use at MNGP. This self-contained system is used for accelerated dewatering of particulate waste material. Extracted water from this system is routed to the liquid drains and back to the plant for processing. Radioactive sludge from the rapid dewatering system unit is stored in the radwaste storage building and shipped offsite to a licensed facility in accordance with applicable DOT and NRC regulations. (NRC 2006b)

Reactor mechanical wastes are stored for decay in the spent fuel storage pool and packaged in suitable approved shipping containers for shipment to an approved offsite disposal facility. Maintenance and operating waste is collected in containers located in appropriate zones in the plant, as dictated by volume and degree of contamination. The activity level of this waste is generally low enough to permit contact handling. After the containers are filled at their respective collection points, the waste is transferred to the radwaste building where it is prepared for shipping offsite to a processing and/or disposal facility.

Other equipment which is too large to be handled in this way requires special procedures. Since the need for handling of large equipment is quite infrequent, providing storage facilities in advance is not justified. Handling of such equipment depends upon the radiation level, transportation facilities, and available storage sites. Procedures for decontamination, shielding, shipment, monitoring, and storage of such items are developed, as necessary.

Radiation exposure to plant operating personnel is minimized by shielding around the sludge collection tanks, centrifuges, drum filling systems, drum storage conveyors and temporary storage areas. Methods are provided for gross decontamination of equipment which may require periodic maintenance.

MNGP does not anticipate any increase in solid waste releases beyond normal operations during the proposed SPEO.

2.2.6.4 Ultimate Disposal Operations

A radwaste storage building is provided for the solid radwaste truck loading area. This sheet metal building is provided with shield walls, floor drains, heating, and fire protection systems. An overhead crane is located in the building. The building is designed to enclose the radwaste shipping truck and to facilitate loading of the truck. In addition to normal pendant controls, the overhead crane is radio controlled to enable the crane operator to select the best location to handle the waste and minimize radiation exposure. A radwaste shipping building is erected along the west side of the radwaste storage building. The building is a metal, steel-framed building.

The waste is packaged, stored, and shipped in accordance with applicable DOT and NRC regulations. All activities are performed in accordance with a process control program and are under the control of the plant staff. As discussed earlier, the quantity of radioactive waste shipped from MNGP is reported in the annual monitoring report in accordance with the ODCM.

2.2.6.5 Low-Level Mixed Waste

Mixed waste is radioactive waste that contains or consists of waste constituents that the U.S. Environmental Protection Agency (EPA) lists as hazardous waste. Therefore, any mixed waste falls under regulatory requirements of the NRC and EPA.

MNGP is a very small quantity (VSQG) generator that generates mixed waste from various work activities. Radioactively contaminated lead paint and associated rags are generated from plant painting activities as well as other projects and are collected in closed containers. Radioactively contaminated rags with chromates are generated from maintenance activities on a closed cooling water system and are collected in closed containers. The generation of both streams is ongoing and storage facilities are inspected as required by Minnesota's rules for satellite accumulation areas. Onsite inventories of both waste streams are shipped for disposal approximately every other year, as needed. MNGP's last shipment of mixed waste occurred in 2018.

MNGP generates a small amount of mixed waste each year which is stored in the high-level storage area in the radwaste building. When enough drums are accumulated for a shipment, Xcel Energy has a contract with UniTech Services, which subcontracts with Chase Environmental. Chase Environmental sends a shipper to MNGP to characterize, label, and manifest the waste, and transport it to a facility that can encapsulate, treat, or otherwise prepare the waste for disposal. For future shipments, MNGP may use Waste Control Solutions in a similar fashion to prepare and ship the waste or assist in preparing the proper shipping documents. Xcel Energy's chemistry procedure describes the process for shipping mixed waste.

MNGP makes every effort to minimize or eliminate mixed waste generation by minimizing the use of hazardous material in the Radiologically Controlled Area (RCA), reviewing the possibility of utilizing a non-hazardous substitute material, identifying and reporting petroleum products leaks within the RCA in a timely manner, and recycling mineral spirits or Stoddard solvent to the greatest extent possible when being used for parts washing activities within the RCA.

As MNGP is a VSQG of mixed waste, it does not require a conditional exemption for low-level mixed waste in accordance with 40 CFR Part 266, Subpart N. MNGP no longer provides semi-annual reports to MPCA, and no reports were submitted within the last five years (2016–2020).

2.2.6.6 Low-Level Radioactive Waste

Low-level radioactive waste (LLRW) is classified as Class A, Class B, or Class C (minor volumes are classified as greater than Class C). Class A includes both dry active waste and processed waste (e.g., dewatered resins). Classes B and C normally include processed waste and irradiated hardware. MNGP has a contract with UniTech Services, which utilizes one of its two landfills licensed to take radioactive material. If the amount of dry active waste is large, UniTech Services sends waste up to certain dose rate to Waste Control Specialists and Energy Solutions for the disposal of LLRW.

In 2020, low-level waste (LLW) was shipped to the Energy Solutions facility in Clive, UT; the Erwin Resin Solutions facility in Erwin, TN; and the UniTech Services facility in Oakridge, TN, for burial or disposal (Xcel 2021d). Currently, MNGP has no waste greater than Class C stored onsite. Disposal of greater than Class C waste is the responsibility of the federal government.

2.2.7 Nonradioactive Waste Management System

The Resource Conservation and Recovery Act (RCRA) governs the disposal of solid waste. Solid and hazardous waste in Minnesota is regulated under the RCRA and the Minnesota Hazardous Waste Rules and administered by the MPCA (MPCA 2021a). MNGP generates nonradioactive waste as a result of plant maintenance, cleaning, and operational processes that occur at the site. Nonradioactive waste commonly generated at MNGP includes waste oil/grease, used batteries, spent resin, paint-related materials, spent and expired mercury-containing lightbulbs, hazardous chemicals, oily absorbents, used anti-freeze, used oil filters, spent solvents, spent capacitors, spent light ballasts, spent aerosol cans, asbestos, and laboratory waste.

Nonradioactive liquid waste at MNGP consists of wastewater from lavatories, showers, and sinks. This wastewater is discharged from the MNGP sanitary sewer system to the City of Monticello sanitary sewage disposal system. Xcel Energy is required to manage its hazardous waste in accordance with the hazardous waste generator license from the MPCA. (NRC 2006b)

The sanitary sewer system at MNGP removes wastewater from onsite buildings and carries it to the City of Monticello sanitary sewage disposal system. Originally, the plant utilized an onsite septic tank soil absorption system for the treatment and disposal of sewage. A lift station and forced main were installed in 1983 to connect the plant to the city system, and the septic tank and drain field were closed. (NMC 2005) Discharges from the MNGP sanitary sewer system to the City of Monticello sanitary sewer system are covered under a separate agreement with the City of Monticello. (NRC 2006b). Sanitary sewer agreement information is included in Table 9.1-1.

MNGP also applies specific wastewater at approved locations at the plant site. This wastewater is generated intermittently and may consist of wash waters from steam cleaning, equipment cleaning, heat exchanger cleaning, and other miscellaneous wash waters.

Sediment removed (dredged material) under the scope of the dredging permit consists primarily of silt, sand, and rocks. Dredge material typically includes a maximum of 600 cubic yards of sediment from the intake bay, which is removed either mechanically or hydraulically approximately every two years and a maximum of 350 cubic yards of sediment from the traveling screen bay/service water bay area, which is removed hydraulically approximately every 12–18 months. The volume of dredge material may vary, with the possibility of more material being removed depending on river water quality and sediment characteristics. Mechanically dredged material and small volumes of hydraulic cleaning sediment from cooling systems are taken directly upland for dewatering and disposal. Hydraulically dredged material and material from cooling system cleaning is placed in a permitted concrete dewatering basin with multiple storage cells. Effluent from the dewatering basin is routed to the cooling tower basin and eventually to the discharge canal. Dredging permit information is included in Table 9.1-1.

MNGP's hazardous waste management procedure provides stepwise guidance for handling, transportation, record keeping, management, and reporting of hazardous and mixed waste. This procedure also summarizes the regulatory provisions and best management practices (BMPs) based on current understanding of the applicable law and regulations and MNGP's current business practices. MNGP's non-radioactive waste management procedure provides guidelines and instructions for shipping non-radioactive hazardous wastes, specially regulated wastes, and non-hazardous wastes to approved treatment, storage, and disposal facilities. Currently the treatment, storage, and disposal facility used is Xcel Energy's hazardous waste facility at the Chestnut Service Center.

MNGP is classified by the EPA and MPCA as a VSQG of hazardous waste. This means that MNGP generates 220 pounds or less of hazardous waste, and less than 2.2 pounds of acute hazardous waste per month and may accumulate 2,200 pounds of any type of hazardous waste onsite. (MPCA 2021b)

MNGP maintains log of approved waste vendors currently used to manage and dispose of hazardous and nonhazardous waste and recyclable waste generated at MNGP. Nonradioactive hazardous and nonhazardous waste quantities over the most recent five years (2016–2020) are provided in Table 2.2-2.

Because MNGP ships hazardous materials regulated by the DOT offsite, the facility is subject to and complies with the applicable requirements of the Hazardous Materials Transportation Act described in Title 49 of the CFR, including the requirement to possess a current hazardous materials certificate of registration. DOT registration information is included in Table 9.1-1.

MPCA requires that a VSQG must keep a copy of each signed receipt for waste delivered to a collection site as a record for at least three years from the date the waste was accepted at the collection site. (MAR 2021)

Table 2.2-1 Meteorological Parameters Monitored at MNGP

Parameter	Primary Tower (elevation level)	Backup Tower (elevation level)
Wind Speed	10 m, 43 m, 100 m	10 m
Wind Direction	10 m, 43 m, 100 m	10 m
Ambient Air Temperature	10 m, 43 m, 100 m	N/A
Dewpoint/Relative Humidity	10 m	N/A
Precipitation	Surface	N/A

Table 2.2-2 Nonradioactive Waste Quantities at MNGP

Year	Hazardous, Nonhazardous, and Recycled Waste (pounds)
2016	29,024
2017	36,949
2018	37,607
2019	38,417
2020	27,600

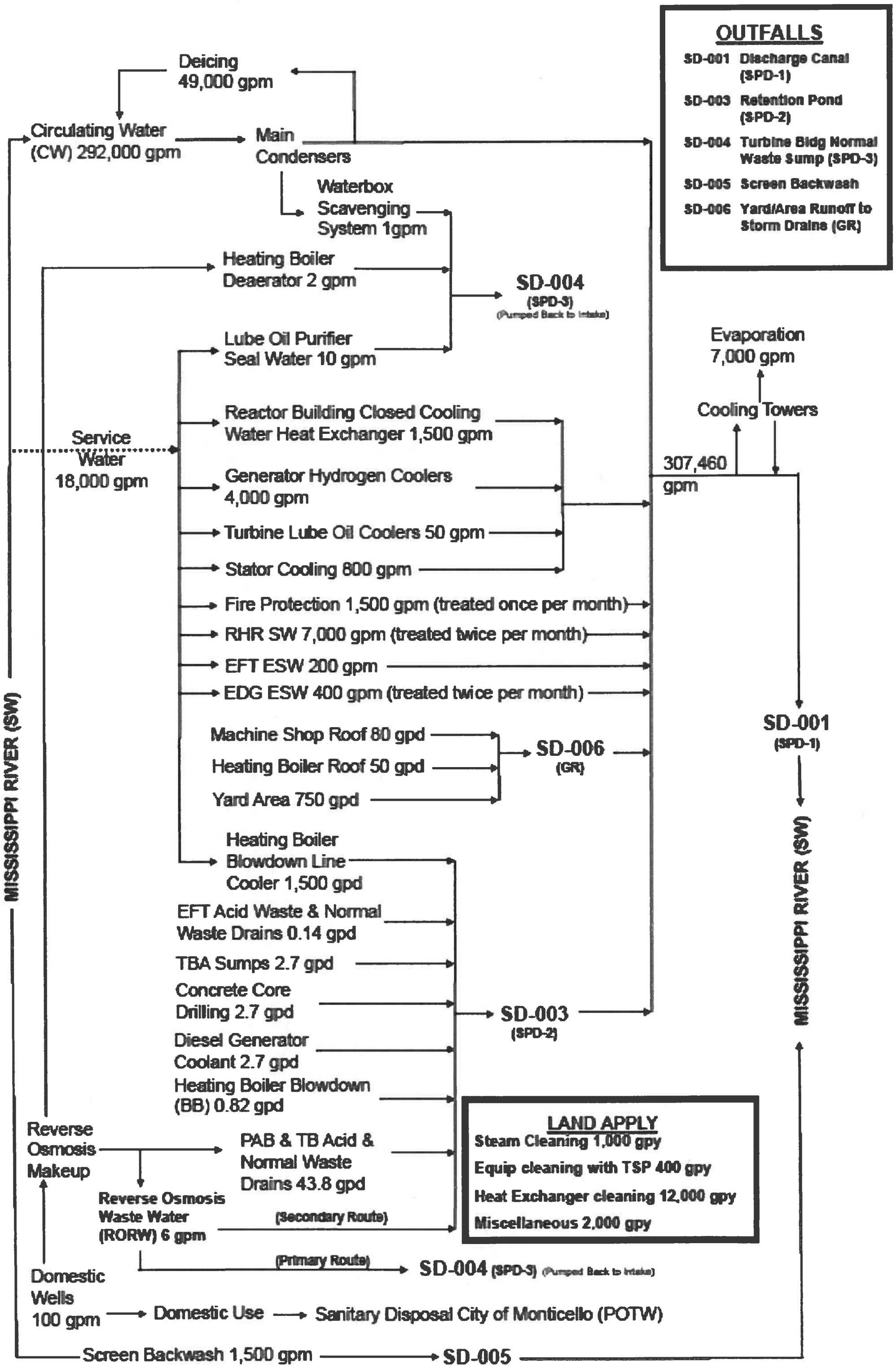


Figure 2.2-1 MNGP Typical Water Balance

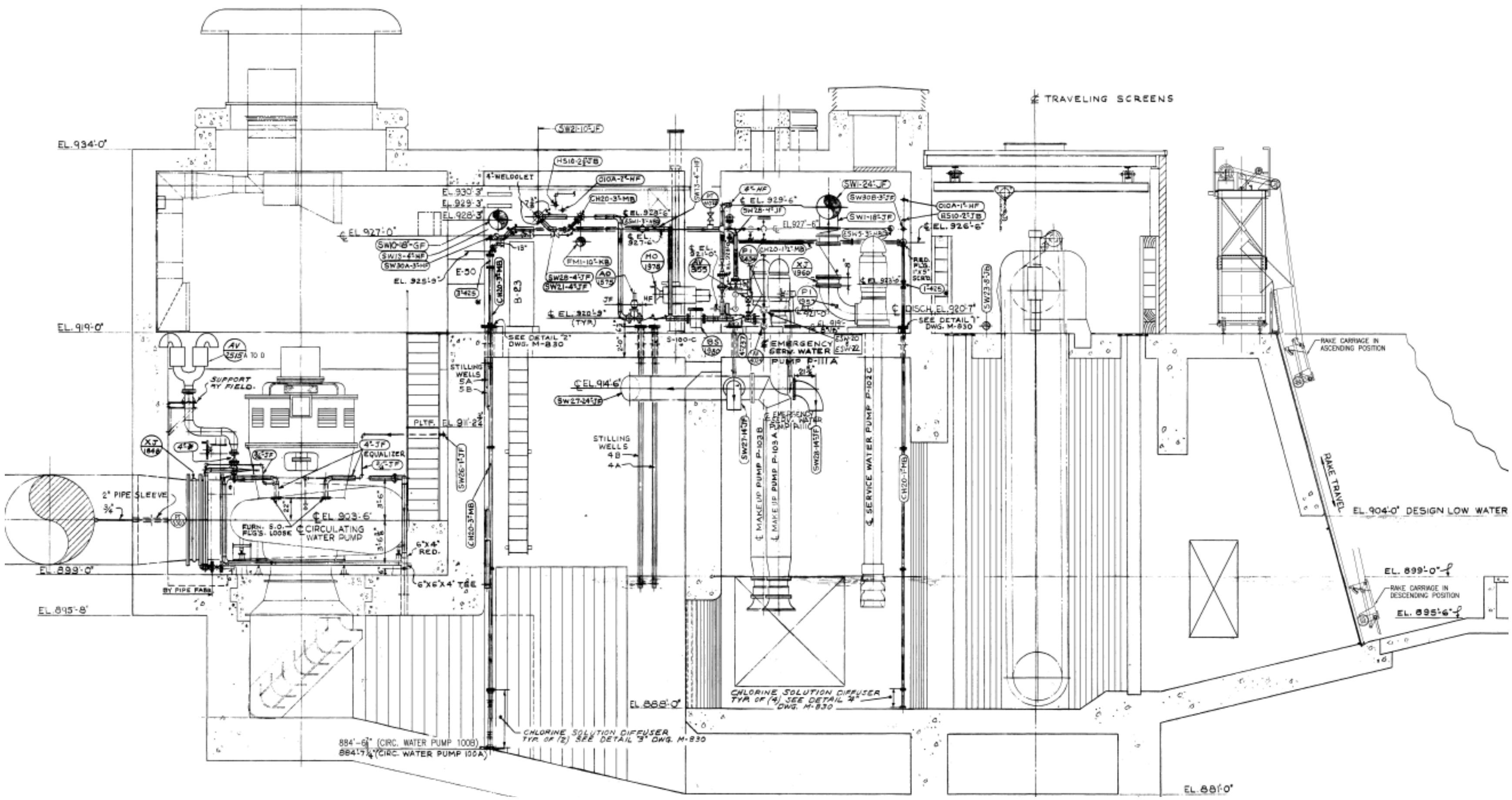


Figure 2.2-2 MNGP Intake Structure—Section

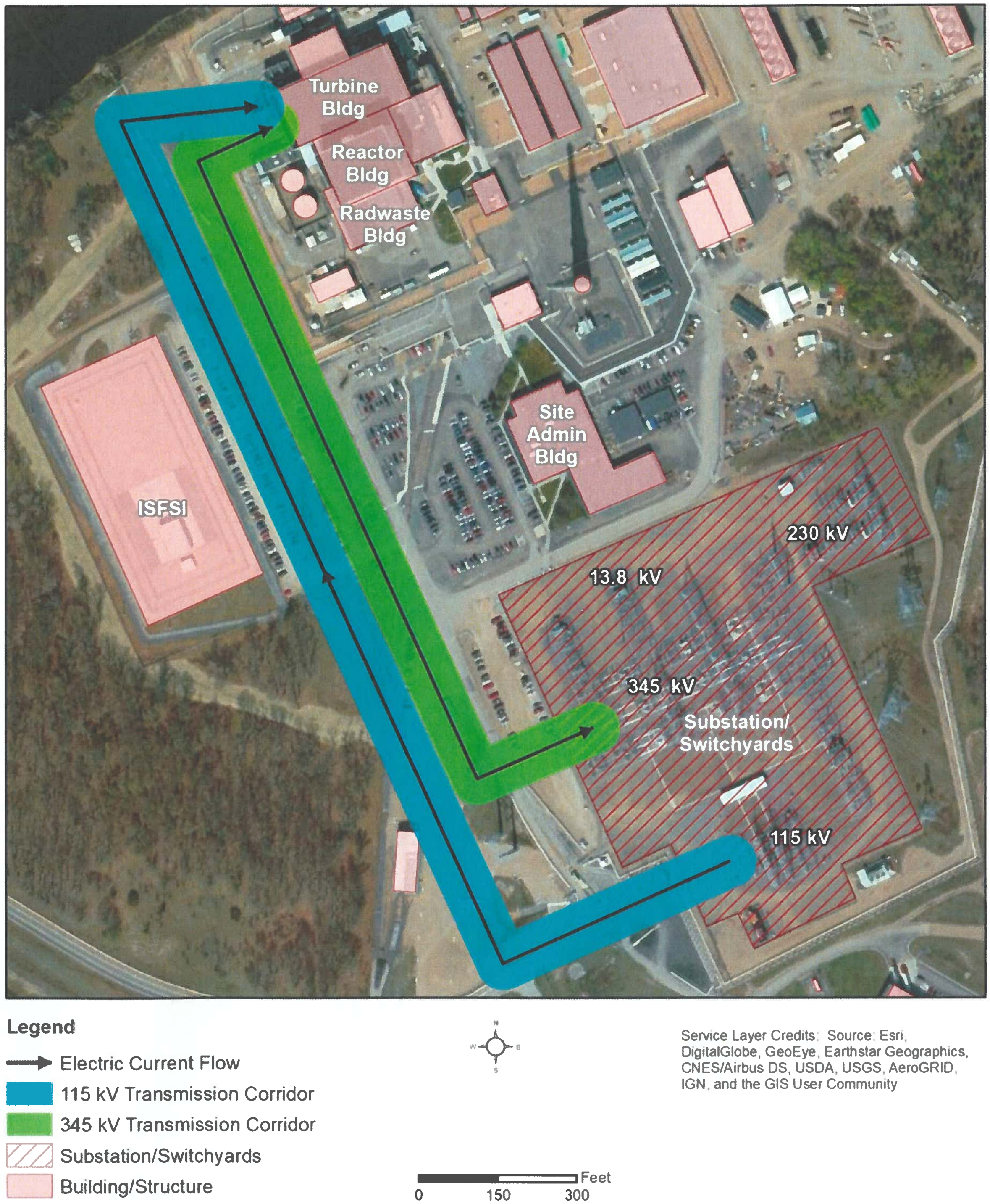


Figure 2.2-3 In-Scope Transmission Lines

2.3 Refurbishment Activities

In accordance with 10 CFR 51.53(c)(2), a license renewal applicant's ER must contain a description of the applicant's plan to modify the facility or its administrative control procedures as described in accordance with § 54.21. If SLR-related refurbishment is planned at a facility, the applicant's ER would include analysis for environmental impacts of the proposed refurbishment activity [10 CFR 51.53(c)(3)(ii)].

Refurbishment activities are replacement and repair of major components which usually occur infrequently and possibly only once in the life of the plant systems (e.g., steam generator and vessel head replacement). The NRC considered such refurbishment activities to include replacement of reactor vessel heads, steam generators and pressurizers in pressurized water reactors, and replacement of recirculation piping systems in BWRs. The NRC acknowledges that licensees may undertake refurbishment activities for reasons of safety, economics, reliability, or efficiency (i.e., not just to support license renewal). Refurbishment activities undertaken to allow continued operation beyond the current license term would be license renewal-related refurbishment and would be addressed in the applicant's license renewal ER. Impacts from refurbishment activities outside of license renewal are assumed by the NRC to have been accounted for in annual site evaluation reports, environmental operating reports, and radiological environmental monitoring program reports. (NRC 2013a)

The incremental aging management activities implemented to allow operation of a nuclear power plant during a renewal term are assumed to fall under one of two broad categories. One of these categories involves refurbishment actions, which usually occur infrequently and possibly only once in the life of the plant for any given item. The other category is SMITTR actions, most of which are repeated at regular intervals and schedules. (NRC 2013a)

The NRC requirements for the renewal of an OL for a nuclear power plant include preparation of an integrated plant assessment (IPA) [10 CFR 54.21]. The IPA must identify systems, structures, and components (SSCs) subject to an aging management review. The objective of the IPA is to determine whether the detrimental effects of aging could preclude certain SSCs from performing in accordance with the current licensing basis during the additional 20 years of operation requested in the SLR application (SLRA). An example of an SSC subject to aging is the reactor vessel.

MNGP's IPA, which Xcel Energy conducted under 10 CFR Part 54 and is described in the body of the SLRA, has identified no SLR-related refurbishment or replacement actions needed to maintain the functionality of SSCs, consistent with the current licensing basis, during the proposed SPEO. However, MNGP will exhaust its current state-approved SNF dry storage capacity in 2030 and must receive a CN from the State of Minnesota prior to placing additional dry storage modules on the onsite ISFSI. The needed dry storage capacity would involve a construction of a second pad within the existing ISFSI fenced area, so no expansion of the ISFSI footprint would be needed (Xcel 2021b). Xcel Energy does not anticipate the continued operations of MNGP to result in any environmental impact greater than SMALL. Xcel Energy also does not anticipate the need for refurbishment for purposes of SLR as a result of the technical and aging management program information submitted in accordance with the NRC license renewal process.

2.4 Programs and Activities for Managing the Effects of Aging

In accordance with 10 CFR 51.53(c)(2), a license renewal applicant's ER must contain a description of the applicant's plans to modify the facility or its administrative control procedures as described in accordance with §54.21. This report must describe in detail the modifications directly affecting the environment or any plant effluents.

The programs for managing the effects of aging on certain structures and components within the scope of license renewal at the site are described in the body of the SLRA (see Appendix B of the MNGP SLRA). The evaluation of structures and components required by 10 CFR 54.21 identified the activities necessary to manage the effects of aging on structures and components during the proposed SPEO.

2.5 Employment

The non-outage workforce at the MNGP site consists of approximately 663 employees, including 374 permanent employees and an additional 289 supplemental staff who support plant operations. Approximately 66 percent of the permanent employees reside in Sherburne and Wright counties (39 and 27 percent, respectively), with the remaining 34 percent residing in various other locations. Table 2.5-1 summarizes the residential distribution of MNGP permanent employees. Overall plant staffing levels have been reduced over time as part of a deliberate strategy to improve Xcel Energy nuclear plant cost competitiveness, and because of attrition. Xcel Energy utilizes corporate procedures and the NEI's "Delivering the Nuclear Promise" strategic plan as guidance for implementing efficiency improvements. There are no plans to add additional permanent employees to support plant operations during the proposed SPEO, and as noted in Section 2.3, no SLR-related refurbishment activities have been identified. There are no plans to add additional permanent operation staff to support SMITTR activities during the proposed SPEO.

During refueling outages, which last from 25–33 days, there are typically an additional 650 contract employees onsite. Refueling and maintenance outages for MNGP Unit 1 are on a two-year cycle and occur on odd numbered years from April through May.

Table 2.5-1 MNGP Permanent Employee Residence Information, August 2021 (Sheet 1 of 3)

State	County	City/Town	Regular Full-Time Employees
Maryland (1)	Anne Arundel (1)	Annapolis	1
Minnesota (370)	Anoka (13)	Andover	1
		Anoka	1
		Bethel	1
		Circle Pines	1
		Coon Rapids	4
		Lino Lakes	1
		Ramsey	3
		Wyoming	1
	Benton (9)	Foley	3
		Rice	2
		Sauk Rapids	4
	Brown (1)	New Ulm	1
	Carver (1)	Waconia	1
	Cass (1)	Pillager	1
	Chisago (1)	Chisago City	1
	Dakota (1)	Burnsville	1
	Hennepin (42)	Bloomington	1
		Brooklyn Center	7
		Brooklyn Park	1
		Champlin	3
		Corcoran	1
		Maple Grove	9
		Minneapolis	4
		Minnetrista	1
		Mound	1
		Osseo	5
		Plymouth	3
		Rogers	5
		St. Bonifacius	1

Table 2.5-1 MNGP Permanent Employee Residence Information, August 2021 (Sheet 2 of 3)

State	County	City/Town	Regular Full-Time Employees
	Isanti (1)	Cambridge	1
	Kanabec (1)	Grasston	1
	Meeker (2)	Dassel	2
	Mille Lacs (5)	Milaca	1
		Princeton	4
	Morris (1)	Bowlus	1
	Ramsey (1)	St. Paul	1
	Scott (1)	Shakopee	1
	Sherburne (146)	Becker	46
		Big Lake	41
		Clear Lake	13
		Elk River	33
		Nowthen	1
		St. Cloud	8
		Zimmerman	4
	Stearns (37)	Albany	2
		Avon	1
		Clearwater	8
		Holdingford	1
		Kimball	2
		Sartell	2
		St. Augusta	2
		St. Cloud	17
		St. Joseph	1
		St. Stephen	1
	Todd (1)	Burtrum	1
	Washington (4)	Lake Elmo	1
		Scandia	1
		Stillwater	1
		Woodbury	1

Table 2.5-1 MNGP Permanent Employee Residence Information, August 2021 (Sheet 3 of 3)

State	County	City/Town	Regular Full-Time Employees
	Wright (102)	Albertville	10
		Annandale	2
		Buffalo	13
		Howard Lake	1
		Maple Lake	7
		Monticello	54
		Otsego	1
		Rockford	3
		South Haven	3
		St. Michael	8
Texas (1)	Midland (1)	Midland	1
Wisconsin (1)	Brown (1)	Green Bay	1
		Total	**374**

(USCB 2021a)

Note: MNGP employee place of residence information is for permanent full-time staffing and does not include a breakdown for non-outage supplemental staff, nor temporary refueling outage workers. Supplemental staff settlement patterns are assumed to generally follow the county settlement patterns indicated by the permanent MNGP staff.

2.6 Alternatives to the Proposed Action

The proposed action as described in Section 2.1 is for the NRC to renew the MNGP OL for an additional 20 years. Because the NRC decision is to renew or not renew the existing MNGP OL, the only fundamental alternative to the proposed action is the no-action alternative, which would result in the NRC not renewing the MNGP OL. Because MNGP provides a significant block of long-term baseload capacity for Xcel Energy's Upper Midwest Region, it is reasonable to assume that the decision not to renew the MNGP license would involve replacement of its 640 MWe (net) of generation. Xcel Energy has considered a range of replacement power alternatives from which to select the alternatives to be further analyzed for replacement of MNGP's baseload power generation.

2.6.1 Alternatives Evaluation Process

Xcel Energy developed the following set of evaluation criteria to review MNGP replacement alternatives:

- The purpose of the proposed action (SLR) is the continued generation of approximately 640 MWe net baseload power beyond MNGP's current license term to meet future system generating needs.
- Alternatives evaluated in this ER would need to provide adequate levels of baseload generation to provide reliable electricity for Xcel Energy's service area.
- Alternatives considered must be fully operational by 2030, when MNGP's OL expires, considering development of the technology, permitting, construction of the facilities, and connection to the grid.
- Alternatives must be electricity-generating sources that are technically feasible and commercially viable.
- Technically feasible and commercially viable alternatives with large acreage requirements and/or multiple site requirements must be deployable by 2030 given land acquisition requirements

2.6.2 Alternatives Considered

Using a screening process based on the above criteria, Xcel Energy considered the full range of alternatives considered in the GEIS in light of the need to meet the criteria.

The following generation sources were selected as reasonable replacement alternatives based on capability to provide reliable baseload power:

1. Natural Gas and Renewables Alternative
    - Natural gas combustion turbine (CT) units with MDCTs located offsite
    - Wind turbines located offsite
    - Solar panels located onsite and at offsite locations

    - Additional generation from existing natural gas-fired plants
    - Purchased power

2. Renewables and Storage Alternative
    - Wind turbines located offsite
    - Solar panels located onsite and offsite
    - Lithium battery storage located with offsite solar
    - Occasional additional generation from existing natural gas-fired plants

3. Nuclear Alternative
    - Small modular reactors (SMRs) with MDCTs located within Xcel Energy's service area

The alternatives selected as reasonable replacement baseload generation alternatives are presented in Section 7.2.1.

Xcel Energy determined the following generating alternatives were not considered reasonable replacements in comparison to renewal of the MNGP OL. Wind and solar are included in the list as unreasonable as discrete alternatives but are components of the combination and renewables alternatives identified above. Purchased power is included in the list as unreasonable as a discrete alternative but is a component of the combination alternative identified above.

- Purchased power
- Plant reactivation or extended service life
- Conservation and energy efficiency measures
- Wind
- Solar
- Geothermal
- Hydropower
- Biomass
- Fuel cells
- Wave and current energy
- Oil-fired plants
- Coal-fired plants

The alternatives not selected as reliable baseload generation for replacing the MNGP generation are presented in Section 7.2.2.

3.0 AFFECTED ENVIRONMENT

Located in central Minnesota on the Mississippi River, MNGP is a single unit plant owned by Xcel Energy and operated by NSPM. The MNGP site is approximately 2,000 acres, with part of the property located on the left bank of the Mississippi River in Sherburne County, Minnesota, and part of the property located on the right bank of the Mississippi River in Wright County, Minnesota.

3.1 Location and Features

In Wright County, the MNGP plant industrial area is located within the city limits of Monticello, Minnesota. The population of the city of Monticello was 14,455 persons in 2020, up from 12,759 in 2010 (see Table 3.11-1). The main residential and business district of Monticello is located about three miles southeast of the plant. The coordinates for MNGP are latitude 45° 20' North and longitude 93° 50' West. Figure 3.1-1 shows the MNGP site boundary, facility structures, switchyards, and the EAB. See Section 2.2 for a description of MNGP site facilities and structures. Topographic features adjacent to MNGP and within the site boundary are shown in Figure 3.1-2.

3.1.1 Vicinity and Region

The vicinity of MNGP is defined as the area within a 6-mile radius of the reactor center point. As seen in Figure 3.1-3, the MNGP vicinity falls within the rural portions of both Sherburne and Wright counties. Because of overall population size and proximity to nearby urban areas, both Sherburne and Wright counties fall within the Minneapolis-St. Paul-Bloomington metropolitan statistical area inside the Minneapolis-St. Paul combined statistical area (USCB 2021b). Sherburne County's population was 97,183 persons in 2020, an increase from 88,499 in 2010. Wright County's population was 141,337 persons in 2020, an increase from 124,700 in 2010. (USCB 2021c)

Table 3.11-1 provides a list of communities located within a 50-mile radius of MNGP. Along with the city of Monticello in Wright County, within the MNGP vicinity are the cities of Becker and Big Lake in Sherburne County (see Figure 3.1-3). Located approximately 4 miles north-northwest, the city of Becker's population was 4,877 persons in 2020, an increase from 4,538 in 2010. Located approximately 5 miles east of MNGP, the population of the city of Big Lake was 11,686 in 2020, an increase from 10,060 in 2010. (USCB 2021d)

The region of MNGP is defined as the area within a 50-mile radius of the established MNGP plant center point. As seen in Figure 3.1-4 and detailed in Table 3.11-2, all, or parts of 23 counties are located within the MNGP region. According to the demographic analysis discussed in Section 3.11, the region is considered a high population area. As of 2020, there were two Minnesota cities in the 50-mile region with populations of over 100,000 persons: Minneapolis and St. Paul. There were 34 Minnesota communities within the 50-mile region with populations of over 25,000 persons (see Table 3.11-1). (USCB 2021d)

The area in Minnesota where MNGP is located is principally rural in character, with the land used primarily for farming. The terrain is heavily wooded along the Mississippi River, while the bluffs away from the river are cultivated.

As seen in Figure 3.1-1, south of the Mississippi River, MNGP plant access on Control Rod Drive is available from Wright County Road 75 NE, which is about 4,500 feet southeast of the reactor building. Interstate 94 (I-94) runs northwest from Minneapolis to St. Cloud and is located about 2,000 feet southwest of MNGP. Railroad access is available from the Burlington Northern Santa Fe track, which is about 2,000 feet south of MNGP. MNGP is served by a spur from this line. There is public intercity transportation between the city of Monticello and downtown Minneapolis (MNDOT 2021a). Also located within the MNGP region, the Metro Transit Northstar Commuter Rail service provides transportation between the city of Big Lake and downtown Minneapolis, with stops in Elk River, Ramsey, Anoka, Coon Rapids, and Fridley. There is a proposal to extend Northstar rail service to the city of St. Cloud at some point in the future. Currently St. Cloud commuters have access to the Northstar station in Big Lake via daily bus service between each community. (MNDOT 2021b) Within the region, access to the nearest Minnesota Amtrak passenger rail service and stations are St. Paul-Minneapolis and the city of St. Cloud (Amtrak 2021).

The reach of the Mississippi River near MNGP is not suitable for navigation because its gradient is steep and numerous shoals exist due to the current. The nearest navigable Mississippi River port is located in the city of Minneapolis. While there is no Mississippi River commercial barge traffic in the vicinity of MNGP, recreational boating does take place. (MNDOT 2021c)

As depicted in Figures 3.1-3 and 3.1-4, there are six airports found within approximately 10 miles of MNGP. These include four private airports: Centracare Health Heliport (4.5 miles southeast); Triple H Heliport (6.5 miles east-southeast); Miller Airport (8.4 miles northwest); and Buffalo Hospital Heliport (9.7 miles south). The remaining two are public airports and include Maple Lake Municipal-Bill Mavencamp Sr. Field Airport (9.5 miles southwest) and Leaders Clear Lake Airport (9.7 miles northwest). Larger public airports in the MNGP region include the St. Cloud Regional Airport (approximately 18 miles northwest) and Minneapolis-St Paul International Airport (approximately 44 miles southeast). (AirNav 2021)

3.1.2 Station Features

As depicted in Figure 3.1-1, the MNGP area within the site boundary is approximately 2,000 acres. The topography of the MNGP site is characterized by relatively level bluffs that rise sharply above the river (see Figure 3.1-2). Three distinct bluffs exist within the MNGP site boundary at elevations of 920, 930, and 940 feet above msl. Bluffs located about one mile north and south of the site rise to 950 feet msl.

The MNGP EAB falls within the site boundary. Access to the exclusion zone is restricted by a perimeter fence with "No Trespassing" signs posted at intervals along the fence line. Access to the exclusion zone by water is not restricted by a fence; however, "No Trespassing" signs are placed at intervals along the shoreline of the Mississippi River.

As described in Section 3.2, Xcel Energy has active lease agreements in place that allow for agricultural and recreational activities within the MNGP site boundary. These include two lease agreements for agricultural use. MNGP also has a lease agreement with the city of Monticello for the ballpark facilities located within the site boundary (see Figure 3.1-5). Located outside the MNGP site boundary north of the Mississippi River is the Oaks on the River Campground, which is exclusively available for current and retired Xcel Energy employee recreational use (see Figure 3.1-1). (ORC 2021)

There are no public residences within the site boundary. The nearest residence to MNGP is located 0.52 miles southwest of the plant.

3.1.3 Federal, Native American, State, and Local Lands

As shown in Figures 3.1-5 and 3.1-6, there are a variety of national, state, and local parks, and recreational and wildlife management areas located in the MNGP 50-mile region. As described in Table 3.1-1, there are 53 public lands within the 6-mile vicinity of MNGP, all of which are in Sherburne and Wright counties. Of these, a portion of the Mississippi River State Wild and Scenic Recreational District, and all of the Mississippi Island Sherburne State Aquatic Management Area, and Mississippi Island Wright State Aquatic Management Area fall within the MNGP site boundary. The Monticello city softball fields are also located within the site boundary. (CM 2021a; MGIO 2021; SC 2021a; USDA 2021a; USFWS 2021a)

There are 11 federally recognized American Indian tribes with reservations located throughout Minnesota. Within the MNGP 50-mile region, the Shakopee Mdewakanton Sioux tribe has lands located southwest of Minneapolis in Scott County. Outside the 50-mile region, the Mille Lacs Reservation is located approximately 53 miles north of MNGP in Mille Lacs County. (MNSOS 2021; USCB 2021e)

There are two Minnesota military installations located within the MNGP region, including the National Guard Arden Hills Army Training Center and the Minneapolis-St. Paul Air Reserve Station (USDOT 2021a).

3.1.4 Federal and Non-Federal Related Project Activities

Since the MNGP license renewal was finalized, the plant has undertaken minor construction and maintenance activities at the site. A cooling tower replacement project was completed at the plant. The project replaced both cooling towers using the same footprint as the existing MNGP facility. The replacement of the cooling towers was undertaken in two phases, with the second MNGP cooling tower completed in May 2022.

Near future projects currently planned for MNGP include the following:

By 2030, it is anticipated that MNGP will exhaust its storage capacity for SNF within the plant and at the existing ISFSI located onsite. On September 1, 2021, Xcel Energy submitted a CN application to the Minnesota Public Utilities Commission (MPUC) for additional dry cask storage at the MNGP ISFSI to allow continued operation of MNGP until 2040. With the CN, Xcel Energy proposes to increase the storage capacity of the existing MNGP ISFSI with the construction of a second concrete storage pad to be located within the existing ISFSI fenced area. The current ISFSI footprint was originally constructed with sufficient space to add the necessary storage with minimal environmental or other impacts. The current ISFSI is roughly 3.5 acres in size and the construction area for the proposed storage expansion project would be less than one acre (see Section 3.2). The State of Minnesota's approval of the MNGP CN application for ISFSI expansion is a multi-year process. While the MNGP ISFSI expansion conceptual plan takes into account construction of a pad sufficient in size to include the proposed SPEO through 2050, MNGP will not use the expanded ISFSI to accommodate storage of waste generated after the current CN application specified dates, absent additional State of Minnesota approval. (Xcel 2021b)

Additional offsite potential projects in the MNGP vicinity include Xcel Energy's 2021 proposal to construct the Sherco solar project, a solar energy conversion facility with a projected capacity of up to 460 MW, located outside the city of Becker in Sherburne County, Minnesota. Xcel Energy has announced that it will pursue 100 percent carbon-free electricity by 2050 (Xcel 2021c). As a replacement for the Sherco coal-fired plant, Xcel Energy initially considered construction of a combined-cycle natural gas plant in Becker, but now intends to add four smaller natural gas facilities to the region. The Sherco solar project covers 3,479.4 acres and is comprised of the west block (1,653.7 acres) located west of the Sherco generating plant; and the east block (1,825.7 acres) located east of the Sherco generating plant. The solar project west and east project blocks would each have approximately 230-MW capacity. The new solar project facility will share the existing transmission infrastructure at the Sherco generating plant, and the project will include construction of two 345-kV transmission lines to connect the solar project to the transmission grid. The west transmission line is approximately 3.2 miles in length, and the east transmission line is approximately 1.7 miles in length. It is anticipated that the Sherco solar project will be built in the 2022–2024 timeframe. Approximately 900 temporary construction jobs will be required, and the solar facility will employ approximately 24 long-term personnel for operations and maintenance. (MNCD 2021; MPRNEWS 2021; Xcel 2021c)

The city of Becker in Sherburne County is also pursuing the addition of a new Google data center at the Becker business park. Bond funds were secured through state of Minnesota legislation in 2020 and Becker has dedicated funds to add infrastructure to the park. No agreement between Google and the city of Becker has been finalized. (SCT 2021)

No major changes to MNGP operations or refurbishment during the proposed SPEO are anticipated.

Table 3.1-1 Federal, State, and Local Lands[(a)] Totally or Partially within a 6-Mile Radius of MNGP (Sheet 1 of 2)

Name	Type	Distance[(b)] (miles)	County
Mississippi River State Wild and Scenic Recreational District[(c)]	State	0	Sherburne and Wright
Mississippi Island Sherburne State Aquatic Management Area[(c)]	State	0	Sherburne
Mississippi Island Wright State Aquatic Management Area[(c)]	State	0	Wright
Monticello City Softball Fields	Local	1	Wright
Montissippi County Park	Local	1	Wright
Hillcrest Park	Local	1	Wright
Balboul Park	Local	1	Wright
Otter Creek Park	Local	2	Wright
Kelly-Meyer State Wildlife Management Area	State	2	Wright
Country Club Park	Local	3	Wright
Bertram Chain of Lakes Regional Park	Local	3	Wright
Silver Creek Waterfowl Production Area	Federal	3	Wright
West Bridge Park	Local	3	Wright
Groveland Park	Local	3	Wright
East Bridge Park	Local	3	Wright
Harry Larson County Forest	Local	4	Wright
4th St. Park	Local	4	Wright
Rivers Edge Park	Local	4	Wright
Ellison Park	Local	4	Wright
Lake Ridge Park	Local	4	Sherburne
Carl E. Johnson Park	Local	4	Sherburne
Mississippi River Park	Local	4	Wright
Big Lake State Aquatic Management Area	State	4	Sherburne
Lakeside Park	Local	4	Sherburne
Lake Mitchell Park	Local	4	Sherburne
Featherstone Park	Local	4	Wright
Becker Athletic Complex	Local	5	Sherburne
Lions Park	Local	5	Wright
Kolbinger Park	Local	5	Sherburne
Cardinal Hills Park	Local	5	Wright
Becker Community Center	Local	5	Sherburne

Table 3.1-1 Federal, State, and Local Lands[a] Totally or Partially within a 6-Mile Radius of MNGP (Sheet 2 of 2)

Name	Type	Distance[b] (miles)	County
Snuffy's Landing	Local	5	Sherburne
Jefferson Square Park	Local	5	Sherburne
Lake Maria State Park	State	5	Wright
Hunters Crossing Park	Local	5	Wright
Tot Lot	Local	5	Sherburne
Cardinal Hills Tot Lot	Local	5	Wright
Powell Park	Local	5	Wright
River Mill Park	Local	5	Wright
Lions Park	Local	5	Sherburne
Wright's Crossing Park	Local	5	Sherburne
Pleasant Valley Park	Local	5	Wright
Watertower Park	Local	5	Wright
Battle Rapids Park	Local	5	Wright
River Oaks Park	Local	5	Wright
Silver Creek State Aquatic Management Area	State	5	Wright
Meadow Oaks Park	Local	6	Wright
Wildwood Park	Local	6	Wright
Parkside Park	Local	6	Wright
Rolling Woods Park	Local	6	Wright
Oak Ridge Park	Local	6	Wright
Becker City Park	Local	6	Sherburne
Oak Savanna Park	Local	6	Sherburne

(CM 2021a; MGIO 2021; SC 2021a; USDA 2021a; USFWS 2021a)

a. Table list is based on available public information and includes lands that are totally or partially located within a 6-mile radius of MNGP.

b. Distances are approximate (rounded to the nearest mile and calculated based on the MNGP center point and land centroid data).

c. Lands/districts that lie partially or wholly within the site boundary.

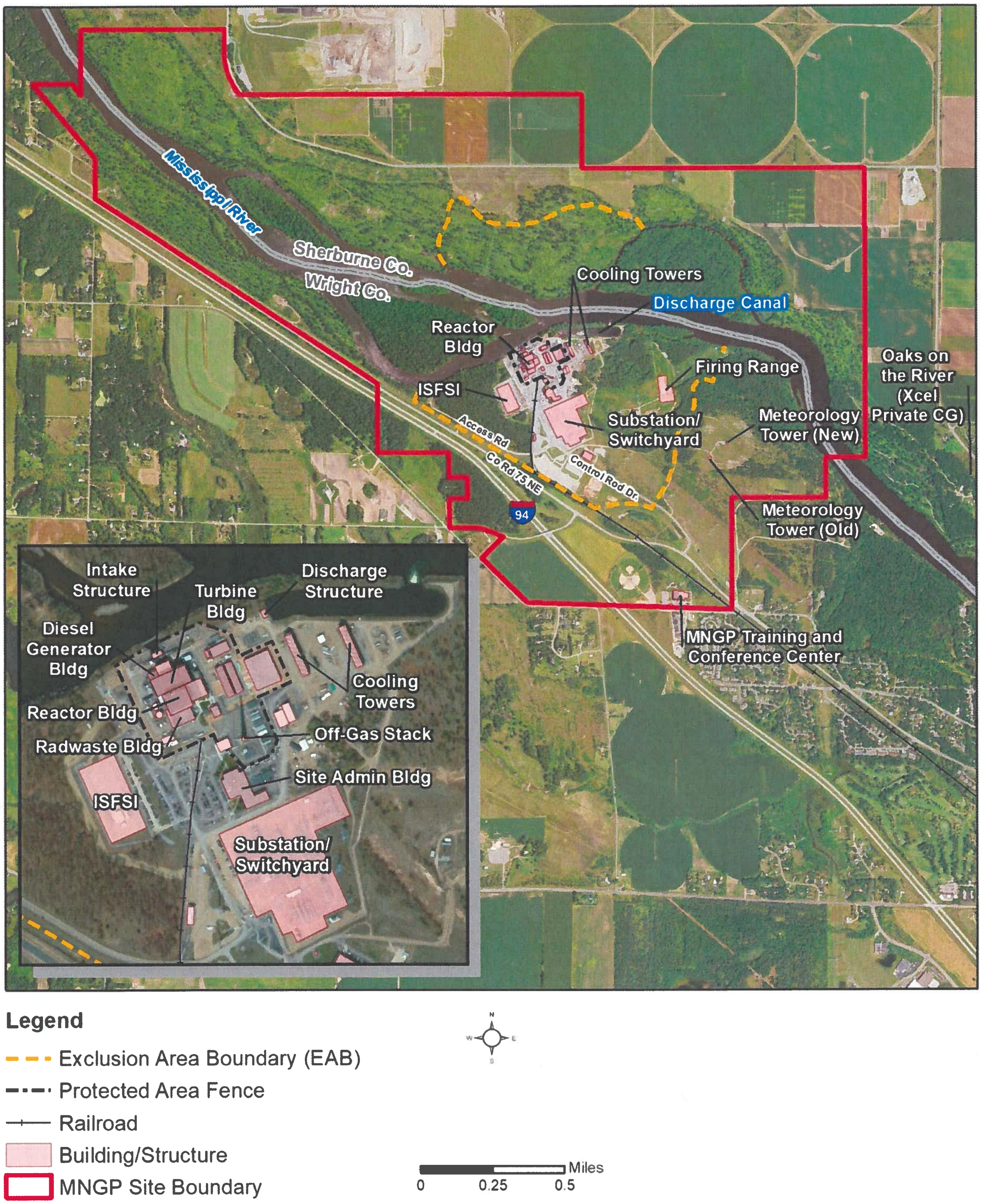


Figure 3.1-1 MNGP Plant Layout

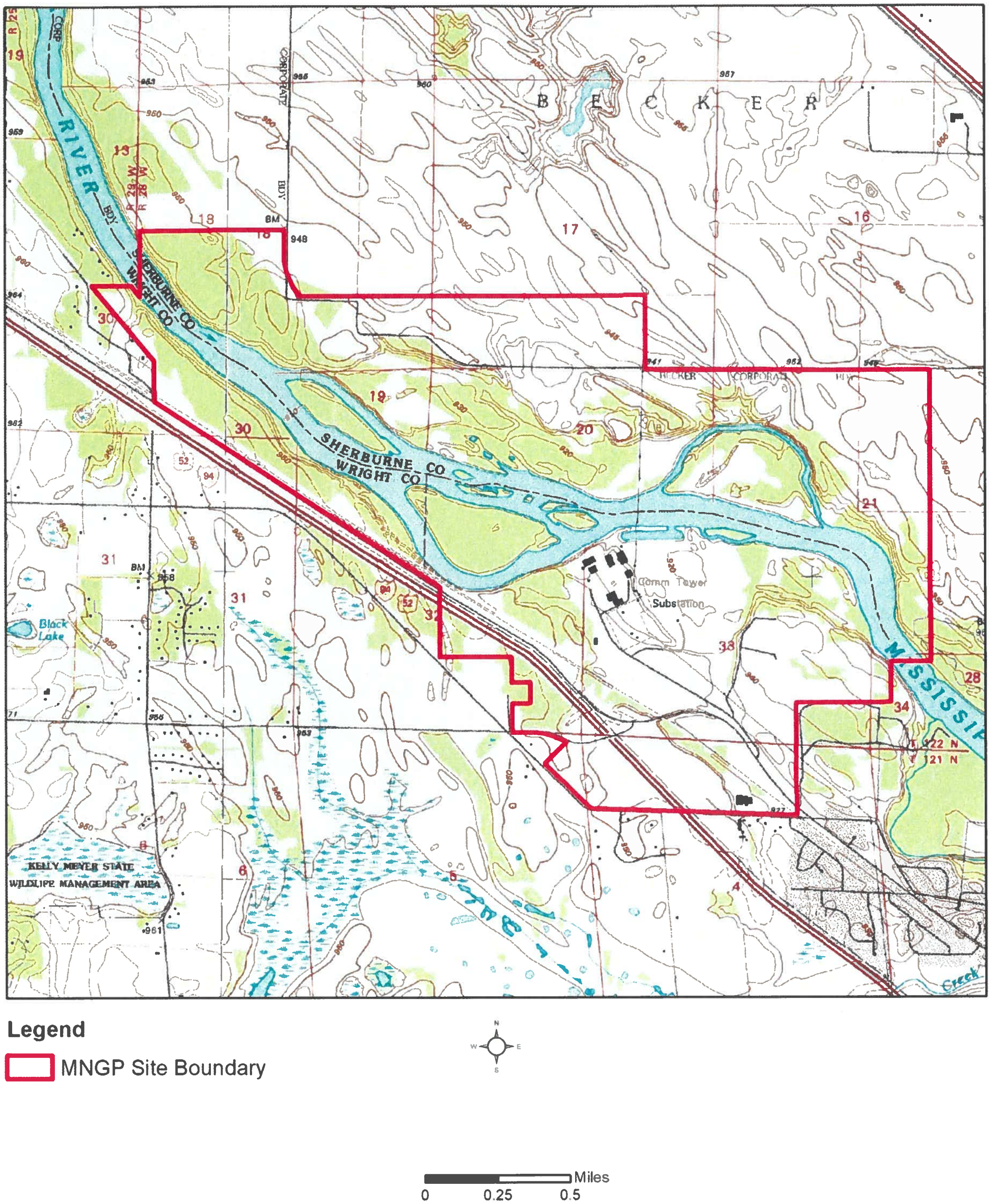


Figure 3.1-2 MNGP Area Topography

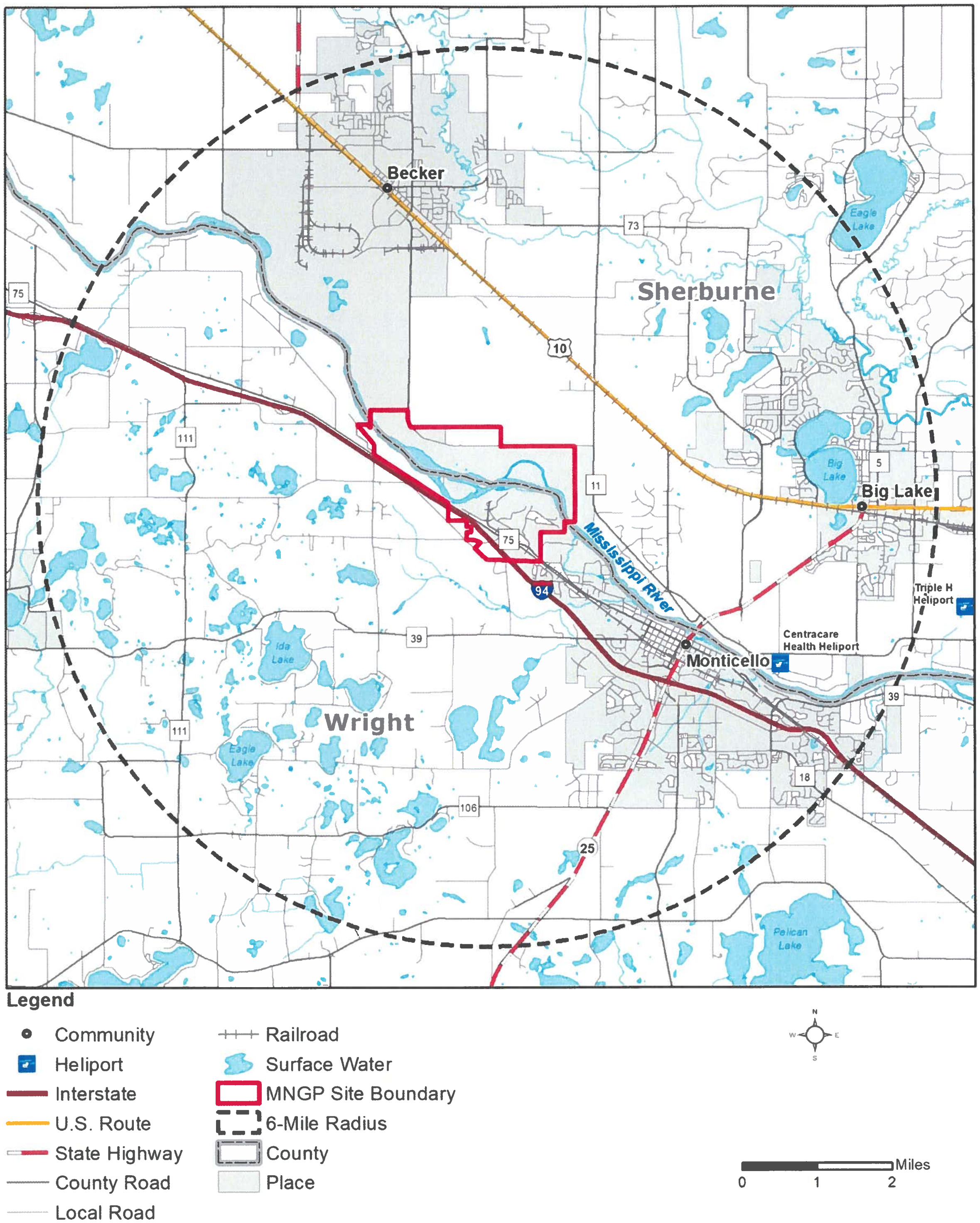


Figure 3.1-3 MNGP Site and 6-Mile Radius

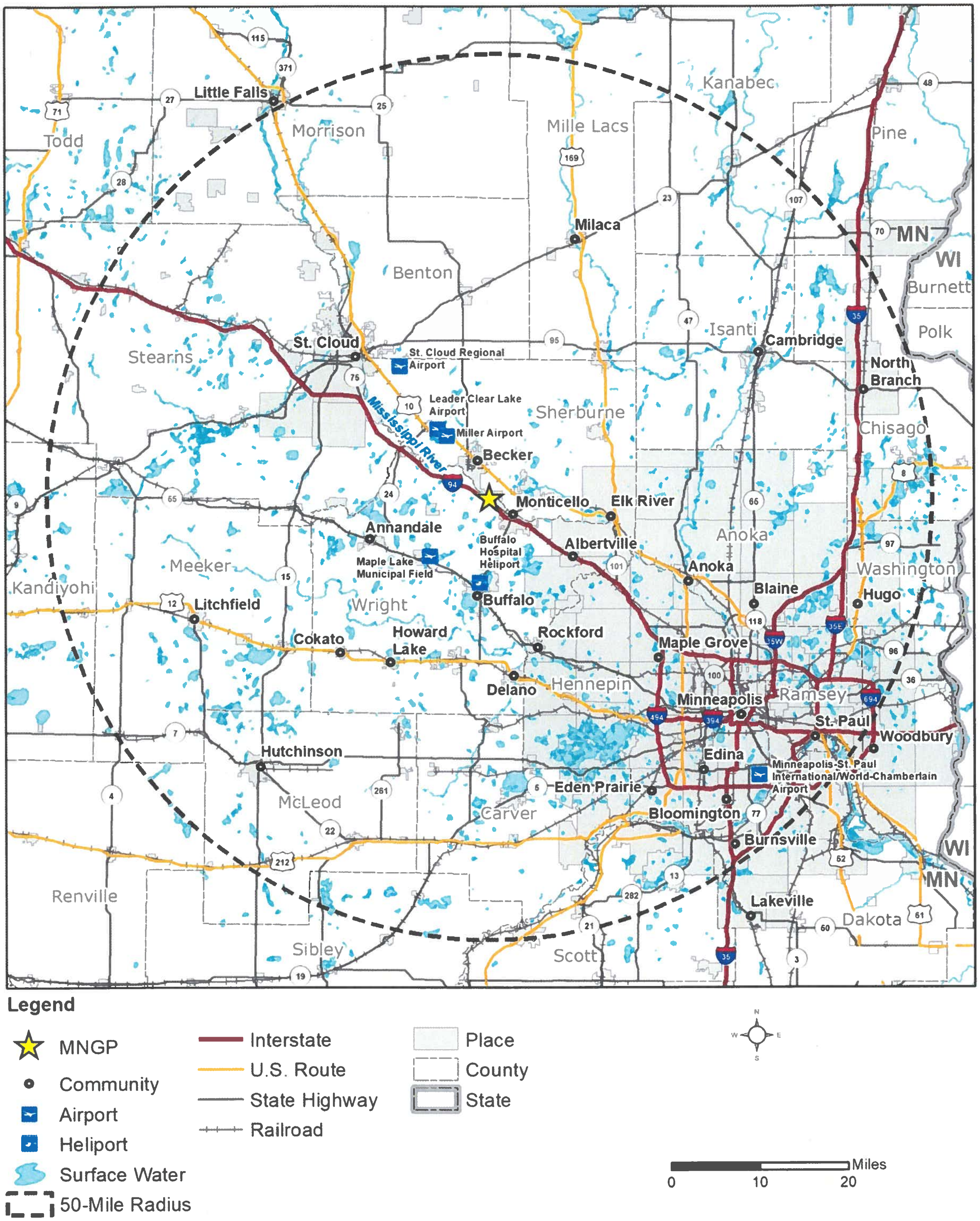


Figure 3.1-4 MNGP Site and 50-Mile Radius

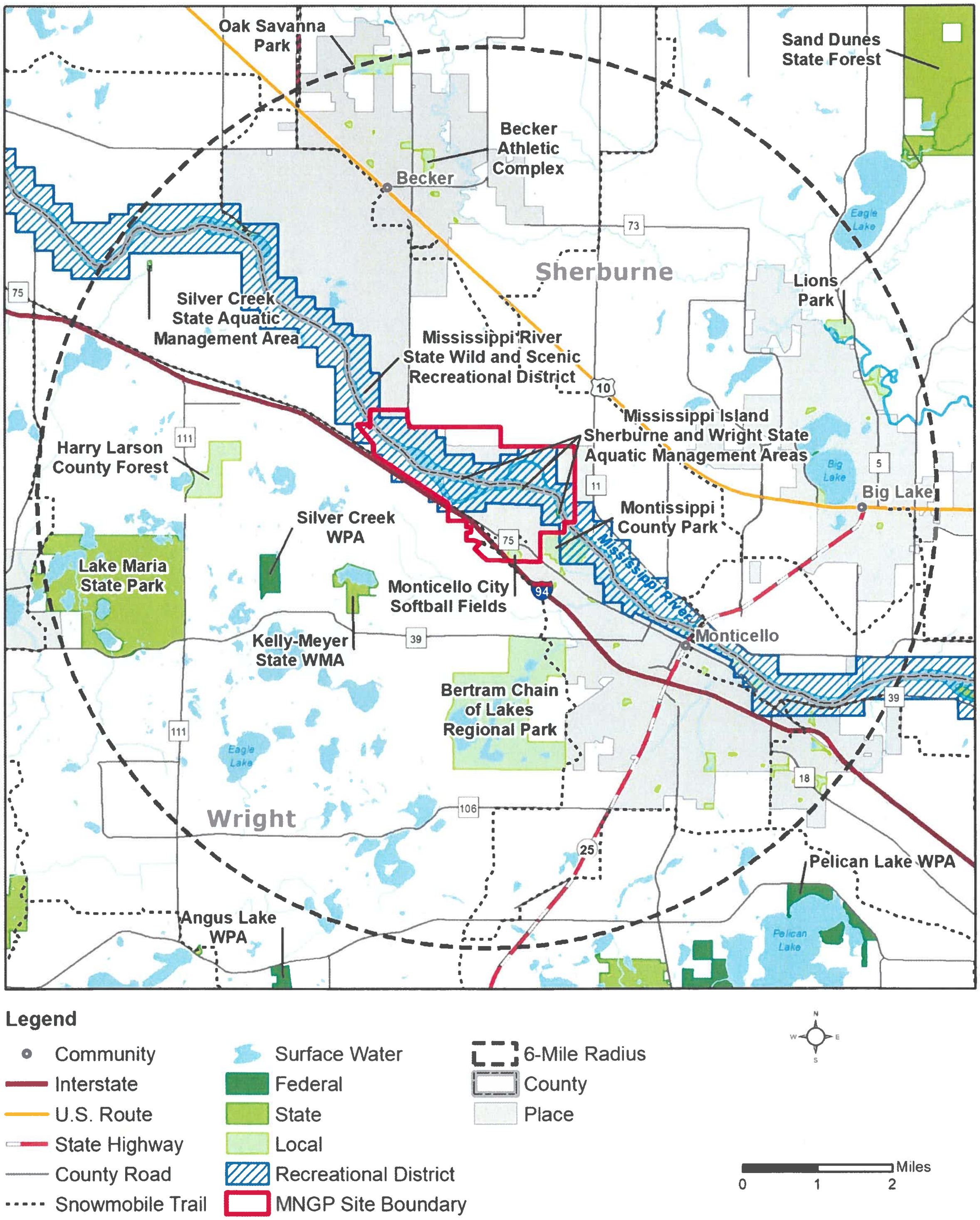
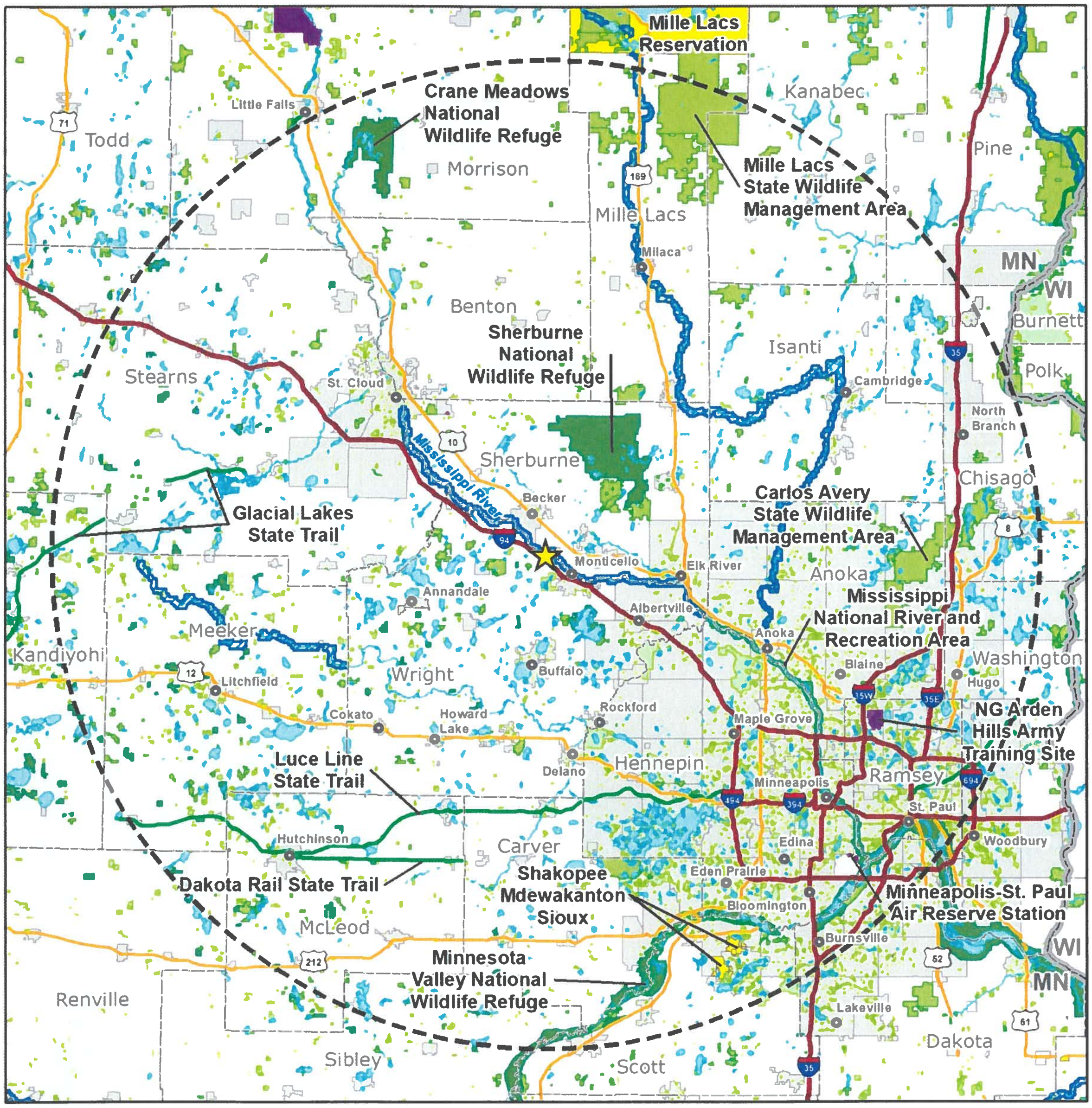


Figure 3.1-5 Federal, State, and Local Lands within a 6-Mile Radius of MNGP



Legend

MNGP	State Trails	State Wild and Scenic Recreational Districts
Community	Federal	Place
Interstate	State	County
U.S. Route	Local	State
Surface Water	Indian Tribal Land	
50-Mile Radius	Military	

Miles: 0 10 20

Figure 3.1-6 Federal, State, and Local Lands within a 50-Mile Radius of MNGP

3.2 Land Use and Visual Resources

Land use description focuses on Wright and Sherburne counties, Minnesota, because as described in Section 2.5, approximately 66 percent of the MNGP permanent workforce reside in the two counties and MNGP pays taxes to Wright County.

3.2.1 Onsite Land Use

As described in Section 3.0, MNGP is located on the banks of the Mississippi River, with portions of the property located in both Wright and Sherburne counties. The industrial area, which consists of the plant and auxiliary facilities, is located in Wright County and situated along the southern bank of the Mississippi River, as seen in Figure 3.1-1. The MNGP site consists of approximately 2,000 acres, with the industrial area occupying approximately 50 acres (NMC 2005). The remaining acreage is primarily undeveloped, with approximately 353 acres held in agricultural leases by the University of Minnesota and Centre Farms (305 acres and 48 acres respectively). Approximately 14 acres are leased for recreational use by the City of Monticello as part of the City of Monticello softball fields. In 2018 and 2019, a small portion of the MNGP site north of the Mississippi River in Sherburne County was harvested for timber as part of a larger timber harvesting project in the area. Timber harvesting occurs on a limited basis and is not expected to occur again onsite within the next 5 to 10 years.

As shown in Table 3.2-1 and illustrated in Figure 3.2-1, deciduous forest is the largest land use/land cover category within the MNGP site boundary, covering approximately 35 percent of the site. The cultivated crops category is the next largest land use/land cover category with approximately 18.2 percent of the MNGP site, followed by open water and pasture/hay categories with 13.9 percent and 13 percent, respectively. Developed (low/medium/high intensity) land use/land cover categories account for approximately 10.6 percent in total, with the remaining six land use/land cover categories covering approximately 9.5 percent of the site. (MRLC 2021) As discussed in Section 3.1.4, Xcel Energy proposes to increase the storage capacity of the existing ISFSI during the current LR operating term with the construction of second concrete storage pad within the existing ISFSI fence. Developed, medium intensity is the current land use/land cover category for the existing ISFSI and proposed project area. No additional land will be disturbed beyond what has already been disturbed or developed, and existing land use/land cover is not expected to change as part of the proposed ISFSI expansion.

The MNGP industrial area is located within the city limits of Monticello, Minnesota. The Monticello zoning ordinance implements policies and objectives outline in the Monticello comprehensive plan and regulates land development within city limits. The industrial area is zoned as a heavy industrial district (I-2) for principle uses associated with heavy industry and manufacturing development, and for uses that by the nature of the product or character of the activity requires isolation from residential or commercial use. (CM 2021b)

3.2.2 Offsite Land Use

As seen in Tables 3.11-2 and 3.11-3, Wright and Sherburne counties have seen an increase in total population since 2010, and this trend is expected to continue through 2050.

As described in Section 3.1, the vicinity (6-mile radius) surrounding MNGP includes portions of Wright and Sherburne counties, Minnesota. The land use/land cover categories located within the vicinity of MNGP are illustrated in Figure 3.2-2. The area surrounding MNGP is characterized by rural development with agriculture, pastureland, streams, and lakes dominating the area. As shown in Table 3.2-2, cultivated crops is the largest land use/land cover category at approximately 35 percent. The next largest land use/land cover categories in the vicinity are developed (low/medium/high intensity) areas (19 percent in total); deciduous forest (14.9 percent); and pasture/hay (13 percent). The remaining land use/land cover categories found within the vicinity of MNGP comprise approximately 18.2 percent. (MRLC 2021) As discussed in Section 3.1.4, Xcel Energy is proposing a 3,479.4-acre solar project to be located north of MNGP in Sherburne County. Based on 2016 national land cover data, the proposed project would predominately affect the cultivated crop land use category, which covers 96.3 percent of the project footprint. The remaining 3.7 percent is comprised of pasture/hay, developed land, wetland, and open water land use categories. It is anticipated that areas outside of the proposed facility will continue their existing land use. (MNCD 2021)

Wright County occupies approximately 423,192 acres of land, of which 240,651 acres (approximately 57 percent) are farmland. The 2017 census of agriculture reports that the county had a total of 1,338 farms, with an average farm size of 180 acres. Approximately 1,193 farms produce crops, with the primary crops reported as soybeans (87,051 acres), corn for grain (71,881 acres), corn for silage or greenchop (8,807 acres), wheat (1,750 acres), oats (777 acres), orchards (373 acres), sorghum for silage or greenchop (29 acres) and potatoes (13 acres). Other agricultural uses of farmland within the county include pasturelands (13,829 acres; 616 farms), woodlands (12,784 acres; 579 farms) and permanent pasture and rangeland (9,389 acres; 543 farms). Livestock is also an important product in the county, with livestock commodities such as cattle and calves (412 farms), layers (144 farms), sheep and lambs (52 farms), hogs and pigs (37 farms), and broilers and other meat-type chickens (27 farms) reported. (USDA 2021b)

Sherburne County occupies approximately 277,062 acres of land, of which 102,544 acres (approximately 37 percent) are proportioned to farmland. In 2017, the county reported a total of 501 farms, with an average farm size of 205 acres. Approximately 390 farms produce crops, with the primary crops reported as corn for grain (27,579 acres), soybeans (19,533 acres), potatoes (9,568 acres), forage (5,696 acres), corn for silage and greenchop (1,785 acres), wheat (757 acres), oats (100 acres), and orchards (30 acres). Livestock is also an important product in the county, with livestock commodities such as cattle and calves (117 farms), layers (85 farms), sheep and lambs (37 farms), hogs and pigs (22 farms), and broilers and other meat-type chickens (17 farms). Other agricultural uses of farmland within the county include woodlands (11,027 acres; 275 farms), pastureland (9,254 acres; 239 farms), and permanent pasture and rangeland (5,336 acres; 179 farms). (USDA 2021b)

Minnesota Statute 394, "Planning, Development, Zoning," authorizes counties with populations less than 300,000 people to prepare and adopt a comprehensive plan that characterizes current conditions and establishes standards, regulations, and goals for future land development for unincorporated areas (MLORS 2021a). Comprehensive plans typically include chapters on land use, housing, transportation, parks, community facilities and services, and implementation tools, along with future land use maps to show desired land use across the community on a parcel-by-parcel basis (MDH 2021a). Minnesota Statute 462, "Planning, Zoning," authorizes municipalities to prepare, adopt, and amend a comprehensive plan for guiding future development and improvement of the municipality. Both counties and municipalities are encouraged to prepare and implement a community-based comprehensive plan that incorporates coordination and joint planning with other counties, municipalities, and towns that are geographically contiguous. Community-based comprehensive plans are reviewed and updated no less than once every 10 years (MLORS 2021a; MLORS 2021b). Comprehensive plans are in place for the city of Monticello, Wright County, and Sherburne County, and reflect the planning efforts of local and county governments, as well as public involvement in the planning process (CM 2021c; SC 2021b; WC 2021a).

The City of Monticello, the municipality where the MNGP industrial area is located, developed and adopted the Monticello Comprehensive Plan on November 23, 2020, with a primary theme of sustainability, community health, and a sense of place. The 20-year plan addresses existing and future economic development, housing, and utilities and transportation. Monticello regulates land use within the city limits through zoning ordinances implemented in its plan. The comprehensive plan also includes a future land use designation and map to provide a strategic approach to land uses and development for the next 20 years. MNGP has a future land use designation of Xcel MNGP that recognizes the site as a "special facility and land use with unique operational characteristics warranting a special designation for long-term planning purpose." The comprehensive plan also notes that "the designation is intended to safeguard the operation of the facility so that it continues to provide essential utility services that contribute to the local and regional economies." (CM 2021c)

The Wright County land use plan was adopted in 1988 and has been reviewed and updated several times since its adoption. Updating the plan involved separating the county into three geographic areas and creating individual plans based on differing needs and development patterns. The geographic planning areas include the northeast quadrant (NEQ), which is subject to significant urbanization and development pressure; the northwest quadrant, which is known for its many lakes and natural features; and the U.S. Highway 12 corridor with its vast amount of prime fertile farmland. The individual plans collectively serve as a vision and guide for the future development of Wright County. MNGP is located within the NEQ land use plan, which was adopted July 31, 2007, and specifically relates to Buffalo, Monticello, and Rockford townships with participation and input from the cities of Albertville, Buffalo, Hanover, Monticello, Rockford, and Otsego. The Wright County planning and zoning office provides planning services and administers all regulations for townships in the NEQ planning area. (WC 2021b)

In Wright County, the County Board of Commissioners adopted the Wright County zoning ordinance to regulate land use and development in areas outside of the incorporated limits of municipalities and to carry out goals and policies of the county's land use plan. Wright County has traditionally been predominately rural but has experienced pressures from suburban development due to its proximity to the Minneapolis-St. Paul metropolitan area. From 1990–2005, Wright County was one of the fastest-growing counties in the state, with the NEQ absorbing most of the population growth and doubling its population from 28,453 residents to 69,793 residents. Most of the population growth has occurred in cities as opposed to the townships. This indicates that the cities are annexing more land from the townships to accommodate population growth, and the nature of the rapid growth and development is not rural and agriculturally based. Wright County has a long-standing policy that most growth be directed into the cities where adequate services can be provided, while preserving open space, farmland, and environmentally sensitive areas in the remainder of the county. To accommodate the continued growth, Wright County established transition areas to properly manage the land at the fringe of urban and rural areas, avoid premature annexation of land by the growing cities, and limit the possibility of incompatible future land uses. (WC 2021b)

The Sherburne County comprehensive land use plan was adopted by the County Board of Commissioners on September 13, 2011. The plan serves as a legal basis for establishing zoning and subdivision ordinances for current land uses in unincorporated areas and a guide to future land use development through the year 2030. Sherburne County is comprised of 10 unincorporated townships and 7 cities. The county administers planning and zoning in its townships, with the exception of portions of Becker Township and the Haven Township orderly annexation area, and has agreements with Baldwin, Big Lake, and Livonia townships to administer parallel zoning authority, where the county and each township maintain separate, but identical zoning and subdivision ordinances. (SC 2021b)

Sherburne County's proximity to the Minneapolis-St. Paul metropolitan area has caused the county to experience a transformation from an agrarian economy to one more suburban and exurban in nature. Between 2000–2010, the county's population grew by 37 percent from 64,417 to 88,499, with the townships alone experiencing a 27 percent population increase. Eastern portions of the county are oriented toward the Minneapolis-St. Paul metropolitan area, where local land use policy has allowed for more rural residential development, while the western portions remain agriculturally based and oriented toward the city of St. Cloud. With the county's location, transportation access, and natural soil and water features, it is expected that these qualities will continue to promote urban and rural residential growth. The county's comprehensive plan puts forth policies, implementation strategies, and future land use maps and designations to manage growth and maintain a balance between preserving natural and agricultural resources while promoting development. (SC 2021b)

3.2.3 Visual Resources

As discussed in Section 3.1, MNGP is located in central Minnesota on the Mississippi River, with portions of the site falling in both Wright and Sherburne counties. Figure 3.1-1 shows the building site layout and site boundary in association with the Mississippi River and county boundaries. The surrounding area is primarily agricultural in character, with natural areas, small cities, and rural residential development interspersed. The nearest resident to MNGP is located approximately 0.52 miles southwest of the plant.

Predominant visual features at MNGP include the reactor building, turbine building, radwaste building, EDG building, off-gas stack, mechanical cooling towers, and transmission lines and corridors. The tallest structure onsite is the off-gas stack, which is approximately 328 feet in height. The area surrounding MNGP is primarily farmland, forest, and small residential communities. Though views of the plant are offered from portions of I-94, nearby service roads, and the Mississippi River, the majority of MNGP is not visible to local communities. The off-gas stack is the most visible feature to local communities and the surrounding area. (NRC 2006b) A plume may also be visible periodically during the operation of the cooling towers, which run for approximately 120–150 days a year. There are no plans for refurbishment that would create new visual impacts during the proposed SPEO. Therefore, MNGP would continue to have minimal visual impact on the neighboring communities, nearby interstate, and Mississippi River.

Table 3.2-1 Land Use/Land Cover, MNGP Site

Category	Acres	Percentage
Open Water	284.4	13.9
Developed, Open Space	25.8	1.3
Developed, Low Intensity	58.9	2.9
Developed, Medium Intensity	77.4	3.8
Developed, High Intensity	54.3	2.6
Deciduous Forest	714.8	34.9
Evergreen Forest	16.9	0.8
Mixed Forest	2.7	0.1
Shrub/Scrub	8.2	0.4
Grassland/Herbaceous	32.0	1.6
Pasture/Hay	266.0	13.0
Cultivated Crops	373.6	18.2
Woody Wetlands	90.3	4.4
Emergent Herbaceous Wetlands	45.6	2.2
Total	**2,050.9**	**100**

a. The acreages presented in this table are based on the Multi-Resolution Land Characteristics Consortium land use/land cover data. These data are presented in a raster (pixel-based) format and because of their square geography, they do not exactly match the MNGP site boundary. This geographic variation creates a small difference between total acreages reported in Table 3.2-1 compared to the MNGP site acreage reported throughout the ER. (MRLC 2021)

Table 3.2-2 Land Use/Land Cover, 6-Mile Radius of MNGP

Category	Acres	Percentage
Open Water	4,572.9	6.3
Developed, Open Space	4,464.1	6.2
Developed, Low Intensity	4,246.9	5.9
Developed, Medium Intensity	3,771.6	5.2
Developed, High Intensity	1,249.0	1.7
Barren Land (Rock/Sand/Clay)	146.1	0.2
Deciduous Forest	10,764.8	14.9
Evergreen Forest	338.0	0.5
Mixed Forest	507.5	0.7
Shrub/Scrub	166.6	0.2
Grassland/Herbaceous	814.4	1.1
Pasture/Hay	9,404.2	13.0
Cultivated Crops	25,359.2	35.0
Woody Wetlands	2,205.5	3.0
Emergent Herbaceous Wetlands	4,467.5	6.2
Total	**72,478.3**	**100**

(MRLC 2021)

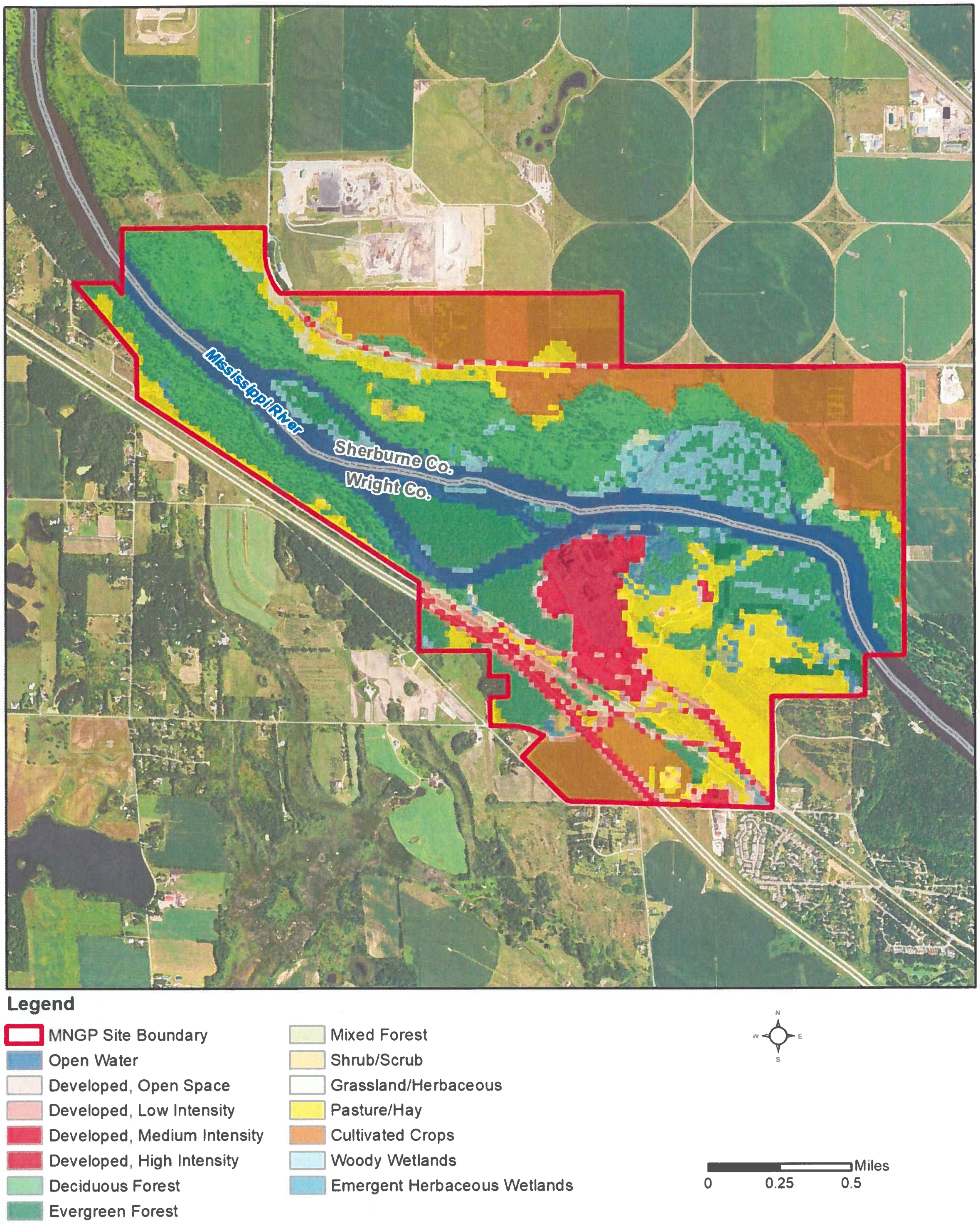


Figure 3.2-1 Land Use/Land Cover, MNGP Site

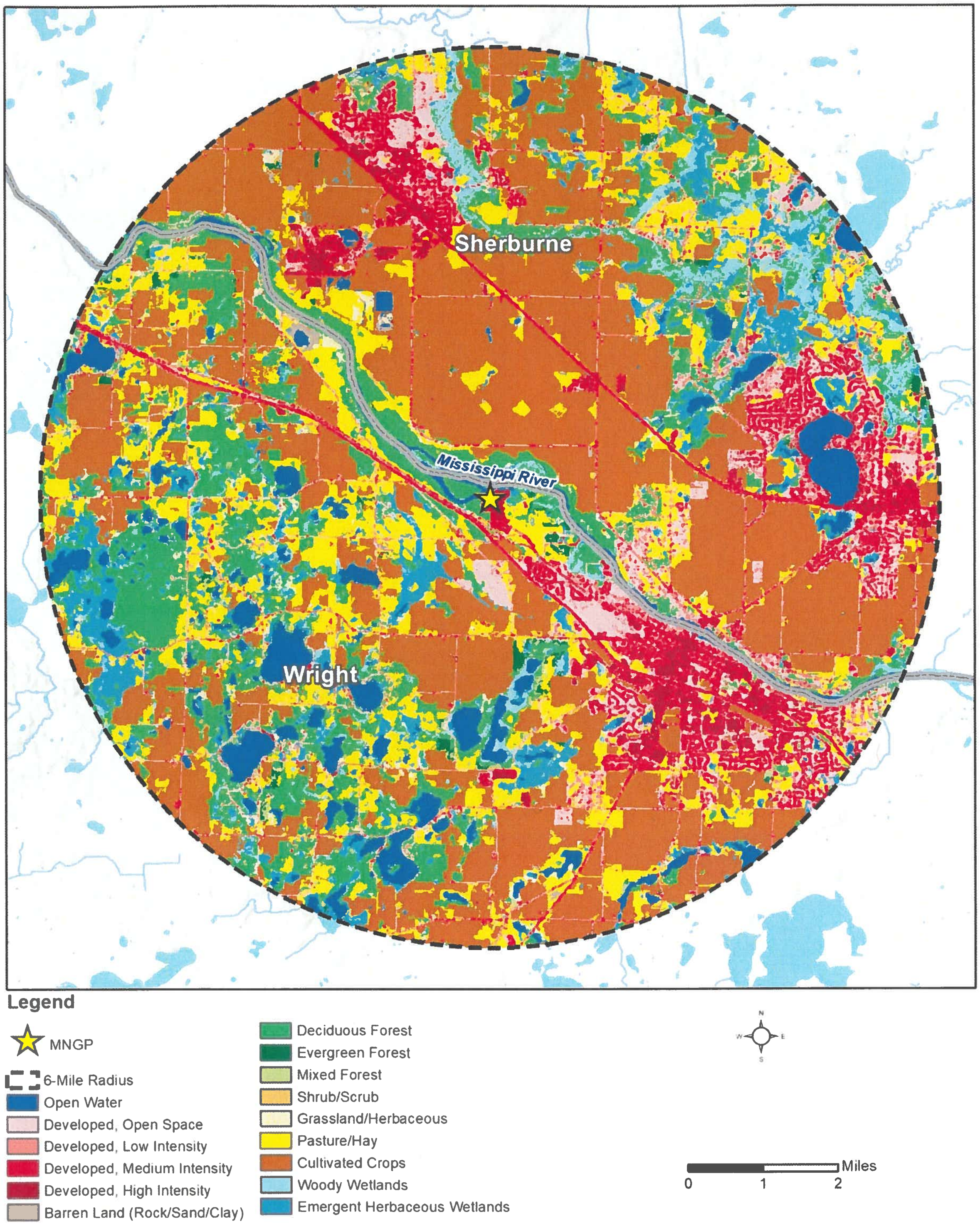


Figure 3.2-2 Land Use/Land Cover, 6-Mile Radius of MNGP

3.3 Meteorology and Air Quality

The meteorology, climate, and air quality of MNGP were previously evaluated during the MNGP Unit 1 initial license renewal approval processes (NRC 2006b). MNGP is located on the southern bank of the Mississippi River in the City of Monticello, Minnesota. The general climatic regime of the site is that of a marked continental type characterized by wide variations in temperature, scanty winter precipitation, normally ample summer rainfall, and a general tendency to extremes in all climatic features (Xcel 2020a). A high-level overview of the plant layout is provided in Figure 3.1-1.

Climatological data presented below have been provided to represent a range of meteorological conditions considered typical for the MNGP site region. The St. Cloud and Minneapolis weather stations are the closest first-order National Weather Service data collection stations to MNGP with a significant period of meteorological data, and thus have been used to describe the representative climatic conditions. St. Cloud and Minneapolis climatological information has been used in previous MNGP licensing environmental reviews, thus making its continued use appropriate for comparison. (Xcel 2020a; NRC 2006b)

3.3.1 General Climate

The Minneapolis station is located at the Minneapolis-St. Paul International Airport, approximately 45 miles southeast of the site. The Twin Cities of Minneapolis and St. Paul are located at the confluence of the Mississippi and Minnesota rivers over the heart of an artesian water basin. The area is characterized by flat or gently rolling terrain with little variation in elevation and dotted with numerous lakes. The climate of the area is predominantly continental. Seasonal temperature variations are quite large. Temperatures range from less than -30°F to over 100°F throughout the year. The area lies near the northern edge of the influx of moisture from the Gulf of Mexico, which can be related to severe storms such as blizzards, freezing rain (glaze), tornadoes, wind, and hailstorms. During the growing season, May through September, the normal rainfall is over 16 inches, or approximately 65 percent of the total annual normal precipitation. Winter snowfall is nearly 48 inches and occurs from around Christmas into early March. Snow depths average 6–8 inches in the city and 8–10 inches in the suburbs during this period. Floods can occur along the Mississippi River due to spring snow melt, excessive rainfall, or both. Ice jams can form, creating local flood conditions. (NCDC 2021)

The St. Cloud weather station is located at the St. Cloud regional airport, 18 miles northwest of the site on the banks of the Mississippi River. The topography is gently rolling terrain with numerous lakes and wooded areas. The climate is influenced by atmospheric moisture flowing into the state from the Gulf of Mexico and the Pacific coast. Air masses carrying moisture which is eventually released as precipitation may travel nearly 1,500 miles. Due to this long trek, a minor change in the wind system can result in the area receiving well below or well above the normal precipitation. Thunderstorms are the principal source of rainfall during the average 140-day growing season from mid-May to the end of September. Rainfall is generally ample for farm and garden crops. Prolonged periods of hot and humid weather are infrequent. Extremely hot days with temperatures of 100°F or higher occur only once every 5 to 10 years; rarely are temperatures this high recorded on successive days. Tornadoes and severe local storms are common. Strong winds and high humidity are generally absent on the coldest days of winter. Cold Canadian air masses are prevalent throughout the winter season. The normal winter will have 5 to 10 days with temperatures in the -20° to -30°F range. Heavy snowfalls do occur, but the northern location limits the numerous heavy snowfalls that occur just a short distance to the south. Snowfalls of three inches or more in a 24-hour period occur four times per year on average. Snow generally remains on the ground from the onset of the winter season until spring. Blizzards occur on the average of once per year, with a severe blizzard once every three or four years. Ice storms are infrequent because temperatures are usually too cold and the transition period from season to season is rather abrupt. (NCDC 2021)

The MNGP site is located on the southern bank of the Mississippi River in the City of Monticello, Minnesota. The terrain is generally flat with rolling hills. For detailed meteorological information about MNGP, please see Section 3.3.2. The general climate of the site is continental, characterized by wide variations in temperature, scanty winter precipitation, normally ample summer rainfall, and a general tendency to extremes in all climatic features. Annual snowfall may range from 6 inches to as much as 88 inches. Occasional severe thunderstorms with heavy rainfall and high winds can include tornados or ice storms.

3.3.2 Meteorology

As discussed in Section 3.3, the climatological conditions for the Monticello region and site have been evaluated during the MNGP LRA and by the NRC. For the proposed SLR of MNGP, Xcel Energy completed a review of the most recent meteorological information available from public sources and from MNGP monitoring to confirm the conclusions of those previous reviews remain valid. Due to historical technical data system issues, hourly meteorological data for 1992, 1995, 1997, and 1999 are missing from the MNGP's dataset. Partial data exist for 1994, 1996, 1998, and 2005. The remaining years of data are complete. A summary of Xcel Energy's evaluation is provided below.

3.3.2.1 Wind Direction and Speed

In the spring, the prevailing wind at the MNGP site is from the north-northwest and east-southeast, and the south during the summer season. The predominant wind directions during the fall are south and north-northwest, and from the north-northwest during the winter season. The average wind speed for the past five years is 6.6 miles per hour (mph) which is less than the 37-year average of 9.6 mph at Minneapolis airport (KMSP) and the 37-year average of 8.3 mph at St. Cloud (KSTC). (NCDC 2021)

For the KMSP weather station, the 52-year period of record data show the annual prevailing wind direction (i.e., the direction from which the wind blows most often) is from 320 degrees (i.e., from the northwest). Monthly prevailing winds are from the northwest during fall, winter, and spring. In late spring, summer, and early fall, the mean prevailing wind is from the southeast. As listed in Table 3.3-1, the mean wind speed over the past 37-year period of record was 9.6 mph. A maximum 3-second wind speed of 71 mph was recorded in August 2007. (NCDC 2021)

For the St. Cloud airport (KSTC) weather station, the 26-year period of record data show the annual prevailing wind direction (i.e., the direction from which the wind blows most often) is from 320 degrees (i.e., from the northwest). Monthly prevailing winds are from the northwest during fall, winter, and spring. In summer and early fall, the mean prevailing wind is from the south-southeast and south. As listed in Table 3.3-1, the mean wind speed over the past 37-year period of record was 8.3 mph. A maximum 3-second wind speed of 77 mph was recorded in June 1998. (NCDC 2021)

Mean monthly wind speeds at the MNGP site are provided in Table 3.2-2, based on 22 years of a 30-year record (1991-December 2020) of measurements from the onsite meteorological monitoring system, lower level (32.8 feet above ground level). The average wind speed on an annual basis was 6.1 mph, indicating the site wind speeds are consistently lower than KMSP. The onsite monitoring data indicate the wind at MNGP is from the north-northwest for a significant period of time (especially during October through April), and from the east-southeast and south (May through September). Seasonal wind rose diagrams for the period 2016-2020 are provided in Figure 3.3-1, Figure 3.3-2, Figure 3.3-3, Figure 3.3-4, and Figure 3.3-5. (NCDC 2021)

3.3.2.2 Temperature

Representative regional temperature averages and extremes are available from the KMSP monitoring station. The local climate data summary for the KMSP area indicates that the mean daily maximum temperature is highest during July (83.3°F) and decreases to the seasonal low in January (22.2°F). The KMSP area experiences normal temperatures above 90°F approximately 10.6 days per year in May through September. The highest temperature of record (105°F) occurred in July 1988. The mean daily minimum temperature is above 50°F in June, July, August, and September and is at its lowest in January, when the mean daily minimum decreases to 5.5°F. Record low temperatures below 0°F have been recorded in January, February, March, November, and December, with below freezing temperatures normally occurring approximately 147.6 days per year in every month except June, July, and August. The lowest temperature of record by the KMSP station is -34°F, occurring in January 1970. (NCDC 2021) Monthly and annual daily mean temperature data and temperature extremes for the KMSP area are summarized in Table 3.3-3.

Representative regional temperature averages and extremes are available from the KSTC monitoring station. The local climate data summary for the KSTC area indicates that the mean daily maximum temperature is highest during July (82.4°F) and decreases to the seasonal low in January (19.7°F). The KSTC area experiences normal temperatures above 90°F approximately 8.4 days per year in May through September. The highest temperature of record (103°F) occurred in August 1947. The mean daily minimum temperature is above 50°F in June, July, and August, and is at its lowest in January, when the mean daily minimum decreases to 0.2°F. Record low temperatures below 0°F have been recorded in January, February, March, November, and December, with below freezing temperatures normally occurring approximately 171.6 days per year in every month except June, July, and August. The lowest temperature of record by the KSTC station is -43°F, occurring in January 1977. (NCDC 2021) Monthly and annual daily mean temperature data and temperature extremes for the KSTC area are summarized in Table 3.3-3.

Average temperatures in the area of MNGP are 15.2°F in January and 71.8°F in July, with annual extremes of approximately -29.6°F low and 99.9°F high. Monthly and annual daily mean temperature data and temperature extremes for the MNGP area are summarized in Table 3.3-4. The 5-year average for MNGP (45.0°F) was about the same as the 30-year period of record (44.9°F) and the normal dry bulb temperatures for KMSP (46.2°F) and KSTC (42.8°F). (NCDC 2021)

3.3.2.3 Precipitation

The precipitation records of normal rainfall totals for the KMSP area indicate that precipitation of 0.01 inches or more occurs on average for 116.5 days per year, with 7.4 or more days per month receiving at least some precipitation. The annual normal precipitation at the KMSP station is 30.61 inches per year. Precipitation recorded at the station is cyclic with lowest amount occurring during the winter then peaking in June with average monthly precipitation amounts, with a mean of approximately 3–4 inches falling during May through September. The highest seasonal precipitation occurs during the summer (approximately 41.1 percent falling June, July, and August), which also coincides with record events where more than 4.13 inches have occurred in a 24-hour period. As shown by the extreme values in Table 3.3-5, there is considerable variability in total monthly amounts from year to year. While the summer months may experience significant rainfall events, those months can also be very dry. The maximum 24-hour precipitation total recorded at KMSP, 10.0 inches, occurred in July 1987. KMSP received a record minimum monthly rainfall total (0.01 inches) in October 1952. (NCDC 2021)

The precipitation records of normal rainfall totals for the KSTC area indicate that precipitation of 0.01 inches or more occurs on average for 108.5 days per year, with 6.4 or more days per month receiving at least some precipitation. The annual normal precipitation at the KSTC station is 27.73 inches per year. Precipitation recorded at the station is cyclic with lowest amount occurring during the winter then peaking in June with average monthly precipitation amounts, with a mean of approximately three to four inches falling during June through September. The highest seasonal precipitation occurs during the summer (approximately 40.6 percent falling June, July, and August), which roughly coincides with record events where more than 4.06 inches have occurred in a 24-hour period. As shown by the extreme values in Table 3.3-5, there is considerable variability in total monthly amounts from year to year. While the summer months may experience significant rainfall events, those months can also be very dry. The maximum 24-hour precipitation total recorded at KSTC, 5.37 inches, occurred in September 1985. KSTC received a record minimum monthly rainfall total (0.01 inches) in November 2007. (NCDC 2021)

Precipitation recorded at the MNGP site is cyclic with lowest amount occurring during the winter then peaking May through August with average monthly precipitation amounts of over four inches. The highest seasonal precipitation occurs during this period (approximately 56.1 percent falling May, June, July and August). The data also indicate that while significant rainfall may occur during this period, rainfall amounts during these months can vary significantly from year to year. The remaining months, September through April, receive smaller monthly amounts with the smallest monthly average occurring in January. MNGP receives approximately 32.1 inches of precipitation per year which is slightly more than both KMSP and KSTC . Table 3.3-6 indicates that the precipitation at the site has a similar pattern as the is KMSP and KSTC stations. All three stations have seasonal peaks mid-year with smaller amounts in the winter months. (NCDC 2021).

3.3.2.4 Snow and Glaze

In the KMSP area, snowfall occurs 16 days per year. The average normal snowfall is 54.4 inches per year. Since 1992, annual snowfall has ranged from as little as 22.3 inches to 86.6 inches. Snow can fall in any month of the year with trace amounts falling in June, July, and August. The maximum snowfall in 24 hours of 21 inches occurred in November of 1991. (NCDC 2021)

In the KSTC area, snowfall occurs 14.5 days per year. The average normal snowfall is 45.7 inches per year. Since 1992, annual snowfall has ranged from as little as 27.2 inches to 78.5 inches. The maximum snowfall in 24 hours of 14.5 inches occurred in March of 1965. (NCDC 2021)

Snowfall at the site is not recorded by MNGP.

3.3.2.5 Relative Humidity and Fog

The local climatological data for KMSP and KSTC indicate an average of 9.3 days per year and 27.6 days per year of heavy fog, respectively. Heavy fog is defined by the National Weather Service as fog which reduces visibility to 0.25 mile or less. (NCDC 2021) Fog at the site is not recorded by MNGP.

3.3.2.6 Severe Weather

3.3.2.6.1 Thunderstorms

Thunderstorms are frequent during the late spring, summer, and early fall months, with the greatest occurrence during the month of June and July. The mean number of days with thunderstorms in each month for KMSP and KSTC is provided in Table 3.3-7. Based on National Centers for Environmental Information (NCEI) records, Sherburne County, Minnesota, has recorded 118 significant thunderstorm events since 1966 with most of the thunderstorms occurring in June and July. Wright County, Minnesota, has recorded 231 significant thunderstorm events since 1957 with most of the thunderstorms occurring in June and July. (NCEI 2021)

3.3.2.6.2 Tornados

Tornadoes are infrequent in the MNGP region and have a probability of striking the site of about 6 x 10-4 per year (NRC 2006b, Section 2.2.4). Based on NCEI records, a total of 13 tornadoes have been recorded in Sherburne County, Minnesota, since 1966. The records show that the intensity of the storms was limited to F0, EF0, EF1 and F2. Based on NCEI records, a total of 25 tornadoes have been recorded in Wright County, Minnesota, since 1957. The records show that the intensity of the storms was limited to F0, EF0, F1, EF1 and F2, with two exceptions. Tornados with an F3 magnitude were recorded on June 16, 1992, and July 1, 1997. (NCEI 2021)

3.3.2.6.3 Hurricanes

The NCEI does not have any record of a hurricane in Sherburne or Wright counties, Minnesota (NCEI 2021). Based on the National Oceanic and Atmospheric Administration's (NOAA's) Historical Hurricane Tracks-GIS map viewer, there is no record of any hurricane in the state of Minnesota (NOAA 2021a).

3.3.2.7 Atmospheric Stability

Atmospheric stability is a meteorological parameter that describes the dispersion characteristics of the atmosphere. It can be determined by the difference in temperature between two heights. A seven-category atmospheric stability classification scheme (ranging from A for extremely unstable to G for extremely stable) based on temperature differences is set forth in the NRC's Regulatory Guide 1.23, Revision 1 (NRC 2007). When the temperature decreases rapidly with height (typically during the day when the sun is heating the ground), the atmosphere is unstable and atmospheric dispersion is greater. Conversely, when temperature increases with height (typically during the night as a result of the radiative cooling of the ground), the atmosphere is stable, and dispersion is more limited. The stability category between unstable and stable conditions is D (neutral), which would occur typically with higher wind speeds and/or higher cloud cover, irrespective of day or night. (NRC 2013e).

Based on a 5-year average (2016-2020), onsite temperature difference data recorded at MNGP indicate that stable atmospheric conditions (E to G) occurred about 39.5 percent of the time and unstable conditions (A to C) occurred about 19.2 percent of the time. The remaining observations (about 40.9 percent) fell into the neutral (D) category. Stability class distributions at MNGP covering the period 2016-2020 are presented in Table 3.3-8. (NCDC 2021)

3.3.3 Air Quality

3.3.3.1 Clean Air Act Nonattainment Maintenance Areas

The Clean Air Act (CAA) was established in 1970 [42 USC § 7401 et seq.] to reduce air pollution nationwide. The EPA has developed primary and secondary national ambient air quality standards (NAAQS) under the provisions of the CAA. The EPA classifies air quality within an air quality control region (AQCR) according to whether the region meets or exceeds federal primary and secondary NAAQS. An AQCR or a portion of an AQCR may be classified as being in attainment or non-attainment, or it may be unclassified for each of the six criteria pollutants: carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO_2), particulate matter ($PM_{2.5}$, fine particulates; and PM_{10}, coarse particulates), ozone, and sulfur dioxide (SO_2).

Emissions from non-radiological air pollution sources, including the criteria pollutants, are controlled through compliance with federal, state, and local regulations. Nonattainment areas are areas where the ambient levels of criteria air pollutants in the air violate the criteria set forth in federal, state, and local regulations. Attainment areas are areas that meet the criteria or cannot be classified (depending on the pollutant and other factors). A maintenance area is an area that formerly violated the attainment criteria but currently meets the attainment criteria. (EPA 2021a)

There are no Class I federal areas, in which visibility is an important value as designated in 40 CFR, Part 81, Subpart D, within 100 miles of MNGP. (NRC 2006b)

The MNGP region falls within one intrastate AQCR. The AQCR is the Central Minnesota Intrastate Air Quality Control Region (Minnesota) (40 CFR 81.243). This AQCR consist of nine counties (Benton, Chisago, Isanti, Kanabec, Mille Lacs, Pine, Sherburne, Stearns, and Wright). As of August 31, 2021, Eagan, Minnesota, a city in Dakota County, has been designated as a Pb (2008 standard) nonattainment area. Dakota County has also been designated a maintenance area for Pb (1978 standard), CO (1971 standard), and SO_2 (1971 standard). Ramsey County has been designated a maintenance area for CO (1971 Standard), PM_{10} (1987 standard), and SO_2 (1971 standard). Anoka, Carver, Hennepin, Scott, and Washington counties have been designated a maintenance area for SO_2 (1971 standard) and CO (1971 standard). Wright County has been designated a maintenance area for CO (1971 Standard). All other counties within 50 miles of MNGP are in attainment. Nonattainment areas are illustrated in Figure 3.3-6. (EPA 2021a)

3.3.3.2 Air Emissions

The MPCA issues air emission permits as required by Chapter 116 Section 116.07, Minnesota Statutes, and Title V of the federal CAA.

MNGP holds a conditional operating permit to operate three diesel generators, a security diesel generator, a diesel fire pump, three flexible response pumps, and a heating boiler in accordance with the provisions of air emission permit No. 17100019-004. Following the rules written in the permit, Xcel Energy applied to renew the permit over 180 days prior to its expiration. The air permit has been administratively extended by the state. The renewal application requested minor changes. As discussed in Section 2.2.3.1, MNGP uses once-through cooling, closed cycle, and a combination of closed cycle and once-through cooling. Although particulate matter (PM) is generated by the cooling towers, due to the type of emissions, the manner in which the cooling towers are used and the chemicals used, there is no requirement to include PM emissions from the cooling towers in the Monticello Air Permit. If Federal government requirements for $PM_{2.5}$ change in the future, the MPCA will evaluate the need to include the cooling towers in a future permit.

The permitted emission sources at MNGP are regulated by the applicable regulations cited in the permit. In addition, the emissions reports submitted to the MPCA each year contain tabular summary information related to each permitted emissions unit, and criteria pollutants and applicable hazardous air pollutants are summed and reported for each station in the annual update and emission statement submitted to the MPCA. Annual emissions for the most recent 5 years (2016–2020) are listed in Table 3.3-10.

As presented in Chapter 9, there have been no notices of violation (NOVs), or non-compliances associated with MNGP air emissions over the 5 years from 2016–2020.

As presented in Section 2.3, no SLR-related refurbishment or other SLR-related construction activities have been identified. In addition, Xcel Energy's review did not identify any future upgrade or replacement activities necessary for plant operations (e.g., diesel generators, diesel pumps) that would affect MNGP's current air emissions program. Therefore, no increase or decrease of air emissions is expected over the proposed SPEO.

Studies have shown that the amount of ozone generated by even the largest industry transmission lines in operation (765 kV) would be insignificant (NRC 2013a). As presented in Section 2.2.5, the in-scope transmission lines at MNGP are 115 kV and 345 kV. Therefore, the amount of ozone generated from in-scope transmission lines is anticipated to be minimal.

3.3.4 Greenhouse Gas Emissions

No MNGP data exist for mobile emission sources such as visitors and delivery vehicles. Therefore, Xcel Energy calculated greenhouse gas (GHG) emissions on those direct (stationary and portable combustion sources in Table 3.3-10 reported in MNGP's annual updates and air emissions statements) and indirect (workforce commuting) plant activities where information was readily available. GHG emissions generated at MNGP are presented in Table 3.3-11. As presented in Section 9.5.2.3, MNGP maintains a program to manage stationary refrigeration appliances at the plant to recycle, recapture, and reduce emissions of ozone-depleting substances, including perfluorocarbons, and is in compliance with Section 608 of the CAA. Therefore, Xcel Energy did not include potential emissions as the result of leakage, servicing, repair, and disposal of refrigerant equipment in Table 3.3-11.

Table 3.3-1 Regional Wind Conditions, Minneapolis (KMSP) and St. Cloud (KSTC), Minnesota

	Period of Record	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN
Minneapolis, Minnesota														
Mean speed (MPH)	37 years	9.6	9.6	10.2	11.1	10.2	9.4	8.7	8.4	9.3	9.9	9.8	9.3	9.6
Prevailing direction (degrees from)	52 years	320	310	320	320	130	140	140	140	140	320	320	320	320
Maximum 3-second speed (MPH)	24 years	55	48	60	59	64	69	60	71	55	62	59	58	71
Max speed year of occurrence		2013	2019	2017	2000	1998	2017	2015	2007	2018	2010	2016	2020	Aug. 2007
St. Cloud, Minnesota														
Mean speed (MPH)	37 years	8.4	8.5	9	9.7	9	7.9	6.9	6.6	7.6	8.5	8.7	8.2	8.3
Prevailing direction (degrees from)	26 years	320	320	320	330	320	150	190	170	170	310	320	320	320
Maximum 3-second speed (MPH)	25 years	51	52	56	51	74	77	70	63	58	58	54	56	77
Max speed year of occurrence		2019	2002	2017	2020	2012	1998	2018	2011	2019	2010	2005	2016	June 1998

(NCDC 2021)

The column (ANN) provides summary values for each category for the period of record listed.

Table 3.3-2 MNGP Wind Conditions (1991–2020)

MNGP WIND CONDITIONS														
	Period of Record (years)	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**	**OCT**	**NOV**	**DEC**	**ANN**
Mean Speed (MPH)	30	6.2	6.2	6.4	7.0	6.5	5.8	5.6	5.4	6.0	6.3	6.3	6.0	6.1
Prevailing Direction (degrees from)	30	330	330	330	330	110	170	180	170	170	330	330	330	330

Table 3.3-3 Regional Temperatures, Minneapolis (KMSP) and St. Cloud (KSTC), Minnesota

	Period of Record	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN
Minneapolis, Minnesota														
Mean daily maximum (°F)	130 years	22.2	25.4	39.1	55.2	68.6	77	83.3	80.6	70.8	58.8	40.3	27.1	54.3
Highest daily maximum (°F)	82 years	58	63	83	95	100	103	105	102	98	90	77	68	105
Year of occurrence		1944	2017	1986	1980	2018	2011	1988	1947	1976	1997	1999	1998	July 1988
Mean daily minimum (°F)	130 years	5.5	9.1	22.3	36	48.3	57.6	63.6	61.1	51.4	40.3	25.4	12.5	36.1
Lowest daily minimum (°F)	82 years	-34	-32	-32	2	18	34	43	39	26	13	-17	-29	-34
Year of occurrence		1970	1996	1962	1962	1967	1945	1972	1967	1974	1997	1964	1983	Jan. 1970
St. Cloud, Minnesota														
Mean daily maximum (°F)	123 years	19.7	23.5	37.5	54.2	68	75.9	82.4	79.2	69.7	56.4	37.7	24.7	52.4
Highest daily maximum (°F)	80 years	55	59	79	96	98	102	103	103	98	90	76	61	103
Year of occurrence		1942	2017	2007	1980	2006	1988	1940	1947	1978	1992	2020	1998	Aug. 1947
Mean daily minimum (°F)	123 years	0.2	3.8	18	32.1	44.2	53.1	59	55.9	46.9	35.4	20.8	7.6	31.4
Lowest daily minimum (°F)	80 years	-43	-40	-32	-3	19	32	40	33	18	5	-20	-41	-43
Year of occurrence		1977	1996	1962	1975	1967	1993	1972	2004	1974	1976	1964	1983	Jan. 1977

(NCDC 2021) The column (ANN) provides summary values for each category for the period of record listed.

Table 3.3-4 MNGP Site Temperatures (1991–2020)

MNGP SITE TEMPERATURES 1991-2020														
	Period of Record (years)	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**	**OCT**	**NOV**	**DEC**	**ANN**
Monthly Average(°F) [1]	30	15.2	18.5	31.4	45.1	57.8	67.3	71.8	69.3	61.6	47.2	33.7	20.1	44.9
Highest Daily Maximum (°F)	30	55.4	60.4	77.8	92.3	96.5	99.9	97.8	94.4	95	87.2	75	63.6	99.9
Year of Occurrence	30	2003	2017	2007	2004	2018	2011	2006	2003	2012	2001	2020	1998	2011
Lowest Daily Minimum (°F)	30	-29.6	-19.9	-17.1	8.4	29.7	39.6	48.3	41.3	30.7	13.9	-2.3	-23.4	-29.6
Year of Occurrence	30	2019	2003	2019	2018	2002	2000	2013	2004	2000	2020	1991	2016	2019

[1] Calculated average of all temperature measurements for each month and of all measurements for the period January 1991-December 2020

Table 3.3-5 Regional Precipitation, Minneapolis (KMSP) and St. Cloud (KSTC), Minnesota

	Period of Record	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN
Minneapolis, Minnesota														
Normal monthly precipitation (inches)	30 years	0.9	0.77	1.89	2.66	3.36	4.25	4.04	4.3	3.08	2.43	1.77	1.16	30.61
Maximum monthly precipitation (inches)	82 years	3.63	2.57	4.75	7	9.34	11.36	17.9	9.32	7.53	5.68	5.29	4.27	17.9
Year occurred		1967	2019	1965	2001	2012	2014	1987	2007	1942	1971	1991	1982	July 1987
Maximum 24 hour (inches)	82 years	1.21	1.34	1.66	2.58	3.39	4.13	10	7.36	3.55	4.83	2.91	2.47	10
Year occurred		1967	2012	1965	2006	2012	2014	1987	1977	1942	2005	1940	1982	July 1987
Minimum monthly precipitation (inches)	82 years	0.1	0.06	0.32	0.16	0.53	0.22	0.58	0.43	0.3	0.01	0.02	T	0.01
Year occurred		1990	1964	1994	1987	2009	1988	1975	1946	2012	1952	1939	1943	Oct. 1952
St. Cloud, Minnesota														
Normal monthly precipitation (inches)	30 years	0.65	0.59	1.55	2.57	2.95	4.17	3.31	3.79	3.46	2.49	1.38	0.82	27.73
Maximum monthly precipitation (inches)	80 years	2.52	2.76	4.66	8.42	8.76	10.52	8	8.36	9.48	6.16	3.83	2.56	10.52
Year occurred		1969	1951	2009	2001	2012	1990	1955	2016	1985	1971	1996	2010	June 1990
Maximum 24 hour (inches)	80 years	0.99	1.83	2.67	3.74	3.7	4.06	2.63	4.62	5.37	4.11	2.22	2.57	5.37
Year occurred		1949	1951	2009	2001	1979	1983	2016	1956	1985	2005	1977	2019	Sep. 1985
Minimum monthly precipitation (inches)	80 years	0.02	0.04	0.1	0.05	0.32	0.05	0.21	0.46	0.07	0.07	0.01	0.01	0.01
Year occurred		1942	1964	1959	1987	1948	1988	1975	1950	1952	1952	2007	1943	Nov. 2007

(NCDC 2021)

Table 3.3-6 Precipitation Records

MNGP PRECIPITATION RECORDS 1991-2020														
	Period of Record (years)	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**	**OCT**	**NOV**	**DEC**	**ANN**
Monthly Precipitation (inches)	30	0.4	0.7	1.6	2.7	4.5	4.4	4.5	4.6	3.2	3	1.4	1.1	32.1
Maximum Monthly Precipitation (inches)	30	1.3	2.4	4	7.1	16	7.3	16.9	13.4	8.1	9	4.9	3.9	69.2
Year Occurred	30	2017	2019	2020	2017	2019	2017	2020	2020	2019	2017	2020	2020	2020
Minimum Monthly Precipitation (inches)	30	0.00	0.02	0.39	0.56	0.60	1.74	0.38	0.47	0.09	0.61	0.04	0.02	11.89
Year Occurred	30	2007	2007/1993	2000/1993	2005	2009	2007	2005	2005	2005	2005	1999	1999	2005

Table 3.3-7 Regional Thunderstorms, Minneapolis (KMSP) and St. Cloud (KSTC), Minnesota

Period of Record (years)	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN
Minneapolis, Minnesota													
75	0	0.1	1	2.6	4.8	7.5	7.2	6.4	4.3	1.7	0.6	0.2	36.4
St. Cloud, Minnesota													
48	0	0.1	0.5	2.2	4.3	7.1	6.9	6.3	4	1.7	0.2	0	33.3

(NCDC 2021)

Table 3.3-8 MNGP Stability Class Distributions

MNGP STABILITY CLASS DISTRIBUTIONS							
Percent Frequency of Occurrence by Stability Class Pasquill Stability Class							
YEAR	**A**	**B**	**C**	**D**	**E**	**F**	**G**
2016	8.3	2.8	8.3	41.1	23.1	7.7	8.4
2017	10	3.3	8.1	38.5	22.1	7.9	8.6
2018	6.8	2.8	8.9	41.9	23.3	8.5	7.6
2019	6.1	2.6	7.9	44.1	24	8	7.2
2020	8.7	2.9	8.4	38.9	24.9	8.8	6.9
2016-2020	8	2.9	8.3	40.9	23.5	8.2	7.8

a. Classes are as follows (NRC 2007, Regulatory Guide 1.23, Table 1):

Class A: Extremely unstable

Class B: Moderately unstable

Class C: Slightly unstable

Class D: Neutral

Class E: Slightly stable

Class F: Moderately stable

Class G: Extremely stable

Note: The stability class percentages are based on 98.5–99.9 percent of valid hours. As such, the stability class percentage may not sum to 100 percent for each year.

Table 3.3-9 MNGP Permitted Air Emission Sources

Emission Source[(a)(b)(c)]	Description	Capacity Rating	Permit Conditions[(d)]
EU 001[(c)]	Heating boiler	29.2 MMBtu/hour	May burn distillate fuel oil only containing no more than 0.3% by weight sulfur. Propane may be used for startup. Total PM limited to 0.40 pounds/MMBtu. Opacity shall not exceed 20% except for one 6-minute period per hour of not more than 60% opacity.
EU 002[(b)] EU 003[(b)] EU 004[(b)] EU 005[(b)] EU 006[(b)]	Diesel generator[(c)] Fire pump diesel engine Diesel generator	(2) 23.8 MMBtu/hour 1.8 MMBtu/hour 1.14 MMBtu/hour 15.57 MMBtu/hour	May burn only No. 2 fuel oil containing no more than 0.49% by weight sulfur. SO_2 limited to 0.50 pounds per MMBtu heat input. Distillate fuel only. Opacity shall not exceed 20%.
EU 009[(b)] EU 010[(b)] EU 011[(b)]	Flexible response pump 1 Flexible response pump 2 Flexible response pump 3	1.51 MMBtu/hour (2) 160 HP	CO limited to 5.0 grams per kilowatt-hour. Total PM limited to 0.30 grams per kilowatt-hour. NMHC + NO_x limited to 4.00 grams per kilowatt-hour. SO_2 limited to 0.5 pounds/per MMBtu heat input. Opacity shall not exceed 20%. Distillate fuel only. May burn only No.2 fuel oil containing no more than 0.49% by weight sulfur.

MMBtu=1 million British thermal units

a. Emission source unit reference is from air permit No. 17100019-004.

b. Stationary combustion sources also subject to 40 CFR Part 63, Subpart ZZZZ, National Emissions Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines.

c. Also subject to 40 CFR Part 63, Subpart JJJJJJ, National Emission Standards for Hazardous Air Pollutants for Industrial, Commercial, and Institutional Boilers Area Sources.

d. Air permit No. 17100019-004.

Table 3.3-10 MNGP Reported Annual Air Emissions Summary, Tons per Year, 2017–2021

Year	PM Condensable	PM	$PM_{2.5}$	PM_{10}	SO_2	NO_X	CO	VOC	Pb	CO_2e
2021	0.14	0.28	0.07	0.14	0.76	4.8	1.23	0.1	0.0001	2377.93
2020	0.16	0.31	0.07	0.16	0.9	4.89	1.24	0.11	0.0001	2789.64
2019	0.12	0.29	0.08	0.15	0.7	5.38	1.41	0.12	0.0001	2201.07
2018	0.18	0.33	0.07	0.17	0.97	4.91	1.28	0.10	0.0002	3067.19
2017	0.17	0.48	0.22	0.31	1.27	11.99	2.84	0.61	0.0001	3005.64

Table 3.3-11 MNGP Annual Greenhouse Gas Emissions Inventory Summary, 2017–2021

Carbon Dioxide Equivalent (CO_2e) Emissions, Metric Tons					
Emission Source	2017	2018	2019	2020	2021
Combustion Sources(a)	2,727	2,783	1,997	2,531	2,157
Workforce Commuting[(b)]	2,947	2,947	2,947	2,947	2,947
TOTAL	**5,674**	**5,730**	**4,944**	**5,478**	**5,104**

a. GHG calculated emissions are based on the following:

- Fuel usage for combustion sources shown in Table 3.3-10; 40 CFR Table A-1 to Subpart A of Part 98 - Global Warming Potentials.

b. Workforce commuting calculations are based on:

- Statistical information from U.S. Census Bureau indicates that 3.3 percent of Minnesota workers in the Transportation and Warehouse and Utilities Industry carpool to work (USCB 2021f). Number of MNGP employees as of December 2020 was 663. Utilizing the 3.3 percent USCB carpool statistic, a value of "641" passenger vehicles per day was utilized.
- The EPA's GHG equivalencies calculator the CO_2e/year to be 2,947 metric tons for 641 vehicles (EPA 2021b).
- CO_2e means the number of units of a GHG that has the same global warming effect as a single unit of carbon dioxide.
- As an example, 25 metric tons of carbon dioxide emissions have the equivalent global warming effect as a single metric ton of methane emissions. (Based on Table A-1 to Subpart A of 40 CFR Part 98).
- The commuting workforce was reduced during the COVID-19 epidemic. However, due to data availability, the values presented here do not estimate the reduction.

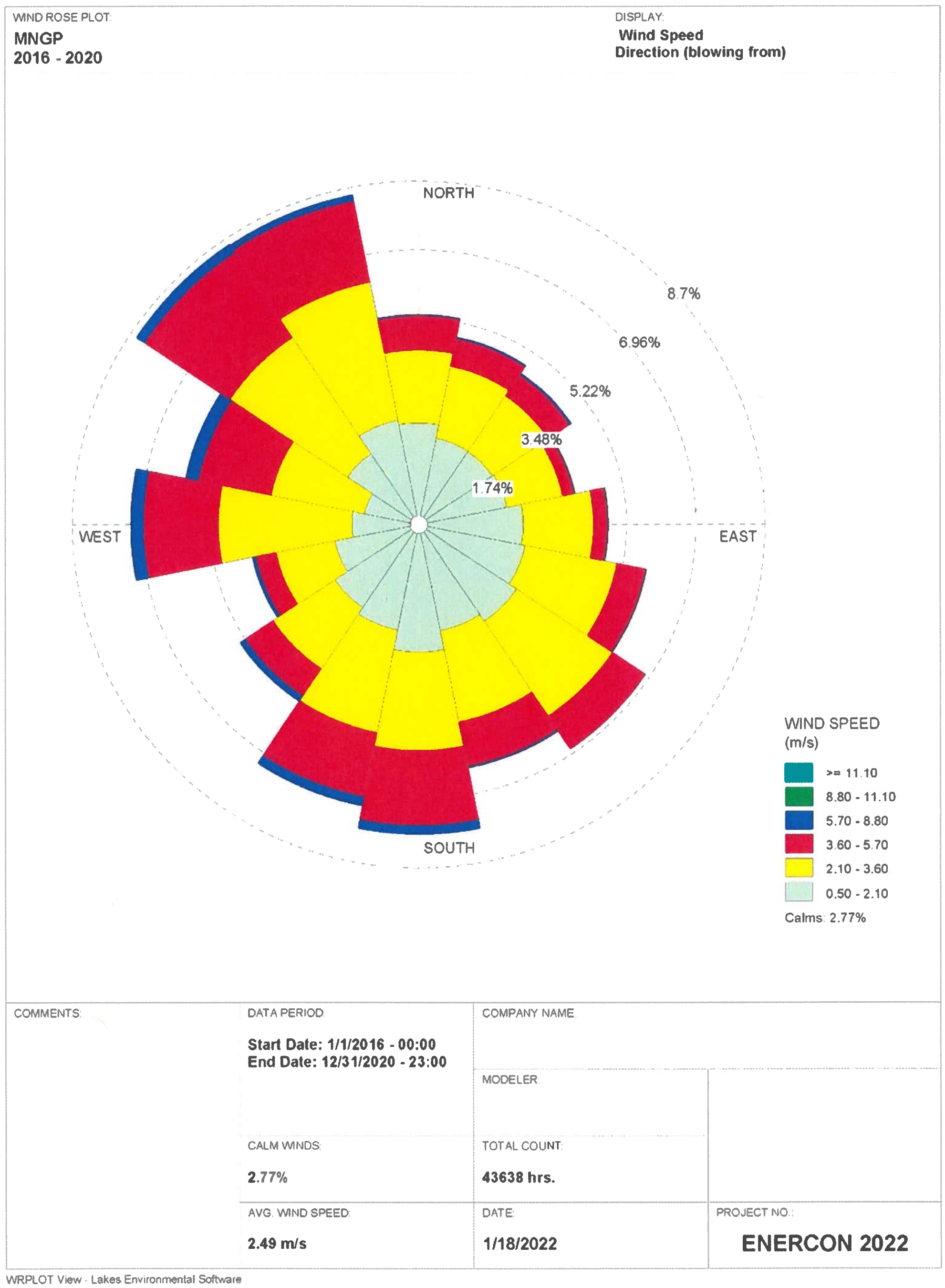


Figure 3.3-1 2016–2020 MNGP Wind Rose

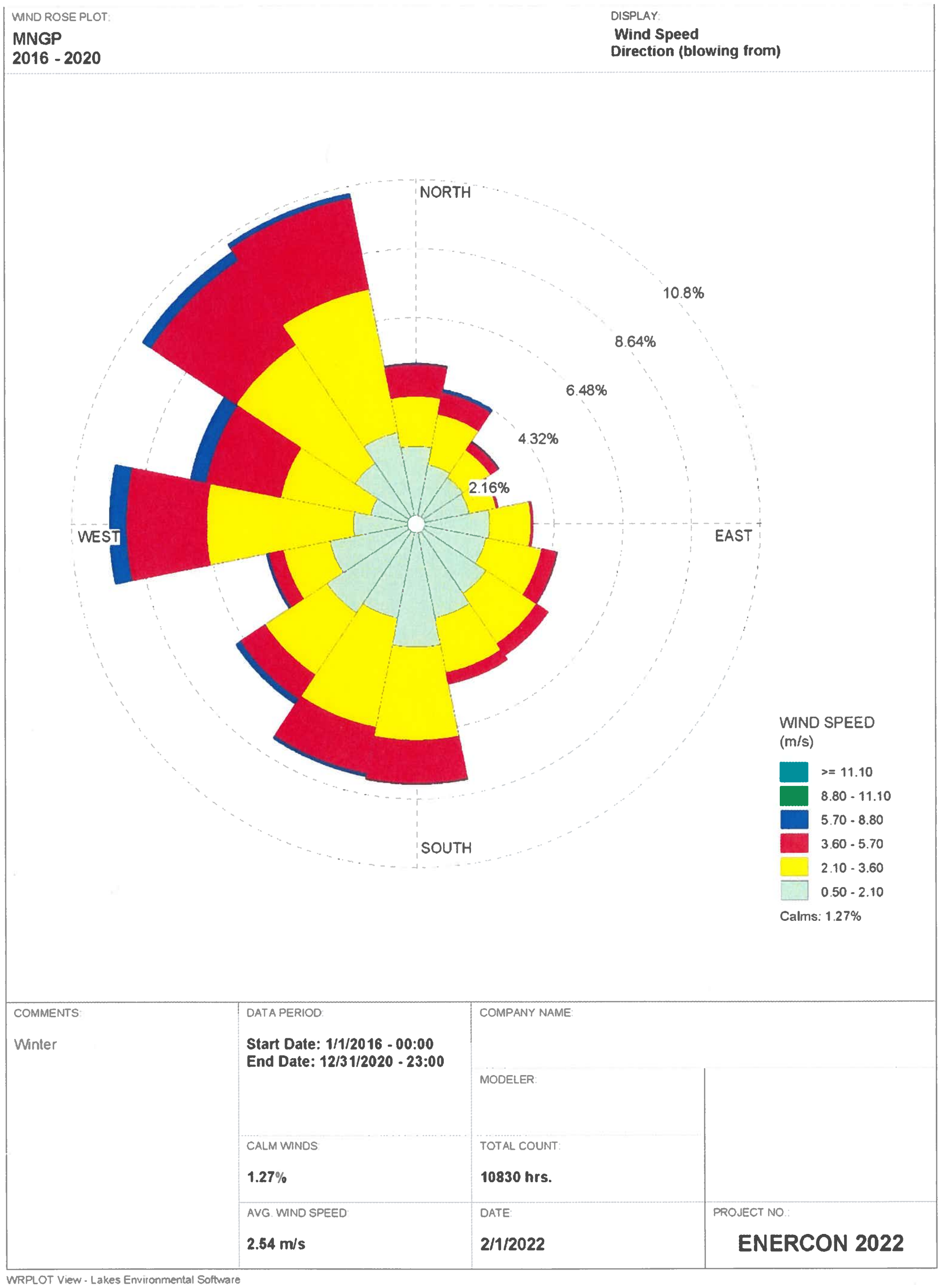


Figure 3.3-2 2016–2020 MNGP Winter Wind Rose

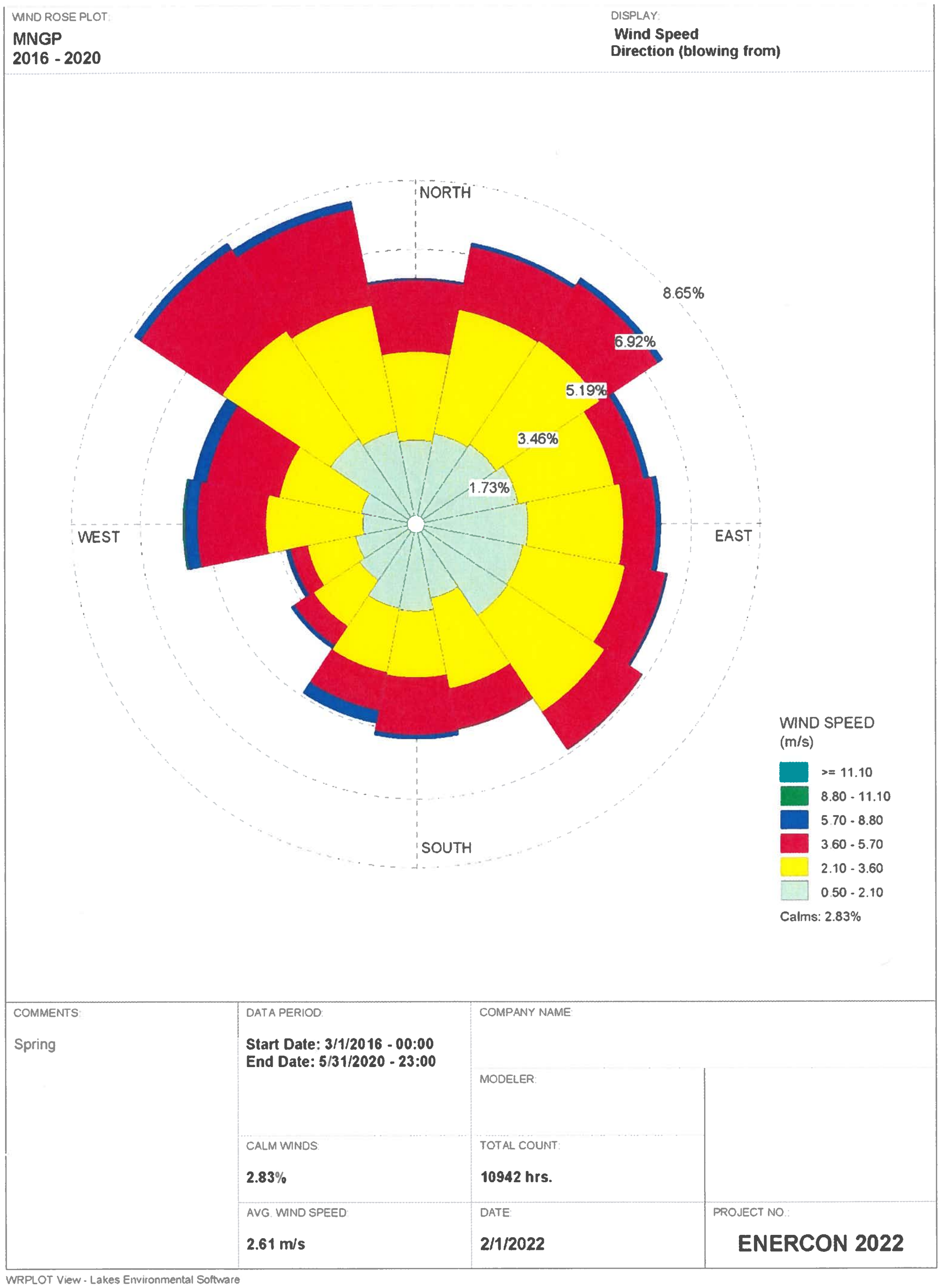


Figure 3.3-3 2016–2020 MNGP Spring Wind Rose

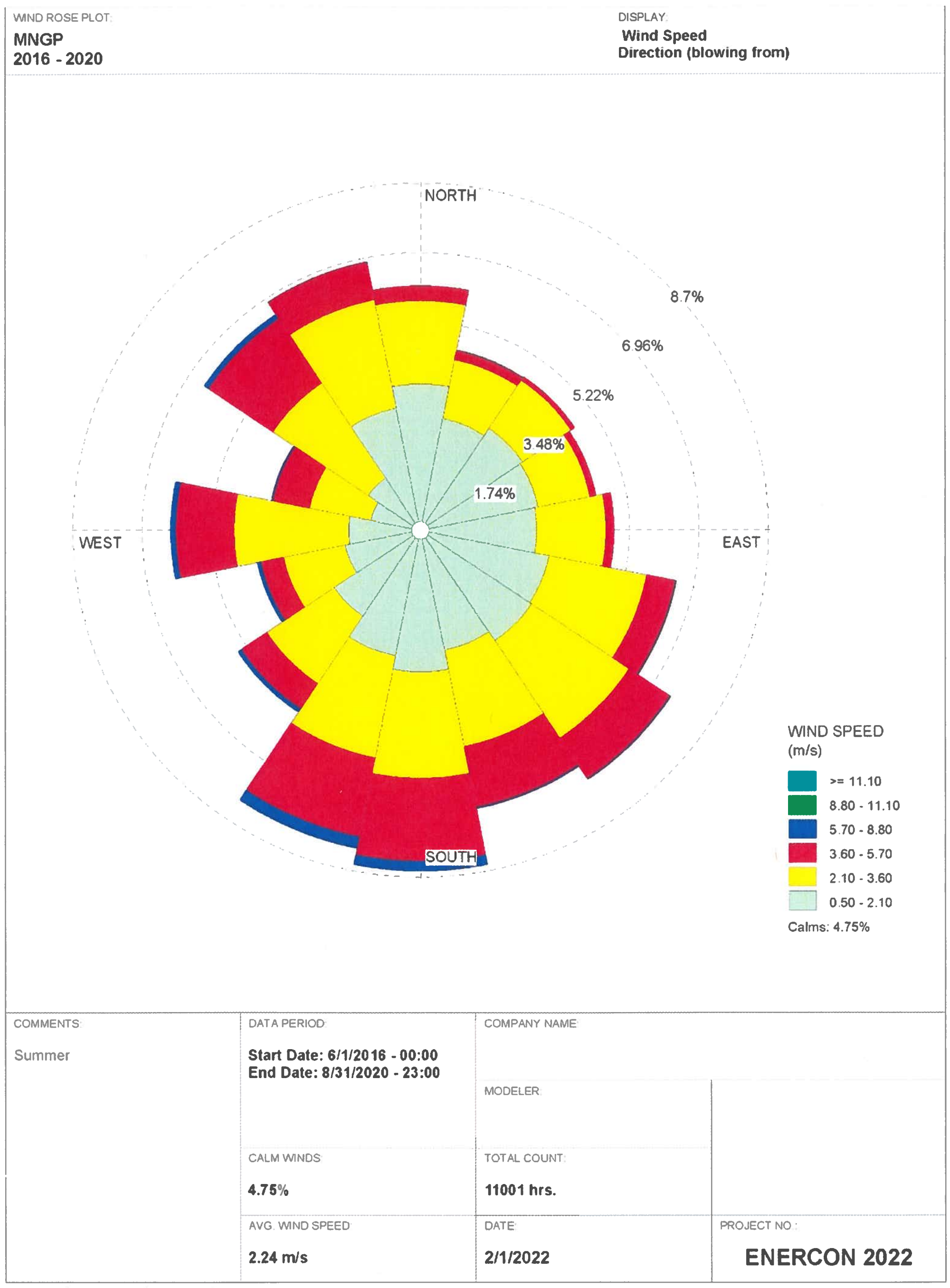


Figure 3.3-4 2016–2020 MNGP Summer Wind Rose

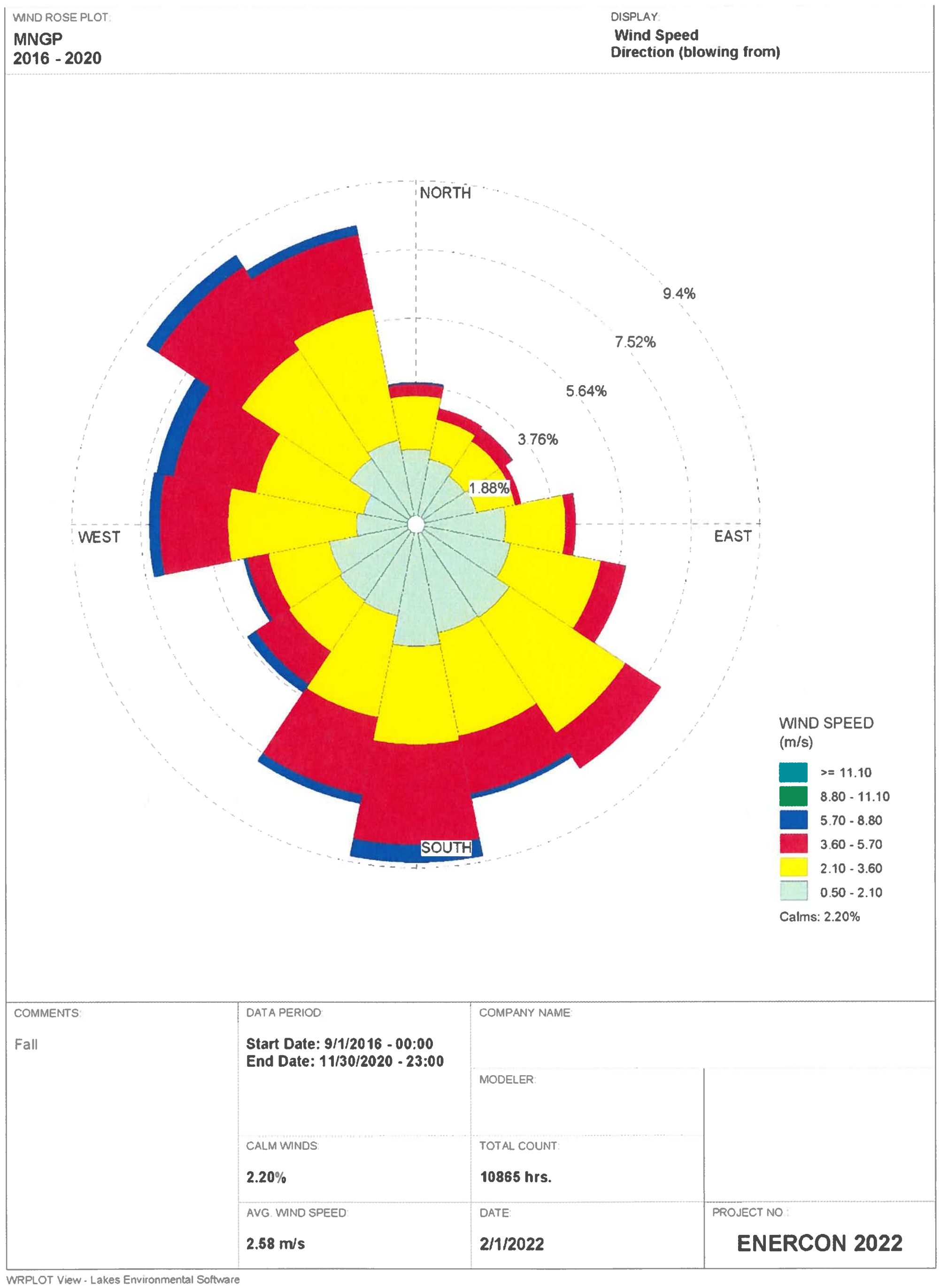


Figure 3.3-5 2016–2020 MNGP Fall Wind Rose

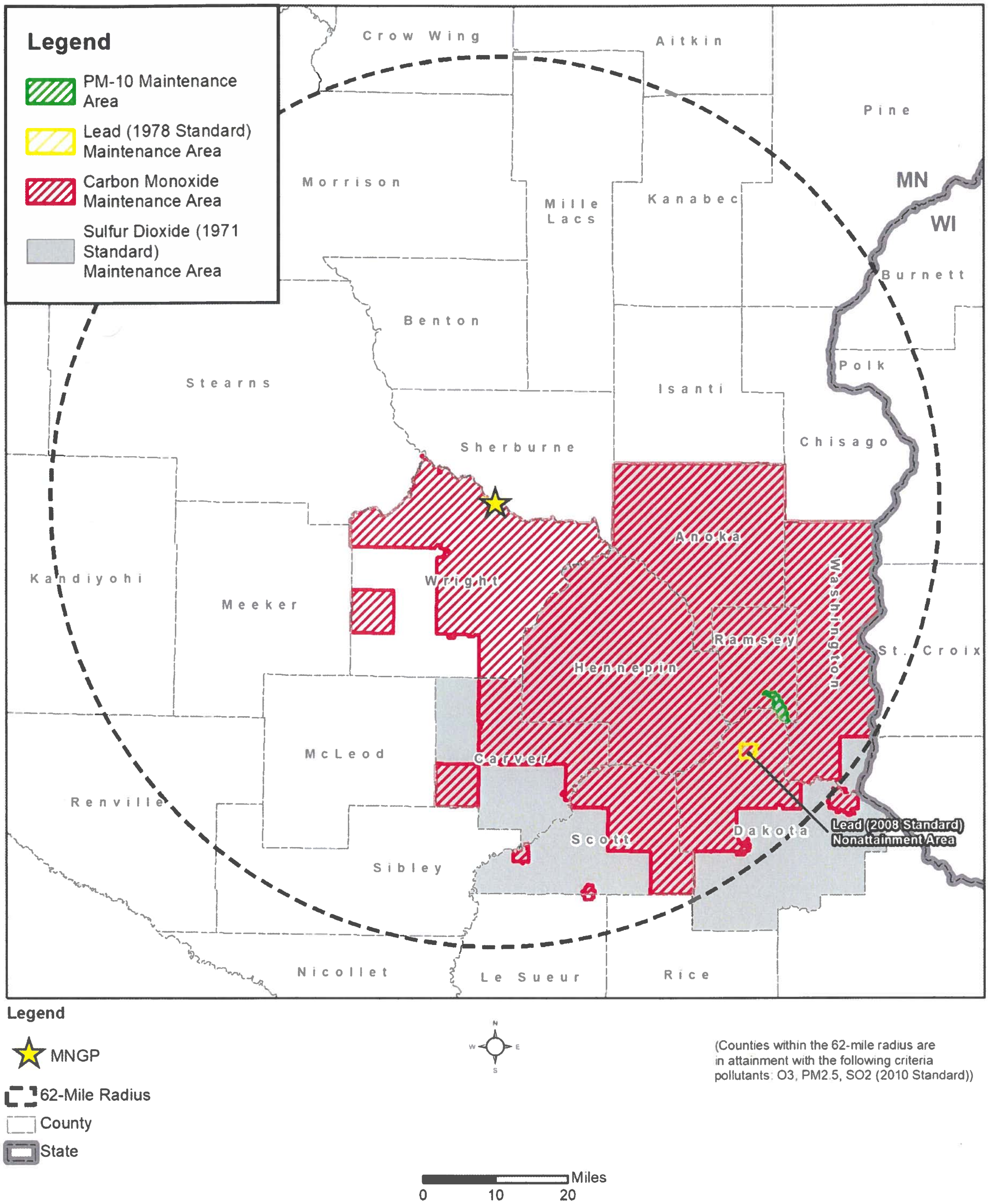


Figure 3.3-6 Nonattainment and Maintenance Areas, 62-Mile Radius of MNGP

3.4 Noise

Noise is produced at MNGP from industrial plant operations and site activities. Industrial background noise at MNGP is generally from EDG operations, turbine generators, transformers, loudspeakers, transmission lines, and the firing range. The loudest sound emitted from MNGP plant systems would be from a limited-duration monthly testing of EDGs.

The zoning of the MNGP site is heavy industrial (I-2) as designated by the City of Monticello. MNGP is also located within the limits of jurisdiction of Wright County, which identifies land use of the MNGP site as urban and industrial. Neither Wright County nor the City of Monticello has a code of ordinance establishing maximum permissible sound limits for receiving land use categories. (CM 2021d; WC 2020a)

MNGP has two independent EDGs located in reinforced concrete cells adjacent to the turbine building. EDGs are tested monthly and generate peak internal noise levels of 101-103 A-weighted decibel (dBA) during EDG operations. Periodic use of the firing range is another onsite activity that creates occasional noise. The point of the site boundary closest to the firing range is approximately 2,070 feet in the southeast direction. The nearest residence is located approximately 0.52 miles in the southwest direction.

Because MNGP is located in a rural area (away from urban areas), it is unlikely that noise levels from MNGP would affect offsite residences. This is further substantiated by the fact that during the most recent five years (2017–2021), no noise complaints have been received from offsite residences by MNGP as it relates to MNGP plant operational and outage activities. Therefore, no noise issues affecting offsite residences are anticipated during the proposed SPEO because noise levels at MNGP are expected to remain the same as under current operating conditions.

The MNGP site is located in a region dominated by rivers, streams, and lakes with numerous recreational and natural areas (state parks, national wildlife refuges, parks) within 50 miles of MNGP (NMC 2005). The land surrounding MNGP is predominantly rural and the used primarily for farming. The terrain is heavily wooded along the Mississippi River, while the bluffs away from the river are cultivated. (Xcel 2020a) Therefore, local offsite noise sources would be associated with seasonal use of river and natural areas and related to area vehicular traffic, boating access, and riverside services. The heavily wooded terrain would help inhibit noise generated by MNGP.

The Xcel Energy personal protective equipment procedure considers a high noise area as any area where noise levels are at or above 85 dBA. Xcel Energy requires hearing protection when working in or traversing high noise areas, and dual hearing protection shall be used when noise levels exceed 100 dBA.

3.5 Geologic Environment

3.5.1 Regional Geology

The MNGP site is in southern Minnesota, which falls within the Central Lowlands physiographic province (Figure 3.5-1). The Central Lowlands province is the largest of the physiographic provinces in the contiguous United States, spanning 585,000 square miles. This largely level region rises less than 1,000 feet above msl in the east to less than 2,000 feet to the west. The Central Lowlands were subject to repeated Pleistocene glaciations and can be divided into regions based on glacial features, including the Great Lakes, Small Lakes, Driftless Area, Till Plains, Dissected Till Plains, and Osage Plains. Underlying glacial deposits are largely horizontal Paleozoic sandstones, shales, limestones, conglomerates, and coals. (NPS 2021a)

This area lies on the periphery of the Canadian Shield, which is a vast province of extremely old (Precambrian) and predominantly crystalline rocks in central Canada, northern Minnesota, northern Wisconsin, and the Upper Peninsula of Michigan. The surface formed by the Precambrian crystalline rocks is present throughout the segment as a floor or basement for the overlying Cambrian and younger sedimentary rock sequence. (Olcott 1992)

Thousands of small to large lakes dot the landscape, which is drained by numerous rivers and streams tributary primarily to the Mississippi River in the west and to the Great Lakes-St. Lawrence River system in the east. (Olcott 1992)

The crystalline rock surface is an ancient erosional surface that yielded vast quantities of sediments through geologic time. The sediments derived from the weathering of the crystalline rocks were transported into multiple ancient seas that periodically encroached onto the crystalline rock surface during the Precambrian and the Paleozoic. The sediments were deposited as extensive sequences of sandstone, shale, and limestone or dolomite. (Olcott 1992)

The principal structural feature in this part of Minnesota is a deep trough formed during Precambrian time in the granite and associated crystalline rocks. This basin extended from Lake Superior into Iowa and provided a site for the deposition of thick sequences of Precambrian and later Paleozoic sediments and volcanics. Strata of Paleozoic age are now exposed along the southern half of the structural trough. In the Minneapolis-St. Paul area, they form a circular basin containing artesian groundwater. (Xcel 2020a)

Pleistocene glaciation and recent alluvial deposition have mantled the older rocks with a variety of unconsolidated materials in the form of glacial moraines, glacial outwash plains, glacial till, and riverbed sediments. This cover of young soil rests upon a surface of glacially carved bedrock consisting of sandstone and shale strata underlain by deeply weathered granite rocks. Volcanics also form portions of the bedrock sequence in certain areas. The bedrock surface is irregular and slopes generally to the east or southeast. (Xcel 2020a)

The ice fronts of glacial lobes advanced across this region during the last stage of glaciation, named the Wisconsin Stage. One lobe came from the general area of Lake Superior and deposited terminal moraines immediately south of the present course of the Mississippi River. A later ice front advanced across the area from the southwest, overriding the earlier moraines. Erosion of these glacial sediments by the Mississippi River has been active since the final retreat of the ice. The present course of the Mississippi River has no relation to the streams that flowed through the area prior to glaciation. There are, therefore, old river channels which cross the region, and which may be substantially deeper than the present river channel. (Xcel 2020a)

The geology in the vicinity of the site consists primarily of river terrace deposits and glacial outwash or till overlying Precambrian age bedrock. The uppermost bedrock that occurs at the site is composed of Cambrian age sandstone overlying granite.

Glacial till and outwash deposits in the area are included in the Anoka Sand Plain, which were formed during the Wisconsin Glaciation. The Wisconsin Glaciation began approximately 75,000 years ago when the Laurentide ice sheet expanded from its center near Hudson Bay southward into Minnesota. Although numerous Wisconsin Stage advances and recessions occurred, only two are recognized in Wright County, as earlier deposits were removed or reworked.

Approximately 30,000 to 35,000 years ago, the Rainy and Superior lobes moved southwesterly into central Minnesota. The Superior lobe expanded from the Lake Superior basin across red sandstone bedrock and into the Minnesota lowland. The Rainy lobe moved across the crystalline upland bedrock north of Lake Superior. These two lobes joined and moved side by side to their common terminus, the St. Croix moraine, which is located approximately 35 to 40 miles southwest of the city of Anoka. During this advance, Superior lobe till was deposited. This till is typically described as brown to reddish brown, massive, poorly graded, non-calcareous, silty, or clayey sand to sandy clay. As the Rainy-Superior lobe receded, a coarse sand and gravel outwash (consisting mostly of mafic to granitic igneous and metamorphic rocks, quartz, red sandstone, red shale, and ironstone) was deposited.

During the Split Rock-Pine City phase, the Superior Lobe and Grantsburg Sublobe of the Des Moines Lobe advanced simultaneously. The Superior lobe advanced southwesterly as the Grantsburg sublobe breached the St. Croix moraine and moved northeasterly, depositing a thick layer of till, and forming the Pine City moraine. Glacial Lake Grantsburg was formed north of the Grantsburg sublobe, which blocked the Mississippi River and other drainage outlets from the north. Eventual drainage of glacial Lake Grantsburg allowed the Mississippi River to realign itself into its current position. Meltwater streams associated with the realignment formed a series of coalescing outwash plains. These glaciofluvial deposits formed the Anoka Sand Plain.

The uppermost bedrock unit across much of the region, especially to the north and west of the MNGP site, is composed of Middle Precambrian age granite. Based on records for wells located adjacent to the site, depth to bedrock is in excess of 80 feet below ground surface. The bedrock surface across much of the region displays an irregular surface topography that was etched by preglacial and interglacial rivers. Approximately 0.5 miles east of the site is the contact between the undifferentiated igneous and metamorphic rocks and the overlying Cambrian age sedimentary rocks, consisting of the Mt. Simon-Hinckley-Fond du Lac and Eau Claire formations. However, based on pre-construction drilling data from the 1960s, the uppermost bedrock unit below the plant is weathered sandstone at a depth of approximately 60 feet with granite encountered at approximately 70 feet.

3.5.2 Site Geology

The site occupies a bluff that forms the southwest bank of the Mississippi River. Several flat alluvial terraces comprise the main topographical features on the property. These terraces lie at average elevations of 930 and 918 feet msl and in general slope very slightly away from the river. The present surface drainage of the immediate plant site area is mainly to the southwest, away from the river. Surface runoff will tend to collect in the depression at the south end of the terrace where it is bounded by higher ground, then flow easterly to the river. (Xcel 2020a) Figure 3.5-2 depicts the geologic map of the subject property and surrounding areas (USGS 2021a).

Six stratigraphic units are present at MNGP: fill, terrace deposits, an upper sandy till, glacial outwash, a lower clay till, and weathered sandstone bedrock. Fill material was encountered below paved surfaces across the site and ranges in thickness from approximately 7–20 feet thick but does extend as deep as 50 feet below ground surface around the reactor building. Fill at MNGP is generally described as brown fine to medium grained sand with varying amounts of gravel and silt and appears to be derived from terrace deposits at MNGP.

Below the fill at varying depths across MNGP are Quaternary age river terrace deposits likely associated with the Langdon terrace deposits of the West Campus Formation. These deposits consist primarily of sand and gravelly sand deposited during early, higher stages of the Mississippi River and preserved as terraces above the modern flood plain. Where present, terrace deposits range in thickness from approximately 10 to 15 feet, decreasing in thickness closer to the Mississippi River. This unit is typically described as brown, fine to medium-grained sand with varying amounts of gravel and silt, sub-rounded, moderately to poorly graded. This alluvial sequence represents successive depositions of glacial outwash, moraine, and more recently, sediments laid down by the Mississippi River. During its history, this river has meandered as much as 1.5 miles south of its present channel. (Xcel 2020a)

Glacial till underlies the terrace deposits within the northern portion of the site. The lateral extent of this unit is minimal, as the till pinches out to the south, likely from being eroded and incorporated into the overlying terrace deposits. Maximum thickness of the till is approximately ten feet. This unit is typically described as unsorted, unstratified brown, medium grained silty sand with clay and trace gravel, sub-round, moderately graded.

Throughout the entire site, terrace deposits and upper till deposits are underlain by glacial outwash. Glacial outwash at the site ranges in thickness from a minimum of approximately 4 feet to a maximum of approximately 25 feet. This unit is typically described as a brown, fine to coarse grained sub-angular, poor to well graded sand with gravel.

A lower glacial till unit underlies the outwash deposits throughout the entire site. This unit is typically described as a gray lean clay with sand, with moderate to low plasticity and low cohesiveness. The thickness of this unit ranges from a minimum of approximately 5 feet to a maximum of approximately 12 feet. The lower till also appears to fully penetrate the deepest structures at MNGP (i.e., the intake structure and reactor building), thus extending to the bedrock surface.

Approximately 10 to 15 feet of medium-grained quartz sandstone which, in general, is moderately well cemented, underlies alluvial and glacial deposits. Decomposed granite and basic rocks of the Precambrian age comprise the oldest formation at the site, within the depth investigated. This material lies below the ground surface at a depth of about 75 to 122 feet. (Xcel 2020a)

MNGP is located on the extreme western edge of a Precambrian structural trough. A well in the town of Monticello about 2.75 miles east of the site that was drilled to a depth of 500 feet did not encounter granite. Other well information generally indicates that 150 to 200 feet of unconsolidated alluvium and drift overlies sandstone and red shale of unknown thickness at Monticello. All the rock and soil units present at the site therefore slope eastward and thicken toward the sedimentary basin and its artesian aquifers. (Xcel 2020a)

Columnar geologic cross sections are shown in Figures 3.5-3a, 3.5-3b, and 3.5-3c.

3.5.3 Soils

3.5.3.1 Onsite Soils and Geology

Soil units that occur within the MNGP site boundary are described in detail in Table 3.5-1 and shown in Figure 3.5-4. They are also summarized below. Approximately 86.24 percent of the site has soil cover. The remaining 13.76 percent of the area is covered in water (13.56 percent) and miscellaneous waters (0.2 percent). (USDA 2021c)

- Arvilla sandy loam
- Dorset-Two Inlets complex
- Duelm loamy sand
- Elkriver fine sandy loam
- Elkriver-Mosford complex
- Fordum loam
- Hubbard loamy sand, 0-2 percent slopes
- Hubbard loamy sand, 1-6 percent slopes
- Hubbard loamy sand, 2-12 percent slopes
- Hubbard-Mosford complex
- Isan-Isan sandy loam
- Mosford sandy loam
- Sandberg loamy coarse sand
- Sandberg loamy sand, 1-6 percent slopes
- Sandberg loamy sand, 2-12 percent slopes
- Sandberg-Arvilla complex
- Stonelake-Nebish complex, 12-25 percent slopes

- Stonelake-Nebish complex, 2-6 percent slopes
- Water
- Water, miscellaneous

During a hydrogeologic investigation, fill material was encountered below paved surfaces across the site, ranging in thickness from approximately 7–20 feet thick, but does extend as deep as 50 feet below ground surface around the reactor building. Fill at the site is generally described as brown fine to medium grained sand with varying amounts of gravel and silt and appears to be derived from terrace deposits at the site.

3.5.3.2 Erosion Potential

Because MNGP has been operational since the early 1970s, stabilization measures are already in place to prevent erosion and sedimentation impacts to the site and vicinity. Based on information from the U.S. Department of Agriculture (USDA), all soil units listed in Table 3.5-1 subject to erosion have a slight to moderate erosion potential, except for the Dorset-Two Inlets complex, 20–35 percent slopes, which has severe erosion potential. This soil comprises 1.4 percent of the mapped area and is mapped in a narrow band along the Mississippi River. (USDA 2021c)

MNGP maintains and implements a stormwater pollution prevention plan (SWPPP) that identifies potential sources of pollution reasonably expected to affect the quality of stormwater, such as erosion, and identifies BMPs that will be used to prevent or reduce the pollutants in stormwater discharges. These practices, as they relate to erosion, include inspecting sloped areas around the bleach unloading house to ensure erosion control measures are in place. In addition, the MNGP SWPPP must be amended and the BMPs will be amended as needed. If spills or other areas of concern are identified, additional BMPs will be included to address each situation.

3.5.3.3 Prime Farmland Soils

The USDA's Natural Resources Conservation Service maps show that approximately 19.04 percent of the site is considered prime farmland or farmland of statewide importance. Except for the Elkriver fine sandy loam, locations designated as prime farmland are small, isolated patches on the site. The Elkriver fine sandy loam is most prevalent as river deposits and is mapped east of the plant. (USDA 2021c) These areas would most likely still be considered prime farmland even though they are part of the property owned by Xcel Energy. Even if areas of the property are designated prime farmland, MNGP would not be subject to the Farmland Protection Policy Act (FPPA) because the act does not include federal permitting or licensing for activities on private or nonfederal lands. Soil units designated as prime farmland are identified in Table 3.5-1.

3.5.4 Seismic History

The magnitude of a seismic event is described by two methods: the modified Mercalli (MM) intensity scale and the Richter magnitude scale. The MM intensity is an estimate of the amount of damage caused at a site by an earthquake. The Richter magnitude scale is an approximate measure of the total amount of energy released by an earthquake. Accurate locations for earthquake epicenters have been available since the installation of modern seismographs in the region. Without seismographs, earthquakes were described using the MM intensity.

A major fault system of Precambrian age has been inferred from regional geophysical surveys. This fault system is associated with the Precambrian structural trough. The major movements along this fault system, which amount to thousands of feet, appear to have been restricted to Precambrian time. Minor fault displacements occurred during the Paleozoic era but faulting within the last few million years is not in evidence. (Xcel 2020a)

The nearest known or inferred fault—the Douglas Fault—is 23 miles southeast of the site. There is no indication that faulting has affected the area of the site in the last few million years. Major movements of thousands of feet along this system appear to have been restricted to Precambrian time, with minor displacements having occurred during the Paleozoic era. Faulting within geologic time is not in evidence. Earthquakes can and do occur in this region away from faults, and probably result from residual stresses due to recent glaciers. (Xcel 2020a)

The earliest earthquake on record occurred in 1860 in central Minnesota; thus over 100 years of records exist. During that period, earthquakes have had little effect at the site. (Xcel 2020a) Regional seismic events that occurred between 1860 and 1961 are listed in the Updated Safety Analysis Report in Table 2.6-1 with the corresponding MM intensities (Xcel 2020a).

Earthquake epicenter locations of seismic events greater than intensity IV/magnitude 3.0 within a 200-mile (322-kilometer(km)) radius of the site from 1970 through July 2022 are listed in Table 3.5-2 and shown in Figure 3.5-5 (USGS 2022). The 93 seismic events that occurred between 2014 and 2022 were caused by mining explosions.

The USGS's national seismic hazard map shows that the MNGP site is in a region with a 2 percent in 50 years (once in 2,500 years) probability of exceeding a peak ground acceleration between 0.04 and 0.08g (USGS 2015).

Table 3.5-1 Onsite Soil Unit Descriptions (Sheet 1 of 7)

Map Unit Symbol[(a)]	Soil Unit Name	Description	Farmland Designation
258B	Sandberg loamy sand, 1-6% slopes	The Sandberg component makes up 12.3% of the map unit. Slopes are 1-6%. This component is on hillslopes and stream terraces. The parent material consists of sandy and gravelly outwash. Depth to a restrictive layer is more than 80 inches. The natural drainage class is excessively drained. Water movement in the most restrictive layer is high to very high. Available water to a depth of 3.8 inches is low. This soil is not flooded. It is not ponded. The frost-free period is 120 to 170 days. Depth to the water table is more than 80 inches. Non-irrigated land capacity classification is 4s. The soil does not meet hydric criteria. Erosion potential is slight.	Not prime farmland
258C	Sandberg loamy sand, 2-12% slopes	The Sandberg component makes up 4.56% of the map unit. Slopes are 2-12%. This component is on hillslopes and stream terraces. The parent material consists of sandy and gravelly outwash. Depth to a restrictive layer is more than 80 inches. The natural drainage class is excessively drained. Water movement in the most restrictive layer is high to very high. Available water to a depth of 3.8 inches is low. This soil is not flooded. It is not ponded. The frost-free period is 120–170 days. Depth to the water table is more than 80 inches. Non-irrigated land capacity classification is 6s. The soil does not meet hydric criteria. Erosion potential is slight.	Not prime farmland
258E	Sandberg loamy coarse sand, 6-30% slopes	The Sandberg component makes up 4.39% of the map unit. Slopes are 6-30%. This component is on hillslopes and stream terraces. The parent material is sandy and gravelly outwash. Depth to a restrictive layer is more than 80 inches. The natural drainage class is excessively drained. Water movement in the most restrictive layer is high to very high. This soil is not flooded. It is not ponded. The frost-free period is 120–170 days. Depth to the water table is more than 80 inches. Non-irrigated land capacity classification is 7s. The soil does not meet hydric criteria. Erosion potential is moderate.	Not prime farmland

Table 3.5-1 Onsite Soil Unit Descriptions (Sheet 2 of 7)

Map Unit Symbol[(a)]	Soil Unit Name	Description	Farmland Designation
261	Isan sandy loam, depressional, 0-1% slopes	The Isan component makes up 0.15% of the map unit. Slopes are 0-1%. This component is on depressions on stream terraces and depressions on outwash plains. The parent material consists of outwash. Depth to a restrictive layer is greater than 80 inches. The natural drainage class is very poorly drained. Water movement in the most restrictive layer is high. Available water to a depth of 4.7 inches is low. This soil is not flooded. It is frequently ponded. The frost-free period is 120-180 days. Depth to the water table is about 0 inches. Non-irrigated land capacity classification is 6w. The soil meets hydric criteria. Erosion potential is slight.	Not prime farmland
341	Arvilla sandy loam, 0-2% slopes	The Arvilla component makes up 0.01% of the map unit. Slopes are 0-2%. This component is on stream terraces and flats. The parent material consists of loamy glaciofluvial deposits over sandy and gravelly outwash. Depth to a restrictive layer is greater than 80 inches. The natural drainage class is somewhat excessively drained. Water movement in the most restrictive layer is high. Available water to a depth of 3.7 inches is low. This soil is not flooded. It is not ponded. The frost-free period is 120–170 days. Depth to the water table is more than 80 inches. Non-irrigated land capacity classification is 3s. The soil does not meet hydric criteria. Erosion potential is slight.	Farmland of statewide importance
768	Mosford sandy loam, 0-2% slopes	The Mosford component makes up 1.1% of the map unit. Slopes are 0-2%. This component is on stream terraces and outwash plains. The parent material consists of outwash. Depth to a restrictive layer is greater than 80 inches. The natural drainage class is somewhat excessively drained. Water movement in the most restrictive layer is high. Available water to a depth of 4.8 inches is low. This soil is not flooded. It is not ponded. The frost-free period is 120-180 days. Depth to the water table is more than 80 inches. Non-irrigated land capacity classification is 3s. The soil does not meet hydric criteria. Erosion potential is slight.	Farmland of statewide importance

Table 3.5-1 Onsite Soil Unit Descriptions (Sheet 3 of 7)

Map Unit Symbol[(a)]	Soil Unit Name	Description	Farmland Designation
771	Elkriver fine sandy loam, 0-2% slopes, rarely flooded	The Elkriver component makes up 17.77% of the map unit. Slopes are 0-2%. This component is on flood plains. The parent material consists of alluvium. Depth to a restrictive layer is more than 80 inches. The natural drainage class is moderately well drained. Water movement in the most restrictive layer is moderately high to high. Available water to a depth of 8.2 inches is moderate. The soil is rarely flooded. It is not ponded. The frost-free period is 120–180 days. Depth to the water table is about 36 inches. Non-irrigated land capacity is 2s. The soil does not meet hydric criteria. Erosion potential is slight.	All areas are prime farmland
1257	Elkriver-Mosford complex, 0-6% slopes, rarely flooded	The Elkriver-Mosford component makes up 0.15% of the map unit. Slopes are 0-6%. This component is on flood plains. The parent material consists of alluvium. Depth to a restrictive layer is more than 80 inches. The natural drainage class is moderately well drained. Water movement in the most restrictive layer is moderately high to high. Available water to a depth of 7.5 inches is moderate. The soil is rarely flooded. It is not ponded. The frost-free period is 120–180 days. Depth to the water table is about 36 inches. Non-irrigated land capacity classification 2s. The soil does not meet hydric criteria. Erosion potential is slight.	Farmland of statewide importance
1260B	Stonelake-Nebish complex, 2-6% slopes	The Stonelake-Nebish component makes up 0.68% of the map unit. Slopes are 2-6%. This component is on hills on moraines. The parent material consists of outwash. Depth to a restrictive layer is more than 80 inches. The natural drainage class is excessively drained. Water movement in the most restrictive layer is very high. Available water to a depth of 3.4 inches is low. The soil is not flooded. It is not ponded. The frost-free period is 120–180 days. Depth to the water table is more than 80 inches. Non-irrigated land capacity is 4s. The soil does not meet hydric criteria. Erosion potential is slight.	Not prime farmland

Table 3.5-1 Onsite Soil Unit Descriptions (Sheet 4 of 7)

Map Unit Symbol[(a)]	Soil Unit Name	Description	Farmland Designation
1260E	Stonelake-Nebish complex, 12-25% slopes	The Stonelake-Nebish component makes up 0.2% of the map unit. Slopes are 12-25%. This component is on hills on moraines. The parent material consists of outwash. Depth to a restrictive layer is more than 80 inches. The natural drainage class is excessively drained. Water movement in the most restrictive layer is high to very high. Available water to a depth of 2.9 inches is very low. The soil is not flooded. It is not ponded. The frost-free period is 120–180 days. Depth to the water table is more than 80 inches. Non-irrigated land capacity is 7s. The soil does not meet hydric criteria. Erosion potential is moderate.	Not prime farmland
D62A	Hubbard-Mosford complex, Mississippi River Valley, 0-3% slopes	The Hubbard-Mosford component makes up 33.49% of the map unit. Slopes are 0-3%. The component is on stream terraces. The parent material consists of sandy alluvium. Depth to a restrictive layer is more than 80 inches. The natural drainage class is excessively drained. Water movement in the most restrictive layer is high to very high. Available water to a depth of 4.6 inches is low. The soil is not flooded. It is not ponded. The frost-free period is 120–170 days. Depth to the water table is more than 80 inches. Non-irrigated land capacity is 4s. The soil does not meet hydric criteria. Erosion potential is slight.	Not prime farmland
D67A	Hubbard loamy sand, 0-2% slopes	The Hubbard component makes up 2.74% of the map unit. Slopes are 0-2%. The component is on stream terraces. The parent material consists of sandy outwash. Depth to a restrictive layer is more than 80 inches. The natural drainage class is excessively drained. Water movement in the most restrictive layer is high to very high. Available water to a depth of 3.9 inches is low. The soil is not flooded. It is not ponded. The frost-free period is 120–170 days. Depth to the water table is more than 80 inches. Non-irrigated land capacity is 4s. The soil does not meet hydric criteria. Erosion potential is slight.	Not prime farmland

Table 3.5-1 Onsite Soil Unit Descriptions (Sheet 5 of 7)

Map Unit Symbol[(a)]	Soil Unit Name	Description	Farmland Designation
D67B	Hubbard loamy sand, 1-6% slopes	The Hubbard component makes up 5.24% of the map unit. Slopes are 1-6%. The component is on hillslopes and stream terraces. The parent material consists of sandy outwash. Depth to a restrictive layer is high more than 80 inches. The natural drainage class is excessively drained. Water movement in the most restrictive layer is high to very high. Available water to a depth of 3.9 inches is low. The soil is not flooded. It is not ponded. The frost-free period is 120–170 days. Depth to the water table is more than 80 inches. Non-irrigated land capacity is 4s. The soil does not meet hydric criteria. Erosion potential is slight.	Not prime farmland
D67C	Hubbard loamy sand, 2-12% slopes	The Hubbard component makes up 1.61% of the map unit. Slopes are 2-12%. The component is on hillslopes and stream terraces. The parent material consists of sandy outwash. Depth to a restrictive layer is more than 80 inches. The natural drainage class is excessively drained. Water movement in the most restrictive layer is high to very high. Available water to a depth of 3.9 inches is low. The soil is not flooded. It is not ponded. The frost-free period is 120–170 days. Depth to the water table is more than 80 inches. Non-irrigated land capacity is 6s. The soil does not meet hydric criteria. Erosion potential is slight.	Not prime farmland
W	Water	Water makes up 13.56% of the map unit.	
260	Duelm loamy sand, 0-2% slopes	The Duelm component makes up 0.17% of the map unit. Slopes are 0-2%. The component is on flats. The parent material consists of sandy outwash. Depth to a restrictive layer is more than 80 inches. The natural drainage class is moderately well drained. Water movement in the most restrictive layer is high to very high. Available water to a depth of 3.7 inches is low. The soil is not flooded. It is not ponded. The frost-free period is 120–170 days. Depth to the water table is about 30 inches. Non-irrigated land capacity is 4s. The soil does not meet hydric criteria. Erosion potential is slight.	Not prime farmland

Table 3.5-1 Onsite Soil Unit Descriptions (Sheet 6 of 7)

Map Unit Symbol[(a)]	Soil Unit Name	Description	Farmland Designation
261	Isan-Isan, frequently ponded, complex, 0-2% slopes	The Isan-Isan component makes up 0.05% of the map unit. Slopes are 0-2%. The component is on stream terraces and flats. The parent material consists of sandy alluvium. Depth to a restrictive layer is more than 80 inches. The natural drainage class is poorly drained. Water movement in the most restrictive layer is high. Available water to a depth of 4.6 inches is low. The soil is not flooded. It is not ponded. The frost-free period is 120–170 days. Depth to the water table is about 6 inches. Non-irrigated land capacity is 4w. The soil does not meet hydric criteria. Erosion potential is slight.	Not prime farmland
1223	Sandberg-Arvilla complex, map >25, 0-3% slopes	The Sandberg-Arvilla component makes up 0.03% of the map unit. Slopes are 0-3%. The component is on stream terraces and rises. The parent material consists of outwash. Depth to a restrictive layer is more than 80 inches. The natural drainage class excessively drained. Water movement in the most restrictive layer is high to very high. Available water to a depth of about 3.9 inches is low. The soil is not flooded. It is not ponded. The frost-free period is 155–200 days. Depth to the water table is more than 80 inches. Non-irrigated land capacity is 4s. The soil does not meet hydric criteria.	Not prime farmland
1356	Water, miscellaneous	Water, miscellaneous makes up 0.2% of the map unit.	Not prime farmland
1377E	Dorset-Two Inlets complex, 20-35% slopes	The Dorset-Two Inlets component makes up 1.4% of the map unit. Slopes are 20-35%. The component is on hills on stream terraces and hills on outwash plains. The parent material consists of outwash. Depth to a restrictive layer is more than 80 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is high. Available water to a depth of about 4.1 inches is low. The soil is not flooded. It is not ponded. The frost-free period is 155–200 days. Depth to the water table is more than 80 inches. Non-irrigated land capacity is 7e. The soil does not meet hydric criteria. Erosion potential is severe.	Not prime farmland

Table 3.5-1 Onsite Soil Unit Descriptions (Sheet 7 of 7)

Map Unit Symbol[a]	Soil Unit Name	Description	Farmland Designation
1378	Fordum loam	The Fordum component makes up 0.24% of the map unit. Slopes are 0-2%. The component is on alluvial flats on flood plains. The parent material consists of alluvium. Depth to a restrictive layer is more than 80 inches. The natural drainage class poorly drained. Water movement in the most restrictive layer is moderately high to high. Available water to a depth of about 8.7 inches is moderate. The soil is occasionally flooded. It is not ponded. The frost-free period is 155–200 days. Depth to the water table is about 6 inches. Non-irrigated land capacity is 4w. The soil does not meet hydric criteria. Erosion potential is slight.	Not prime farmland

a. See Figure 3.5-4 for map unit symbols.

(USDA 2021c)

Table 3.5-2 Historic Seismic Events of Intensity IV/Magnitude 3.0 Mb or Greater within 200 miles of MNGP, 1970–2022[(a)] (Sheet 1 of 5)

Earthquake Date	Local Time	Latitude	Longitude	Magnitude	Distance from MNGP (miles/km)	Approximate Location
7/9/1975	9:54	45.669	-96.041	4.6 mb	109/175	3 km SW of Donnelly, Minnesota
7/11/1982	14:42	44.006	-96.722	3.6 mblg	169/271	5 km W of Egan, South Dakota
6/4/1993	20:24	45.674	-96.293	4.1 mblg	121/195	11 km N of Johnson, Minnesota
2/9/1994	3:45	45	-95	3.1 mblg	61/98	6 km NNE of Blomkest, Minnesota
10/20/1995	10:57	45.788	-96.864	3.7 mblg	150/241	8 km SSE of New Effington, South Dakota
7/17/2014[(b)]	13:20	47.598	-92.6271	3 mb_lg	167/269	7 km N of Mountain Iron, Minnesota
3/2/2017[(b)]	11:53	47.6321	-91.9558	3.2 ml	183/294	8 km S of Babbitt, Minnesota
5/25/2017[(b)]	12:35	47.5939	-92.6365	3 mb_lg	166/268	6 km N of Mountain Iron, Minnesota
6/27/2017[(b)]	12:22	47.5633	-92.6677	3 mb_lg	164/264	4 km NW of Mountain Iron, Minnesota
8/15/2017[(b)]	12:13	47.493	-92.5474	3 mb_lg	162/260	Virginia, Minnesota
11/22/2017[(b)]	13:18	47.5393	-92.6685	3 mb_lg	162/261	Minnesota
12/20/2017[(b)]	13:00	47.4356	-93.0067	3 mb_lg	151/242	5 km W of Hibbing, Minnesota
1/31/2018[(b)]	13:00	47.4114	-93.0578	3 mb_lg	148/239	1 km NE of Keewatin, Minnesota
2/21/2018[(b)]	13:00	47.4254	-93.0725	3 mb_lg	149/240	2 km N of Keewatin, Minnesota
4/2/2018[(b)]	12:24	47.5902	-92.6545	3.2 mb_lg	166/267	6 km NNW of Mountain Iron, Minnesota
5/10/2018[(b)]	12:15	47.5796	-92.7109	3 mb_lg	164/264	7 km NNE of Kinney, Minnesota
4/18/2019[(b)]	12:00	47.4575	-92.9888	3 ml	152/245	5 km NW of Hibbing, Minnesota
4/24/2019[(b)]	11:35	47.5747	-92.6855	3 mb_lg	164/265	6 km NW of Mountain Iron, Minnesota
5/2/2019[(b)]	12:00	47.384	-93.0927	3.1 mb_lg	146/235	2 km SW of Keewatin, Minnesota
5/3/2019[(b)]	11:30	47.573	-92.4873	3 mb_lg	168/270	6 km NE of Virginia, Minnesota
5/14/2019[(b)]	12:00	47.4575	-93.075	3.2 mb_lg	151/243	6 km N of Keewatin, Minnesota
10/31/2019[(b)]	12:24	47.5993	-92.5782	3 mb_lg	168/270	7 km N of Parkville, Minnesota

Table 3.5-2 Historic Seismic Events of Intensity IV/Magnitude 3.0 Mb or Greater within 200 miles of MNGP, 1970–2022[a] (Sheet 2 of 5)

Earthquake Date	Local Time	Latitude	Longitude	Magnitude	Distance from MNGP (miles/km)	Approximate Location
1/9/2020[b]	13:16	47.5481	-92.6796	3.3 mb_lg	163/262	4 km WNW of Mountain Iron, Minnesota
1/24/2020[b]	13:22	47.5171	-92.6489	3.1 mb_lg	161/260	2 km SW of Mountain Iron, Minnesota
1/29/2020[b]	13:31	47.5462	-92.5648	3 mb_lg	165/265	1 km NNE of Parkville, Minnesota
1/31/2020[b]	13:28	47.5921	-92.6549	3.2 ml	166/267	7 km NNW of Mountain Iron, Minnesota
2/7/2020[b]	13:30	47.4784	-92.7255	3.3 ml	157/253	3 km S of Kinney, Minnesota
2/11/2020[b]	13:10	47.5679	-92.5763	3.2 ml	166/267	4 km N of Parkville, Minnesota
2/12/2020[b]	13:36	47.5381	-92.6329	3.1 mb_lg	163/262	0 km NW of Mountain Iron, Minnesota
2/25/2020[b]	13:34	47.454	-93.0442	3.1 mb_lg	151/244	6 km NNE of Keewatin, Minnesota
2/28/2020[b]	13:25	47.5595	-92.6648	3.2 ml	164/264	4 km NW of Mountain Iron, Minnesota
3/4/2020[b]	13:27	47.5463	-92.5982	3 mb_lg	164/264	2 km NW of Parkville, Minnesota
3/6/2020[b]	13:30	47.522	-93.0656	3.1 ml	156/250	13 km N of Keewatin, Minnesota
3/10/2020[b]	12:26	47.5886	-92.6907	3 ml	165/266	8 km NW of Mountain Iron, Minnesota
3/19/2020[b]	12:23	47.6698	-92.6022	3 ml	172/277	15 km N of Mountain Iron, Minnesota
4/2/2020[b]	12:24	47.5627	-92.635	3.1 ml	164/265	3 km NNW of Mountain Iron, Minnesota
4/8/2020[b]	12:14	47.5685	-92.6444	3.3 ml	165/265	4 km NNW of Mountain Iron, Minnesota
4/14/2020[b]	12:28	47.5864	-92.5176	3 ml	168/270	7 km NNE of Virginia, Minnesota
4/17/2020[b]	11:17	47.3256	-92.7843	3 ml	147/236	16 km SE of Hibbing, Minnesota
4/21/2020[b]	12:12	47.5347	-92.6047	3.2 ml	163/263	1 km E of Mountain Iron, Minnesota
4/24/2020[b]	12:23	47.5503	-92.5005	3.2 ml	166/267	4 km NE of Virginia, Minnesota
5/13/2020[b]	12:09	47.6347	-92.781	3.2 ml	167/268	13 km NNW of Kinney, Minnesota
5/14/2020[b]	12:45	47.5703	-92.6984	3.1 ml	164/264	6 km NNE of Kinney, Minnesota

Table 3.5-2 Historic Seismic Events of Intensity IV/Magnitude 3.0 Mb or Greater within 200 miles of MNGP, 1970–2022[(a)] (Sheet 3 of 5)

Earthquake Date	Local Time	Latitude	Longitude	Magnitude	Distance from MNGP (miles/km)	Approximate Location
6/12/2020[(b)]	12:16	47.485	-92.6335	3.1 ml	159/257	5 km WNW of Leonidas, Minnesota
7/6/2020[(b)]	12:09	47.5651	-92.7216	3 mb_lg	163/263	5 km N of Kinney, Minnesota
7/17/2020[(b)]	12:03	47.5357	-92.5884	3 ml	164/263	0 km NW of Parkville, Minnesota
7/21/2020[(b)]	12:22	47.5716	-92.5634	3 ml	166/268	4 km NNE of Parkville, Minnesota
7/24/2020[(b)]	10:27	47.4982	-92.6559	3 ml	160/257	4 km SSW of Mountain Iron, Minnesota
7/29/2020[(b)]	12:31	47.515	-92.5058	3.2 ml	164/263	2 km ESE of Virginia, Minnesota
7/31/2020[(b)]	12:16	47.5892	-92.677	3.3 ml	165/266	7 km NNW of Mountain Iron, Minnesota
8/11/2020[(b)]	12:24	47.5877	-92.5504	3.2 ml	167/270	6 km NNE of Parkville, Minnesota
8/14/2020[(b)]	12:32	47.612	-92.5688	3.1 ml	169/272	9 km N of Parkville, Minnesota
8/19/2020[(b)]	12:14	47.5603	-92.5926	3.1 ml	165/266	3 km NNW of Parkville, Minnesota
8/20/2020[(b)]	12:38	47.5373	-92.6729	3.1 ml	162/261	3 km W of Mountain Iron, Minnesota
8/27/2020[(b)]	12:24	47.5792	-92.5604	3 ml	167/268	5 km NNE of Parkville, Minnesota
9/3/2020[(b)]	11:25	47.4929	-92.5701	3.2 ml	161/259	3 km N of Leonidas, Minnesota
9/23/2020[(b)]	12:21	47.5975	-92.7636	3.1 ml	165/265	9 km NNW of Kinney, Minnesota
9/25/2020[(b)]	12:20	47.5927	-92.5199	3.1 ml	168/271	7 km N of Virginia, Minnesota
10/1/2020[(b)]	12:21	47.6049	-92.5061	3.1 ml	169/273	9 km NNE of Virginia, Minnesota
11/12/2020[(b)]	13:23	47.5688	-92.6767	3 ml	164/264	5 km NW of Mountain Iron, Minnesota
11/20/2020[(b)]	13:27	47.5693	-92.636	3.1 ml	165/265	4 km NNW of Mountain Iron, Minnesota
12/2/2020[(b)]	13:28	47.5839	-92.5024	3.2 ml	168/271	7 km NNE of Virginia, Minnesota
12/8/2020[(b)]	13:30	47.6128	-92.6682	3.1 ml	167/269	9 km NNW of Mountain Iron, Minnesota
12/9/2020[(b)]	13:23	47.5704	-92.5241	3.1 ml	167/269	5 km N of Virginia, Minnesota

Table 3.5-2 Historic Seismic Events of Intensity IV/Magnitude 3.0 Mb or Greater within 200 miles of MNGP, 1970–2022[(a)] (Sheet 4 of 5)

Earthquake Date	Local Time	Latitude	Longitude	Magnitude	Distance from MNGP (miles/km)	Approximate Location
12/11/2020[(b)]	11:52	47.5893	-92.6212	3 ml	166/268	6 km N of Mountain Iron, Minnesota
12/16/2020[(b)]	13:18	47.595	-92.5715	3.4 ml	168/270	7 km N of Parkville, Minnesota
12/29/2020[(b)]	13:17	47.6125	-92.5167	3.1 ml	170/273	10 km N of Virginia, Minnesota
1/4/2021[(b)]	13:21	47.5926	-92.671	3.1 ml	166/267	7 km NNW of Mountain Iron, Minnesota
1/5/2021[(b)]	13:22	47.4652	-92.5646	3 ml	159/257	0 km NE of Leonidas, Minnesota
1/6/2021[(b)]	13:30	47.4073	-93.1401	3 ml	147/237	3 km NE of Nashwauk, Minnesota
1/7/2021[(b)]	13:19	47.6461	-92.5679	3.1 ml	171/275	12 km N of Parkville, Minnesota
1/14/2021[(b)]	13:26	47.6223	-92.6147	3.2 ml	169/271	10 km N of Mountain Iron, Minnesota
1/28/2021[(b)]	13:18	47.5653	-92.6191	3.1 ml	165/265	3 km N of Mountain Iron, Minnesota
2/5/2021[(b)]	12:16	47.559	-92.6905	3.4 ml	163/263	5 km NNE of Kinney, Minnesota
2/9/2021[(b)]	13:23	47.581	-92.708	3.2 ml	164/265	7 km NNE of Kinney, Minnesota
2/15/2021[(b)]	13:19	47.6504	-92.5504	3 ml	172/276	13 km N of Parkville, Minnesota
2/26/2021[(b)]	12:56	47.594	-92.8425	3 ml	163/263	12 km NNE of Chisholm, Minnesota
3/5/2021[(b)]	13:21	47.5722	-92.542	3 ml	167/268	5 km NNE of Parkville, Minnesota
3/9/2021[(b)]	13:24	47.5133	-92.5545	3 ml	163/262	1 km SW of Virginia, Minnesota
3/18/2021[(b)]	12:20	47.5622	-92.7043	3 ml	163/263	5 km NNE of Kinney, Minnesota
4/7/2021[(b)]	12:24	47.5032	-92.7161	3.2 ml	159/256	1 km SE of Kinney, Minnesota
4/27/2021[(b)]	12:03	47.5859	-92.703	3.2 ml	165/265	8 km NNE of Kinney, Minnesota
4/30/2021[(b)]	12:21	47.6157	-92.593	3.2 ml	169/271	9 km N of Parkville, Minnesota
5/6/2021[(b)]	12:27	47.5427	-92.6156	3 ml	163/263	1 km NNE of Mountain Iron, Minnesota
5/7/2021[(b)]	11:54	47.5835	-92.7106	3.1 ml	165/265	7 km N of Kinney, Minnesota

Table 3.5-2 Historic Seismic Events of Intensity IV/Magnitude 3.0 Mb or Greater within 200 miles of MNGP, 1970–2022[a] (Sheet 5 of 5)

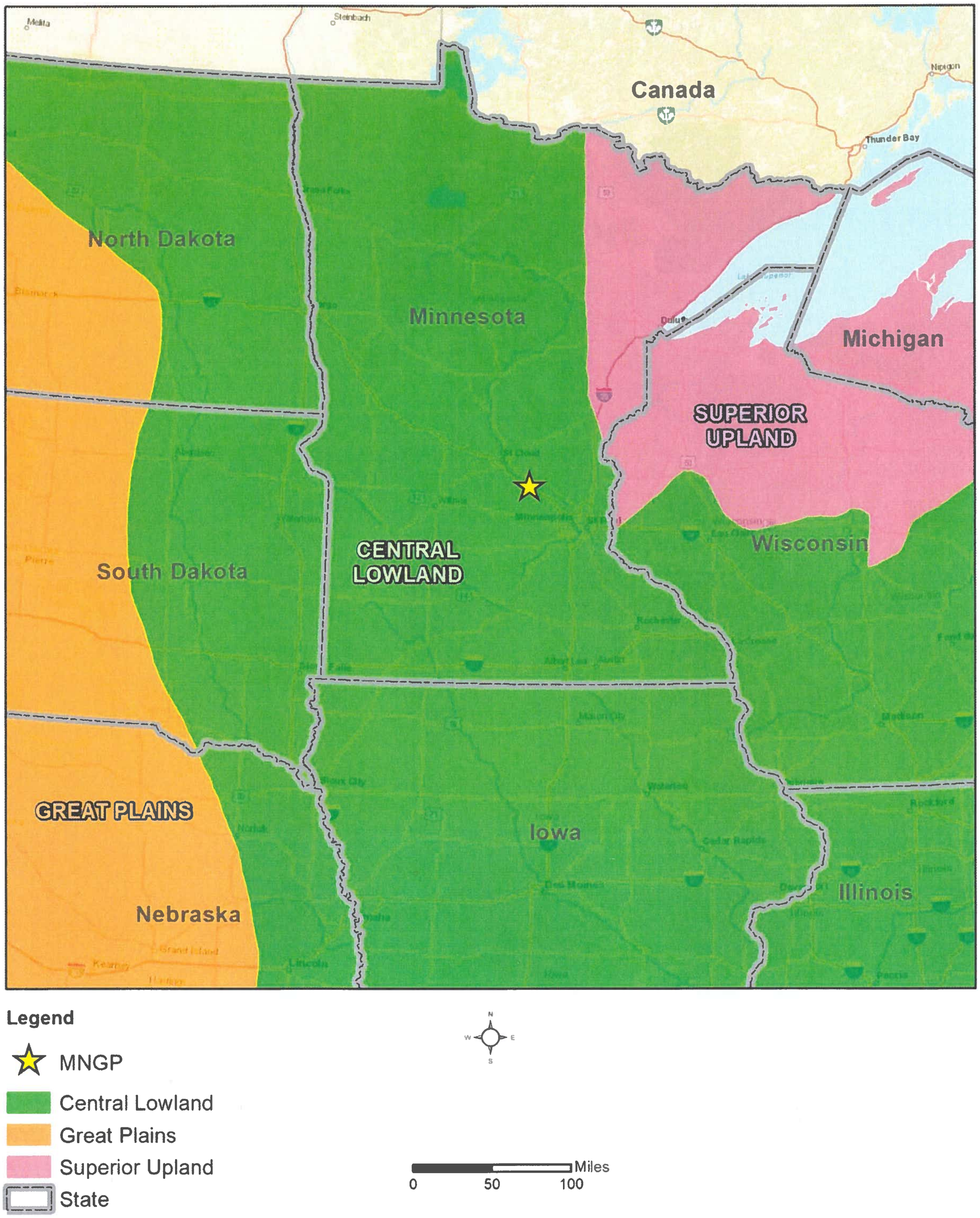
5/19/2021[b]	12:27	47.1966	-93.2823	3 ml	131/212	7 km N of Warba, Minnesota
5/28/2021[b]	12:13	47.5418	-92.5382	3 ml	165/265	2 km N of Virginia, Minnesota
9/3/2021[b]	11:08	47.5353	-92.5209	3.2 ml	265/165	1 km NE of Virginia, Minnesota
9/9/2021[b]	12:10	47.5745	-92.7125	3 ml	264/164	6 km NNE of Kinney, Minnesota
9/10/2021[b]	12:23	47.5768	-92.604	3 ml	267/166	5 km NNE of Mountain Iron, Minnesota
9/15/2021[b]	12:13	47.5334	-92.6733	3 ml	261/162	3 km W of Mountain Iron, Minnesota
9/17/2021[b]	11:27	47.4719	-92.5245	3.1 ml	258/161	1 km NE of Eveleth, Minnesota
10/29/2021[b]	11:55	47.5456	-92.6911	3 mb_lg	261/162	4 km NE of Kinney, Minnesota
12/29/2021[b]	13:18	47.5338	-92.5665	3 ml	264/164	0 km ENE of Parkville, Minnesota
1/14/2022[b]	12:12	47.5704	-92.5061	3 ml	269/167	5 km NNE of Virginia, Minnesota
1/27/2022[b]	13:09	47.555	-92.6323	3 ml	264/164	2 km NNW of Mountain Iron, Minnesota
2/18/2022[b]	12:48	47.605	-92.5604	3.2 ml	271/168	8 km N of Parkville, Minnesota
3/3/2022[b]	12:10	47.5794	-92.7274	3 ml	264/164	7 km N of Kinney, Minnesota

mb = short-period body wave magnitude; mblg, mb_lg, lg = short-period surface wave magnitude; ml = local magnitude

a. All seismic events within 200 miles (322 km) with a Richter magnitude of greater than 3.0.

b. Seismic events caused by mining explosions.

(USGS 2022)



1

2 **Figure 3.5-1 Physiographic Provinces Associated with the MNGP Site**

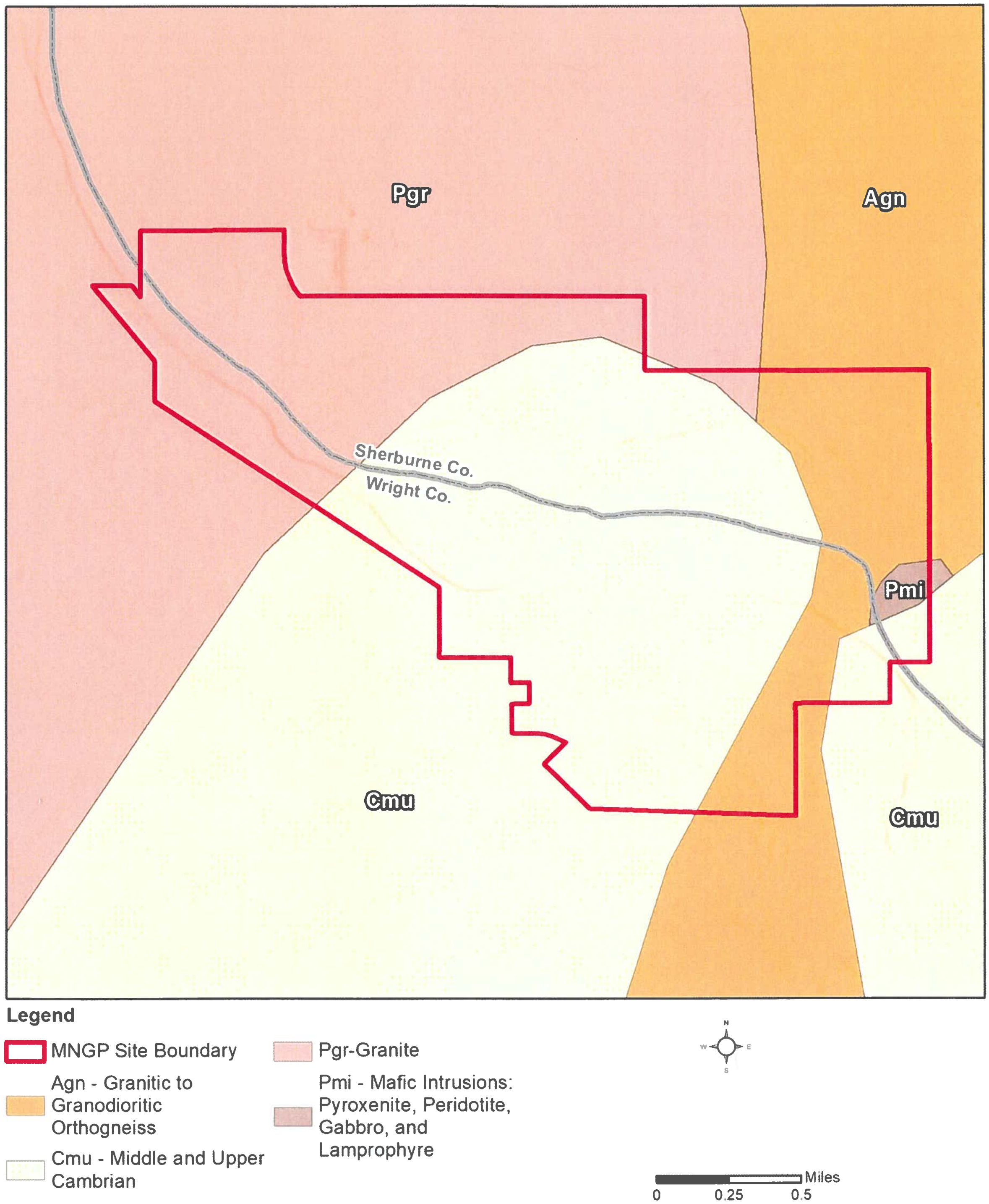


Figure 3.5-2 Surficial Geology Map, MNGP Property

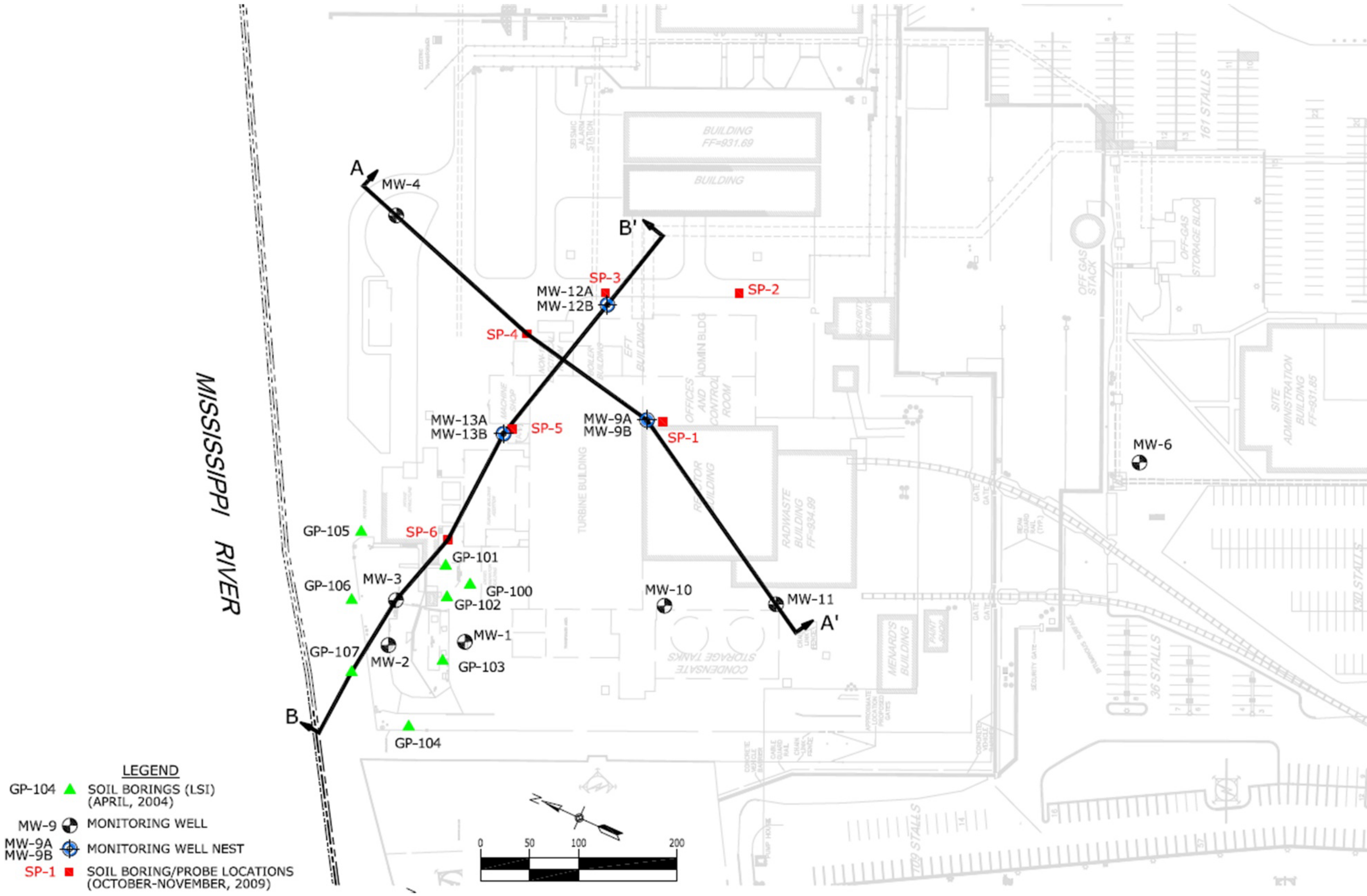


Figure 3.5-3a Hydrological Cross-Section Locations on MNGP Site

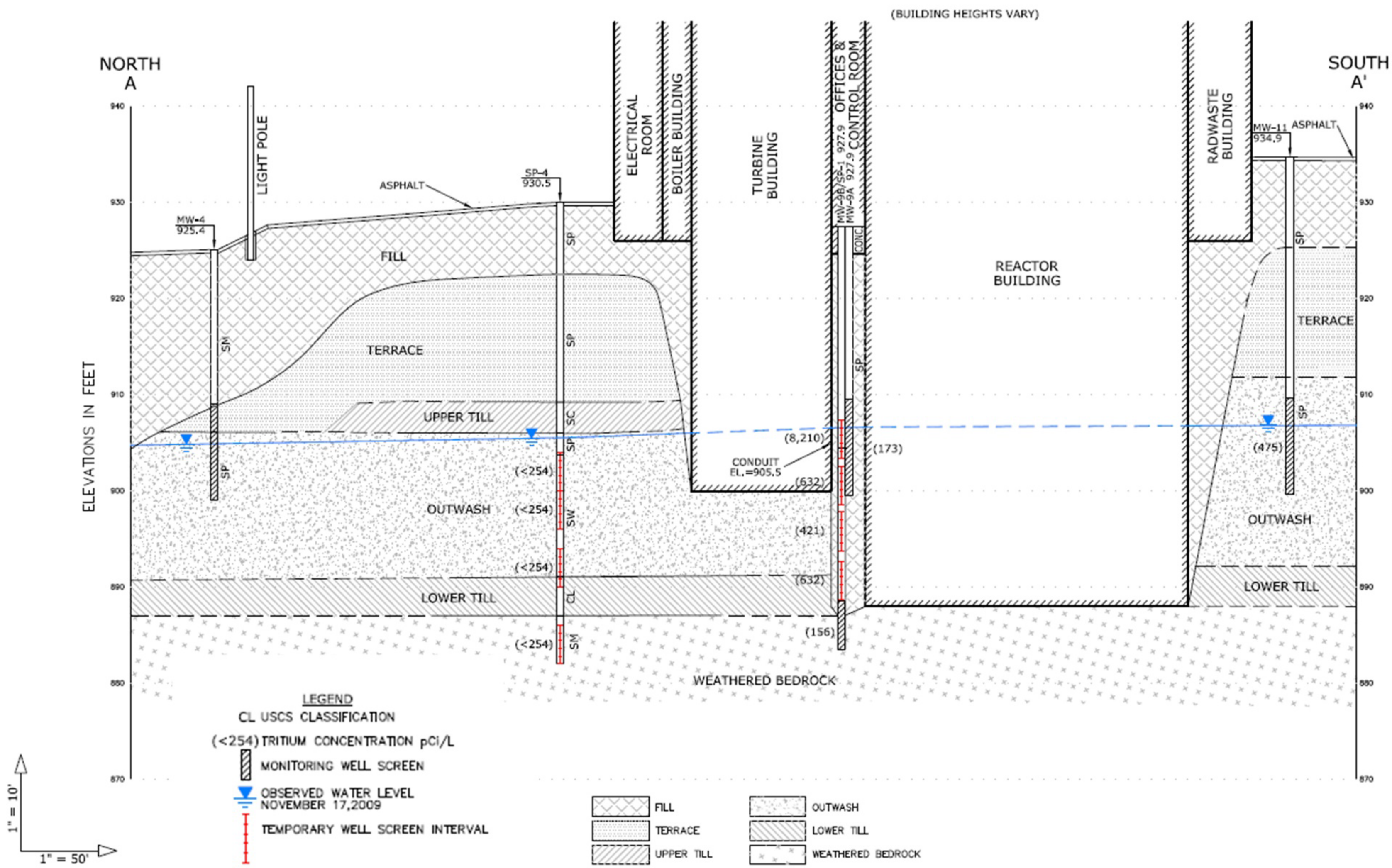


Figure 3.5-3b Cross-Section A-A'

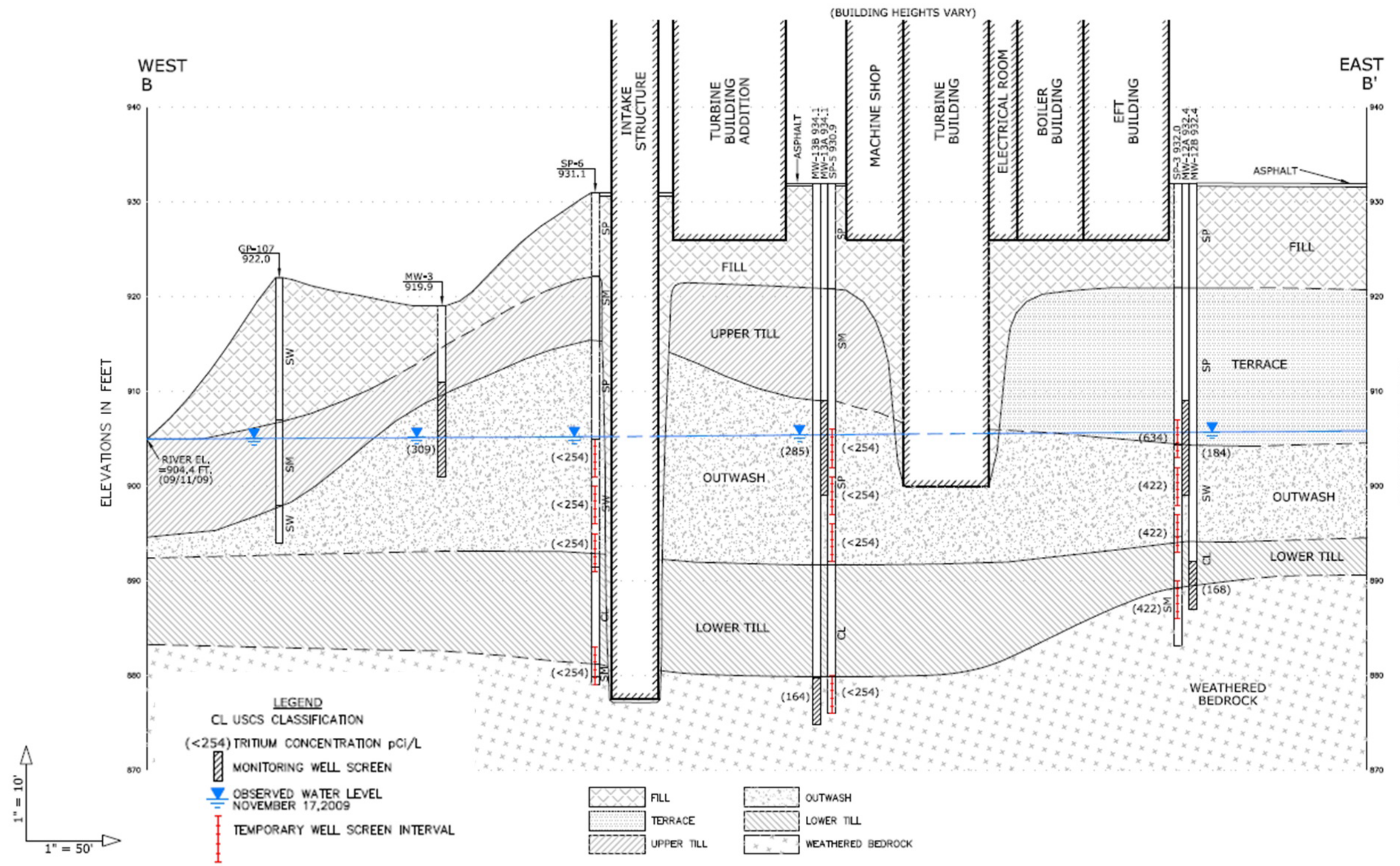


Figure 3.5-3c Cross-Section B-B'

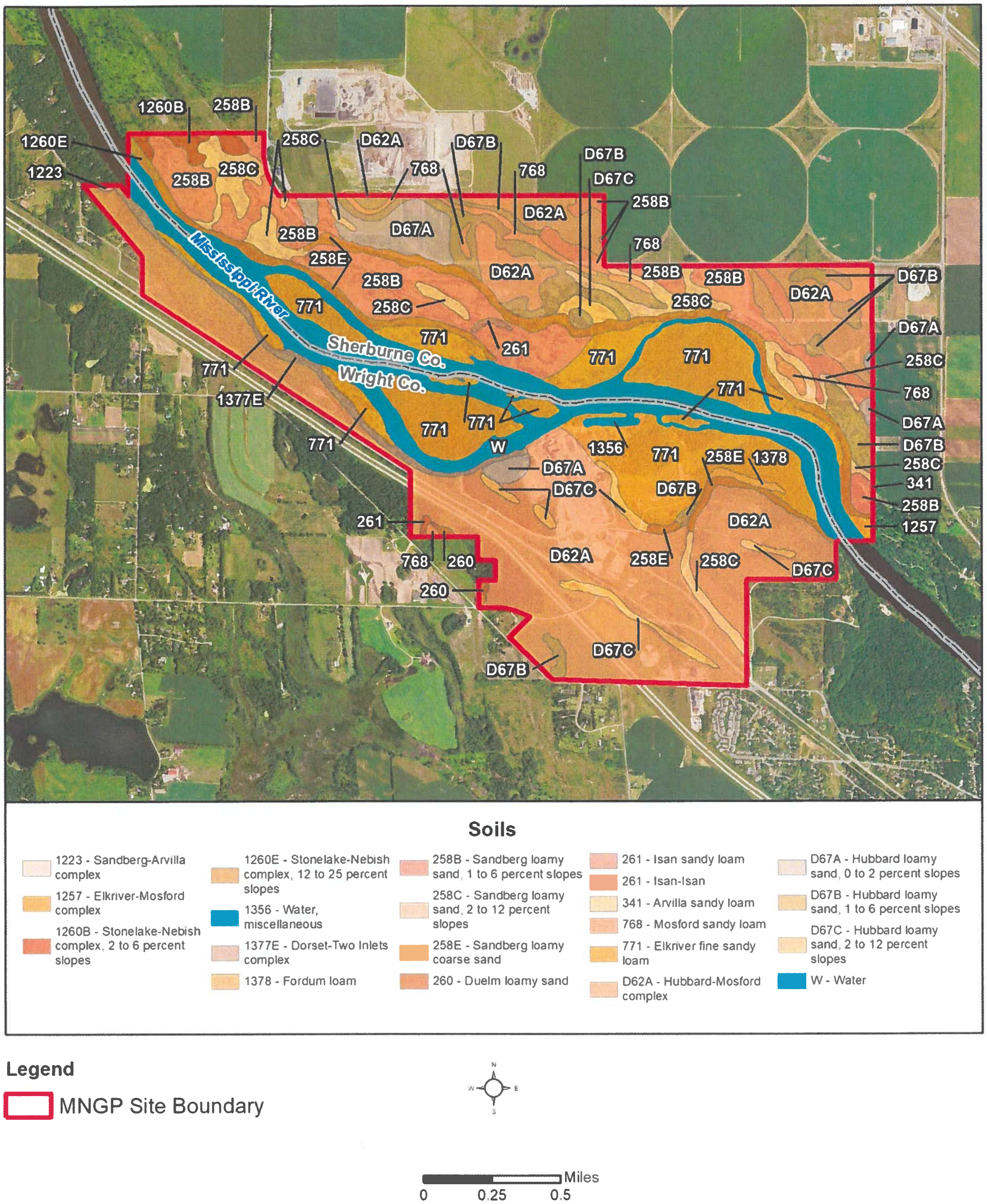


Figure 3.5-4 Distribution of Soil Units, MNGP Property

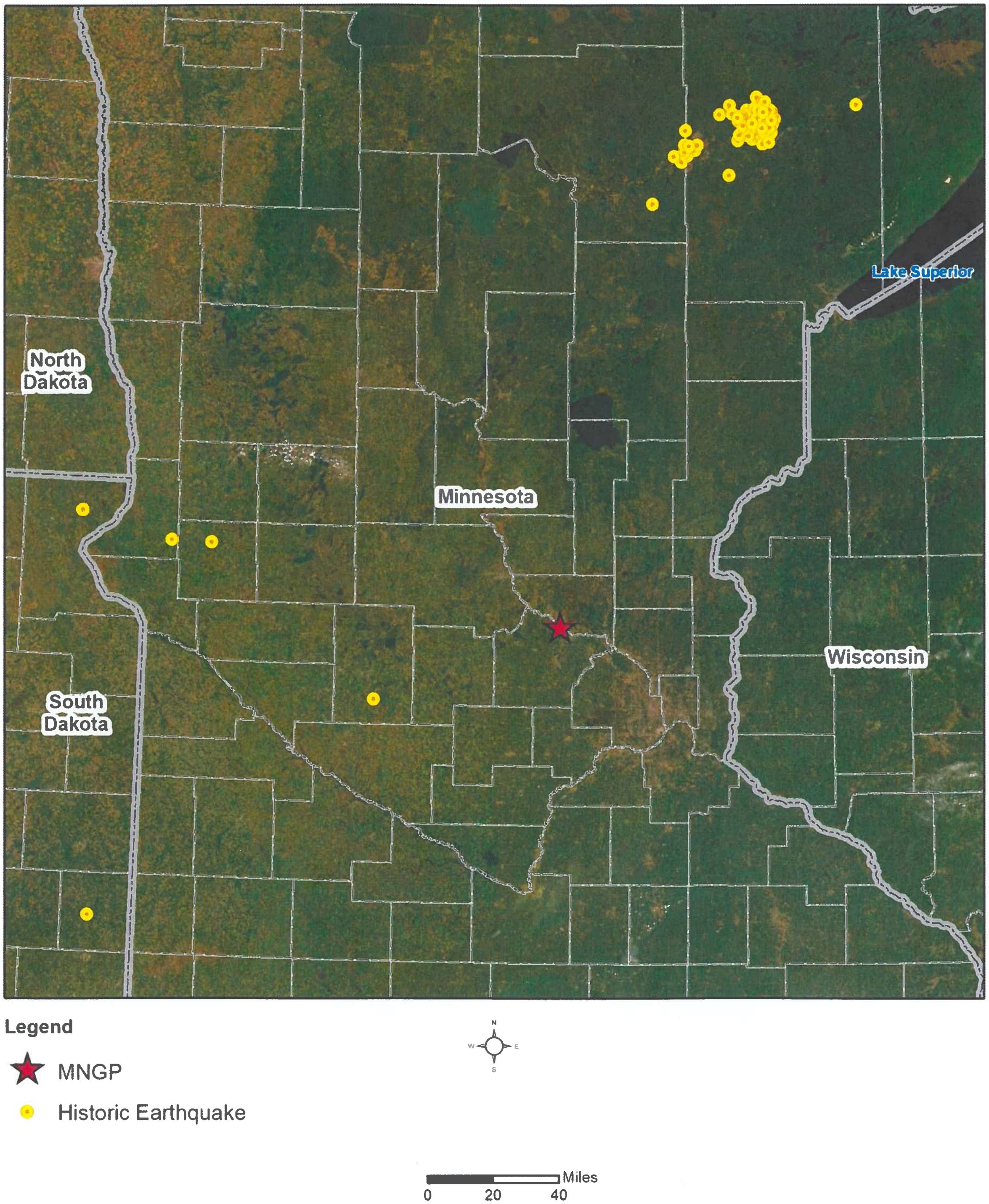


Figure 3.5-5 Historic Seismic Events, 1970–2021

3.6 Water Resources

3.6.1 Surface Water Resources

MNGP is located in the City of Monticello, Wright County, Minnesota, on the southern bank of the Mississippi River (River Mile [RM] 900) (NRC 2006b). The site consists of approximately 2,000 acres of land in Wright and Sherburne counties. The majority of the acreage is on the southern side of the Mississippi River, with 450 acres on the northern side of the river. Approximately 50 acres are occupied by the plant and its supporting facilities. (NMC 2005)

The Mississippi River has the third largest drainage basin in the world, draining 41 percent of the 48 contiguous states of the United States. The basin covers more than 1,245,000 square miles, includes all or parts of 31 states and two Canadian provinces, and roughly resembles a funnel which has its spout at the Gulf of Mexico (USACE 2021). With its source in the north woods of Minnesota in Itasca State Park, the Mississippi River is the longest and largest river in North America. It flows 2,302 miles from its source, Lake Itasca, draining all or parts of 31 states. Eventually, the river reaches the Gulf of Mexico after meandering through the sub-tropical Louisiana delta. The U.S. Geological Survey (USGS) has divided the Mississippi River into six sub-basins: the Upper Mississippi River, Lower Mississippi River, Arkansas Red-White River, Ohio River, Missouri River, and Tennessee River sub-basins. (NMC 2005)

The Upper Mississippi River sub-basin includes portions of Minnesota, Wisconsin, Iowa, Illinois, and Missouri. Within the state of Minnesota, this sub-basin includes seven major drainage basins: Upper Mississippi River, St. Croix River, Minnesota River, Lower Mississippi River, Missouri River, Des Moines River, and Cedar River. Each individual drainage basin is comprised of smaller units (watersheds) corresponding to the drainage of a tributary or lake system. MNGP is located in the Upper Mississippi River drainage basin, which extends from the headwaters at Lake Itasca to lock and dam No. 2 near Hastings, Minnesota. MNGP is found within the Clearwater-Elk watershed in the Upper Mississippi River drainage basin, Upper Mississippi River sub-basin. The Clearwater-Elk watershed includes land in both Sherburne County and Wright County and encompasses all water bodies within its boundaries. A series of dams exist between Lake Itasca and the Saint Anthony Falls lock and dam on the Mississippi River. However, lock systems for these dams are not in place in this stretch of the Mississippi River because it is not used for commercial navigational purposes. (NMC 2005)

Near MNGP, the Mississippi River is a broad turbulent stream with a boulder substrate. Rapids occur frequently as the river drops 10 feet from 1.5 miles upstream to 1.5 miles downstream from the plant. Mississippi River tributaries close to the plant are Silver Creek (5 miles upstream) and Otter Creek (3 miles downstream). The Elk River flows parallel to the Mississippi River along a line four miles northeast of the plant, entering the Mississippi River 15 miles downstream at RM 884.8. The Mississippi River flow continues to increase downstream with additional tributaries entering including the Crow River at RM 879.6, the Minnesota River at RM 844.0, and the St. Croix River at RM 811.3. The Upper Saint Anthony lock and dam is at Mississippi RM 853.8, 46 miles downstream of the MNGP site. Downstream of this location, Mississippi River elevations and flows are regulated by a series of locks and dams. (NMC 2005)

Upstream from the MNGP site in north-central Minnesota, Mississippi River flows are impacted by six primary headwater reservoirs (Mississippi headwaters reservoirs). The reservoirs were created by a series of dams and control structures, initially designed to augment the Mississippi River flows for navigation. The dams creating the six reservoirs were built between 1884 and 1912. (NMC 2005)

General regulations governing the operation of the Mississippi headwaters dams were first established by the U.S. Department of War in 1889 and were formally modified in 1931, 1935, 1936, 1944 and 1988. These regulations deal primarily with the control of water levels in the six reservoirs and include a normal summer band and operating limits. The summer band represents the range of water levels that are the most beneficial to a majority of users during the summer months. The summer band was established as a result of an investigation of desirable summer water levels through public consultation in the late 1920s and early 1930s. Several modifications to summer band parameters have occurred in more recent years. Currently, the range of water elevations for the summer band does not exceed 0.5 feet. (NMC 2005)

The ordinary operating limits for the headwater reservoirs were adopted through public consultation in the 1930s and 1940s. In general, the limits range from a normal winter drawdown level to an upper elevation above which erosion begins to accelerate in a particular reservoir. These limits are meant to be a range of elevations residents might expect to experience during a year as an ordinary annual cycle. The reservoir water levels are lowered every winter to create room for flood control storage in the spring. The drawdown begins in the fall, usually in September or early October, and concludes prior to the spring breakup. The drawdown is targeted for completion by February 15–28. The actual drawdown elevation in any given year is adjusted as the extent of the snowpack reveals itself over the course of a winter. The final drawdown elevation can be higher, or in some cases lower, than the normal drawdown target. (NMC 2005)

The regulations issued between 1931−1944 also contain required average annual flows from the reservoirs. The cumulative required federal minimum average annual flow is 400 cfs, based on the sum of the minimum required flow from lakes Pokegama, Sandy, Cross, and Gull. The MDNR has low-flow guidelines to maintain a minimum instantaneous flow of 270 cfs whenever the same four reservoirs are above a specified elevation. However, the state guideline is secondary to maintaining the federal operating limits. (NMC 2005)

The U.S. Army Corps of Engineers (USACE) and the U.S. Forest Service performed a joint long-range reservoir operating plan evaluation. The primary purpose of the study was to evaluate alternative plans for each of the existing reservoirs and improve system-wide operations of the Mississippi headwaters reservoirs. (NMC 2005) The St. Paul District of the USACE adopted an updated operating plan for the Mississippi River. The USACE amended the regulations to delete all references to minimum flows to eliminate any conflict between the regulations and the water control manuals that guide operations at the Mississippi River headwaters reservoirs. (78 FR 78717)

Water from the Mississippi River is withdrawn through an approach channel excavated to elevation 896 feet msl. The approach channel, angled at 81° to the shoreline, is formed by sheet pile structures that are 98 feet apart and extend 59 feet into the Mississippi River. The width of the approach is reduced to approximately 63 feet, and water enters the intake over a 62.67-foot-wide concrete sill at 899 feet msl, which is equipped with a 12.5-foot-wide stop log section in the center of the sill. The sill serves as a sediment barrier; during very low river levels, the stop log can be removed to allow unobstructed water flow onto a concrete apron at 895.5 feet msl, which extends across the width of the approach and 16 feet upstream of the bar rack. After entering over the sill, the water passes through a bar rack equipped with a motor-operated bar rack rake that prevents large debris from entering the intake structure. (NMC 2005)

The circulating water system utilizes two half-capacity (140,000 gpm rated at 27.8 feet total discharge head) circulating water pumps mounted over each suction chamber of the intake structure. These pumps are designed to circulate 292,000 gpm of cooling water through the main condenser. However, as mentioned earlier in this section, intake is limited to 290,000 gpm by the water appropriation permit. Effluent from the condenser and the service water system is piped approximately 600 feet via two 108-inch steel pipes to the discharge structure. (NMC 2005)

The discharge structure is located approximately 700 feet east of the intake structure. It is constructed of reinforced concrete and measures approximately 50 feet by 54 feet and 38 feet high and is equipped with two isolation and two sluice gates. The roof of the structure is approximately 5 feet above grade, and the lower floor (898 feet msl) supports two cooling tower pumps. Motor-operated sluice gates to the discharge canal are provided to isolate the discharge structure from the discharge canal. During open-cycle operation, the sluice gates are open, and the circulating water is returned to the Mississippi River via the discharge canal. The discharge canal abuts the main discharge structure at 900 feet msl. It is laid on a 0.25 percent slope in an easterly direction and extends approximately 1,000 feet where it enters the Mississippi River. The south bank of the canal has provisions to receive discharges from the cooling towers. In 1980, an overflow weir was added to the discharge canal that permits the normal outflow of cooling water, re-establishes the previously existing shoreline of the Mississippi River, and inhibits fish from entering the canal. The discharge weir consists of an earth-filled dike and a vertical sheet-pile overflow section. The top of the dike (920 feet msl) is 22 feet wide, and the sides of the dike have a 3 to 1 slope. (NMC 2005)

The crest level of the 54-foot-wide weir structure is at 910 feet msl. The water elevation in the discharge canal is at 912.5 feet msl; therefore, the height of the overflow is 2.5 feet. When the water is at this level, the overflow section discharges at a rate of 645 cfs to the Mississippi River. To prevent scouring below the discharge, a 20-foot-long concrete apron was built on the downstream side of the sheet pile wall, and a 50-foot-long rip-rap apron was built downstream of the concrete apron. The top of the concrete apron and the rip-rap section are at 897 feet msl. (NMC 2005)

MNGP utilizes two MDCTs as needed to meet surface water appropriation limits and thermal discharge limits. Two half-capacity (145,000 gpm rated at 57.5 feet total discharge head) cooling tower pumps at the discharge structure are used to divert cooling water to the towers. The pumps are designed to operate in series with the circulating water pumps, delivering 151,000 gpm to each tower. (NMC 2005)

3.6.1.1 Potential for Flooding

The MNGP site includes approximately 2 miles of frontage on the north and south banks of the Mississippi River. (NMC 2005) The topography of the MNGP site is characterized by relatively level bluffs which rise sharply above the river. Three distinct bluffs exist at the plant site at elevations 920, 930, and 940 feet above msl. Normal river elevation is 905 feet msl, and the maximum reported flood elevation is at 916 feet msl. (Xcel 2020a) The spring flood of 1965 exceeds all flood flows on record to date. The stage at the site was about 916 feet msl for an estimated flow of 51,000 ft^3/second. The 1,000-year flood has an estimated stage of 920 feet msl. (Xcel 2020a)

Water movements passing the site are subject to large variations in the course of a year. Plant design with respect to operation and liquid waste disposal takes into account large variations in water flow from less than 200 cfs to flood level up to plant grade (about 930 feet msl), which is well above record historical floods. (Xcel 2020a)

Based on Federal Emergency Management Agency (FEMA) data, the active plant area of the MNGP property is located in floodway areas along the Mississippi River with an area of 0.2 percent annual chance floodplain and a special flood hazards area. The remainder of the MNGP property has been determined as outside the 0.2 percent annual chance floodplain. (Figure 3.6-2) (FEMA 2021)

3.6.1.2 Surface Water Discharges

3.6.1.2.1 MPCA-Permitted Outfalls

NPDES permit No. MN0000868, issued by the MPCA on June 29, 2009, authorizes the discharge of wastewaters into state waters. This permit is currently administratively extended. An application for renewal was submitted and received March 29, 2012. (Attachment A) Water used for condenser cooling is cooled by cooling towers and the discharge canal prior to discharge to meet the permitted thermal effluent limitations during specified periods of the year. The plant cooling waters are discharged, at times via cooling towers, to the plant discharge canal. Surface discharge station SD00l represents the plant discharge out of the canal. The canal discharges to the Mississippi River from a discharge structure designed to dissipate energy and prohibit fish entry into the discharge canal. Surface discharge station SD003 represents the discharge from the waste holdup pond, also referred to as the retention pond. The holdup pond receives reverse osmosis system wastewater, building drain waters, heating boiler blowdown, diesel generator cooling water, filter backwashes, and occasional fire protection waters. After meeting permit discharge limitations, holdup pond discharge SD003 is routed to the discharge canal. Surface discharge S004 represents the turbine building normal waste discharge from the heating boiler deaerator, water-box scavenging system drainage, lube oil seal water, reverse osmosis system wastewater, and miscellaneous floor and area drainage.

After meeting permit discharge limitations, SD004 is discharged to the plant intake area located adjacent to the Mississippi River. Surface discharge SD005 includes the plant intake screen wash water and is discharged to the Mississippi River. Surface discharge SD006 consists of the stormwater runoff from the plant yard, periodic fire protection system water, plant intake screen wash water during impingement studies, and may also include roof drainage. Sediment cleaning of plant cooling water systems is managed in the site's dredged material facilities, which also entails upland placement.

Chemical additives are used in various systems at the plant including boiler feedwaters, cooling water treatment, and other miscellaneous uses. Chemical disinfection of various waste streams is authorized in the NPDES permit for the purpose of controlling problems associated with microbiological activity, as well as problematic conditions that could result from the presence of zebra mussels in MNGP's water systems. Biocide and scale control chemicals are utilized in accordance with all use and discharge requirements, including provisions of the NPDES permit issued to the MNGP site, as well as provisions established in plant-specific requests approved by the MPCA under the NPDES permit. Compliance with NPDES permit limits for discharge of these biocides and associated residuals is ensured through controlled application protocols and monitoring. (NMC 2005) The MPCA has reviewed and approved of these chemical additives, which are on file at the facility. New chemical additives or changes in dosages of chemicals additives must be approved by the MPCA in accordance with the permit.

Process wastewaters are monitored and discharged to the Mississippi River via NPDES Outfall SD-001 in accordance with the MNGP NPDES Permit No. MN00000868 (Attachment A). The current NPDES permit authorizes discharges from five outfalls (one external outfall and four internal outfalls). The Outfall SD001 is depicted in Figure 3.6-3, and the associated effluent limits for Outfall SD001 and the four internal outfalls are listed in Table 3.6-1.

3.6.1.2.2 Stormwater Runoff

The site occupies a bluff which forms the southwest bank of the Mississippi River. Several flat alluvial terraces comprise the main topographical features on the property. These terraces lie at average elevations of 930 and 918 feet msl and, in general, slope very slightly away from the river. Surface run-off tends to collect in the depression at the south end of the terrace where it is bounded by higher ground, then flow easterly to the river. (Xcel 2020a; NMC 2005) The surface drainage for the MNGP site is generally northwesterly on the northern part of the site towards the Mississippi River and is generally easterly on the eastern side of MNGP.

Stormwater discharges associated with MNGP industrial activities are regulated and controlled through the NPDES Permit No. MN00000868 issued by the MPCA. Xcel Energy also maintains and implements an SWPPP that identifies potential sources of pollution, such as erosion, that would reasonably be expected to affect the quality of stormwater and identifies BMPs that will be used to prevent or reduce the pollutants in stormwater discharges.

MNGP conducts screening for pollutants through visual observations as specified in the SWPPP. MNGP conducts bi-monthly inspections of stormwater drainage areas for evidence of pollutants entering the drainage system with one annual inspection (when stormwater is draining from the facility) at stormwater outfalls that receive runoff from the entire industrial area. In addition to routine inspections and visual monitoring, MNGP documents in an annual report all stormwater management issues, and corrective measures taken throughout the reporting period.

3.6.1.2.3 Sanitary Wastewaters

The sanitary sewer system at MNGP removes wastewater from lavatories, showers, and sinks in onsite buildings and carries it to the City of Monticello sanitary sewage disposal system. Originally, the plant utilized an onsite septic tank soil absorption system for the treatment and disposal of sewage. A lift station and forced main were installed in 1983 to connect the plant to the City of Monticello's sanitary sewer system, and the septic tank and drain field were closed. (NMC 2005)

Discharges from the MNGP sanitary sewer system to the City of Monticello sanitary sewer system is covered under a sanitary sewer wastewater discharge agreement with the City of Monticello. The plant also applies specific wastewater at approved locations at the plant site. These wastewaters are generated intermittently and may consist of wash waters from steam cleaning, equipment cleaning, heat exchanger cleaning, and other miscellaneous wash waters.

The current agreement between MNGP and the City of Monticello requires no groundwater monitoring at the site. Plant effluent is discharged to the Mississippi River. All discharges are monitored and regulated under the NPDES permit.

3.6.1.2.4 Dredging

MNGP conducts hydraulic dredging periodically with annual reports submitted to the MPCA. During 2021, MNGP conducted hydraulic dredging on the concrete apron in the area behind the bar rack in front of the traveling screen bays/service water bays and mechanical dredging from the intake bay. The hydraulically removed dredge spoils are pumped to a 20 cubic yard dumpster where a booster pump is used to pump the decant liquid to a permitted concrete dewatering basin. The effluent from that basin is routed to the cooling tower basin and eventually through NPDES Outfall SD001 as indicated in NPDES Permit No. MN00000868. Additionally, mechanical dredging was conducted between the bar racks and intersection of the intake canal and river. As listed in Table 9.1-1, the dredging was permitted by the MDNR and the USACE. As in past years, dredge material will be reused for fill at Xcel Energy's Sherco generating plant.

Sediment removed (dredged material) consists primarily of silt, sand, and rocks. Dredge material typically includes a maximum of 600 cubic yards of sediment from the intake bay which is removed either mechanically or hydraulically approximately every two years, and a maximum of 350 cubic yards of sediment from the traveling screen bay/service water bay area which is removed hydraulically approximately every 12-18 months. The volume of dredge material may vary with the possibility of more material being removed depending on river water quality and sediment characteristics. Mechanically dredged material, and at times small volumes of hydraulic cleaning sediment from cooling systems, are taken directly upland for dewatering and reuse as mentioned above (at the Sherco generating plant) for fill. Hydraulically dredged material and material from cooling system cleaning is placed in a permitted concrete dewatering basin with multiple storage cells. Effluent from the dewatering basin is routed to the cooling tower basin and eventually to the discharge canal where it constitutes part of SD001.

3.6.1.2.5 Compliance History

As presented in Chapter 9, over the period of 2016 to August 2022, there have been no NOVs, or non-compliances associated with MNGP wastewater discharges to receiving surface waters.

3.6.1.2.6 Water Temperatures Reporting

Cooling water intake and discharge water temperatures for the cooling unit are measured by MNGP and the raw data averaged for each month. The averaged values for 2016 through 2021 are plotted in Figure 3.6-4 (intake) and Figure 3.6-5 (discharge).

Water used for condenser cooling is cooled by cooling towers and the discharge canal prior to discharge to meet the permitted thermal effluent limitations during specified periods of the year. Temperature of the discharged cooling water is limited by the NPDES permit which specifies maximum daily average temperature at the end of the discharge canal depending on the month: 95°F in April through October; 85°F in November and March; and 80°F from December through February. (NRC 2006b) Based on past temperature records, the average Mississippi River temperature for the summer months is 71°F. (Xcel 2020a)

Because of possible low stream flow conditions, and high natural river water temperatures, two cooling towers are included in the plant design in order to meet the standards of the MPCA. At times of extremely low flow, the plant operates on a closed cycle and the makeup requirement of about 54 ft^3/sec is withdrawn from the river. This closed cycle operation is rarely required and is conducted only for very short periods of time. At times of substantial flow and high ambient river temperature conditions, the cooling tower may be employed to control the temperature of discharged water. (Xcel 2020a)

All existing cooling towers are operated whenever the ambient river temperature measured at some point unaffected by the plant's discharge is consistently at or above 20°C (68°F), except in the event the cooling towers are out of service due to equipment failure or performance of maintenance to prevent equipment failure. (Xcel 2020a)

3.6.2 Groundwater Resources

3.6.2.1 Groundwater Aquifers

The regional water table lies approximately 25 to 40 feet below the surface within the fill, terrace deposits, glacial outwash, and/or glacial till. Groundwater movement is generally from upland areas toward the Mississippi River. Thus, regional flow (south and west of the Mississippi River) is northeast toward the river. However, flow may vary locally due to discharge of groundwater to smaller streams or lakes. Hydraulic gradients within outwash and terrace deposits tend to be lower than those observed within glacial till due to the higher permeability of the materials (i.e., sand and gravel). With the exception of the southeasternmost portion of the Mississippi and Sauk River watershed, most of the groundwater used in the region comes from wells set in the glacial drift. Water-bearing zones within the glacial drift vary in thickness and aerial extent. Yields of several hundred gpm are common within outwash/terrace deposits with yields of up to 1,000 gpm attainable if sufficient saturated thickness is present.

The principal deep groundwater aquifer in the region of MNGP site occurs in the underlying Precambrian/Cambrian sandstone and is known as the Mount Simon-Hinckley aquifer. The sandstone is supported by underlying bedrock of deeply weathered granite. The granite bedrock surface is irregular, slopes generally to the east or southeast, is non-porous, and has poor water-bearing capacity in relation to that of the overlying sandstone and unconsolidated sediments. Groundwater movement in the granitic rocks is extremely slow. In certain areas within the MNGP site, the sandstone has been completely eroded, leaving weathered granitic rocks in contact with the overlying upper unconsolidated glacial sediments. The sandstone overlying the bedrock varies in thickness from 10 to 25 feet at the site and thickens toward the east. The hydraulic conductivity of the sandstone is approximately 10 feet per day according to laboratory tests conducted on rock extracted from exploration test borings. (NMC 2005)

In the site vicinity, the general direction of deep groundwater flow is to the southeast. The regional hydrologic gradient, therefore, broadly parallels the trend of the topography and the principal surface drainage. (NMC 2005)

Few wells are set in the undifferentiated igneous and metamorphic rocks that underlie glacial deposits and/or thin, discontinuous sandstone across much of the region. Those that do typically yield no more than tens of gpm because the fractures and joints that are present are small and poorly interconnected. In general, the bedrock surface generally slopes toward the Mississippi River. Within this trough-shaped low is a relatively narrow bedrock valley that may be continuous for the length of the river. Wells set in the sandstones of the Mount Simon-Hinckley-Fond du Lac aquifer to the southeast of MNGP are known for producing large quantities of water (up to several thousand gpm).

The MNGP site is underlain by unconsolidated deposits that extend to depths of approximately 40 to 110 feet. The uppermost unconsolidated deposits consist of fluvial terrace deposits associated with the Mississippi River, which are underlain by glaciofluvial outwash deposits and clayey glacial till. In general, the water table aquifer at MNGP is unconfined and occurs within the fill, terrace deposits, or glacial outwash. The saturated thickness of this aquifer is approximately 15 feet thick and extends to the lower till layer. Discontinuous sedimentary bedrock consisting of sandstone and shale is encountered below the unconsolidated glacial deposits (till layer). This weathered sandstone (sedimentary bedrock) is a confined aquifer. Granitic bedrock is encountered below the sedimentary bedrock, except where the sedimentary rock has been completely eroded and the granitic bedrock is the first bedrock encountered.

Over most of the site, and in the vicinity of the MNGP buildings, the water table occurs at depths of approximately 10 to 40 feet below ground surface within the sandy terrace or outwash deposits. On the western side of MNGP, near the river, the water table appears to occur in the lower permeability glacial till deposits. The onsite water supply wells have been developed in the surficial outwash deposits, buried outwash deposits, and in the deeper sandstone formations above the granitic bedrock.

3.6.2.2 Hydraulic Properties

The hydraulic conductivity of Mississippi River sediments (i.e., the capability of the sediment material to transmit water) was estimated to range from 27.4 feet per day to 2,740 feet per day based on laboratory tests of soil and rock extracted from exploration borings taken at the MNGP site. The USGS performed aquifer tests and collected samples at various locations in a 960 square-mile area of central Minnesota during a study of the Sand Plains in Benton, Sherburne, Stearns, and Wright counties. The resulting hydraulic conductivities ranged from 30 to 660 feet per day and the specific yield for the unconfined aquifer ranged from 0.01 to 0.32 with an average value of 0.17. The aquifer test nearest to the MNGP site was a well four miles to the northwest. The hydraulic conductivity at this location was 420 feet per day and the specific yield was 0.29. A hydraulic conductivity of 274 feet per day, which falls in the middle of the laboratory range established for unconsolidated material at MNGP, and is consistent with values obtained by the USGS, was used for calculating the transmissivity of the surficial aquifer at the MNGP site. (NMC 2005)

Hydraulic conductivity values were evaluated for the water table wells at MNGP and ranged from 2.84 feet per day (MW-3) to 71.23 feet per day (MW-7). MW-8 located 3,000 feet south of the reactor building had a hydraulic conductivity value of 139.5 feet per day. Values for the water table wells were fairly consistent and fell within the expected values for the geologic materials of this type. Values for the deep wells were 20.56 feet per day at MW-12B and 19.48 feet per day at MW-13B. The values for the deep wells were also fairly consistent and fell within expected values. These data are summarized below.

The water table aquifer was present within the terrace/upper till deposits across MNGP with a saturated thickness of approximately 15 feet. Groundwater flow direction was determined to be primarily north/northeast during investigation activities. Groundwater flows approximately 0.5 feet per day on average when the hydraulic gradient is low (i.e., 0.00083 on November 17, 2009). Vertical hydraulic gradients evaluated during the fall/winter of 2009 do not appear high enough to influence the migration of contamination potentially vertically. The reactor building and intake structure bisect all unconsolidated materials to bedrock surface and are therefore constructed well below the water table, which appears to influence groundwater flow around those structures.

Below the clay till present across most of MNGP is a confined aquifer within a thin deposit of weathered and competent sandstone. Groundwater flow direction in this aquifer is to the north/northeast, which is similar to the water table aquifer flow direction. Flow velocities appear to be slightly higher in the deep, confined aquifer at around one foot per day. Flow volumes are less than 200 cubic feet per day, which are significantly lower than the water table aquifer, mostly because the minimal saturated thickness estimated for that formation.

Transmissivity is the rate of flow through a vertical section of an aquifer one foot wide and extending the full saturated thickness of an aquifer. Flow volumes were calculated for MNGP and ranged from a low of 54.5 ft^3/day at MW-3 to a high 1,367.6 ft^3/day at MW-7. Flow volume south of MNGP was 2,678.4 ft^3/day at MW-8. Hydraulic conductivity, flow velocity, and flow volume values for each monitoring well are presented in Table 3.6-2.

3.6.2.3 Potentiometric Surfaces

The general path of deep groundwater flow is to the southeast across the region surrounding the site for the plant. The regional gradient, therefore, broadly parallels the trend of the topography and the principal surface drainage. Groundwater at shallower depths moves toward the Mississippi River or its tributaries at variable gradients depending on local conditions. (Xcel 2020a)

The water table beneath the low terraces which border the Mississippi River usually lies at about river elevation and slopes very slightly toward the river during periods of normal stream flow. Such is the case at the site. (Xcel 2020a)

Movement of groundwater takes place within the three principal rock and soil materials at the site. In the decomposed, clayey granitic rocks, which are very low in permeability relative to the overlying materials, the rate of groundwater movement is extremely slow. (Xcel 2020a)

The water table in the area surrounding the plant site ranges from about 908 feet msl to about 942 feet msl, with the site itself at approximately 908 feet msl. With the normal river at about 905 feet msl, groundwater flow is to the river. This usual case of groundwater flow to the river may not exist during floods. (Xcel 2020a)

The dominant groundwater flow direction at MNGP is generally to the north in the vicinity of the reactor and turbine buildings. In months with typical water levels, the groundwater contours appear to bend slightly near these structures due the presence of the structures, the change from mostly outwash to the east to mostly clayey till to the west, and the curvature of the river. Groundwater flow is slightly more northwest in the area west of the buildings and is slightly more northeast on the east side of the structures. When the Mississippi River is trending higher, gradients begin to flatten, and the flow direction will eventually reverse if the river rises above the water table. The apparent groundwater flow direction in the deep unconsolidated deposits and weathered bedrock appears similar to, or slightly more easterly, than the flow direction at the water table.

Contour maps of the shallow groundwater based on water level data collected in June 2020 and December 2020 as part of the NEI's groundwater protection initiative (GPI) program is provided as Figure 3.6-7 and Figure 3.6-8, respectively. Groundwater generally flows north across the MNGP site to the Mississippi River.

3.6.2.4 Groundwater Protection Program

In May 2006, the NEI implemented the GPI, an industry-wide voluntary effort to enhance nuclear power plant operators' management of groundwater protection (NEI 2007).

Industry implementation of the GPI identifies actions to improve licensee management and response to instances when the inadvertent release of radioactive substances may result in detectable levels of plant-related materials in subsurface soils and water, and also describes communication of those instances to external stakeholders. Aspects addressed by the initiative include site hydrology and geology, site risk assessment, onsite groundwater monitoring, and remediation. In August 2007, NEI published updated guidance on implementing the GPI as NEI 07-07, "Industry Ground Water Protection Initiative-Final Guidance Document" (NEI 2007). This guidance was further updated in February 2019. The purpose of NEI 07-07 is to improve the management of situations involving inadvertent radiological releases that get into groundwater and to improve communications with external stakeholders to enhance trust and confidence on the part of local communities, states, the NRC, and the public in the nuclear industry's commitment to a high standard of public radiation safety and protection of the environment. (NEI 2019a) The initiative sets forth voluntary requirements for evaluating and monitoring SSCs with a high risk of impacting groundwater. Additionally, the guidance specifies reporting requirements for onsite groundwater sample results that exceed REMP reporting thresholds and that all onsite groundwater results are reported in either the ARERRs or annual radiological environmental operating reports. (Xcel 2021d)

In 2008, Xcel Energy implemented a Ground Water Protection Program (GWPP). This initiative was developed to ensure timely and effective management of situations involving inadvertent releases of licensed material to groundwater. As part of this program, MNGP monitors 19 wells (including 15 water table wells and four deeper monitoring wells which are nested with a corresponding water table well). No gamma or difficult-to-detect radionuclides, other than naturally occurring radionuclides, were identified in well samples between 2016 and 2020. Groundwater quality is further described in Section 3.6.4.2.

In conjunction with the GPI, MNGP monitors groundwater from a total of 20 onsite locations (19 groundwater monitoring wells and a stormwater drain) for potential radioactive releases to groundwater, environmental conditions, and groundwater elevation in accordance with MNGP procedures. Figure 3.6-6 shows locations of the 19 groundwater monitoring wells with construction details presented in Table 3.6-3.

3.6.2.5 Sole Source Aquifers

A sole source aquifer (SSA), as defined by the EPA, is an aquifer that supplies at least 50 percent of the drinking water consumed by the area overlying the aquifer, and there is no reasonably available alternative drinking water source should the aquifer become contaminated. The SSA program was created by the U.S. Congress as part of the Safe Drinking Water Act and exists to protect of these resources. (EPA 2021c)

MNGP is located in EPA Region 5, which has oversight responsibilities for the public water supply in Minnesota, Wisconsin, Michigan, Illinois, Indiana, Ohio, and 35 tribal nations. The EPA has designated five aquifers in Region 5 as SSAs, one of which is located in Minnesota. This SSA, the Mille Lacs aquifer, is located approximately 49 miles north of MNGP. Therefore, MNGP's property is not situated over any of these designated SSAs. (EPA 2021c)

3.6.3 Water Use

3.6.3.1 Surface Water Use

The nearest domestic water supply reservoir with a free surface open to the air is the Minneapolis Water Works reservoir. This reservoir is located north of Minneapolis and is about 37 miles from MNGP. St. Paul uses a chain of lakes in its water supply system. These lakes, located north of St. Paul, are about 40 miles from MNGP. The major supply of water for these reservoirs is the Mississippi River. The St. Paul intake is about 33 river miles from MNGP, and the Minneapolis intake is about 37 miles from MNGP. (Xcel 2020a)

Between 1960 and 1980, recreational use of the reach of river near Monticello has increased significantly. River water is used for irrigation in a limited way between MNGP and Minneapolis. Twenty-six water appropriation permits have been issued by the MDNR for this reach of the river. At Elk River, the river water is permitted for cooling purposes for a former electric generating plant. (Xcel 2020a)

Surface water withdrawn from the Mississippi River is used at MNGP for condenser cooling, service water cooling, screen wash, and fire protection. Under typical river conditions, the circulating water system removes heat from the Monticello condenser by the once-through circulating water system. Under certain discharge canal temperature, river temperature, and river flow conditions, the circulating water system can utilize the two MDCTs in partial or complete recirculation of the cooling water in compliance with permit limits. The operating modes for the circulating water system are required by the NPDES permit discharge limits and the surface water appropriations permit. (NRC 2006b)

Surface water withdrawals are governed by water appropriation limits set by the MDNR. Under water appropriations permit No. 66-1172, MNGP may withdraw a maximum of 645 cfs (approximately 290,000 gpm) of water from the Mississippi River. Tables 3.6-4a and 3.6-4b show annual and monthly surface water withdrawals for MNGP from 2016–2020. Special operating conditions are applicable if river flow at MNGP is less than 860 cfs, and further restrictions apply if river flow is less than 240 cfs. (NMC 2005)

Heat is removed from the condenser by the circulating water system where water is drawn and discharged to the Mississippi River. MNGP is also equipped with two MDCTs enabling complete or partial recirculation of the cooling water when conditions require. River water is withdrawn through an approach channel excavated to elevation 896 feet msl. The approach channel, angled at 81° to the shoreline, is formed by sheet pile structures that are 98 feet apart and extend 59 feet into the Mississippi River. The width of the approach is reduced to approximately 63 feet, and water enters the intake over a 62.67-foot-wide concrete sill at 899 feet msl, which is equipped with a 12.5-foot-wide stop log section in the center of the sill. The sill serves as a sediment barrier and during very low river levels, the stop log can be removed to allow unobstructed water flow onto a concrete apron at 895.5 feet msl, which extends across the width of the approach and 16 feet upstream of the bar rack. After entering over the sill, the water passes through a bar rack equipped with a motor-operated bar rack rake that prevents large debris from entering the intake structure. (NMC 2005)

The circulating water system utilizes two half-capacity (140,000 gpm rated at 27.8 feet total discharge head) circulating water pumps mounted over each suction chamber of the intake structure. These pumps are designed to circulate 292,000 gpm of cooling water through the main condenser. Effluent from the condenser and the service water system is piped approximately 600 feet via two 108-inch steel pipes to the discharge structure. (NMC 2005)

The discharge structure is located approximately 700 feet east of the intake structure. It is constructed of reinforced concrete and measures approximately 50 feet by 54 feet and 38 feet high and is equipped with two isolation and two sluice gates. The roof of the structure is approximately five feet above grade, and the lower floor (898 feet msl) supports two cooling tower pumps. Motor-operated sluice gates to the discharge canal are provided to isolate the discharge structure from the discharge canal. During open-cycle operation, the sluice gates are open, and the circulating water is returned to the Mississippi River via the discharge canal. The discharge canal abuts the main discharge structure at 900 feet msl. It is laid on a 0.25 percent slope in an easterly direction and extends approximately 1,000 feet where it enters the Mississippi River. The south bank of the canal has provisions to receive discharges from the cooling towers. In 1980, an overflow weir was added to the discharge canal that permits the normal outflow of cooling water, re-establishes the previously existing shoreline of the Mississippi River, and inhibits fish from entering the canal. The discharge weir consists of an earth-filled dike and a vertical sheet-pile overflow section. The top of the dike (920 feet msl) is 22 feet wide, and the sides of the dike have a 3 to 1 slope. (NMC 2005)

The crest level of the 54-foot-wide weir structure is at 910 feet msl. The water elevation in the discharge canal is at 912.5 feet msl; therefore, the height of the overflow is 2.5 feet. When the water is at this level, the overflow section discharges at a rate of 645 cfs to the Mississippi River. To prevent scouring below the discharge, a 20-foot-long concrete apron was built on the downstream side of the sheet pile wall, and a 50-foot-long rip-rap apron was built downstream of the concrete apron. The top of the concrete apron and the rip-rap section are at 897 feet msl. (NMC 2005)

MNGP utilizes two MDCTs, as needed, to meet surface water appropriation limits and thermal discharge limits. Two half-capacity (145,000 gpm rated at 57.5 feet total discharge head) cooling tower pumps located at the discharge structure are used to divert cooling water to the towers. The pumps are designed to operate in series with the circulating water pumps, delivering 151,000 gpm to each tower. (NMC 2005)

In 2015, total surface water withdrawals in Wright County were reported as 315.31 million gallons per day (MGD), of which 315.06 MGD was used for power generation and 0.13 MGD was used for irrigation. The total surface water withdrawals in Sherburne County to the north were reported as 53.53 MGD, of which 53.30 MGD was withdrawn for power generation, 0.15 MGD for mining, and 0.8 MGD for irrigation, with no reported domestic or public supply uses. (USGS 2021b) Estimated Use Summaries of surface water use in Wright County and Sherburne County are presented in Table 3.6-5.

3.6.3.2 Groundwater Use

Large supplies of groundwater are available from the Mississippi River sediments, the glacial deposits, and the underlying sandstones in the area. Most of the private wells in the area are shallow and penetrate either the river alluvium or the glacial deposits. The town of Monticello derives its water supply from a well approximately 237 feet deep, which is believed to penetrate sandstone aquifers. The communities of Big Lake, Albertville, and Elk River also recover water from this formation. (Xcel 2020a)

The closest public water supply wells are the City of Monticello wells. These wells are 16 inches in diameter and 250 feet deep. The 1,200-gpm capacity is limited by the installed pumps. The wells have been tested to 2,000 gpm. They are located in the City of Monticello. (Xcel 2020a)

The wells, which obtain their water from the drift, are recharged by local precipitation, while the wells which withdraw water from the bedrock are recharged by precipitation where the bedrock is at or near the land surface. The largest increment of recharge occurs during the spring thaw. (Xcel 2020a)

As noted in Section 3.6.3.1, water used at the plant for condenser cooling, service water cooling, screen wash, and fire protection is withdrawn from the Mississippi River. The MNGP domestic water supply relies on groundwater via onsite wells. The surface water and groundwater withdrawals are governed by water appropriation limits set by the MDNR under water appropriations permit No. 66-1172. Under an amended water appropriations permit No. 67-0083, MNGP may withdraw up to a total of 20 million gallons per year (gpy), which is approximately 38 gpm, for the domestic water system with a withdrawal rate of 200 gpm of groundwater via two onsite water supply wells: Well 2 (Unique Well #236025, Well #11) and Well 4 (Unique Well #218039, Well #12). The wells, manifolded together and each equipped with a 100-gpm pump, are regulated by the MDNR under this single water appropriations permit to withdraw a maximum combined total withdrawal rate of 100 gpm. The domestic water system supplies raw water to the reverse osmosis/make-up demineralizer system used to produce purified water for the plant primary systems and seal water to pumps located at the plant intake structure. The domestic water system also supplies the water for potable use, including drinking water, lavatories, and showers at MNGP. (NMC 2005) Actual usage for the two water supply wells averaged less than 11.5 million gpy from 2016–2020, as presented in Table 3.6-6a. Monthly withdrawals from 2016–2020 are shown in Table 3.6-6b.

There are seven onsite active water supply wells at MNGP. A summary of the MNGP water supply wells is in Table 3.6-7, and the well locations are shown on Figure 3.6-6. Water supply Wells 1 and 10 were decommissioned and sealed in 2020. Well 1 was replaced by Well 13 which was installed in December 2020.

The five other water supply wells are serviced by 20-50 gpm pumps and provide domestic water on an as-needed basis to a warehouse and the site administration building (SAB). Annual usage for these wells is less than one million gpy, or less than 1.9 gpm; therefore, water appropriation permits are not required by MDNR. (NMC 2005)

There are currently no discharges to groundwater from MNGP requiring permits by regulatory agencies.

In 2015, groundwater withdrawals in Wright County were reported as 28.24 MGD with 14.12 MGD withdrawal for power generation, 8.09 MGD for public water supply and 3.26 MGD domestic self-supplied water, 1.72 MGD for irrigation, 0.72 MGD for livestock, 0.26 MGD for industrial self-supplied water, and 0.07 MGD for mining. The total groundwater withdrawals in Sherburne County were reported as 54.3 MGD, of which 27.15 MGD was withdrawn for power generation, 18.28 MGD for irrigation, 4.95 MGD for public water supply, 2.69 MGD domestic self-supplied water, 0.34 MGD for mining, and 0.17 MGD for livestock. (USGS 2021b) Groundwater use in Wright County and Sherburne County is summarized in Table 3.6-8.

A list of 129 offsite registered groundwater wells within a 2-mile radius of the MNGP center point is depicted in Figure 3.6-9 and presented in Table 3.6-9. The majority of these wells withdraw groundwater from the Quaternary buried artesian aquifer and are primarily used for domestic purposes. The closest well to the MNGP property (#159969) is located 0.6 miles to the southwest of the MNGP center point and is listed as a domestic water well.

3.6.4 Water Quality

3.6.4.1 Surface Water Quality

As presented in Section 3.6.1, MNGP is located in the City of Monticello and on the southern bank of the Mississippi River. Section 305(b) requires each state to report every two years to the EPA on the condition of its surface waters, and Section 303(d) requires each state to report on its impaired water bodies (those not meeting water quality standards). A review of the MPCA's 2020 303(d) list of impaired waters (EPA 2021d) included the following impaired waters within a 6-mile radius:

- Snake River, AUID# 07010203-539, aquatic recreation, *Escherichia coli* (*E. coli*)
- Elk River, AUID# 070010203-548, aquatic recreation, *E. coli*
- Silver Creek, AUID# 07010203-557, aquatic life, benthic macroinvertebrates bioassessments, dissolved oxygen, fish bioassessments
- Elk River, AUID# 07010203-579, aquatic life, fish bioassessment
- St Francis River, AUID# 07010203-702, aquatic life, fish bioassessments
- Mississippi River, AUID# 07010203-729, aquatic consumption, polychlorinated biphenyls (PCBs) in fish tissue, aquatic recreation fecal coliform

The known permitted discharges to the Mississippi River are limited to those from the existing unit. These sources and permitted discharge limits are described in the NPDES permit. MNGP is in compliance with its NPDES permit, discussed in Section 3.6.1.2.1, and does not contribute to these impairments. The MDNR classifies the portion of the Mississippi River adjacent to the plant as suitable for aquatic recreation, including fishing and swimming, as well as for protection as a drinking water source. (NMC 2005)

3.6.4.2 Groundwater Quality

Shallow wells in outwash and alluvial deposits supply water for many farms and residences in the surrounding countryside. The water usually is generally very mineral rich containing calcium, magnesium, and bicarbonates, with small amounts of sodium, potassium, sulfates, and chlorides. (NMC 2005) Dissolved solids decrease from the southwest to the northeast across the watershed. Dissolved solids ranging from 150–250 milligrams per liter (mg/L) are common within outwash/terrace deposits. Groundwater within the watershed is typically hard (121 to 180 mg/L) to very hard (greater than 180 mg/L). Groundwater within outwash/terrace deposits tends to be on the lower end of the range. In addition, the groundwater typically contains high iron and manganese.

Onsite groundwater is monitored at MNGP in accordance with the guidance presented in NEI 07-07, as discussed in Section 3.6.2.4 (Xcel 2021d). MNGP monitors groundwater for tritium as part of the GWPP. The groundwater monitoring wells are sampled at different frequencies ranging from monthly to quarterly to annually. Table 3.6-10 summarizes the current (since June 2018) sampling frequencies for groundwater monitoring wells at MNGP. Wells are monitored once annually for tritium and gamma-emitting nuclides that have historically had background levels and are unlikely to become impacted. Wells that have historically had tritium levels detected near background levels but are more likely to include activity from leaks or spills are monitored quarterly for tritium and gamma-emitting nuclides. The remaining wells are monitored more frequently to ensure that high-risk SSCs are adequately monitored, and existing activity is characterized with sufficient resolution; these wells are monitored monthly for tritium and quarterly for gamma-emitting nuclides. Several groundwater monitoring wells have been designated as sentinel wells and are monitored to indicate if radioactive material were migrating offsite into the Mississippi River; these wells are bolded in Table 3.6-10. (Xcel 2021d)

Additional sampling performed under the guidance of the GWPP includes sampling water from storm drains. These samples periodically indicate elevated tritium activities due to recapture of tritium from gaseous effluents. Rain and snow samples taken onsite indicate that tritium is commonly detected in rainwater at concentrations historically ranging from approximately 200 picoCuries per liter (pCi/L) to nearly 1,000 pCi/L. The highest detected concentrations of tritium in rain and snow samples around MNGP have approached 2,000 pCi/L, far below the drinking water limit of 20,000 pCi/l. (Xcel 2021d)

Historically, monitoring well MW-9A has indicated elevated tritium levels that vary seasonally since 2009. It is understood that there is likely a plume of water containing tritium under the turbine building that moves tritium activity into, and out from, the monitoring well depending upon the hydraulic gradient at the time of sampling; the plume appears to be stagnant under the turbine building, based on results from surrounding wells. Evidence indicates that the activity in the plume originated from process water containing tritium that migrated through the turbine building concrete base-mat. Sources of tritium to the turbine building base-mat were thoroughly evaluated in MNGP's corrective action program and all potential contributors were corrected during the 2011 refueling outage. Corrective actions taken included lining sumps and discontinuing use of embedded piping identified as potential sources of the tritium found in the plume. (Xcel 2017; Xcel 2021d)

Tritium is also regularly identified in samples from MW-10. Levels of tritium activity in this well are more consistent throughout the year and at a significantly lower level than the levels of activity observed in MW-9A. During 2021, two samples from MW-10 were identified as having tritium above background with an average concentration of approximately 164 pCi/L. (Xcel 2022a)

From 2016–2021, groundwater samples were collected from selected monitoring wells onsite and analyzed for radionuclides to detect potential impacts to groundwater from inadvertent leaks or spills. Results for 2021 indicate that monitoring well MW-9A contained tritium activities ranging from 8,220 ± 409 pCi/l to <223 pCi/l. All other monitoring wells indicated activities at less than 300 pCi/l, indicating that the plume extent is confined to the MNGP site. No gamma-emitting isotopes were identified in groundwater samples during 2021. As discussed in Section 3.6.2.4, no plant-related gamma isotopes or hard-to-detect radionuclides have been detected in groundwater samples during 2021. (Xcel 2017; Xcel 2018; Xcel 2019; Xcel 2020b; Xcel 2021d, Xcel 2022a)

The lower limit of detection (LLD) for groundwater monitoring of tritium at MNGP during 2021 was less than 300 pCi/L, in accordance with MNGP's processes and procedures; this LLD is far below the required REMP LLD (2,000 pCi/L) and very far below the REMP reporting threshold for water samples (20,000 pCi/L). MNGP has chosen to use this low LLD to quickly identify and characterize any potential contamination sources. The LLD as reported represents the activity at which there is a 95 percent chance that a sample containing that level of activity would be characterized as detected with only a 5 percent chance that the sample would be characterized as a blank. (Xcel 2022a)

Xcel Energy's groundwater monitoring program has established a baseline threshold level for tritium, defined as the 95 percent confidence level determined using Student's t and a statistical mean of ten or more sample results; at this level, a sample would be considered to be statistically different from background, based on analytical results. For wells that consistently indicate near or below LLD, the baseline threshold level is 400 pCi/l. The program also provides an action level of three times the baseline threshold level, or 1,200 pCi/l for these wells; at this level, additional action is taken to evaluate the cause of the change in activity and work through the corrective action process to address the concern. No statistically significant concentrations of tritium were identified in sentinel wells in 2021; therefore, no tritium discharge to groundwater was reported. (Xcel 2022a)

Industrial practices at MNGP involving the use of chemicals are associated with painting, cleaning of parts/equipment, refueling of onsite vehicles/generators, fuel oil and gasoline storage, and the storage and use of water treatment additives. The use and storage of chemicals at MNGP is controlled in accordance with Xcel Energy procedures and site-specific spill prevention plans. In addition, as presented in Section 2.2.7, nonradioactive waste is managed in accordance with MNGP's waste management procedure, which contains preparedness and prevention control measures.

3.6.4.2.1 History of Radioactive Releases

Low-level radioactive gases, liquids, and solids are routine byproducts of nuclear power plant operation. Radioactive waste management systems, commonly called radwaste systems, collect, process, and either recycle or dispose of these radioactive materials. The design and operation of the radwaste systems are regulated by the NRC. As part of normal operation of the plant, radioactive material must sometimes be discharged to the environment. Such discharges are also regulated by the NRC, and submittal of annual reports to the NRC detailing the amounts and compositions of radwaste discharged intentionally or accidentally from their facilities is required. The EPA has a separate regulation that limits the radioactivity of drinking water. This regulation sets a maximum allowed concentration for each radionuclide in drinking water, including a maximum radioactivity concentration of 20,000 pCi/L for tritium, a radioactive form of hydrogen produced by power plants. There are no planned MNGP tritium releases discharged during normal, procedurally controlled, operations (outages, maintenance activities, normal discharges) into the Mississippi River. However, as discussed in Section 3.6.4.2, since at least 2009, tritium has been measured in the groundwater. Tritium detections for groundwater samples collected in 2016–2021 ranged from non-detect to 8,220 pCi/L (Well 9A in 2021) far below the drinking water limit of 20,000 pCi/L limit (Xcel 2017; Xcel 2022a).

3.6.4.2.2 History of Nonradioactive Releases

Based on review of MNGP records from 2016–2021, there have been two inadvertent nonradioactive releases. These are described below.

MDH NOV

During routine sampling by the Minnesota Department of Health (MDH), carbon tetrachloride was detected at Well 10, which supplied the water for the security access facility (SAF). On discovery of the carbon tetrachloride impact, MDH began taking quarterly samples from the well to assess compliance with drinking water standards. On August 4, 2016, MDH issued an NOV for a carbon tetrachloride exceedance of 13.5 micrograms per liter (µg/L) (average level for June 18, 2016, water sample and previous quarter water sample) which is above the maximum contaminant level of 5.4 µg/L. While levels varied over time, Well 10 was eventually determined to be out of compliance with the Safe Drinking Water Act maximum contaminant level for carbon tetrachloride based on the results of a four-period moving average, which was over the limit of 5.4 µg/l carbon tetrachloride. As an initial response to the carbon tetrachloride impact, MNGP stopped using the well for drinking water and food preparation and posted signage indicating that the water was not suitable for potable uses per MDH public notification requirements. On March 20, 2018, NSPM entered into a compliance agreement with the MDH which included a timeline for developing a compliant water supply for the SAF.

After assessing the MNGP water supply wells, it was determined that Well 1, the water supply well for the SAB, would be a suitable alternative, and the engineering work to extend the water line to the SAF began. The connection was completed in October 2018 and MDH issued a letter of compliance on November 21, 2018. MDH referred MNGP to the MPCA for follow-up on the carbon tetrachloride exceedance. MNGP was entered into the federal Superfund Program as a voluntary responsible party on April 11, 2018.

In 2018, a limited site investigation was conducted in conjunction with the MPCA and voluntary responsible party to address the water quality issues in the vicinity of Well 10. The carbon tetrachloride contamination appears to be limited to the vicinity of Well 10 and decommissioning of the well has effectively eliminated the only known point of potential exposure. Given the hydrogeologic setting and limited extent of contamination, it is unlikely that additional receptors are at risk of exposure. There is also no evidence of past spills or releases that would explain the presence of carbon tetrachloride at Well 10. Plant personnel have also indicated that carbon tetrachloride is not currently being used or held in inventory at the plant.

After reviewing the information provided, a determination was made by the MPCA to take no further action with regard to the identified release and a “no further action” letter was issued on May 1, 2020. The determination is contingent on compliance with the terms and conditions set forth, including the following: sealing Well 10 in accordance with the MDH well code and filing an affidavit on the property stating that no water supply wells will be installed in the area of Well 10 in the future. Well 10 was sealed at the end of 2020.

Reportable Spill

Section 9.5.3.7 provides details for a July 16, 2019, leak from a flange between two valves in the service water sodium hypochlorite injection system. Approximately 300 gallons of water leaked into the building containing the service water and circulating water sodium hypochlorite injections systems. The leak was secured upon discovery and most of the water was contained within the building by a berm. However, approximately a half gallon of water reached a floor drain which returns to the Mississippi River through NPDES permitted Outfall SD001. A completed release sampling report was submitted to the MPCA as part of the July discharge monitoring report for the reporting period covered. No further action was taken or required by the MPCA concerning the spill, and no recordable spills or violations were reported in the NPDES permit compliance summary issued by the MPCA for the reporting period of October 1, 2018, to September 30, 2019.

Table 3.6-1 MPCA Water Quality Monitoring Program (Sheet 1 of 3)

Outfall	Description	Parameter	Permit Requirement	Frequency
SD001	Plant Cooling Water Discharge	Flow Rate	Monitor only, calendar month average in mgd	Estimate 1/month
		Flow Rate	Monitor only, calendar month maximum in mgd	Estimate 1/month
		Flow Rate	Monitor only, calendar month total in MG	Estimate 1/month
		Oxidants, Total Residual (Bromine) Continuous[a]	Monitor only, daily maximum in mg/L	Grab 1/day
		Oxidants, Total Residual (Bromine) Intermittent[a]	Monitor only, instantaneous maximum in mg/L	Grab 1/day
		Oxidants, Total Residual (Chlorine) Continuous[a]	Monitor only, daily maximum in mg/L	Grab 1/day
		Oxidants, Total Residual (Chlorine) Intermittent[a]	Monitor only, instantaneous maximum in mg/L	Grab 1/day
		Phosphorus, Total (as P)	Monitor only, calendar month average in mg/L	Grab 1/month
		Plant Capacity Factor, Percent of Capacity	Monitor only, calendar month average in %	Calculation 1/month
		Temperature, Water[b]	80 °F daily maximum (Dec. – Feb.)	Measurement, continuous 1/day
		Temperature, Water[b]	85 °F daily maximum (March – Nov.)	Measurement, continuous 1/day
		Temperature, Water[b]	95 °F daily maximum (April – Oct.)	Measurement, continuous 1/day
SD003	Hold-up Pond Effluent Discharge	Flow Rate[c]	Monitor only, calendar month average in mgd	Estimate 1/month
		Flow Rate[c]	Monitor only, calendar month maximum in mgd	Estimate 1/month

Table 3.6-1 MPCA Water Quality Monitoring Program (Sheet 2 of 3)

Outfall	Description	Parameter	Permit Requirement	Frequency
		Flow Rate[c]	Monitor only, calendar month total in MG	Estimate 1/month
		pH[d]	9.0 SU calendar month maximum	Grab 1/week
		pH[d]	6.0 SU, calendar month minimum	Grab 1/week
		Phosphorus, Total (as P)[c]	Monitor only, calendar month average in mg/L	Grab 1/month
		Solids, Total Suspended (TSS)[c]	9.9 kg/day, calendar month average	Grab 1/week
		Solids, Total Suspended (TSS)[e]	30 mg/L, calendar month average	Grab 1/week
		Solids, Total Suspended (TSS)[c]	33.2 kg/day, daily maximum	Grab 1/week
		Solids, Total Suspended (TSS)[c]	100 mg/L, daily maximum	Estimate 1/week
SD004	Turbine Building Sump & Miscellaneous Discharge	Flow Rate	Monitor only, calendar month average in mgd	Estimate 1/month
		Flow Rate	Monitor only, calendar month maximum in mgd	Estimate 1/month
		Flow Rate	Monitor only, calendar month total in MG	Estimate 1/month
		Oil & Grease, Total Recoverable (Hexane Extraction)	4.2 kg/day, calendar month average	Grab 1/week
		Oil & Grease, Total Recoverable (Hexane Extraction)	10 mg/L, calendar month average	Grab 1/week
		Oil & Grease, Total Recoverable (Hexane Extraction)	6.3 kg/day, maximum calendar week average	Grab 1/week
		pH[d]	9.0 SU calendar month maximum	Grab 1/week
		pH[d]	6.0 SU, calendar month minimum	Grab 1/week

Table 3.6-1 MPCA Water Quality Monitoring Program (Sheet 3 of 3)

Outfall	Description	Parameter	Permit Requirement	Frequency
		Solids, Total Suspended (TSS)	12.7 kg/day, calendar month average	Grab 1/week
		Solids, Total Suspended (TSS)(f)	30 mg/L, calendar month average	Grab 1/week
		Solids, Total Suspended (TSS)	42.3 kg/day, daily maximum	Grab 1/week
		Solids, Total Suspended (TSS)(f)	100 mg/L, daily maximum	Grab 1/week
SD005, SD006	Screen Backwash Discharge, Screen Backwash & Roof/Yard Drain	Flow Rate	Monitor only, calendar month average in mgd	Estimate 1/month
		Flow Rate	Monitor only, calendar month maximum in mgd	Estimate 1/month
		Flow Rate	Monitor only, calendar month total in MG	Estimate 1/month

a. Total residual oxidants are expressed as chlorine.

b. Limitation applies to the maximum daily average temperature at the end of the discharge canal. Additional thermal discharge limitation requirements are listed in the NPDES permit's Chapter 5, Section 2 (Attachment A).

c. During discharge only.

d. During discharge only. pH is measured as soon as practicable after sample collection and no later than one hour after collection.

e. During discharge only. In addition to the monthly average and daily maximum TSS limitations, the calendar week average concentration shall not exceed 45 mg/l.

f. Calendar week average (seven consecutive days) concentration shall not exceed 45 mg/l.

Table 3.6-2 MNGP Aquifer Data

Well ID	Hydraulic Conductivity Based on Rising Head Tests (feet per day)[(a)]	Flow Velocity (feet per day)[(b)]	Flow Volume (cubic feet per day)[(c)]
MW-1	38.12	0.41	731.9
MW-2	49.23	0.53	945.2
MW-3	2.84	0.16	54.5
MW-4	20.21	0.22	388.0
MW-5	47.23	0.51	906.8
MW-6	65.55	0.71	1,258.6
MW-7	71.23	0.52	1,367.6
MW-8	139.5	1.51	2,678.4
MW-10	18.34	0.20	352.1
MW-11	11.36	0.12	218.1
MW-12A	43.59	0.47	836.9
MW-12B	20.56	0.82	197.4
MW-13A	13.13	0.14	252.1
MW-13B	19.48	1.06	187.0

a. Hydraulic conductivity values calculated in AQTESOLV using slug test data.

b. Flow velocity values calculated by equation 5.18b which is derived from the Darcy equation and using an approximate average gradient of 0.003.

c. Flow volume equals transmissivity multiplied by the hydraulic gradient multiplied by the width of the vertical section through which flow occurs.

d. Aquifer dimensions are estimated to be 20 feet deep by 300 feet wide in water table wells and 10 feet deep by 300 feet wide in confined aquifer.

Table 3.6-3 MNGP Groundwater Monitor Well Details

Well No.	MDNR Unique Well No.	Well Diameter[a]	Elevations (feet msl)					
			Top of Casing	Top of Filter[b]	Top of Screen[b]	Bottom of Screen[b]	Bottom of Filter[b]	Well Construction Material
MW-1	547747	2	930.19	—	912.4	902.4	—	PVC
MW-2	547748	2	923.82	—	907.5	897.5	—	PVC
MW-3	547749	2	919.91	—	911.2	901.22	—	PVC
MW-4	747055	2	927.86	—	909.1	899.1	—	PVC
MW-5	747056	2	942.75	—	912.1	902.1	—	PVC
MW-6	747057	2	933.24	—	910.3	900.3	—	PVC
MW-7	747058	2	922.49.0	—	908.5	898.5	—	PVC
MW-8	747059	2	934.00	—	910.5	900.5	—	PVC
MW-9A	725274	0.7	927.58	913.2	911.2	901.2	911.2	PVC
MW-9B	772326	0.7	927.75	888.5	888.5	883.5	888.5	PVC
MW-10	725272	2	934.69	911.8	909.8	899.8	909.8	PVC
MW-11	725273	2	934.519	911.7	909.7	899.7	909.7	PVC
MW-12A	772328	2	932.14	910.7	908.7	898.7	908.7	PVC
MW-12B	772329	2	932.13	892.6	891.6	886.6	891.6	PVC
MW-13A	772330	2	933.82	909.9	907.9	897.6	907.9	PVC
MW-13B	772331	2	933.81	879.4	878.4	873.4	878.4	PVC
MW-14	778176	2	911.36	—	905.1	902.1	—	Stainless Steel
MW-15A	789990	2	918.67	915.0	913.0	903.0	902.0	PVC
MW-15B	789991	2	918.79	876.5	874.5	869.5	869.5	Stainless Steel

a. Measured in inches.

b. Approximate measurement in feet.

Dashed cells indicate data were not reported.

Table 3.6-4a MNGP Yearly Surface Water Withdrawal Summary

Year		2016	2017	2018	2019	2020	2016–2020
Monthly Maximum	MGM	12,556.64	12,491.13	12,444.93	12,729.14	12,458.47	12,729.14
	gpm_a	281,286.74	279,819.22	278,784.27	285,150.99	279,087.59	285,150.99
Monthly Average	MGM	11,312.88	10,082.04	10,545.34	10,146.09	10,902.06	10,597.68
	gpm_a	257,501.47	230,047.20	239,963.41	231,323.52	248,228.07	241,412.73
Monthly Minimum	MGM	9,073.15	5,746.76	8,444.02	4,686.37	9,395.45	4,686.37
	gpm_a	217,268.92	133,026.85	200,367.16	108,480.79	210,471.55	108,480.79
Yearly Total	MGY	135,754.50	120,984.42	126,544.02	121,753.04	130,824.75	127,172.15
	MGD	370.91	331.46	346.70	333.57	357.44	348.02

MGY = millions of gallons per year

MGD = millions of gallons per day

MGM = millions of gallons per month

gpm_a = gallons per minute for the month

Table 3.6-4b MNGP Monthly Surface Water Withdrawal Summary (Sheet 1 of 2)

Month	Intake (MGM)	Total (gpm)
January-2016	9,706.34	217,435.93
February-2016	9,073.15	217,268.92
March-2016	11,310.89	253,380.15
April-2016	11,708.31	271,025.69
May-2016	12,267.96	274,819.89
June-2016	11,872.00	274,814.81
July-2016	12,483.20	279,641.58
August-2016	12,556.64	281,286.74
September-2016	11,912.77	275,758.56
October-2016	11,832.06	265,055.11
November-2016	11,251.56	260,452.78
December-2016	9,779.62	219,077.51
January-2017	9,311.32	208,586.92
February-2017	8,835.92	219,144.84
March-2017	10,553.19	236,406.59
April-2017	5,746.76	133,026.85
May-2017	7,988.49	178,953.63
June-2017	12,005.84	277,912.96
July-2017	12,491.13	279,819.22
August-2017	12,398.65	277,747.54
September-2017	11,911.86	275,737.50
October-2017	11,579.82	259,404.57
November-2017	9,352.22	216,486.57
December-2017	8,809.22	197,339.16
January-2018	9,055.60	202,858.42
February-2018	8,444.02	202,203.54
March-2018	9,502.16	212,862.01
April-2018	10,271.28	237,761.11
May-2018	12,111.31	271,310.71
June-2018	11,825.18	273,731.02
July-2018	12,444.93	278,784.27
August-2018	12,133.11	271,799.06
September-2018	11,609.72	268,743.52

Table 3.6-4b MNGP Monthly Surface Water Withdrawal Summary (Sheet 2 of 2)

Month	Intake (MGM)	Total (gpm)
October-2018	11,391.43	255,184.36
November-2018	8,810.89	203,955.79
December-2018	8,944.39	200,367.16
January-2019	8,704.82	195,000.45
February-2019	7,976.07	197,819.20
March-2019	9,302.66	208,392.92
April-2019	4,686.37	108,480.79
May-2019	9,467.35	212,082.21
June-2019	12,316.77	285,110.42
July-2019	12,729.14	285,150.99
August-2019	12,594.25	282,129.26
September-2019	12,175.46	281,839.35
October-2019	12,149.53	272,166.89
November-2019	10,054.24	232,737.04
December-2019	9,596.38	214,972.67
January-2020	9,816.93	219,913.31
February-2020	9,458.50	226,496.65
March-2020	10,768.95	241,239.92
April-2020	11,879.88	274,997.22
May-2020	12,255.61	274,543.23
June-2020	11,854.52	274,410.19
July-2020	12,458.47	279,087.59
August-2020	11,888.45	266,318.32
September-2020	10,197.26	236,047.69
October-2020	9,969.80	223,337.81
November-2020	10,880.93	251,873.38
December-2020	9,395.45	210,471.55

MG = millions of gallons

MGM = millions of gallons per month

gpm = gallons per minute for the month

Table 3.6-5 Surface Water Usage Summary in MGD, 2015

Category	Wright County	Sherburne County
Public Supply	0.00	0.00
Domestic, Self-Supplied	0.00	0.00
Industrial, Self-Supplied	0.00	0.00
Irrigation	0.13	0.08
Livestock	0.00	0.00
Aquaculture	0.00	0.00
Mining	0.12	0.15
Power Generation (Thermoelectric)	315.06	53.30
Total	**315.31**	**53.53**

(USGS 2021b)

Table 3.6-6a MNGP Yearly Groundwater Withdrawal Summary – Water Wells 11 (MDH Unique Well No. 236025) and 12 (MDH Unique Well No. 218039)

Year		2016	2017	2018	2019	2020	2016–2020
Monthly Maximum	gals	1,127,836.00	1,314,828.00	1,245,024.00	1,053,679.00	1,249,159.09	1,314,828.00
	gpm_a	26.06	29.45	27.89	23.89	27.98	29.45
Monthly Average	gals	962,236.33	985,007.33	1,004,697.17	892,709.67	928,466.82	954,623.46
	gpm_a	21.90	22.41	22.93	20.37	21.13	21.77
Monthly Minimum	gals	820,636.00	673,500.00	554,547.00	589,909.00	666,272.73	554,547.00
	gpm_a	19.00	15.59	12.84	13.66	15.42	12.84
Yearly Total	gals/yr	11,546,836.00	11,820,088.00	12,056,366.00	10,712,516.00	11,141,601.82	11,455,481.56
	gpd_a	31,635.17	32,383.80	33,031.14	29,349.36	30,441.54	31,350.91

gpd_a = average gallons per day for the month

gpm_a = average gallons per minute for the month

Table 3.6-6b MNGP Monthly Groundwater Withdrawal Summary – Water Wells 11 (MDH Unique Well No. 236025) and 12 (MDH Unique Well No. 218039) (gals) (Sheet 1 of 2)

Month	Water Wells 11 and 12 (gals)	Total (gpm[a])
January-2016	1,003,414.00	22.48
February-2016	844,164.00	20.21
March-2016	940,048.00	21.06
April-2016	832,909.00	19.28
May-2016	867,295.00	19.43
June-2016	1,125,724.00	26.06
July-2016	1,127,836.00	25.27
August-2016	1,106,379.00	24.78
September-2016	820,636.00	19.00
October-2016	941,836.00	21.10
November-2016	994,759.00	23.03
December-2016	941,836.00	21.10
January-2017	1,021,027.00	22.87
February-2017	892,564.00	22.14
March-2017	932,566.00	20.89
April-2017	673,500.00	15.59
May-2017	842,559.00	18.87
June-2017	1,179,682.00	27.31
July-2017	1,146,718.00	25.69
August-2017	1,314,828.00	29.45
September-2017	1,031,182.00	23.87
October-2017	818,259.00	18.33
November-2017	844,862.00	19.56
December-2017	1,122,341.00	25.14
January-2018	1,078,586.00	24.16
February-2018	976,436.00	24.22
March-2018	1,007,500.00	22.57
April-2018	1,070,319.00	24.78
May-2018	1,245,024.00	27.89
June-2018	1,153,773.00	26.71
July-2018	1,135,727.00	25.44
August-2018	1,134,066.00	25.40

Table 3.6-6b MNGP Monthly Groundwater Withdrawal Summary – Water Wells 11 (MDH Unique Well No. 236025) and 12 (MDH Unique Well No. 218039) (gals) (Sheet 2 of 2)

Month	Water Wells 11 and 12 (gals)	Total (gpm_a)
September-2018	554,547.00	12.84
October-2018	873,666.00	19.57
November-2018	875,727.00	20.27
December-2018	950,995.00	21.30
January-2019	1,053,679.00	23.60
February-2019	785,145.00	18.25
March-2019	897,732.00	20.11
April-2019	589,909.00	13.66
May-2019	709,259.00	15.89
June-2019	1,031,864.00	23.89
July-2019	1,008,676.00	22.60
August-2019	1,005,386.00	22.52
September-2019	1,024,773.00	23.72
October-2019	889,593.00	19.93
November-2019	771,000.00	17.85
December-2019	945,500.00	21.18
January-2020	844,590.00	18.92
February-2020	762,173.00	18.25
March-2020	869,972.73	19.49
April-2020	666,272.73	15.42
May-2020	875,162.07	19.60
June-2020	1,155,136.00	26.74
July-2020	1,184,948.28	26.54
August-2020	1,249,159.09	27.98
September-2020	1,071,000.00	24.79
October-2020	808,137.93	18.10
November-2020	779,864.00	18.05
December-2020	875,186.00	19.61

gpm_a = average gallons per minute for the month

Table 3.6-7 MNGP Water Supply Wells

MDH Unique Well No.	MDH Name	Location	Well Depth (feet, bgs)	Principal Aquifer Utilized
197429	Well 1[(a)]	SAB, SAF	80	Buried outwash
236025	Well 2	Well #11, West of Plant–MNGP Admin Building	93	Mt. Simon sandstone
437214	Well 3	MNGP Engineering Building	72	Mt. Simon sandstone
218039	Well 4	Well #12, West of Plant–MNGP Admin Building	80	Mt. Simon sandstone
706817	Well 7	Security Training Facility (Double Wide Trailer)	65	Buried outwash
731132	Well 8	Shipping and Receiving Warehouse	73	Buried outwash
786216	Well 9	Security Training Facility (Shooting Range Building)	38	Buried outwash
778039	Well 10[(a)]	SAF	61	Surficial outwash
849724	Well 13	Replacement for Well 1	80	Buried outwash

a. Wells 1 and 10 have been decommissioned and permanently sealed.

Table 3.6-8 Groundwater Usage Summary in MGD, 2015

Category	Wright County	Sherburne County
Public Supply	8.09	4.95
Domestic, Self-Supplied	3.26	2.69
Industrial, Self-Supplied	0.26	0.72
Irrigation	1.72	18.28
Livestock	0.72	0.17
Aquaculture	0.00	0.00
Mining	0.07	0.34
Power Generation (Thermoelectric)	14.12	27.15
Total	**28.24**	**54.3**

(USGS 2021b)

Table 3.6-9 Registered Offsite Groundwater Wells, 2-Mile Radius from MNGP Center Point (Sheet 1 of 6)

Map ID	MGS Water Well ID	Distance[(a)] (miles)	Well Depth (feet)	Use Description	Aquifer Name
1	159969	0.6	28	Domestic water well	Quaternary water table aquifer
2	569363	0.9	95	Domestic water well	Quaternary buried artesian aquifer
3	458974	0.9	82	Domestic water well	Mt. Simon formation
4	544566	0.9	95	Domestic water well	Quaternary buried artesian aquifer
5	517717	1.0	90	Domestic water well	Quaternary buried artesian aquifer
6	583289	1.0	88	Domestic water well	Quaternary buried artesian aquifer
7	472244	1.0	102	Domestic water well	Quaternary buried artesian aquifer
8	595614	1.0	105	Domestic water well	Mt. Simon formation
9	785282	1.0	69	Domestic water well	(b)
10	496121	1.0	86	Domestic water well	Quaternary buried artesian aquifer
11	459040	1.0	51	Domestic water well	Quaternary buried artesian aquifer
12	836266	1.0	121	Irrigation water well	Quaternary buried artesian aquifer
13	182158	1.0	39	Irrigation water well	Quaternary water table aquifer
14	584445	1.0	81	Domestic water well	Quaternary buried artesian aquifer
15	556090	1.1	68	Domestic water well	Quaternary buried artesian aquifer
16	519909	1.1	116	Domestic water well	Quaternary buried artesian aquifer
17	539752	1.1	78	Domestic water well	Quaternary buried artesian aquifer
18	229642	1.2	73	Irrigation water well	Quaternary water table aquifer
19	506445	1.2	87	Domestic water well	(b)
20	699097	1.2	62	Domestic water well	Quaternary water table aquifer
21	472277	1.3	68	Domestic water well	Quaternary buried artesian aquifer
22	785281	1.3	73	Domestic water well	(b)

Table 3.6-9 Registered Offsite Groundwater Wells, 2-Mile Radius from MNGP Center Point (Sheet 2 of 6)

Map ID	MGS Water Well ID	Distance[a] (miles)	Well Depth (feet)	Use Description	Aquifer Name
23	501282	1.3	65	Domestic water well	Quaternary buried artesian aquifer
24	539759	1.4	75	Domestic water well	Quaternary water table aquifer
25	472276	1.4	68	Domestic water well	Quaternary buried artesian aquifer
26	169573	1.4	40	Domestic water well	Quaternary water table aquifer
27	143510	1.4	65	Domestic water well	Mt. Simon formation
28	145393	1.4	65	Domestic water well	Quaternary buried artesian aquifer
29	459011	1.4	58	Domestic water well	Quaternary water table aquifer
30	415427	1.4	51	Domestic water well	Quaternary water table aquifer
31	777650	1.5	84	Domestic water well	Quaternary buried artesian aquifer
32	155317	1.5	77	Domestic water well	Quaternary buried artesian aquifer
33	155163	1.5	74	Domestic water well	Quaternary buried artesian aquifer
34	574701	1.5	56	Domestic water well	Quaternary buried unconfined aquifer
35	696493	1.5	84	Industrial water well	Quaternary buried artesian aquifer
36	126730	1.5	75	Domestic water well	Quaternary water table aquifer
37	169575	1.5	76	Domestic water well	Quaternary water table aquifer
38	160674	1.5	82	Domestic water well	Quaternary buried artesian aquifer
39	605024	1.5	85	Domestic water well	Mt. Simon formation
40	682381	1.5	63	Domestic water well	Quaternary buried artesian aquifer
41	422381	1.5	58	Domestic water well	Quaternary buried artesian aquifer
42	530043	1.5	63	Commercial water well	Quaternary water table aquifer
43	229643	1.5	88	Irrigation water well	Quaternary buried artesian aquifer
44	459036	1.5	66	Domestic water well	Quaternary water table aquifer

Table 3.6-9 Registered Offsite Groundwater Wells, 2-Mile Radius from MNGP Center Point (Sheet 3 of 6)

Map ID	MGS Water Well ID	Distance[(a)] (miles)	Well Depth (feet)	Use Description	Aquifer Name
45	447286	1.5	67	Domestic water well	Quaternary buried artesian aquifer
46	437592	1.5	65	Domestic water well	Quaternary buried artesian aquifer
47	485333	1.5	56	Domestic water well	Quaternary water table aquifer
48	535313	1.5	58	Domestic water well	Quaternary buried artesian aquifer
49	225852	1.6	95	Irrigation water well	Quaternary buried artesian aquifer
50	656147	1.6	59	Domestic water well	Quaternary water table aquifer
51	186253	1.6	46	Domestic water well	Quaternary buried artesian aquifer
52	462819	1.6	70	Domestic water well	Mt. Simon formation
53	770430	1.6	134	Irrigation water well	Quaternary buried artesian aquifer
54	795512	1.6	83	Irrigation water well	Quaternary water table aquifer
55	593870	1.6	66	Domestic water well	Quaternary water table aquifer
56	140132	1.6	60	Domestic water well	Quaternary water table aquifer
57	502987	1.6	70	Domestic water well	Mt. Simon formation
58	539596	1.6	56	Domestic water well	Quaternary buried artesian aquifer
59	585549	1.6	60	Domestic water well	Quaternary buried artesian aquifer
60	457869	1.6	69	Domestic water well	Quaternary buried artesian aquifer
61	800190	1.7	78	Domestic water well	(b)
62	502512	1.7	97	Irrigation water well	Quaternary water table aquifer
63	186296	1.7	55	Domestic water well	Quaternary water table aquifer
64	434359	1.7	106	Domestic water well	Quaternary buried artesian aquifer
65	420161	1.7	80	Domestic water well	Quaternary water table aquifer
66	107223	1.7	76	Domestic water well	Quaternary water table aquifer

Table 3.6-9 Registered Offsite Groundwater Wells, 2-Mile Radius from MNGP Center Point (Sheet 4 of 6)

Map ID	MGS Water Well ID	Distance[a] (miles)	Well Depth (feet)	Use Description	Aquifer Name
67	619831	1.8	98	Domestic water well	Quaternary buried artesian aquifer
68	537967	1.8	76	Domestic water well	Quaternary buried artesian aquifer
69	401403	1.8	51	Domestic water well	Quaternary buried artesian aquifer
70	447733	1.8	87	Domestic water well	Quaternary water table aquifer
71	587894	1.8	96	Domestic water well	Quaternary water table aquifer
72	183922	1.8	70	Domestic water well	Quaternary buried artesian aquifer
73	188756	1.8	168	Irrigation water well	Quaternary buried artesian aquifer
74	662211	1.8	130	Domestic water well	Quaternary water table aquifer
75	426752	1.8	63	Domestic water well	Quaternary water table aquifer
76	421009	1.8	57	Domestic water well	Quaternary buried artesian aquifer
77	670000	1.8	70	Domestic water well	Quaternary water table aquifer
78	705400	1.8	124	Irrigation water well	Quaternary buried artesian aquifer
79	626288	1.8	74	Industrial water well	Quaternary buried artesian aquifer
80	528643	1.8	94	Domestic water well	Quaternary buried artesian aquifer
81	425466	1.8	65	Domestic water well	Quaternary buried artesian aquifer
82	717858	1.8	89	Domestic water well	Quaternary water table aquifer
83	417679	1.8	84	Domestic water well	Quaternary buried unconfined aquifer
84	460056	1.9	94	Irrigation water well	Quaternary buried artesian aquifer
85	452616	1.9	128	Domestic water well	Quaternary buried artesian aquifer
86	225851	1.9	84	Irrigation water well	Quaternary buried artesian aquifer
87	687115	1.9	107	Domestic water well	Quaternary buried artesian aquifer
88	400265	1.9	71	Domestic water well	Quaternary buried artesian aquifer

Table 3.6-9 Registered Offsite Groundwater Wells, 2-Mile Radius from MNGP Center Point (Sheet 5 of 6)

Map ID	MGS Water Well ID	Distance[(a)] (miles)	Well Depth (feet)	Use Description	Aquifer Name
89	822963	1.9	85	Domestic water well	(b)
90	704127	1.9	110	Domestic water well	Quaternary buried artesian aquifer
91	175452	1.9	56	Domestic water well	Quaternary buried artesian aquifer
92	214549	1.9	197	Irrigation water well	(b)
93	681324	1.9	90	Domestic water well	Quaternary buried artesian aquifer
94	641965	1.9	74	Domestic water well	Quaternary water table aquifer
95	521119	1.9	95	Domestic water well	Quaternary buried artesian aquifer
96	175454	1.9	74	Domestic water well	Quaternary buried artesian aquifer
97	682384	1.9	67	Domestic water well	Quaternary water table aquifer
98	523032	1.9	90	Domestic water well	Quaternary buried artesian aquifer
99	821618	1.9	70	Domestic water well	(b)
100	506571	1.9	117	Domestic water well	Quaternary buried artesian aquifer
101	596588	1.9	95	Domestic water well	Mt. Simon formation
102	593655	1.9	128	Domestic water well	Quaternary buried artesian aquifer
103	698300	1.9	78	Domestic water well	Quaternary water table aquifer
104	594811	1.9	114	Domestic water well	Quaternary buried artesian aquifer
105	655183	1.9	80	Domestic water well	Quaternary water table aquifer
106	515671	1.9	80	Domestic water well	Quaternary water table aquifer
107	550949	1.9	74	Domestic water well	Quaternary buried artesian aquifer
108	635277	1.9	111	Domestic water well	Quaternary water table aquifer
109	427942	1.9	65	Domestic water well	Quaternary buried artesian aquifer
110	707598	2.0	70	Domestic water well	Quaternary water table aquifer

Table 3.6-9 Registered Offsite Groundwater Wells, 2-Mile Radius from MNGP Center Point (Sheet 6 of 6)

Map ID	MGS Water Well ID	Distance[(a)] (miles)	Well Depth (feet)	Use Description	Aquifer Name
111	563679	2.0	140	Irrigation water well	Quaternary buried artesian aquifer
112	503123	2.0	108	Domestic water well	Mt. Simon formation
113	502936	2.0	110	Domestic water well	Quaternary water table aquifer
114	506570	2.0	105	Domestic water well	Quaternary buried artesian aquifer
115	166975	2.0	75	Domestic water well	Quaternary water table aquifer
116	400404	2.0	70	Domestic water well	Quaternary water table aquifer
117	811016	2.0	73	Domestic water well	(b)
118	686557	2.0	68	Domestic water well	Quaternary buried artesian aquifer
119	645845	2.0	71	Domestic water well	Quaternary buried artesian aquifer
120	449899	2.0	74	Domestic water well	Quaternary buried artesian aquifer
121	434369	2.0	80	Domestic water well	Quaternary buried artesian aquifer
122	711437	2.0	93	Domestic water well	Quaternary water table aquifer
123	578823	2.0	74	Industrial water well	Quaternary buried artesian aquifer
124	523216	2.0	110	Domestic water well	Quaternary buried artesian aquifer
125	648532	2.0	78	Domestic water well	Quaternary buried artesian aquifer
126	433892	2.0	82	Domestic water well	Quaternary buried artesian aquifer
127	554651	2.0	105	Industrial water well	Quaternary buried artesian aquifer
128	421125	2.0	80	Domestic water well	Quaternary buried artesian aquifer
129	490713	2.0	65	Domestic water well	Quaternary buried artesian aquifer

a. Distance is from the MNGP center point and rounded to the nearest tenth of a mile. Wells listed are limited to those within a 2-mile radius of the center point.

b. No aquifer name provided.

(MGIO 2021; MPCA 2021c)

Table 3.6-10 Groundwater Monitoring Well Sampling Frequencies

Tritium Sampling Frequency	Number of Wells	Groundwater Monitoring Wells[a]
Quarterly	11	MW-1, **MW-2**, **MW-3**, **MW-4**, MW-9B, MW-11, MW-12A, MW-12B, **MW-14**, **MW-15A**, **MW-15B**
Monthly	4	MW-9A, MW-10, MW-13A, MW-13B
Annual	4	MW-5, MW-6, MW-7, MW-8

a. Locations in **BOLD** typeface are considered sentinel wells.

(Xcel 2021d)

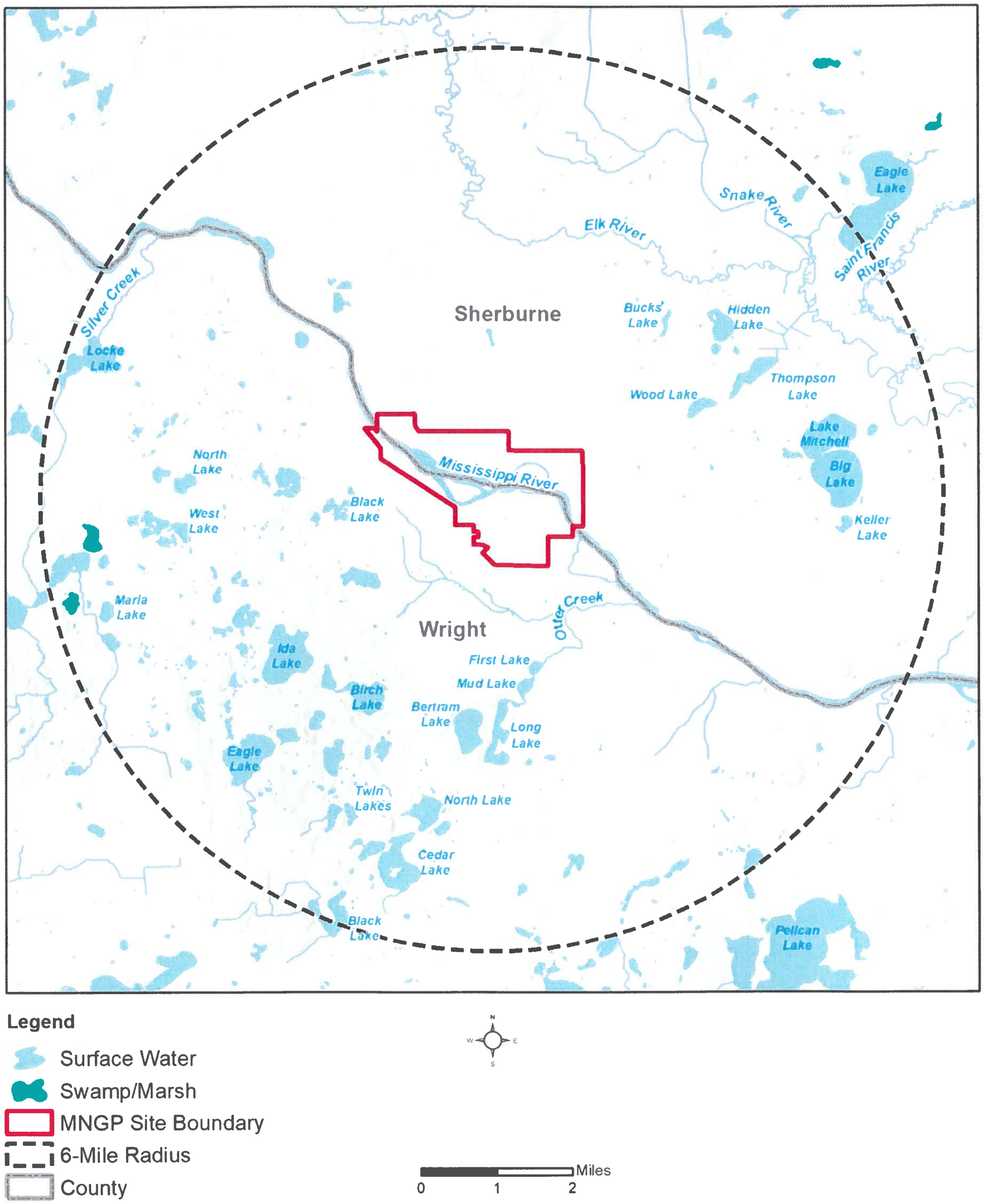
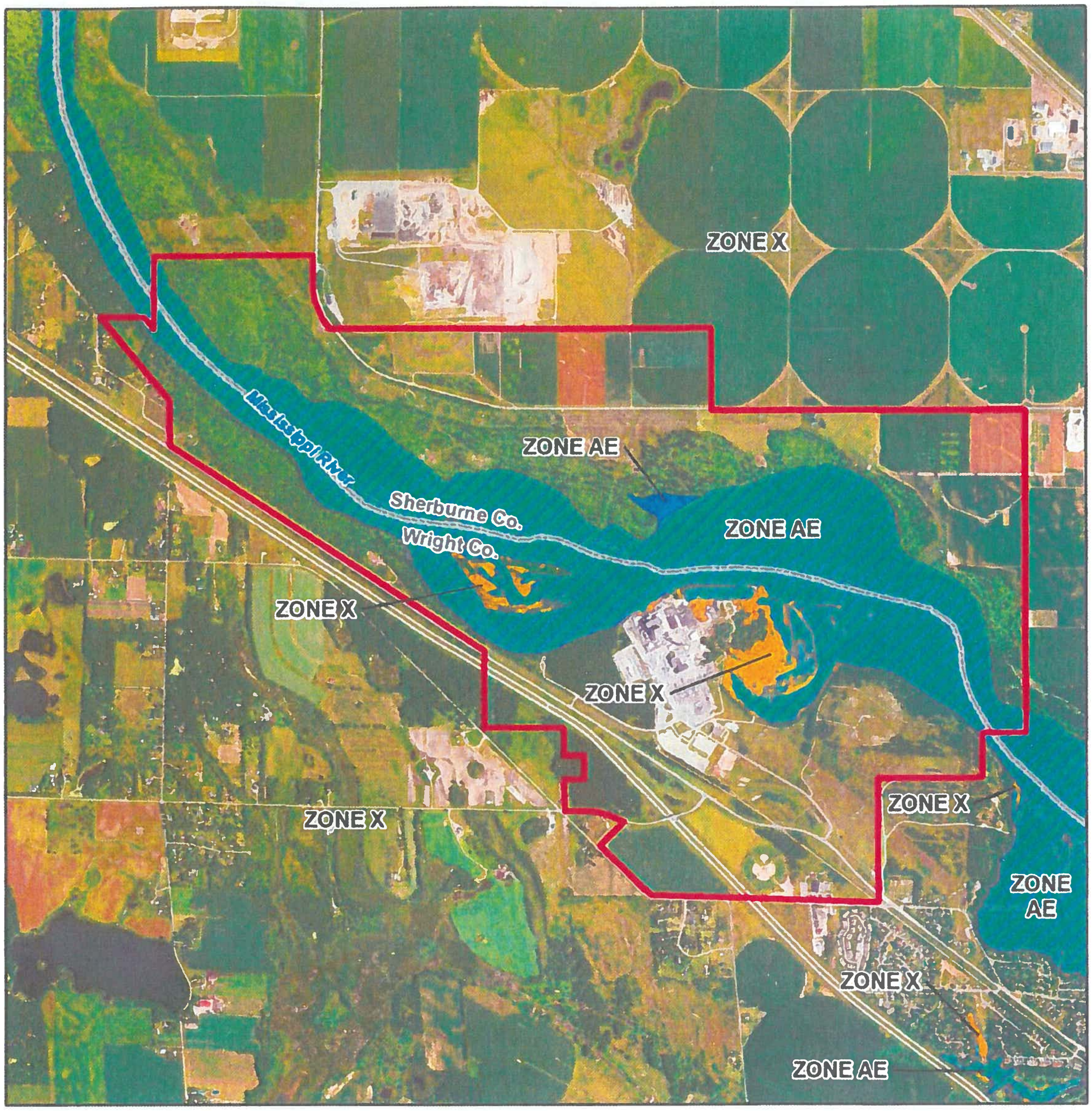


Figure 3.6-1 Hydrological Features in the Vicinity of MNGP



Legend

- MNGP Site Boundary
- ZONE AE - Special Flood Hazard Areas (Base Flood Elevation determined)
- ZONE AE - Floodway areas in ZONE AE (Base Flood Elevation determined)
- ZONE X - Areas of 0.2% annual chance flood hazard
- ZONE X - Areas determined to be outside 0.2% annual chance floodplain

Miles
0 0.25 0.5

Note Wright County FEMA data is considered preliminary as of June 22, 2011

Figure 3.6-2 FEMA Floodplain Zones at MNGP

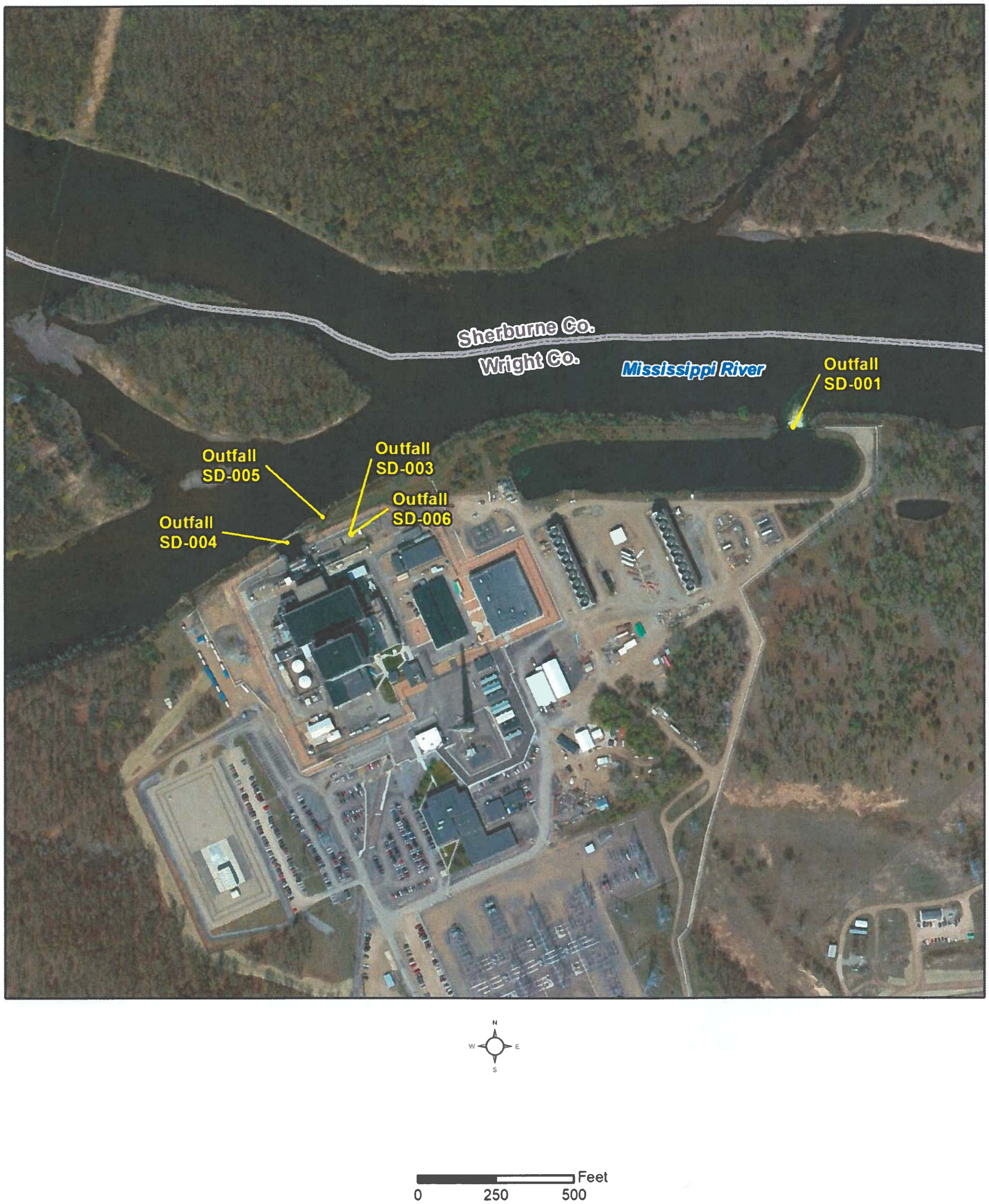


Figure 3.6-3 NPDES Outfalls at MNGP

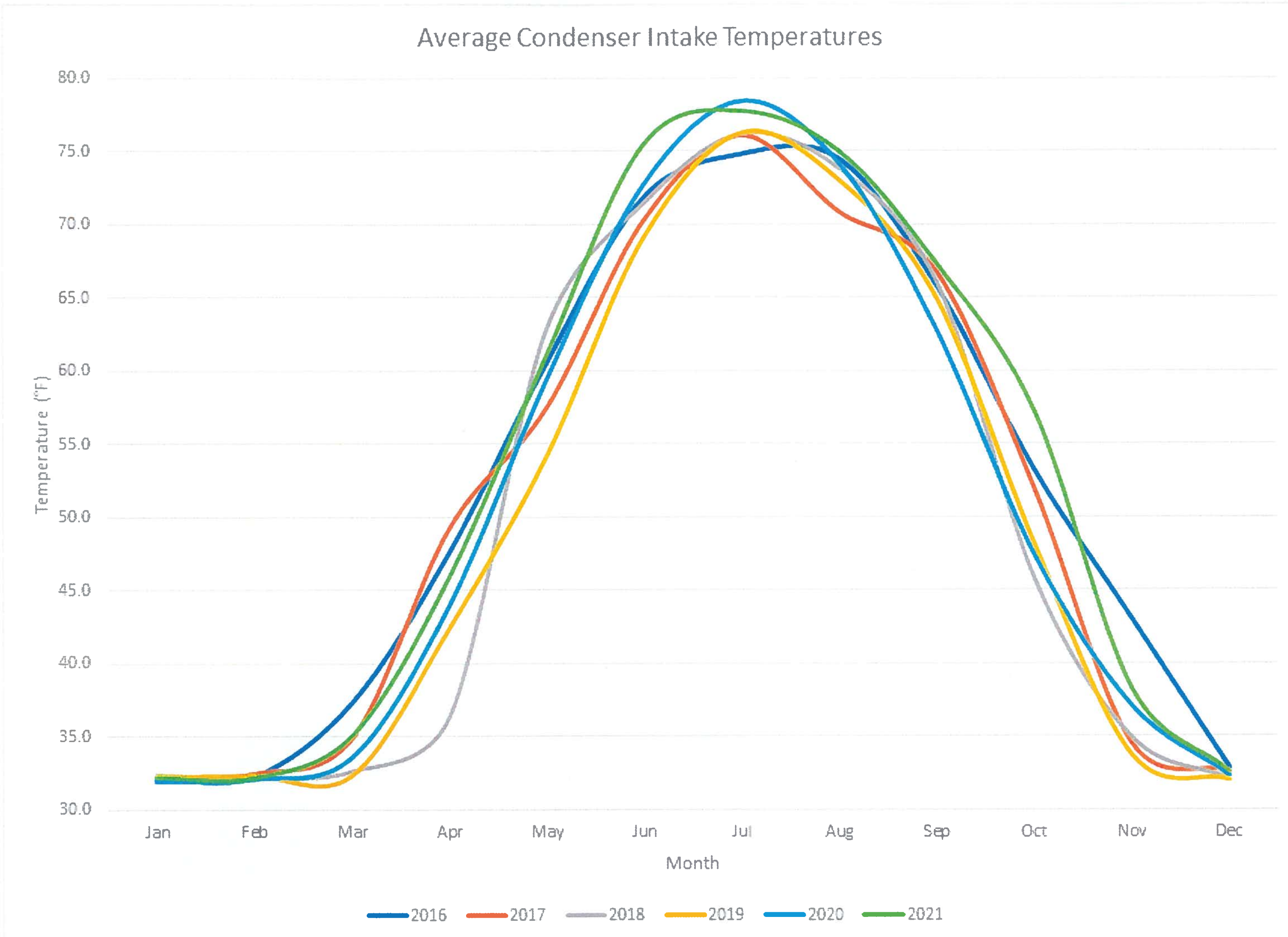


Figure 3.6-4 Average Condenser Intake Temperatures at MNGP

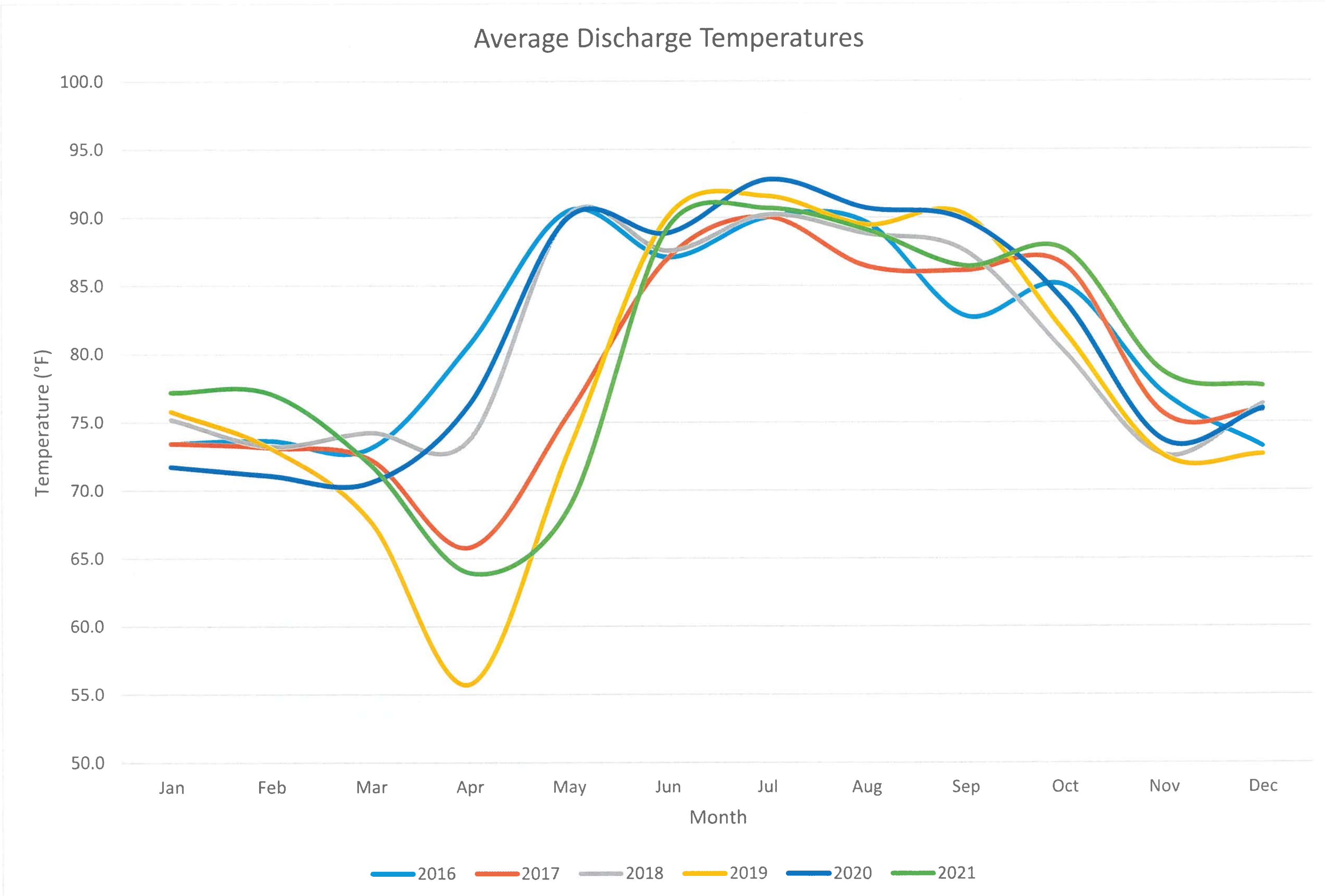
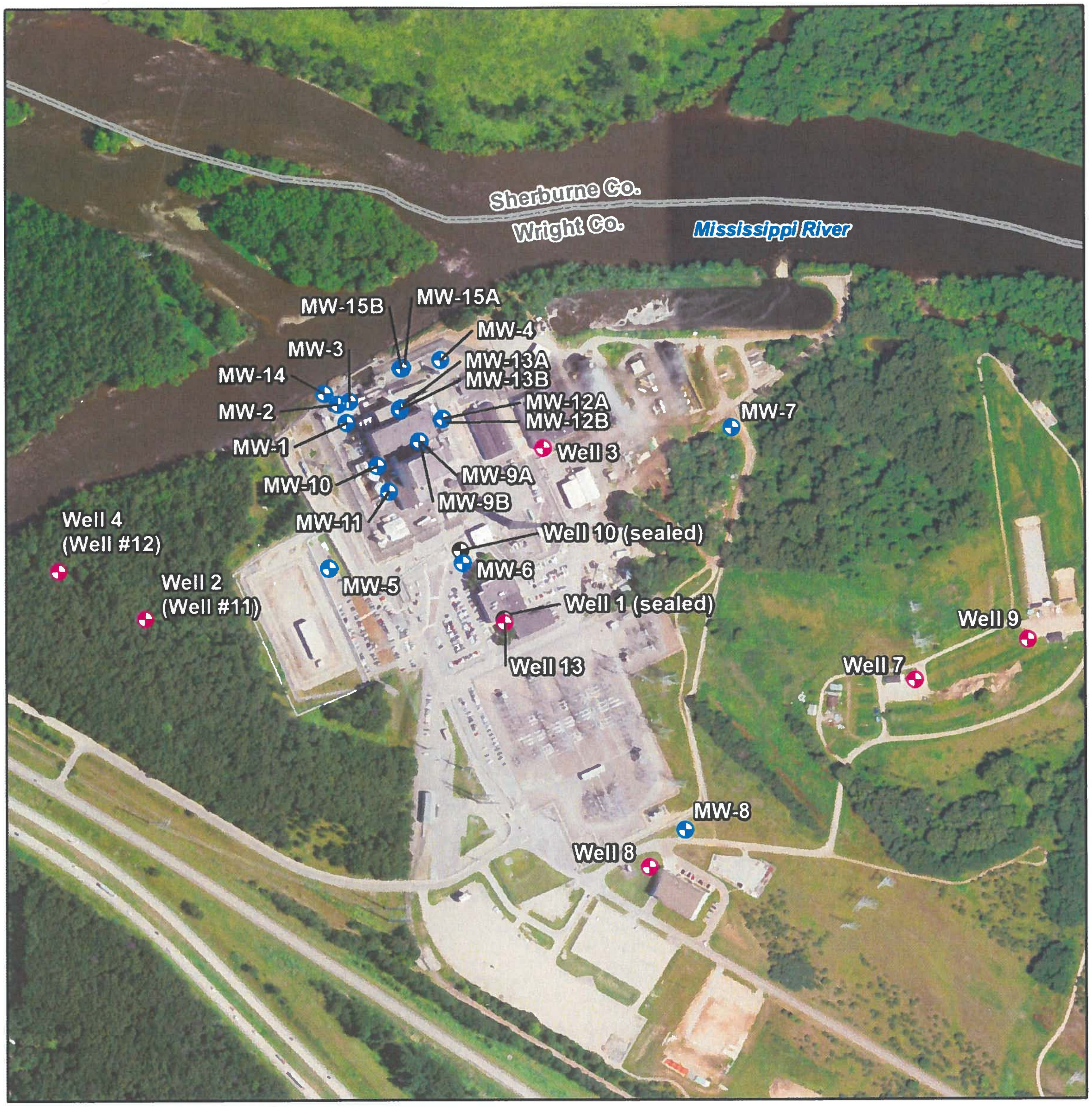


Figure 3.6-5 Average Discharge Temperatures at MNGP



Legend

- Monitoring Well
- Water Supply Well
- Sealed Water Supply Well

N W E S

Feet 0 300 600

Figure 3.6-6 MNGP Onsite Wells

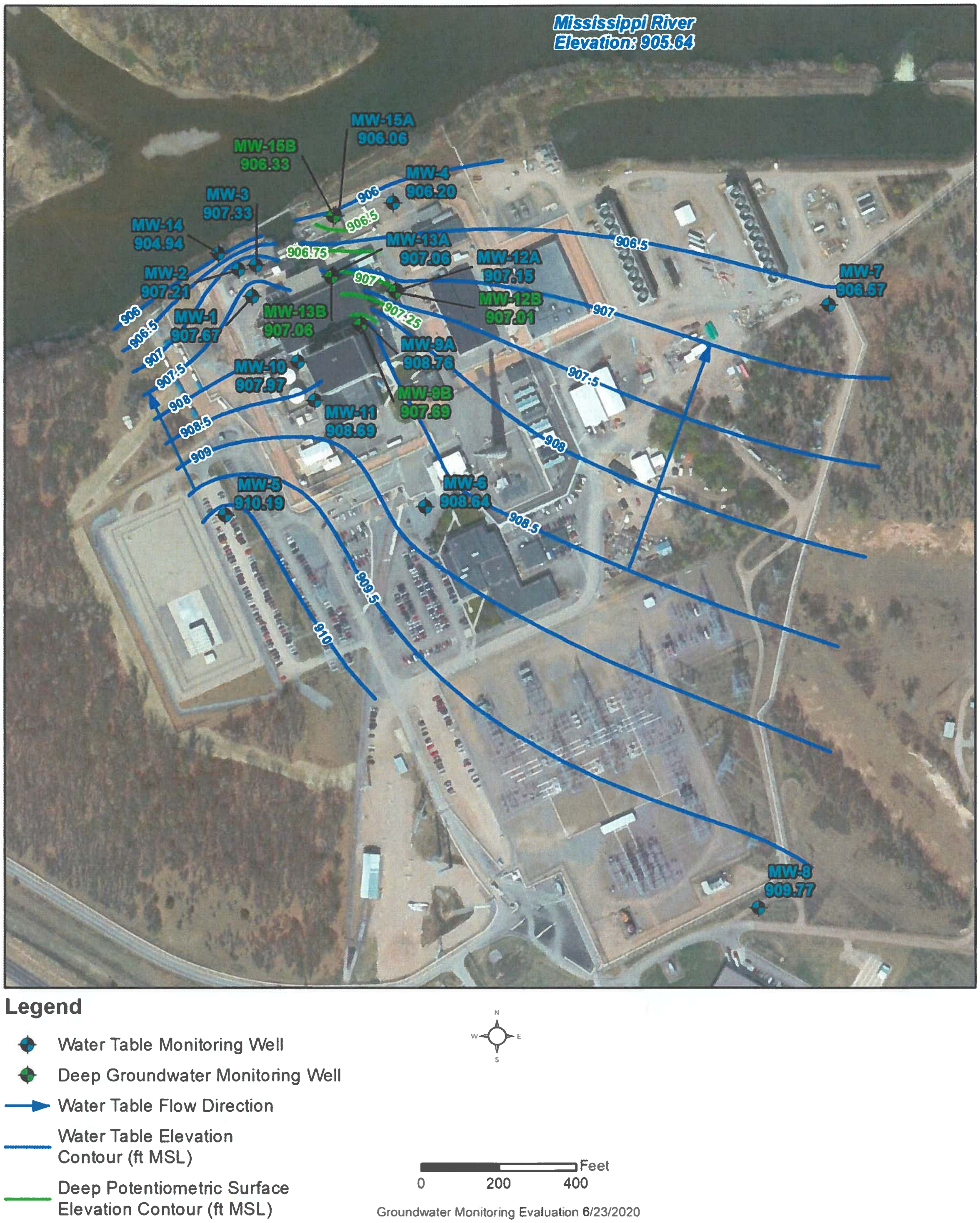


Figure 3.6-7 MNGP Potentiometric Map (June 23, 2020)

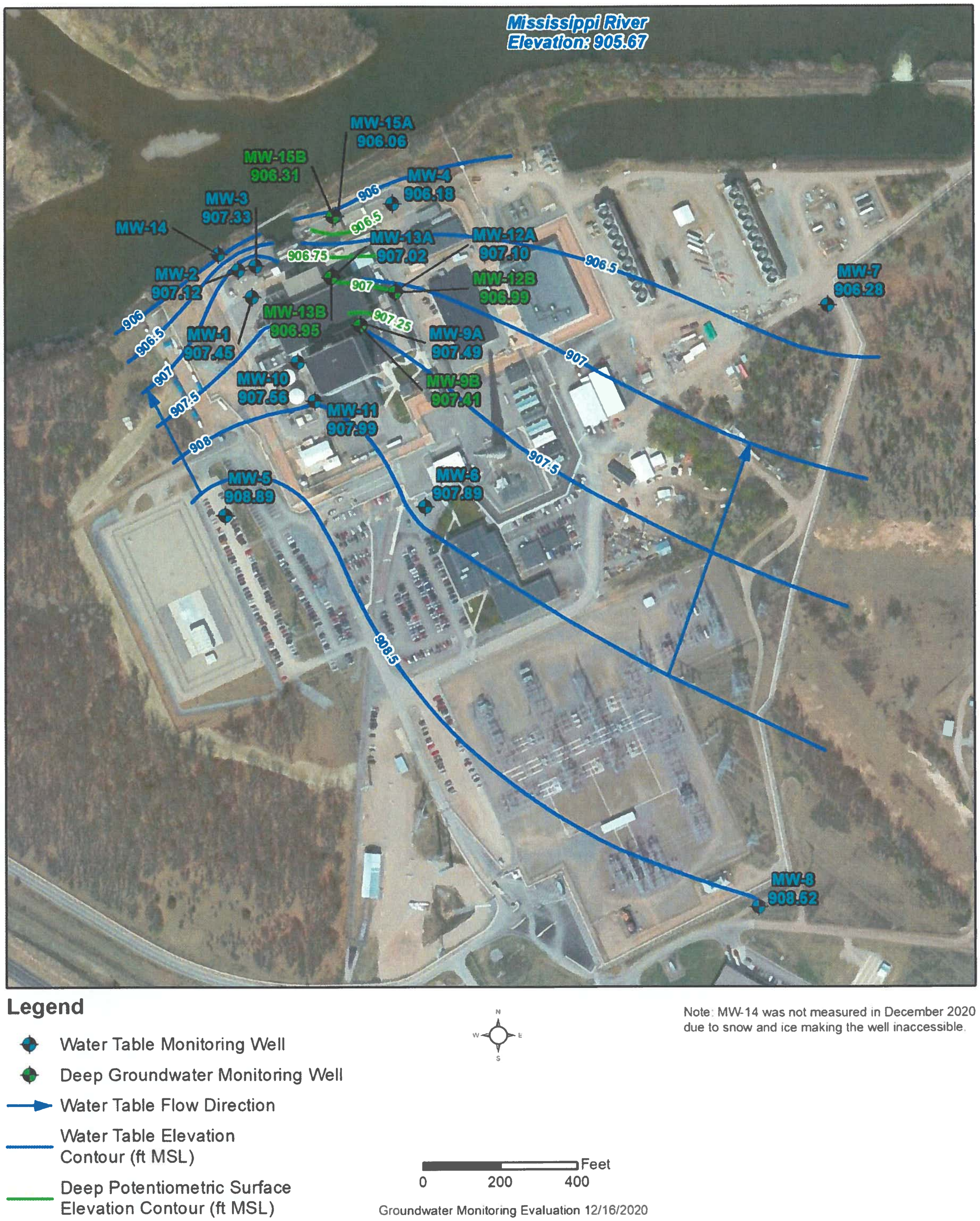


Figure 3.6-8 MNGP Potentiometric Map (December 16, 2020)

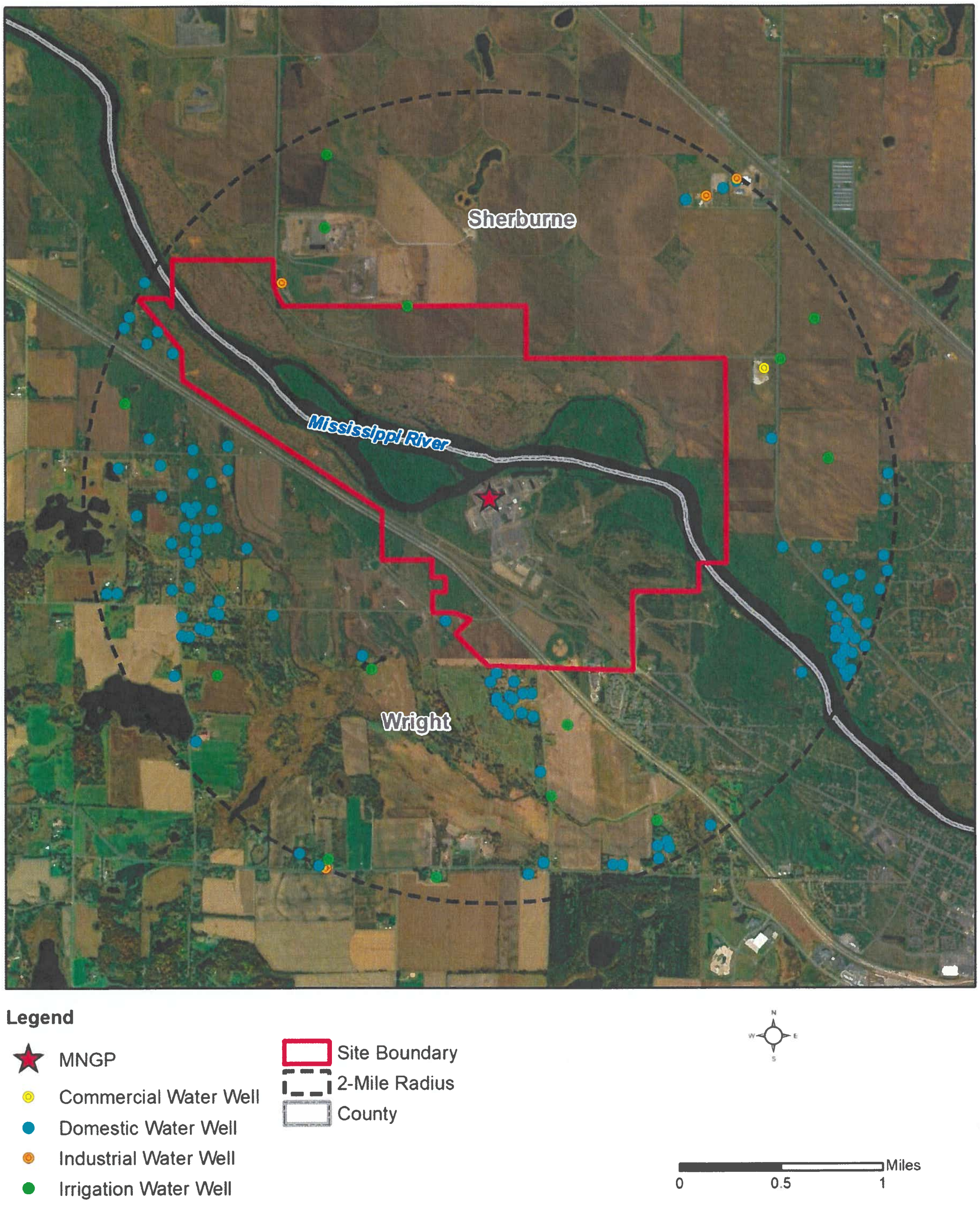


Figure 3.6-9 Offsite Registered Water Wells within a 2-Mile Radius of MNGP Center Point

3.7 Ecological Resources

Regional ecology is greatly influenced by the geomorphic and physiographic characteristics of the region. Soils determine the basic fertility of the region, which in turn determines the types of plants that may grow there. The plants that are present greatly influence the types and number of animals that reside in the region. Soil types also greatly influence the basic fertility of aquatic ecosystems and the species present. Climatological factors such as temperature, day length, and precipitation further refine the plants and animals that may live in a locale.

This section details the ecological resources of the MNGP site, in-scope transmission lines, and the surrounding landscape within the site vicinity.

3.7.1 Aquatic Communities

This section describes the aquatic environment and biota near the MNGP site and other areas potentially affected by the continued operation of MNGP. It includes a description of the aquatic ecosystems at or near the site, a description of representative important species that are present or are expected to occur, critical habitats, or other areas carrying special designations.

3.7.1.1 Clearwater Elk Watershed

MNGP is located in the Clearwater-Elk watershed (identified by the MPCA as the Mississippi River-St. Cloud Watershed, HUC 07010203) (MPCA 2021d). There are 374 lakes and 907 miles of river in the watershed. Major rivers and streams include Mayhew Creek, Rice Creek, Clearwater River, Elk River, and the St. Francis River (MPCA 2012). The watershed covers 691,200 acres (1,080 square miles) in the south-central part of the upper Mississippi River basin. In the recent past, during the height of the economy, significant residential development occurred within the watershed. In general, the water resources within this watershed tend to have intensively developed shorelines. (MPCA 2021e)

The aquatic environment near the MNGP site is associated with the Mississippi River, which is the source and receiving water for the MNGP cooling system (NRC 2006b). Three major tributaries of the Mississippi are located within 6 miles of the MNGP site: the Elk River, the Snake River, and the St. Francis River. The St. Francis and Snake rivers converge with the Elk River prior to reaching the Mississippi River. The point at which the Elk River converges with the Mississippi River is approximately 15 stream miles downstream of the MNGP site. The Elk, St. Francis, and Snake rivers are not expected to influence the aquatic communities at the MNGP site, nor would their aquatic communities be influenced by activities on the MNGP site; thus, additional discussion on the ecology of these features is not provided.

Silver Creek and Otter Creek, two minor tributaries of the Mississippi River, are located within 6 miles of the MNGP site. Otter Creek converges with the Mississippi River approximately three stream miles downstream of the MNGP site. Otter Creek is not expected to influence the aquatic communities at the MNGP site, nor would its aquatic community be influenced by activities on the MNGP site; thus, additional discussion on the ecology of Otter Creek is not provided. Silver Creek converges with the Mississippi River approximately 5 miles upstream of the MNGP site. The biological communities through the Silver Creek watershed unit are generally poor due to the overall lack of fish species (richness) and lack of sensitive aquatic macroinvertebrate and fish species; however, habitat is considered fair to good. The poor biological diversity may be related more to water chemistry than habitat. Additionally, Silver Creek is impaired due to high bacterial levels. (MPCA 2021f)

Numerous lakes are located in the vicinity of the MNGP site. These features are discussed in Section 3.7.2.4.

3.7.1.2 Mississippi River

The Mississippi River serves as the cooling water source for MNGP and receives cooling water discharge via a discharge canal located onsite. The Mississippi River is the second longest river in North America, flowing 2,350 miles from its source at Lake Itasca through the center of the continental United States to the Gulf of Mexico. (NPS 2021b) The reach of the Mississippi River within the project area serves a multitude of uses. St. Cloud is the first city along the Mississippi River to obtain its drinking water from the river. The Mississippi River is also used by two of Minnesota's most important power plants (Becker and MNGP) as a non-contact cooling water source. (MPCA 2022)

The MNGP facilities are located on the southern bank of the Mississippi River in Wright County at RM 900. Near MNGP, the Mississippi River is broad and turbulent. The average river velocity varies from about 1.5 to 2.5 feet/second. The river, 1.5 miles upstream to 1.5 miles downstream of the plant, loses 10 feet in elevation, resulting in rapids and current velocities that exceed 4.9 feet/second. The main channel of the Mississippi River is approximately 980 feet wide in the vicinity of the MNGP site. This portion of the river is also shallow, averaging approximately 6.2 feet in depth. Within backwaters and protected shoreline areas, the river is less than 2 feet deep with silt and mud substrates, whereas the main channel substrates consist of gravel, rubble, and boulders with some sand. (NRC 2006b) USGS gage station data are available approximately 26 miles upstream from MNGP since 1988 (Station 05270700). Based on available data for the past 10 years, the maximum and minimum daily flows at the upstream USGS gage was 28,200 cfs and 553 cfs, occurring on June 25, 2012, and August 19, 2021. (USGS 2021c)

This reach of the Mississippi River is included in the Minnesota Wild and Scenic River System due to the abundance of wildlife, a high-quality smallmouth bass fishery, a series of unique bluffs, and beaver islands. All portions of the Mississippi River within 6 miles of MNGP are classified as "Recreational." Recreational rivers are those rivers that may have undergone some impoundment or diversion in the past and that may have adjacent lands which are considerably developed but are still capable of being managed so as to further the purposes of this act. (MDNR 2021a; MDNR 2021b) Additionally, this reach of the Mississippi River is classified as an outstanding resource value water – restricted. This classification is assigned to high quality waters and waters that have exceptional recreation, cultural, aesthetic, or scientific value for which new or expanded waste discharges are restricted. The rolling forested bluffs, numerous access points and rest areas, along with abundant wildlife make this segment of the Mississippi River a popular route for day-long canoe trips. This portion of the river also provides excellent recreational fishing opportunities and is recognized for its high-quality smallmouth bass fishing. (MPCA 2021d; MPCA 2021e; MPCA 2021f; MPCA 2021g)

Studies characterizing the primary producer, benthic, and fish communities of the upper Mississippi River, including the reach associated with MNGP, were conducted between 1940 and 1976 (NMC 2005). With the exception of biennial electrofishing and seining as part of their environmental monitoring studies conducted in accordance with their NPDES permit, MNGP has not conducted additional aquatic ecology studies. Additionally, MNGP is not aware of any aquatic studies conducted by any public or private entities in the vicinity of the project. Thus, discussions regarding trophic communities are based on historical studies presented in the 2005 MNGP ER (NMC 2005), the NRC's 2006 GEIS supplement for MNGP's initial license renewal (NRC 2006b), and other publicly available information, including the MDNR Natural Heritage Inventory (NHI) data.

The major primary producers, or plant groups, present are periphyton (attached algae), phytoplankton (floating algae), and macrophytes, which are larger flowering plants, either rooted or floating (Table 3.7-1) (NMC 2005; NRC 2006b). Near the site, periphyton is the most important primary producer. Their ability to attach to underwater substrates allows these organisms to function in the higher velocity waters near MNGP. Although present in the area, neither phytoplankton nor macrophytes are prominent, because they are not well adapted to the relatively turbulent currents in the area. (NMC 2005)

The periphyton community consists of diatoms, blue-green algae, green algae, and golden algae; periphyton contributes an estimated 60–82 percent of the primary production in the MNGP area (NRC 2006b). Studies of periphyton near the MNGP site were conducted from 1968-1976. A total of 149 algal taxa were recorded, most of which were diatoms. Diatoms are single-celled algae with often ornate, silica-based cell walls. They often form a large portion of a periphyton community. Based on prior studies, the diatom *Gomphonema olivaceum* dominated the winter community. That species was also present in spring, as were *Diatoma vulgare*, *Synedra ulna*, and *Navicula gracilis*. Peak periphyton production occurred during summer and included diatoms as well as species of blue green algae. The fall community was again dominated by diatoms, with *Cocconeis placentula* and *Cocconeis pediculus* being most common. Periphyton cell densities varied from year to year, and among seasons. Species composition was reported to be similar between preoperational and operational years of MNGP. (NMC 2005; NRC 2006b)

As noted, floating phytoplankton do not commonly occur in flowing water systems. Most "phytoplankton" in fast-flowing streams originate from backwaters and from scouring of the periphyton community. Several distinct communities have been described, two of which were dominated by blue-green algae genera such as *Anabaena* and *Microcystis*. A third distinct community was dominated by the diatom genus *Navicula* and *Surirella*. Eighteen to 40 percent of the primary productivity in the Mississippi River near the MNGP site is attributed to phytoplankton. Although this is a significant proportion of overall primary productivity, its likely origin was scoured portions of the periphyton community. (NMC 2005; NRC 2006b)

Aquatic vascular plants are also important in energy flow, primary productivity, and substrate stabilization of some streams. Previous surveys of the upper Mississippi River between Minneapolis and Crosby, which is inclusive of the MNGP site, reported 81 species of macrophytes, of which only 15 were common. Most common were American wild celery (*Vallisneria americana*), American pondweed (*Potamogeton americanus*), and sago pondweed (*Potamogeton pectinatus*). However, specific macrophyte studies near the MNGP site in the late 1960s to 1970 recorded only three species: water moss (*Fontinalis antipyretica*), American pondweed, and sago pondweed. Although not a macrophyte by definition, the macroscopic green alga *Cladophora glomerata* was reported as important in the area. The low abundance of macrophytes was attributed to the high current velocity and shifting sand and gravel substrates in the area. (NMC 2005; NRC 2006b)

Lower trophic level animal groups present in the Mississippi River include zooplankton (Table 3.7-1) and benthic invertebrates (Table 3.7-2). Although some zooplankton species are present in the area, they are not a prominent component of the ecosystem, because few zooplankton species are well-adapted to flowing water. Zooplankton communities that do exist in flowing streams tend to be dominated by microscopic, single-celled protozoans and rotifers, with few crustaceans. This was confirmed in earlier studies of the upper Mississippi River where the dominant zooplankter was the rotifer *Keratella cochlearis*. Overall, their contribution to energy flow in streams is negligible, although fish larvae may feed on them to some extent. (NMC 2005; NRC 2006b)

Benthic invertebrate fauna is the main source of food supply for fish. Benthic invertebrate species in the vicinity of the MNGP site are summarized in Table 3.7-2. The benthic invertebrate community—comprising a great variety of insects, crustaceans, mollusks, and others—constitutes a prominent faunal feature of the Mississippi River near MNGP. Numerous samples were collected between Minneapolis and Crosby, and over 100 taxa were recorded. The most abundant groups were aquatic earthworms (oligochaetes); insect larvae (mayflies, beetles, caddisflies, midges, and blackflies); snails; and fingernail clams. Five species of true clams (freshwater mussels, family Unionidae) were also collected. Bottom fauna densities were notably higher in shallow weed beds compared to bare gravel areas. (NMC 2005; NRC 2006b)

The upper Mississippi River once supported a substantial mussel fishery; however, freshwater mussels within the upper Mississippi River have been adversely impacted by activities such as collection for the pearl button and cultured pearl industries, siltation (associated with agriculture, poor land management, and impoundments), pollution from agriculture and industrial chemicals, establishment and maintenance of the navigation channel, dams, loss of appropriate fish host species, and competition from exotic species, particularly the non-native zebra mussel *(Dreissena polymorpha)*. The mainstem upper Mississippi River upstream of St. Anthony Falls has not been heavily fished because of the small size and thinness of shells of available commercial species. Mussel species documented in the upper Mississippi River include mucket (*Actinonaias carinata)*, *Anodonta grandis plana*, black sandshell (*Ligumia recta)*, fatmucket (*Lampsilis siliquoidea)*, and *Lampsilis ventricose*. (NMC 2005; NRC 2006b) The black sandshell is listed as a state species of special concern according to the MDNR; five occurrences of this species have been documented within 6 miles of the MNGP site. Asiatic clams have been documented in the vicinity of MNGP and are discussed further in Section 3.7.5.

The Mississippi River supports a diverse array of fish species, which are integral to ecosystem functioning. The fish fauna of the upper Mississippi River system has been well described, and species in the vicinity of the MNGP site are summarized in Table 3.7-3. The Monticello area is considered rough fish habitat due to the prevalence of shorthead redhorse (*Moxostoma macrolepidotum*), silver redhorse (*Moxostoma anisurum*), white sucker (*Catostomus commersonii*), and common carp (*Cyprinus carpio*). Additional fishes reported as abundant in the mainstem Mississippi River include several species of minnow, and three bullhead (catfish) species (*Ameiurus* sp.). Common game fish include smallmouth bass (*Micropterus dolomieu*), yellow perch (*Perca flavescens*), black crappie (*Pomoxis nigromaculatus*), and walleye (*Stizostedion vitreum*). Other sport fish include northern pike (*Esox ucius*), and black bullhead (*Ameiurus melas*). A low number of muskellunge (*Esox masquinongy*) are also taken by anglers. The spotfin (*Cyprinella spiloptera*) and sand (*Notropis stramineus*) shiners are the major forage fish species in the area. Channel catfish, originally stocked in 1970, have also become abundant. (NMC 2005; NRC 2006b) No stocking of any species is being done by the MDNR in the Mississippi River. All of the species currently present are maintained by natural reproduction. (MDNR 2021c; MPCA 2021e) Based on the fish species assemblage, the reach of the Mississippi River within 6 miles of the MNGP site does not support a commercial fishery (MDNR 2021d).

MNGP conducts biennial environmental monitoring as required under its NPDES permit (No. MN0000868) (Attachment A). The monitoring requires electrofishing studies be conducted four times each year in May, July, September, and October in two sectors of the Mississippi River (special permit No. 30309). Sector 1 encompasses an area of approximately 21 hectares and extends from the discharge structure upstream 1.7 km to the north end of Cedar Island. Sector 2 extends 1.5 km downstream from the discharge structure to Boy Scout Rapids and includes an area of approximately 21 hectares. The thermal plume generally covers less than half of the area of Sector 2 throughout most of the sampling period. Additionally, seining is conducted six times at approximately two-week intervals between the months of June and September. Approximately 2.6 km of river are sampled to make observations on the relative abundance and species composition of the small fish community in the vicinity of MNGP. The most abundant fish species ((based on catch per unit effort (CPUE) and/or accounting for 10 percent or greater of the species composition)) documented during 2016–2017 and 2018–2019 environmental monitoring efforts include shorthead redhorse, smallmouth bass, silver redhorse, sand shiner, spotfin shiner, suckers, common carp, white sucker, bluegill, and spottail shiner. Based on MDNR NHI data, four occurrences of the least darter (*Etheostoma microperca*), a species of concern, have been documented within 6 miles of the MNGP site.

The Mississippi River likely provides habitat for several reptile and amphibian species summarized in Table 3.7-3. Species that may be in the vicinity of the MNGP site include the northern water snake (*Nerodia sipedon*), green frog (*Lithobates clamitans*), and mudpuppy (*Necturus maculosus*). Several turtle species have been recorded on or near the MNGP site, including snapping turtles (*Chelydra serpentina*), northern map turtles (*Graptemys geographica*), and spiny softshell turtles (*Apalone spinifera*) (ARSM 2021; iNaturalist 2021). The state-listed Blanding's turtle (*Emydoidea blandingii*) has been documented within 6 miles of the MNGP site. This species is discussed further in Section 3.7.8.2. (ARSM 2021).

3.7.1.2.1 Water Quality Indicators

The designated beneficial uses of the reach of the Mississippi River within 6 miles of the MNGP site are as follows (MPCA 2021h):

- Domestic consumption (requires heavy treatment)
- Aquatic life and recreation also protected as a source of drinking water – general warm water habitat (lakes and streams)
- Industrial consumption (heavy treatment)
- Agriculture and wildlife (irrigation)
- Agriculture and wildlife (livestock and wildlife)
- Aesthetic enjoyment and navigation
- Other uses

According to the 2020 MPCA 303(d) list of impaired waterbodies, this reach is listed as impaired for fish and shellfish consumption due to PCBs in fish tissue and aquatic recreation due to fecal coliform (MPCA 2021f). A total maximum daily load (TMDL) and implementation plan have not been completed at this time and are not included in the MPCA prioritization plan for 303(d) listings for TMDLs. (MPCA 2015)

Fish consumption guidelines have been established in Minnesota due to the high levels of mercury, PCBs, and other contaminants found in some species. The guidelines are more restrictive for pregnant women, women who may become pregnant, and children under the age of 15 than for the general population. Consumption guidelines exist within the reach of the Mississippi River that includes Monticello for channel catfish due to the presence of mercury and PCBs; although statewide guidelines recommend limiting or avoiding consumption of bass, catfish, northern pike, walleye, muskellunge, sunfish, and yellow perch (MDH 2020a; MDH 2020b; MDH 2020c; MDH 2020d; MDH 2021b).

3.7.1.3 MNGP Discharge Canal

The discharge canal is approximately 1,000 feet long by 200 feet wide at the surface, sloping down to a width of 92 feet on the bottom. It is 18 feet deep at the center. The fish population inhabiting the discharge canal in the fall and winter of 1974 through 1975 included black bullhead, rock bass (*Ambloplites rupestris*), black crappie, and bluegill. These observations were made before the channel catfish (*Ictalurus punctatus*) first appeared in the Monticello area. In 1980, an overflow weir was added to the discharge canal that closely approximates the shoreline of the Mississippi River. The weir was added to minimize cold shock fish mortality from sudden plant shutdowns within the discharge canal and in the river area adjacent to the discharge. It allows normal outflow of water while reducing the movement of fish into the discharge canal. (NRC 2006b)

3.7.2 Terrestrial and Wetland Communities

This section identifies terrestrial and wetland ecological resources and describes species composition and other structural and functional attributes of terrestrial biotic assemblages that could be affected by the continued operation and maintenance of the facilities.

3.7.2.1 Physiographic Province

MNGP is located within the central lowland physiographic province of the United States. This province is the largest in the United States and covers 585,000 square miles. It covers all of Iowa and Michigan, and the majority of Oklahoma, Illinois, Indiana, Ohio, Wisconsin, and Minnesota. It stretches into the northern portion of Missouri and the eastern sections of North Dakota, South Dakota, Nebraska, and Kansas. The Great Lakes region of the central lowland physiographic province is the result of repeated glacial scouring, and the shape of the lakes is the result of pre-glacial streams bordering rocks that influenced the direction of the advancing ice. (NPS 2021a)

3.7.2.2 Ecoregion

The MNGP site is located within the North Central Hardwood Forests Ecoregion (EPA Level III ecoregion). The physiography of this region is characterized by nearly level to rolling till plains, lacustrine basins, outwash plains, and rolling to hilly moraines. The land use and land cover in this ecoregion consists of a mosaic of deciduous forests, wetlands and lakes, cropland agriculture, pasture, and dairy operations. The growing season is generally longer and warmer than that of the region to the north, and the soils are more arable and fertile, especially in the mesic soils in the southern part of the region, contributing to the greater agricultural component of the land use. Two EPA Level IV ecoregions are located within 6 miles of the MNGP site. (White 2020)

3.7.2.2.1 Anoka Sand Plain and Mississippi Valley Outwash Ecoregion

The Anoka Sand Plain and Mississippi Valley Outwash Ecoregion is dominated by a sandy lake plain and terraces along the Mississippi River. The pre-settlement vegetation was primarily oak openings and savanna in the sandy areas with an area of wet prairie in the eastern part of the ecoregion and with prairie on the terraces near the Mississippi River. The soils are sandy forest Psamments in the extensive sandy areas with moist prairie Udolls on the terraces, moderately decomposed Hemists in the formerly wet prairie area, and small patches of forest Udalfs in the center of the ecoregion. The terraces north of the Elk River are largely cropland; the former wet prairie is mainly bog with patches of aspen or other hardwoods. The rest of the northern part of the ecoregion is a mixture of row crops, pasture and hay, and woods. (White 2020)

3.7.2.2.2 Big Woods Ecoregion

The Big Woods Ecoregion is a distinctive ecoregion in southern Minnesota in its pre-settlement vegetation and soils. This was an island of oak, maple, basswood, and other hardwoods surrounded by prairie and savanna. The woods had many small patches of wet prairie and a number of lakes. The moraines that cover the area have a rolling topography. The predominant soil suborder is forest Udalfs with a patch of wet prairie Aquolls in the southern part of the ecoregion. Within a radius of 30–45 km from the center of Minneapolis, this ecoregion is a mixture of suburban development, lakes, woods, and pasture. In the rest of the ecoregion there are several sections of corn and soybean agriculture and other sections of mixtures of row crops, woods, lakes, and pasture. (White 2020)

3.7.2.3 MNGP Terrestrial Habitats

No terrestrial habitat studies have been conducted for the MNGP site in the past five years. The MNGP plant and supporting facilities occupy approximately 50 acres of the site. The site includes approximately 174 acres leased by local farmers for growing row crops and 144 acres are under lease for recreational use. For the most part, facilities in use at MNGP are located on previously cultivated areas. (NMC 2005; NRC 2006b)

Existing vegetation in these areas consists of early successional forbs and grasses. Upland forests on the MNGP site are predominately northern pin oak (*Quercus ellipsoidalis*), green ash (*Fraxinus pennsylvanica*), basswood, and prickly ash (Z*anthosxylum americanum*). Forested wetlands on the northeast bank of the river and the river islands include American elm (*Ulmus americana)*, box elder *(Acer negundo*), silver maple (*A. saccharinum*), cottonwood (*Populus deltoides*), and black willow (*Salix nigra*). (NMC 2005; NRC 2006b)

Through the Minnesota County Biological Survey, MDNR identifies significant natural areas and collects and interprets ecological data including the distribution of rare plants, native plant communities, and animals throughout the state. The MDNR Division of Ecological Services' natural heritage database indicated that designated significant native plant communities exist on the MNGP site. MDNR has identified the following native plant communities as occurring on the MNGP site: floodplain forest; silver maple-Virginia creeper floodplain forest; bur oak woodland; oak woodland-brushland; willow swamp; dry oak savanna; and dry prairie. The silver maple-Virginia creeper floodplain forest and floodplain forest types occur on the larger river islands. (NMC 2005; NRC 2006b)

The floodplain forest community is known to occur on the northeastern bank of the Mississippi River and on the portion of the MNGP site in Wright County. The floodplain forest community types are generally dominated by silver maple with bur oak (*Quercus macrocarpa*) and green ash (*Fraxinus pennsylvanica*) as associates. The floodplain forest has a fairly open understory where woody climbers such as Virginia creeper (*Parthenocissus quinquefolia*) may occur in light gaps and along open channels, overgrowing trees and contributing to the canopy. (NMC 2005; NRC 2006b)

The willow swamp community occurs on Oxbow Island and on the MNGP site. The willow swamp type is dominated by shrubby willows (*Salix gracilis*, *S. bebbiana*, and *S. discolor*) and often with red-osier dogwood. Two patches of oak woodland brushland occur adjacent to the river on the Sherburne County side of the MNGP site to the east and west of the power block. This community is typified by a dry to dry-mesic woodland with a patchy canopy dominated by bur oak or northern pin oak and a pronounced shrub layer dominated by American hazel (*Corylus americana*), red raspberry (*Rubus strigosus*), blackberry (*Rubus alleghaniensis*), smooth sumac (*Rhus glabra*), prickly ash, or red cedar (*Juniperus virginiana*). An area of dry oak savanna sand and gravel occurs on the Sherburne County side of the property, on the first terrace north of the river. This community is typified by scattered open-grown bur oaks or northern pin oaks; a shrub layer of American hazels, chokecherries (*Prunus virginiana*), and juneberries (*Amelanchier* spp.). The ground layer is dominated by grasses and forbs. (NMC 2005)

On the portion of the MNGP site in Wright County, patches of the bur oak-pin oak woodland community occur south and west of the power block extending from the riverbank south below I-94. This community has historically been found in areas protected from fire. Hazelnuts, chokecherries, gray-bark dogwood (*Cornus foemina*), and *Rubus* spp. are common in the understory. Bur oaks and pin oaks form the canopy. An area of dry sand-gravel prairie occurs west of the power block on the narrow sloping area between the railroad right-of-way and the Mississippi River. The area consists of scattered prairie and savanna remnants. Dry prairies are typified by dry to mesic herbaceous communities dominated by grasses and sedges with common species of big bluestem (*Andropogon gerardii*), Indian grass (*Sorghastrum nutans*), porcupine grass (*Stipa spartea)*, little blue stem (*Schizachyrium scoparium*), side-oats grama (*Bouteloua curtipendula*), prairie June-grass (*Koeleria macrantha*), and sunloving sedge (*Carex heliophila*). The dry oak savanna areas are dominated by a canopy of bur oak and pin oaks. (NMC 2005)

River islands in the immediate MNGP site area consist of Cedar Island and Oxbow Island. Both of these islands are mapped primarily as uplands by the USFWS; however, the forest communities that occupy nearly the entire area of these islands, silver maple-Virginia creeper floodplain forest on Cedar Island and willow swamp bordered by floodplain forest on Oxbow Island, are MDNR-recognized natural communities. Silver maple (*Acer saccharinum*) generally predominates in floodplain forests in the area. A variety of willow species (*Salix* sp.), often with red-osier dogwood (*Cornus stolonifera*), dominate willow swamps in the area. Species composition of the forested wetlands on the northeastern bank of the river and the river islands include American elm, box elder, silver maple, cottonwood, and black willow. (NMC 2005)

3.7.2.4 Wetlands

Wetlands are defined as areas inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas (USACE 1999).

Thirteen functions and values typically considered by regulatory and conservation agencies when evaluating wetlands are used as part of the New England method. These include groundwater recharge/discharge; flood flow alteration; fish and shellfish habitat; sediment, toxicant, and pathogen retention; nutrient removal, retention, and transformation; production export (nutrient); sediment and shoreline stabilization; wildlife habitat; recreation (consumptive and non-consumptive); educational and scientific value; uniqueness, heritage, visual quality, and aesthetics; and threatened or endangered species habitat. (USACE 1999)

No wetland delineations have been conducted onsite. The USFWS maintains the National Wetlands Inventory (NWI), which integrates digital map data along with other resource information to produce current information on the status, extent, characteristics, and functions of wetland, riparian, and deep-water habitats in the United States.

Based on a review of USFWS NWI maps of the MNGP site (USFWS 2021b), there are approximately 12,299.8 acres of wetlands within a 6-mile radius of MNGP, composed of the following types (Figure 3.7-1):

- Freshwater emergent wetlands covering approximately 4,253.76 acres (34.58 percent of total wetland habitat)
- Freshwater forested/shrub wetlands covering approximately 2,730.70 acres (22.20 percent of total wetland habitat)
- Freshwater ponds covering approximately 1,031.91 acres (8.39 percent of total wetland habitat)
- Lakes covering approximately 2,983.92 acres (24.26 percent of total wetland habitat)
- Riverine waters covering approximately 1,299.49 acres (10.57 percent of wetland habitat)

The MNGP site has an irregular boundary with property on both sides of the Mississippi River. Based on NWI data (USFWS 2021b), a total of 45 acres of wetlands, ponds, and riverine waters are located on the MNGP site (Figure 3.7-2). Several freshwater emergent and forested/shrub wetlands are mapped as occurring along these drainages.

Based on the NWI data, the following wetland water types are located on the MNGP site:

- Freshwater emergent wetlands covering approximately 13.68 acres (3.01 percent of total wetland habitat)
- Freshwater forested/shrub wetlands covering approximately 161.22 acres (35.46 percent of total wetland habitat)
- Freshwater ponds covering approximately 4.76 acres (1.05 percent of total wetland habitat)
- Riverine waters covering approximately 274.93 acres (60.48 percent of total wetland habitat)

3.7.2.5 Terrestrial Animal Communities

The MNGP site is a mosaic of forested, open, and disturbed habitat. Wildlife species found primarily in the wooded wetlands and agricultural areas are those typically found in the central Lake Michigan ecological landscape. MNGP has not conducted any terrestrial studies subsequent to the 2006 license renewal. Thus, information on terrestrial communities is based on the initial license renewal ER and other publicly available information, including MDNR NHI data.

Terrestrial species likely to be observed on or in the vicinity of the MNGP site are summarized in Table 3.7-4. Mammals identified on or in the vicinity of the site included white-tailed deer (*Odocoileus virginianus*), red fox (*Vulpes vulpes*), raccoon (*Procyon lotor*), red and grey squirrel (*Tamiasciurus hudsonicus* and *Sciurus carolinensis*), short-tailed shrew (*Blarina brevicauda*), southern red-backed and meadow voles (*Clethrionomys gapperi* and *Microtus pennsylvanicus*), various species of mice (*Peromyscus* spp.), pocket gopher (*Geomys bursarius*), whitetailed jack rabbit (*Lepus townsendii*), thirteen-lined ground squirrel (*Ictidomys tridecemlineatus*), beaver (*Castor canadensis*), muskrat (*Ondatra zibethicus*), gray fox (*Urocyon cinereoargenteus*), coyote (*Canis latrans*), fox squirrel (*Sciurus niger*), chipmunk (*Tamias striatus*), mink *(Mustela vison*), long tailed and least weasel (*Mustela frenata* and *nivalis*), stoat (*Mustela ermina*), woodchuck (*Marmota monax*), and striped skunk (*Mephitis mephitis*). (NMC 2005; iNaturalist 2021) The federally threatened northern long-eared bat (*Myotis septentrionalis*) is listed within Sherburne and Wright counties, Minnesota (USFWS 2022). Based on review of aerial photography, forested habitat likely provides suitable northern long-eared bat habitat on the MNGP site. The northern long-eared bat is discussed in detail in Section 3.7.8.1.

Avian species observed on or in the vicinity of the site included mourning dove (*Zenaida macroura*), cliff swallow (*Petrochelidon pyrrhonota*), barn swallow (*Hirundo rustica*), robin (*Turdus migratorius*), European starling (*Sturnus vulgaris*), vesper sparrow (*Pooecetes gramineus*), red-winged blackbird (*Agelaius phoeniceus*), grackle (*Quiscalus quiscula*), goldfinch (*Carduelis tristis*), house sparrow (*Passer domesticus*), Canada geese (*Branta canadensis*), mallards (*Anas platyrhynchos*), wood ducks *(Aix sponsa*), meadowlark (*Sturnella magna* and *neglecta*), blue jay (*Cyanocitta cristata*), eastern bluebird (*Sialia sialis*), flicker (*Colaptes auratus*), red-tailed hawk (*Buteo jamaicensis*), wild turkey (*Meleagris gallopavo*), killdeer (*Charadrius vociferus*), black-capped chickadee (*Poecile atricapillus*), rose-breasted grosbeak (*Pheucticus ludovicianus*), sandhill crane (*Antigone canadensis*), common loon (*Gavia immer*), western kingbird (*Tyrannus verticalis*), prothonary warbler (*Protonotaria citrea*), and kestrel (*Falco sparverius*). (iNaturalist 2021; NMC 2005; NRC 2006b; Pfannmuller 2017) Avian species observed on or in the vicinity of the site are listed in Table 3.7-4.

In addition to the above-listed species, wintering trumpeter swans (*Cygnus buccinator*), a state species of concern, have been observed in increasing numbers on the Mississippi River downstream from MNGP. The swans in this area are drawn to the site's open water in the winter and local efforts to feed the birds (NMC 2005; Pfannmuller 2017). Having disappeared from Minnesota in 1880s, the trumpeter swan has been successfully restored to the state. The 2015 count conducted by Three Rivers Parks, The Trumpeter Swan Society, the USFWS, and the

National Park Service statewide totaled 17,021 trumpeter swans, suggesting there are about 1,700 nesting pairs in the state. Current trumpeter swan population estimates are over 30,000. (MDNR 2021e)

Additionally, according to MDNR NHI data, there have been documented occurrences of the following state-listed species within 6 miles of the MNGP site: the red shouldered hawks *(Buteo lineatus*, five occurrences); Acadian flycatchers (*Empidonax virescens,* two occurrences); peregrine falcons (*Falco peregrinus*, three occurrences); cerulean warblers (*Setophaga cerulea*, 14 occurrences); and purple martins (*Progne subis*, one occurrence). Five occurrences of the federally protected bald eagle (*Haliaeetus leucocephalus*) and 12 occurrences of the state-listed loggerhead shrike (*Lanius ludovicianus*) were also documented within 6 miles of the MNGP site. These species are further discussed in Section 3.7.8.

Reptile and amphibian species likely to be observed on or in the vicinity of the site include garter snake (*Thamnophis sirtalis* and *radix*), eastern hognose snake (*Heterodon platirhinos*), prairie skink (*Plestiodon septentrionalis*), American toad (*Anaxyrus americanus*), boreal chorus frog (*Pseudacris maculate*), green frog (*Lithobates septentrionalis*), gray treefrog complex (*Hyla versicolor*), and tiger salamanders (*Ambystoma tigrinum*). (ARSM 2021)

3.7.2.6 Transmission Lines

Physical features (e.g., length, width, route) of each of the in-scope transmission lines are described in Section 2.2.5.1. The transmission corridors are situated within the central lowlands' physiographic province, which is described in Section 3.7.2.1. All in-scope transmission lines are located completely within the MNGP site, as shown in Figure 2.2-3.

The in-scope transmission corridors do not cross any state or federal parks or designated critical habitat for protected species. The in-scope transmission line corridors consist primarily of developed land (substation/switchyard, parking lots, etc.); however, some vegetated areas are crossed, consisting of maintained grass with some trees and shrubs. While significant vegetation growth is unlikely due to the industrialized location of the in-scope transmission corridors, the corridors are monitored for vegetation. The facilities department is responsible for maintaining the land beneath the transmission line. There are no site-specific procedures regarding maintenance of vegetation under the in-scope transmission lines; however, appropriate control measures are applied to discourage vegetation that is incompatible with the in-scope transmission lines. Control methods are based on environmental impact and anticipated effectiveness, along with site characteristics, security, economics, current land use, and other factors. These methods include, but are not limited to pruning, removal, herbicide application, and mowing. All vegetation-related work will comply with the following industry standards: ANSI Z133.1-2012 safety requirements for arboricultural operations; OSHA 1910.269 electric power generation, transmission and distribution; ANSI A300 (Part 1) 2012 pruning for tree care operations–tree, shrub, and other woody plant maintenance–standard practices; and ANSI A300 (Part 7) 2012 IVM tree, shrub, and other woody plant maintenance standard practices (integrated vegetation management approach for electric utility rights-of-way). There are no site-specific procedures for the application of herbicides used to control vegetation under in-scope transmission lines; however, the Xcel Energy chemical control program is applicable.

The risk of collision with in-scope transmission lines poses a potential threat to avian species. Xcel Energy's avian protection plan describes the company's practices and measures to avoid and minimize risk of avian collision with transmission lines. Xcel Energy Standard G-14 (as detailed in the avian protection plan) depicts installing swan flight diverters on a distribution line. The standards consist of using diverters spaced 45 feet apart on three wires, staggered to give the illusion of a device every 15 feet.

Currently, NSPM maintains a migratory bird special purpose utility permit authorized by the USFWS. A special purpose utility permit authorizes the permittee to carry out management actions common, or desirable for, electric utilities.

3.7.3 Potentially Affected Water Bodies

The major water resources on the MNGP site are the discharge canal and the Mississippi River. Water from the Mississippi River is used for once-through cooling water. The Mississippi River is the second longest river in North America, flowing 2,350 miles from its source at Lake Itasca through the center of the United States to the Gulf of Mexico. (NPS 2021b) Overall, the Mississippi River drains an area of about 1.2 million square miles. MNGP is located within the Clearwater-Elk watershed (HUC 07010203), which encompasses approximately 34.5 miles of the Mississippi River (MPCA 2021d). Elevations in the Clearwater-Elk watershed range from 1,020 feet above msl near Sauk Rapids in the northwest, sloping to elevations of 940 feet near the towns of Elk River and Big Lake in the southeast. (NRCS 2021)

MNGP is located on the southern bank of the Mississippi River in Wright County at Mississippi RM 900 (NRC 2006b). The physical characteristics of the Mississippi River are described in Section 3.7.1.2. The Mississippi River is the source of water at MNGP for plant condenser cooling and some auxiliary water systems, such as service water cooling, screen wash, and fire protection. Under typical river conditions, the circulating water system removes heat from the MNGP condenser by the once-through circulating water system described in Section 2.2.3. Under certain discharge canal temperature, river temperature, and river flow conditions, the circulating water system can utilize the two MDCTs in partial or complete recirculation of the cooling water in compliance with permit limits. The operating modes for the circulating water system are required by the NPDES permit (MN0000868) discharge limits and the surface water appropriations permit. The surface water appropriations permit allows MNGP to withdraw up to 645 cfs (or 290,000 gpm) of water from the Mississippi River, with special operating conditions if the river flow is less than 860 cfs, and further restrictions if river flow is 240 cfs or less. The NPDES permit specifies maximum daily average temperature at the end of the discharge canal depending on the month: 95°F from April through October; 85°F in November and March; and 80°F from December through February. When the ambient river temperature is below 68°F but river flow would otherwise cause the average daily mixed river temperature immediately below the discharge to exceed 86°F, MNGP is required to operate its cooling towers in partial circulation or closed cycle mode and may discharge heated water in excess of these thermal limitations. Additionally, MNGP is permitted to exceed the thermal limitations under energy emergency conditions, such as an unusual heat wave. (Attachment A)

MNGP has procedures for maintenance of the plant's cooling water intake structure (CWIS) which includes the cleaning bar rack, cleaning and inspecting areas below water, and maintaining traveling screens. Additionally, maintenance dredging is conducted at the intake structure in accordance with the NPDES permit, USACE public waters work permit (1967-0743), and MDNR permit requirements. Maintenance dredging is conducted as warranted. To date, dredge material has been dewatered and staged until used in a beneficial use project at SherCo power plant in Sherburne County or used as fill material for the SherCo power plant ash pond.

MNGP cannot operate without the intake and discharge of cooling water, which directly impacts the Mississippi River. The NRC is responsible for authorizing the operation of nuclear facilities, as well as approving any extension of an initial operating license through the license renewal process. Intake and discharge of water through the cooling water system would not occur but for the operation of the facility pursuant to a renewed license. The effects of the proposed federal action to subsequently renew the MNGP Unit 1 OL, which necessarily involves the removal and discharge of water from the Mississippi River, are therefore shaped by the NPDES permit issued to the plant. The current NPDES permit was issued in October 2007 and modified in June 2009 (Attachment A). An application for renewal of the NPDES was submitted to MPCA on March 29, 2012. MPCA has not renewed the permit at this time; however, the permit has been administratively extended.

3.7.4 Places and Entities of Special Ecological Interest

3.7.4.1 Lake Maria State Park

Lake Maria State Park is one of the few remaining stands of the "Big Woods," a maple, oak, and basswood forest that once covered part of southern Minnesota. The park lies in the St. Croix moraine, which was formed during the last glacier, the Wisconsin Age. The bedrock of the park is mainly granite-covered by several feet of rock debris. Three different glaciers carved the landscape. The first glacier came about one million years ago; the last glacier came about 10,000 years ago. The ice brought two types of soil: red, sandy till from around Lake Superior and clay and loam (sand, clay, silt, and organic matter) from the Red River Valley. Lake Maria State Park is located at the northern edge of the Big Woods. This region is characterized by rough, wooded terrain and terminal moraine. The moraine consists of an accumulation of boulders, stone, and other debris left by a glacier that melted 10,000 years ago. The marshes, potholes, and lakes provide excellent habitat for wildlife. Approximately 205 different species of birds have been reported living in or passing through on seasonal migrations. Visitors have seen bald eagles, Cooper's hawk, Franklin's gull, osprey, common egret, common loon, trumpeter swans, great blue heron, marsh hawk, and goldfinch. Owl species include the screech, great-horned, snowy, and barred. (MDNR 2021f)

3.7.4.2 Wildlife Management Areas and Aquatic Management Areas

Within 6 miles of the MNGP site are parcels of land managed by the MDNR and USFWS for fish and aquatic life, wildlife, and waterfowl. The Kelly-Meyer Wildlife Management Area (WMA) borders a 100-acre shallow lake. Most of the upland has been restored to native prairie. The lake that borders this WMA is well known for viewing waterfowl during the spring migration and sometimes also in the fall. The WMA is managed to provide habitat for grassland species, migratory waterfowl, raptors, cavity nesting birds, deer, and pheasants. Native and tame grasslands are managed as nesting and brood-rearing areas for grassland dependent species. The wooded areas of this unit are maintained to provide nesting sites for passerine birds and raptors. These areas, along with the conifer planting, also serve as winter shelter for a large variety of species. Hard and soft snags are left to promote use by cavity nesting species such as wood duck, mergansers, pileated woodpeckers, tree swallows, bluebirds, etc. Emergent wetland areas are managed for breeding as well as migrating wetland-dependent species. These areas will also provide winter cover for a variety of resident wildlife species such as pheasants and deer. (MDNR 2021g)

Areas included in the Mississippi Island State Aquatic Management Area (AMA) and Silver Creek AMA are located within 6 miles of the MNGP site. Five areas of the Mississippi Island State AMA are located within the MNGP site. AMAs are managed by MDNR and established to protect, develop, and manage lakes, rivers, streams, and adjacent wetlands and lands that are critical for fish and other aquatic life, for water quality, and for their intrinsic biological value, public fishing, or other compatible outdoor recreational uses. (MDNR 2021h)

3.7.5 Invasive Species

This section contains the occurrences of aquatic and terrestrial invasive species in the MNGP vicinity, and management activities undertaken by the plant to control such species. The MDNR maintains an inventory of invasive species that are not native to Minnesota and that cause economic or environmental harm or harm to human health (MDNR 2021i). Invasive species observed within six miles of the MNGP site based on MDNR biological survey data are summarized below (MDNR 2021j; MDNR 2021k). With the exception of the zebra mussel, MNGP does not have procedures for monitoring or control of invasive species.

3.7.5.1 Aquatic Plants

Purple Loosestrife

Purple loosestrife (*Lythrum salicaria*) is a perennial plant found rooted in a range of wet soil habitats. It can grow in a couple of feet of water or on dry shore near the water line. It is commonly found in roadside ditches. Purple loosestrife spreads primarily by seeds. When flowers drop off, capsules containing many tiny seeds appear in their place. As tiny as grains of sand, seeds are easily spread by water, wind, wildlife, and humans. Germination can occur the following season, but seeds can also lay dormant for several years before sprouting. This species' dense growth along shorelands can make it difficult to access open water and provides unsuitable shelter, food, and nesting habitat for native animals. Additionally, this species outcompetes native aquatic plants, potentially lowering diversity. The dense root systems of this species may change the hydrology of wetlands. (MDNR 2021i) Purple loosestrife has been observed on the MNGP site (MDNR 2021j).

Curly-leaf Pondweed

Curly-leaf pondweed (*Potamogeton crispus*) is a rooted, submersed aquatic plant that generally grows from the shore to water depths of 15 feet, and can grow up to 15 feet tall. It tolerates low water clarity and will readily invade disturbed areas. The plant may mat at the surface but does not have true floating leaves. Curly-leaf pondweed is native to Eurasia, Africa, and Australia. It was likely introduced when common carp were intentionally introduced into midwestern waters as a game fish in the 1880s. Curly-leaf pondweed can form dense mats at the water's surface, inhibit water recreationists and provides unsuitable shelter, food, and nesting habitat for native animals. Additionally, this species outcompetes native aquatic plants, potentially lowering diversity. Midsummer die-offs can litter the shoreline with dead plants. The species spreads through the movement of watercraft and water-related equipment. (MDNR 2021i) Curly-leaf pondweed has not been documented on the MNGP site (MDNR 2021j).

Eurasian Watermilfoil

Eurasian watermilfoil (*Myriophyllum spicatum*) is a perennial rooted, submerged aquatic plant. Even though each plant can produce approximately 100 seeds per season, this species is more successful at reproducing via fragments. It can grow up to 20 feet tall, but typically only grows from three to nine feet tall. It creates canopy-like structures as it grows toward the water's surface. It primarily establishes through vegetative fragmentation—i.e., a fragment breaks off, settles in the sediment, grows roots, and establishes a new plant. The plant dies back in the fall, but the root system can survive the winter and begin growing again in the spring. The species was likely introduced and spread through the movement of watercraft and water-related equipment. This species can form dense mats at the water's surface, inhibit water recreationists and provides unsuitable shelter, food, and nesting habitat for native animals. Additionally, this species outcompetes native aquatic plants, potentially lowering diversity. (MDNR 2021i) Eurasian watermilfoil has not been documented on the MNGP site (MDNR 2021j).

3.7.5.2 Aquatic Animals

Chinese Mystery Snail

The Chinese mystery snail (*Cipangopaludina chinensis*) is native to Asia. The Chinese mystery snail grazes on lake and river bottom material. They are called "mystery" snails because females give birth to young, fully developed snails that suddenly and "mysteriously" appear. Their lifespan is about four years. The species is commonly imported and sold by the aquarium trade, leading to the potential for illegal release into the wild. Additionally, adults and young, which may be hidden in mud and debris, can stick to anchors and ropes as well as scuba, fishing, and hunting gear. The snails' operculum allows them to close their shells and survive out of water for multiple days. These snails can die off in large numbers and wash up on shore, fouling beaches and shoreland. In Asia, the snail can transmit human intestinal flukes; however, no cases have been documented in the United States. It is also a carrier of trematode parasites found in native mussels. (MDNR 2021i) This species has not been documented on the MNGP site (MDNR 2021j).

Zebra Mussel

Zebra mussels (*Dreissena polymorpha*) are 0.25 to 1.5-inch-long bivalve mollusks. They have a D- or wedge-shaped shell, which is often marked by alternating brown and yellow bands in a zigzag pattern. They live on lake and river bottoms, rocks, aquatic plants, docks, lifts, and boats to which they attach using small dark fibers called "byssal threads." Viewed up-close underwater, two tiny siphons can be seen projecting into a narrow gap between the shell valves of each animal. These siphons are used to pump water for respiration and feeding. Zebra mussels are native to large rivers and lakes draining into the Black, Caspian, and Azov seas of southwestern Russia and the Ukraine. They appeared in North America in 1988, and in five years they spread rapidly throughout the Great Lakes and large rivers. In North America, barge traffic and (to unknown extent) larval dispersal were responsible for rapid initial spread throughout the Great Lakes and the Mississippi, Ohio, and Susquehanna rivers. Spread to inland lakes has occurred by larvae transported down connected streams and waterways, and overland via mussels attached to vegetation and to surfaces of recreational boats, trailers, docks, and lifts. Veliger larvae may also be transported in the "residual water" remaining inside boat compartments when trailered boats are moved between waterways. (UMN 2021)

As of May 2018, the MDNR listed 335 waterbodies in the state as infested due to either confirmed zebra mussel presence or connection to a waterbody with a confirmed presence (UMN 2021). Zebra mussels encrust equipment, such as boat motors and hulls, which reduces performance and efficiency and is costly to clean and repair. Swimmers and pets can cut their feet on zebra mussels attached to rocks, docks, swim rafts, and ladders. Zebra mussels filter tiny food particles out of the water, which can reduce available food for larval fish and other animals and can increase aquatic plant growth as a result of increased water clarity. Zebra mussels also attach to and kill native mussels. Additionally, this species creates a costly problem for power plants, cities, and residents when they clog water intakes. (MDNR 2021i)

MDNR data indicate that zebra mussels have been observed in the reach of the Mississippi River located within the MNGP site (MDNR 2021j). MNGP monitors for zebra mussels at the site due to the potential impact to plant equipment. To date (2021), approximately 11 zebra mussels have been found on the site. MNGP has a procedure requiring periodic inspections for the presence of zebra mussels.

Banded Mystery Snail

The banded mystery snail (*Vivaparus georgianus*) grazes and filter-feeds on dead organic matter, typically on silt and mud substrates. They are called "mystery" snails because females give birth to young, fully developed snails that suddenly and "mysteriously" appear. The banded mystery snail's historic range is the southeastern United States, primarily in the Mississippi River system up to Illinois. The species is commonly imported and sold by the aquarium trade, leading to the potential for illegal release into the wild. The banded mystery snail is a regulated invasive species in MN, which means it is legal to possess, sell, buy, and transport, but it may not be introduced into a free-living state, such as being released or planted in public waters. Young banded mystery snails can be as small as a grain of rice. Adults and young, which may be hidden in mud and debris, can stick to anchors and ropes as well as scuba, fishing, and hunting gear. The snails' operculum allows them to close their shells and survive out of water for multiple days. Banded mystery snails can die off in large numbers, fouling beaches and shorelines. Additionally, banded mystery snails can cause mortality of largemouth bass embryos by invading bass nests. (MDNR 2021i) This species has not been documented on the MNGP site (MDNR 2021j).

Asiatic (Golden) Clam

The Asiatic clam (*Corbicula Fluminea*) is native to tropical and temperate regions of the eastern Mediterranean extending west to southern Asia and Africa. Although not currently listed as an invasive species subject to regulation by MDNR, Asiatic clams may be used for food, bait, and aquariums. Isolated populations of this species have been reported and confirmed from a few locations in major rivers in Minnesota, with reports occurring over multiple years. Currently, MDNR is in the process of completing a classification summary that supports decisions about whether and how to regulate Asiatic clams as an invasive species under Minnesota statutes. The current draft document recommends designation as a prohibited invasive species. (MDNR 2021l)

The Asiatic clam lives in brackish to freshwater rivers, lakes, streams, canals, and reservoirs. It lies on or slightly buried in silt, sand, or gravel-bottomed areas. It prefers moving water with high oxygen levels and has no tolerance for polluted or near-freezing water. The Asiatic clam is capable of self-fertilization and one clam can lay up to 70,000 eggs a year. Because they are so prolific, they compete with native species for food and space. Asiatic clams can cause major biofouling in power plants, water treatment systems and pipes. The Asiatic clam can be spread by human transport. They have been known to be sold for use in aquaria. Asiatic clams also are spread through water currents. (UWSGI 2021)

Literature suggests that low temperatures (less than 2°C) as well as low dissolved oxygen or high temperatures could result in mass mortality. In Minnesota, the scattered populations are near power plant locations, suggesting that other factors like warm water discharge, may create situations that allow for sustained populations. The lack of spread downstream from these isolated pools suggest that current seasonal conditions may not support spread. (MDNR 2021o) The Asiatic clam has been found at the MNGP site and has been observed in the traveling screen forebays (NRC 2006b).

Common Carp

The common carp (*Cyprinus carpio*) is native to Europe and Asia. It was intentionally introduced into midwestern waters as a game fish in the 1880s and is now established in 48 states. They are distributed in hundreds of waters in the southern two-thirds, and a few waters in the northern third of Minnesota. They live in lakes, rivers, and wetlands and are often seen in spring when they spawn in shallow waters. Common carp is one of the most damaging aquatic invasive species due to its wide distribution and severe impacts in shallow lakes and wetlands. Their feeding disrupts shallowly rooted plants, muddying the water. They release phosphorus that increases algae abundance. Carp-induced declines in water quality causes declines of aquatic plants needed by waterfowl and fish. (MDNR 2021i) The common carp has been found in the Mississippi River at the MNGP site.

3.7.5.3 Terrestrial Plants

Reed Canary Grass

Reed canary grass (*Phalaris arundinacea*) is a perennial grass that grows in wetlands, ditch banks, moist fields, and along roadsides. Disturbed wetlands are most susceptible to invasion. Seeds ripen in late June. They are dispersed via waterways, animals, humans, and machines. Reed canary grass also reproduces vegetatively through horizontal stems growing below the soil surface, called rhizomes. These create a thick, impenetrable mat at or directly below the soil surface. Reed canary grass has been planted throughout the U.S. since the 1800s for forage and erosion control. It can outcompete most native species in natural wetlands and presents a major challenge for restoration in wetland mitigation efforts. (MDNR 2021i) This species has not been documented on the MNGP site (MDNR 2021k)

Common and Glossy Buckthorn

The common and glossy buckthorn (*Rhamnus cathartica* and *Frangula alnus*) species were first brought to the United States from Europe as a popular hedging material. They became a nuisance plant, forming dense thickets in forests, yards, parks, and roadsides. They crowd out native plants and displace the native shrubs and small trees in the mid-layer of the forest where many species of birds build nests. These species are also listed as noxious weeds in Minnesota. Common and glossy buckhorn lack natural controls, like insects or disease, that would curb their growth, allowing them to form impenetrable layers of vegetation that out-competes native plants for nutrients, light, and moisture, and degrades wildlife habitat. These species contribute to erosion by shading out other plants that grow on the forest floor. They are considered a threat to the future of forests, wetlands, prairies, and other natural habitats. (MDNR 2021i) Common buckthorn has been observed within the MNGP site on islands in the Mississippi River; however, glossy buckhorn has not been documented on the site (MDNR 2021k).

Amur Maple

Amur maple (*Acer ginnala*) was introduced to North American in the 1860s as an ornamental and for wildlife and windbreak plantings. It is tolerant of shade and is often found in disturbed areas, along forest edges, roadsides, in early successional forests, and in ornamental landscapes. Amur maples displace native shrubs and understory trees in open woods, and shade out native grasses and herbaceous plants in savanna habitats. It can produce allelopathic chemicals that limit growth and reproduction of other plants. (MDNR 2021i) This species has not been documented on the MNGP site (MDNR 2021k).

Birdsfoot Trefoil

Birdsfoot trefoil (*Lotus corniculatus*) was introduced to the United States for livestock forage and erosion control and is still sold commercially. It spreads by seeds transported by animals, water, and machines (e.g., mowers). Prescribed fires can increase seed germination. It grows well in the Midwest and is most problematic in prairies and disturbed open areas, such as roadsides, where it forms dense mats that shade and choke out native vegetation, degrading prairie habitat. (MDNR 2021i) This species has not been documented on the MNGP site MDNR 2021k).

Bull Thistle

Bull thistle (*Cirsium vulgare*) is a biennial plant that can grow up to 6 feet tall. Bull thistle grows in disturbed areas such as pastures, roadsides, and ditches. Once bull thistle has established, it spreads quickly, replacing native plants and decreasing diversity. Bull thistle is distasteful to most grazing animals, giving the thistle a competitive edge and reducing forage quality. Bull thistle is native to Europe, Asia, and Africa and was introduced to the United States in the early 1800s. Bull thistle was likely accidentally introduced from seeds in ship ballast or as a seed contaminant with other seeds that were brought over purposefully. Today, bull thistle is found in every state and throughout Minnesota. (MDNR 2021i) This species has not been documented on the MNGP site (MDNR 2021k).

Non-native Bush Honeysuckles

Bush honeysuckles (*Lonicera* spp.) are native to central and eastern Asia and were introduced to the United States as ornamental shrubs. Honeysuckles are most commonly found in the northeastern United States but can be found throughout most of the country. There are four different species of non-native bush honeysuckle of concern to Minnesota: Tatarian honeysuckle (*Lonicera tatarica*), Morrow's honeysuckle (*L. morrowii)*, Bell's honeysuckle (*L. x bella*), and Amur honeysuckle (*L. maackii*). They thrive in sunny and moderately shaded disturbed areas. Non-native honeysuckles displace native forest shrubs and herbaceous plants by their invasive nature and early leaf-out. They shade out herbaceous ground cover and deplete soil moisture. The seeds are readily spread by birds; however, they do not provide nutritional value. Some research suggests that honeysuckles inhibit growth of other plants in its vicinity. (MDNR 2021i) Bell's honeysuckle has been observed on the MNGP site on islands in the Mississippi River (MDNR 2021k).

Canada Thistle

Canada thistle (*Cirsium arvense*) grows in a variety of habitats with full or partial sun and is often found in disturbed areas such as roadsides, trails, pastures, and recently flooded areas. A native of southeastern Europe and Asia, it is suspected that Canada thistle was introduced in contaminated imported crop seed in the 1700s. Canada thistle invades natural areas such as prairies, savannas, open areas in forests, and dunes if some degree of disturbance already exists. It also invades wet areas with fluctuating water levels such as streambanks, sedge meadows, and wet prairies. Canada thistle can reproduce by seed and has male and female flowers on separate plants. Additionally, plants can spread vegetatively through horizontal roots, which can spread 10 to 12 feet in one season. Once Canada thistle is established, it spreads quickly, replacing native plants and decreasing diversity. Canada thistle is a noxious weed and can reduce the amount of desirable forage for grazing animals in pastures. Canada thistle grows quickly in disturbed areas making it a challenge in landscape restoration projects. (MDNR 2021i) This species has not been documented on the MNGP site (MDNR 2021k).

Common Tansy

Common tansy (*Tanacetum vulgare*) is a perennial plant with distinctive yellow button-like flowers. Common tansy was introduced to the United States from Europe for medicinal purposes. It reproduces by seed and can also spread by rhizomes and root fragments. It is most often found in dry soils growing in full sun. Often, it is found in open, disturbed areas such as roadsides, gravel pits, and pastures. It can form dense cover and degrade pastures, impede reforestation efforts, and outcompete native plants. This species is a noxious weed in Minnesota and can be toxic to cattle and horses. It can become abundant in pastures and reduce available forage. Dense common tansy can make it difficult for trees to establish, so it can negatively impact timber production and habitat restoration. (MDNR 2021i) This species has not been documented on the MNGP site (MDNR 2021k).

Cow Vetch and Hairy Vetch

Cow vetch (also known as bird vetch) and hairy vetch (*Vicia cracca* and *Vicia villosa*) are legumes which have been planted in Minnesota for forage and escaped to establish itself on roadsides and in disturbed sunny areas. Their weak stems grow two to three feet high and grow over other plants, smothering them. Both species are annual or short-lived perennial plants that reproduce by seeds. They grow best on the dry sandy soils of disturbed fields and thickets. Cow vetch and hairy vetch are not thought to be a threat to healthy native prairies at this time but can be a problem in prairie reconstructions and on disturbed sites. (MDNR 2021i) This species has not been documented on the MNGP site (MDNR 2021k).

Garlic Mustard

Garlic mustard (*Alliaria etiolate*) was likely brought to the United States for food or medicinal purposes in the 1800s. It can be spread by transporting mud that contains its tiny seeds, so it is often found along highly trafficked trails. Garlic mustard forms thick mats that shade and outcompete native plant species and can impede natural forest regeneration by producing chemicals that reduce growth of other plants. Garlic mustard is shade tolerant and is often found covering the forest floor in thick mats that shade and outcompete native plant species. This species is a noxious weed in Minnesota. (MDNR 2021i) This species has not been documented on the MNGP site (MDNR 2021k).

Hoary Alyssum

Hoary alyssum (*Berteroa incana*) is an annual plant that can occasionally be a biennial. It is native to Europe and Asia and was likely originally introduced to North America as a contaminant in clover and alfalfa seed. It spread in North America as a contaminant in seed mixes, hay, and gravel as well as along roadsides. Hoary alyssum grows well in dry soils with sparse vegetation. It is commonly found in disturbed dry areas such as along roads and railroads. It can be found in lawns, fields, and pastures. It displaces native species, particularly in dry prairies and sand blowouts where vegetation is sparse. It can be a nuisance in prairie reconstruction but declines as prescribed burns are administered. Hoary alyssum is toxic to horses when they eat the fresh plant in a pasture or the dried plant in hay; however, it is not currently listed as a noxious weed. (MDNR 2021i) This species has not been documented on the MNGP site (MDNR 2021k).

Japanese Barberry

Japanese barberry (*Berberis thunbergii*) is a shrub that can form dense cover in forests and open areas. The spines on Japanese barberry plants can make it difficult to move through patches. Japanese barberry is native to Japan. It was introduced to North America as an ornamental plant, as a living fence, and for erosion control. Seeds are dispersed when birds eat the berries. Additionally, Japanese barberry spreads vegetatively through horizontal lower branches that root freely when they contact the soil. It invades oak woodlands and oak savanna and prefers well-drained soils. It can form impenetrable, thorny thickets. Once established, its prolific spreading shades out native plants. Japanese barberry can alter soil properties and change soil microbial communities. Researchers in the eastern United States are finding that forests with dense Japanese barberry harbor more black-legged ticks (deer ticks) than those without Japanese barberry. It is thought that the Japanese barberry plants cause a humid microclimate that is favorable for the ticks. Black-legged ticks can carry Lyme disease and other tick-borne diseases, so there are human health impacts from Japanese barberry. There is concern that hybrids of Japanese barberry and common barberry would be able to host black stem rust, which can cause severe losses to grain crops. Japanese barberry is listed as a noxious weed in Minnesota. (MDNR 2021i) This species has not been documented on the MNGP site (MDNR 2021k).

Leafy Spurge

Leafy spurge (*Euphorbia esula*) is a perennial plant that grows well in sunny and partly sunny areas such as pastures, grasslands, prairies, and roadsides. It can grow well in a wide range of soil types from dry to moist. Leafy spurge is native to Europe and Asia. It was introduced to the United States in the late 1800s as a contaminant in oats from Russia. Plants can reproduce sexually by seed and spread vegetatively from underground roots. It can cover open grassy areas, decrease native plant species, and reduce forage for grazing animals. Leafy spurge is toxic to cattle and horses and is listed as a noxious weed in Minnesota. Leafy spurge greatly reduces the productivity and biodiversity of pasture and prairie lands. (MDNR 2021i) This species has not been documented on the MNGP site (MDNR 2021k).

Oxeye Daisy

Oxeye daisy (*Leucanthemum vulgare*) is native to Europe and was introduced to the United States in the 1800s as an ornamental plant. It has spread from gardens to become one of the most common roadside weeds. Oxeye daisy is a perennial plant that grows in disturbed, open areas. Oxeye daisy can spread by seed and can also spread vegetatively by rhizomes sending up plants nearby the parent plant. It frequently invades disturbed fields and meadows, competing with native plants, especially when grazing livestock is present; however, it is not a threat to intact prairies and savannas. (MDNR 2021i) This species has not been documented on the MNGP site (MDNR 2021k).

Crown Vetch

Crown vetch (*Securigera varia*) is native to Europe and southeast Asia. It was introduced to the United States during the 1950s as a groundcover, a bank and slope stabilizer along roads and waterways, and as a green fertilizer crop. Crown vetch can spread vegetatively by horizontal stems growing below the soil surface (rhizomes) that form roots and produce new plants. Rhizomes can grow up to 10 feet long, contributing to extensive vegetative spread. Crown vetch can cover other plants, spread vegetatively, and cover acres of land, reducing species diversity and habitat by outcompeting other plants. Crown vetch is challenging to manage, and its impacts have been particularly an issue in prairies and dunes. As a legume, crown vetch can change nitrogen levels in soils, which can make it difficult for native plants to compete. Crown vetch contains chemicals that make it non-palatable to grazing animals. While there are conflicting reports on toxicity to grazing animals, it is listed as a noxious weed in Minnesota. (MDNR 2021i) This species has not been documented on the MNGP site (MDNR 2021k).

Queen Anne's Lace

Queen Anne's lace (*Daucus carota*) is native to Europe and Asia. It is also known as wild carrot, as it is the parent of the cultivated varieties of carrots we have today. Queen Anne's lace may have arrived in the United States as a seed contaminant in grain and through planting in gardens. Queen Anne's lace has small, barbed seeds that promote dispersal by animals and wind. Its seeds stay viable in the soil for one to two years. Queen Anne's lace is often found in disturbed areas, including along roadsides, rights-of-way, abandoned fields, and forest edges. It does not do well in shaded habitats. It invades disturbed dry prairies, abandoned fields, waste places, and roadsides. It is a threat to recovering grasslands and can be persistent on clay soils, but it tends to decline as native grasses and herbaceous plants become established. This species is listed as a noxious weed in Minnesota. (MDNR 2021i) This species has not been documented on the MNGP site (MDNR 2021k).

Siberian Elm

A native of east Asia, Siberian elm (*Ulmus pumila*) was introduced to the United States in the 1860s for its hardiness, fast growth, and ability to grow in various moisture conditions. It is resistant to Dutch elm disease and is sold commercially as a shelterbelt and windbreak tree. Siberian elm is a perennial deciduous tree that grows well in disturbed areas and blooms from March to May. Its seed germination rate is high, and seedlings establish quickly in sparsely vegetated areas. It often grows in open, sunny areas such as roadsides, grasslands, and along waterways. Siberian elm has a shallow and widely spreading root system; when the trees are cut, they can resprout from the stump and roots. The tree can invade and dominate disturbed prairies in just a few years. (MDNR 2021i) This species has not been documented on the MNGP site (MDNR 2021k).

Smooth Brome Grass

Smooth brome (*Bromus inermis*) is native to Europe and Asia. It was imported in the late 1800s and was widely used as a forage grass for hay production and erosion control. It reproduces both sexually via seeds and vegetatively by underground rhizomes. While tolerant of a wide variety of conditions, it prefers moist soils and sunny locations. It can form dense cover and outcompete other species, spreading into grasslands, prairies, roadsides, ditches, and moist wooded areas. It starts growing early in the spring before native warm season grasses. (MDNR 2021i) This species has not been documented on the MNGP site (MDNR 2021k).

Plumeless Thistle

Plumeless thistle (*Carduus acanthoides*) is found in a wide range of habitats, most commonly in disturbed areas along road, trail, and railroad rights-of-way, pastures, rangeland, gravel pits, vacant lots, and field edges. It also aggressively invades natural areas and landscape restorations. Plumeless thistle is highly invasive to disturbed habitats and can quickly replace desirable plants, creating large monocultures that significantly lessen the biological diversity and productivity of native landscapes. It is a common pasture weed that reduces the availability of desirable forages leading to the economic hardships for livestock producers. It is listed as a noxious weed in Minnesota. (MDOA 2021) This species has not been documented on the MNGP site (MDNR 2021k).

Spotted Knapweed

Spotted knapweed (*Centaurea stoebe spp. micranthos*) is native to Europe and Asia. Its seeds were likely introduced as a contaminant in seeds of other species imported to the United States. The plants can spread by seed or send up shoots to form new plants near the parent plant. Spotted knapweed is poisonous to other plants (phytotoxic) and forms dense monocultures. It especially threatens dry prairie, oak and pine barrens, dunes, and sandy ridges. It spreads rapidly along road corridors and in gravel pits, agricultural field edges, and overgrazed pastures. Cattle and other animals avoid eating it, so it can cause large reductions in available food for grazing animals. It is listed as a noxious weed in Minnesota. (MDNR 2021i) This species has not been documented on the MNGP site (MDNR 2021k).

White and Yellow Sweetclover

White and yellow sweetclover (*Melitotus alba*, *M. officinalis*) are native to Europe and Asia and were brought to the United States in the late 1600s. They have been planted as a forage crop and as soil enhancers in the Great Plains and upper Midwest. Plants grow abundantly on disturbed lands and open, sunny areas such as roadsides, and abandoned fields. The sweetclovers reproduce by seed, with plants producing thousands of seeds which can remain viable for 40 years. Sweetclovers invade and degrade native grasslands by overtopping and shading native sun-loving plants, thereby reducing diversity. The large, dead stalks can also alter habitat conditions. Sweetclovers host root bacteria that can increase soil nitrogen levels and potentially make the habitat less favorable for native species adapted to lower nitrogen levels in the soil. If sweetclovers are cut for hay and the hay rots, they produce a chemical that can cause a bleeding disease in cattle if the spoiled hay is eaten. (MDNR 2021i) These species have not been documented on the MNGP site (MDNR 2021k).

Wild Parsnip

A native of Europe and Asia, wild parsnip (*Pastinaca sativa*) escaped from cultivation. It was grown as a root vegetable and is common throughout the United States. Seeds spread via human and animal activity and through movement of wind and water. Seeds remain viable in the soil for up to four years. Wild parsnip readily moves into disturbed habitats and is often found along roadsides, forest edges, and trails. It does not do well in shaded habitats. It invades slowly, but once the population builds up, it spreads rapidly and can severely modify open dry, moist, and wet-moist habitats. Wild parsnip has also been found to invade native prairies. When the sap of wild parsnip contacts skin in the presence of sunlight, it can cause chemical burns that can look like a rash with blistering and discoloration of the skin (phytophotodermatitis). It is listed as a noxious weed in Minnesota. (MDNR 2021i) This species has not been documented on the MNGP site (MDNR 2021k).

Butter and Eggs or Common Toadflax

Butter and eggs (*Linaria vulgaris*) is a plant native to the steppes of Europe and Asia. In the 1700s it was introduced into North America as an ornamental plant and is sometimes still sold commercially. It produces flowers and seeds and can also spread by sending up new shoots from spreading roots. Root fragments can also produce new plants. This plant has the ability to adapt to various site conditions. By spreading vegetatively through horizontal lower branches that root freely when they contact the soil, butter and eggs can form dense patches. It competes well against less aggressive native plants in gravelly and sandy soils. It presents a problem in prairie reconstruction projects once it has established itself. It can be mildly toxic to cattle and degrade pastures. (MDNR 2021i) This species has not been documented on the MNGP site (MDNR 2021k).

3.7.6 Procedures and Protocols

MNGP relies on administrative controls and other regulatory programs to ensure habitats and wildlife are protected as a result of a change in plant operations (i.e., water withdrawal increase, new NPDES discharge point, wastewater discharge increase, air emissions increase), or prior to ground-disturbing activities. MNGP does not have a site-specific procedure for evaluating impacts to ecological resources in advance of construction or maintenance activities; however, the Xcel Energy corporate environmental policy requires that the appropriate level of environmental due diligence or review in managing properties and easements or prior to the initiation of a new project. Xcel Energy corporate environmental policy identifies Environmental Services as the entity responsible for overseeing environmental compliance, obtaining environmental permits, submitting necessary reports, communicating with the regulatory agencies, and providing consultation to business areas and/or projects.

The administrative controls, as presented in Section 9.5, involve reviewing the change, identifying effects, if any, on the environmental resource area (i.e., habitat and wildlife), establishing BMPs, modifying existing permits, or acquiring new permits as needed to minimize impacts. Existing regulatory programs that the site is subject to, as presented in Chapter 9, also ensure that habitats and wildlife are protected. These are related to programs such as the following: stormwater management for controlling the runoff of pollution sources such as sediment, metals, or chemicals; spill prevention to ensure that BMPs and structural controls are in place to minimize the potential for a chemical release to the environment; USACE permitting programs to minimize dredging impacts; and management of herbicide applications to ensure that the intended use will not adversely affect the environment.

3.7.7 Studies and Monitoring

3.7.7.1 Impingement and Entrainment Monitoring

In accordance with the statutory guidelines set forth in the NPDES permit issued to Xcel Energy for MNGP, and to maintain compliance under Section 316(b) of the Clean Water Act (CWA), periodic monitoring of entrainment and impingement of fish and aquatic species is conducted to verify that MNGP is utilizing the best technologies available (BTA) to reduce entrainment and impingement. The current NPDES permit was issued in October 2007 and modified in June 2009 (Attachment A). An application for renewal of the NPDES permit was submitted to MPCA on March 29, 2012. MPCA has not renewed the permit at this time; however, the permit has been administratively extended.

Entrainment monitoring took place at MNGP during three time periods: 1978, 2006, and 2017 to 2018. Impingement studies were conducted in 1972–1975 and 2006. The 1978 entrainment and 1972–1975 impingement studies are summarized in the 2006 GEIS for MNGP (NRC 2006b). The 2006 impingement and entrainment study and 2017–2018 entrainment study results are summarized below.

3.7.7.1.1 2005–2006 Entrainment and Impingement Characterization Study

The purpose of this study was to provide information to support the determination of "best professional judgement decisions" for MNGP pursuant to Section 316(b) of the CWA.

Entrainment Methodology

During the 2006 study, entrainment samples were obtained from the discharge pump with supplemental samples taken in the forebay. Discharge pump sampling was conducted by mechanically pumping water from the discharge pump well through a drum filter type sampling apparatus. The sampling apparatus consisted of a 2-inch flex hose and pipe system fitted with flow control valve and an in-line flow meter to convey water from each pump to a centralized sampling container equipped with an ichthyoplankton net. The ichthyoplankton net consisted of a 300-micrometer mesh and was equipped with a removable bucket. The net was suspended in water within a tank to reduce velocities and extrusion of sampled organisms. The tank was also equipped with two overflow outlets to convey filtered water to appropriate discharge locations.

Total volume of each sample was at least 100 cubic meters (m^3) as measured by the accumulating flow meter. When a sufficient sample volume was achieved as indicated on the accumulating flow meter, sample collection was ended, and the net was removed from the sampling tank and positioned for external wash-down. Washing of the net was accomplished using a low-pressure wash consisting of previously filtered raw water. All organisms and detritus were washed into the collection bucket at the cod end of the net.

After the net had been thoroughly washed down, the collection bucket was carefully removed. A large white sorting tray was positioned under the collection bucket when it was removed and as the contents of the bucket were transferred to labeled sample containers. Collection buckets were carefully rinsed to ensure that all organisms have been properly transferred to the sample container. Samples were preserved using 10 percent formalin solution with Rose Bengal stain.

Collection of ichthyoplankton samples within the intake forebay was performed on a monthly basis using a 0.5-meter, 300 microgram mesh conical net deployed from a catwalk. Nets were deployed from two locations and were set at mid-water depth. Nets were equipped with a General Oceanics flow meter. Minimum sample volume for all collections was 100 m^3 (approximately 20-minute duration). Following sample collection, flow meter readings were recorded, and the collection net was washed using a low-pressure external wash. All material collected in the collection bucket at the cod end of the net was removed and transferred to a labeled sample jar. Sample contents were preserved using a 10 percent formalin solution containing Rose Bengal stain. Each sample was stored and transported to a laboratory for processing.

Entrainment samples were collected from each CWIS according to the following intervals: 0–0600, 0600–1200, 1200–1800, 1800–2400 such that one sample was obtained every six hours. Entrainment samples were processed according to standard operating procedures for laboratory processing. All fish eggs, larva, and juveniles were sorted from the sample using a 10X magnifying lamp and submitted for taxonomic analysis. If samples contained a large number of specimens or large amounts of detritus, samples were split using a plankton splitter. Subsamples were processed until a minimum of 200 identifiable specimens were found but counts for individual subsamples were maintained.

Water quality parameters of temperature and dissolved oxygen were measured for each sampling event at each location. Parameters were measured by lowering a temperature and dissolved oxygen meter probe into the source water for a single reading during each sampling event. This reading was conducted at the same interval during each sampling event.

Entrainment Taxonomy Results

Only 225 larvae and eggs representing six taxa were found in 2006 entrainment samples taken from the discharge at MNGP. The total collection was numerically dominated by sucker (Catostomidae) larvae (77.3 percent). Based on the results of historical source water surveys, the specimens were primarily redhorses (*Moxostoma* spp.). Brook stickleback (*Culaea inconstans*) was the only distinct species identified. In the larval stage, cyprinid taxonomy is difficult, and specimens are frequently separated into ground based on preanal myomere counts, eye morphology, and ventral pigmentation. The three groups that were most abundant in forebay samples from MNGP were the flattened eye (34.1 percent), mid-ventral stripe (24.4

percent), and outlined gut groups (18 percent). At this location, the flattened eye group likely contained bluntnose minnow and sand shiner; the mid-ventral stripe group probably consisted of the fathead minnow and mimic shiner; the outlined gut group were probably the spotfin shiner, river shiner, longnose dace, or blacknose dace. The difference in the taxonomic composition of the forebay and discharge sample sites seems most attributable to seasonal variability. The April and June forebay sampling events occurred on dates where densities in the discharge entrainment samples were low, thus missing the peak collections of larval catostomids. Alternatively, many of the larvae collected in forebay samples may have been residents of that area, but not particularly vulnerable to entrainment. Potential evidence for this speculation was that cyprinid larvae that were relatively numerous in the July and August forebay samples were absent in discharge entrainment samples. Most individuals from the entrainment samples were not easily identifiable due to deterioration prior to collection at the discharge pump house. Even so, taxonomic richness in entrainment samples appeared to be very low.

Very few of the representative important species—spotfin shiner, shorthead redhorse, black bullhead, channel catfish, bluegill, smallmouth bass, and black crappie—appeared to be commonly entrained. No ictalurid or centrarchid larvae were found in samples and only one potential spotfin shiner was encountered. Further, even if it is assumed that all Catostomidae larvae were shorthead redhorse, the degree of entrainment for these species was low (174 specimens for the combined sample).

Summary of Entrainment Results

Density peaks at the discharge pump sites occurred in mid-May and late May, reflecting an increased collection of catostomid larvae, and early August, when eggs and unidentified larvae were the primary components of the sample. Ichthyoplankton density was typically less than 40 per 1,000 m^3 and never exceeded 160 per 1,000 m^3. When these densities were multiplied by the amount of intake water from the river, the total number of larvae entrained during the survey period was estimated to be 5,702,590 during the 2006 study year (April through September). Most larvae were entrained in May, when over 70 percent of the total was obtained. August and June contributed 11 percent and 7 percent of the total, respectively. Of the major taxa, catostomids were present in the greatest numbers during May, whereas cyprinids were more prevalent from June to September. Entrainment during the 2006 survey period was lower than, but comparable to, that reported in 1976, when an estimated 10 million fish and eggs were entrained between early April and late August. This was attributed to extremely low river flow during the 1976 survey period, as annual ichthyoplankton densities are typically greater in low-flow years.

The condition of larval fish entrainment samples was frequently poor. Because entrainment samples were taken at the discharge rather than the intake, it is possible that some degradation in condition occurred while they were traveling through the cooling water system. However, samples taken at discharges of other power plants did not exhibit this problem. Further, sampling discharge of power plants has been demonstrated to be equally as effective as sampling from the cooling water intake site.

An additional possibility is that dead individuals naturally occurring as a component of the larval drift were retained in the eddy at the right of the intake forebay, and decomposition occurred there. The EPA has stated that larval drift included live and dead organisms, and natural mortality is high for early life history stages of all species. In either case, the low numbers of entrained individuals indicate that this had little effect on the overall results.

Forebay Results

Results of forebay samples were compared to the results of entrainment samples. In four of the five occasions, greater total density was obtained at one or both of the forebay samples, although densities were relatively low (<60/1,000 m^3) at all locations when comparisons could be made. In May, entrainment density (83/1,000 m^3) far exceeded that obtained in forebay samples, where no larvae were encountered. In the April, June, July, August, and September collections, however, densities at one (June and September) or both forebay locations were higher. In June, the density at Boom 2, in the middle of the forebay, was considerably higher (43/1,000 m^3) than either Boom 1 (6/1,000 m^3) or the discharge (10/1,000 m^3). In July, densities from Boom 1 and Boom 2 (208 and 114/1,000 m^3 respectively) exceeded that of the discharge sample (3/1,000 m^3). Similarly, August densities were higher at Boom 1 and Boom 2 (62 and 61/1,000 m^3 respectively) than at the discharge (13/1,000 m^3).

Impingement Methodology

Impingement samples were collected for approximately two hours during each 6-hour interval over the course of each 24-hour sampling event. Samples were obtained using a collection basket having a 3/8-inch mesh. A basket was placed under a diversion pipe installed on the screen wash discharge outside of the cooling water intake system. At the onset of each 2-hour sampling event, the basket was put in place and the diversion pipe was made operational. Fish were removed from the collection basket after each 2-hour sampling period (or more frequently during periods of heavy debris loading).

During each 2-hour sampling event, contents of the baskets were emptied into holding containers as necessary to prevent overflow, and the baskets were cleaned of all organisms at the end of the sampling period. Sampling date, start time, and stop time was recorded for all samples. Additionally, daily plant operational information (pump operation, traveling water screen operation, inlet water temperature) was also obtained and used to adjust daily catch information to flow-based catch rates.

Diel sampling was intrinsic to the design of the overall impingement monitoring program. Sub-samples were obtained during each 6-hour interval (four times a day) which allowed for the characterization of diel variation in impingement.

All fish removed from the sampling apparatus were sorted by species, weighed, and measured. No sub-sampling was performed on any of the samples. Fish total length was measured to the nearest millimeter using a measuring board. Weight was measured to the nearest gram using a digital scale. If partial fish were present in the sample (head only, tail only), measurements were accompanied by a description of the body part. No samples collected contained so many fish that they required analyses by batch sampling.

Shellfish found in the impingement sample such as native freshwater mussels, Asiatic clams, and crayfish were identified to the lowest practicable taxonomic level and were counted (in the case of a few specimens such as native freshwater mussels or crayfish or Asiatic clams). A total of two native mussels and one Asiatic clam were collected during the study. In addition, other biological taxa found in impingement samples (i.e., not fish or shellfish) were also recorded.

Abnormalities of collected fish were also noted. Abnormalities that typically occur in fish include the following:

- Missing fins
- Eroded fins or tails
- Ulcerated skin
- Spinal abnormalities
- Head/mouth abnormalities
- Fishing injuries
- Diseases
- Parasites

The existing screens at MNGP have a long upward travel (greater than 20 feet), depending on river stage. As a result, there may be a potential for fish to fall off of the traveling screens onto the concrete sill or other structures and not be carried to the collection point. Other fish losses may occur from gaps in the screen system, holes in screens, etc. prior to being washed into the screen-wash collection. As a result, such fish may not be represented in the impingement sample which is analyzed at the collection device. Collection efficiency of the traveling screen system was therefore evaluated using the following protocol:

1. Evaluation of the collection efficiency was conducted three times over the course of the study.
2. A minimum of 90 fish previously collected from either electrofishing or seining were marked and injected in front of the bar rack at the beginning of the 24-hour sample period. Fish used for mark-recapture were collected opportunistically. On one occasion they were represented by different species of different sizes. The other two mark-recapture tests used gizzard shad that were two to three inches long.

From each impingement sample, the number of marked fish recovered was recorded. Collection efficiency was expressed as the percent of marked fish that were recaptured.

Impingement Results

During the year-long weekly impingement sampling program from August 2005 through July 2006 a total of 31 species were collected at MNGP. Additionally, three shellfish taxa were encountered in impingement samples. Of the 767 fish collected in samples, the dominant species were bluegill, channel catfish, and black crappie. These accounted for 28, 21, and 19 percent of the total catch, respectively. Other common species (i.e., those representing more than 2 percent of the total catch) included black bullhead, smallmouth bass, and yellow bullhead. A total of 109 shellfish was collected. Crayfish comprised the majority of this total (98 percent), with unionid mussels and Asiatic clams also encountered.

Sportfish, notably bluegill, channel catfish, and black crappie dominated, by number, the overall impingement collection. Common prey-forage taxa included spotfin shiner, sand shiner, spottail shiner, longnose dace, and fathead minnow. No threatened or endangered species included on federal, or state (Minnesota) lists were collected.

Weekly event totals were converted to a rate (number per million gallons of water pumped) in order to estimate impingement based on actual plant water use over the course of the survey period. The resulting value was then applied to actual daily water use over a 1-month interval. Based on these adjustments, the total annual impingement during the 1-year survey period was estimated to be 15,027 fish weighing 373 kilograms. By number, the major species in impingement samples were bluegill (5,392 per year), channel catfish (2,811 per year), and black crappie (2,086 per year). In contrast, common carp black bullhead, shorthead redhorse, smallmouth bass, and black crappie were the major species with regard to biomass, each over 10 percent of the total for the year. Total numbers of impinged fish were greatest in August, October, and November 2005, then considerably lower through the remainder of the study period. In August, black crappie and channel catfish comprised most of the total, whereas bluegill was the dominant species in October and November. In contrast to the seasonal pattern evident for numbers, total biomass increased from February 2006 to a peak in July 2006. Carp accounted for much of the biomass totals in August, September, and October 2005, and July 2006, whereas black bullhead was a major species, by weight, in April, May, and June 2006. Black crappie was an important contributor to the overall biomass (at least 4 kg per month, flow-adjusted) in August 2005 (18.9 kg) and May, June, and July 2006. Smallmouth bass was a major contributor in August and October 2005 and July 2006. Shorthead redhorse (June 2006), channel catfish (August 2005 and June 2006), and bluegill (October and November 2005) were primary contributors to total biomass only sporadically.

Impingement of shellfish was generally low throughout the survey period. Bivalves were collected too infrequently to determine a seasonal pattern, but crayfish were most numerous in July 2006, followed by November 2005 and June 2006, respectively.

Results of the 2005–2006 collections indicated moderately lesser impingement rates than were noted in studies from the 1970s. In 1972, an annualized estimate of 8,900 fish were impinged. These were primarily black bullhead (65 percent) and black crappie (26 percent), and the highest numbers were present in June. For the following year, approximately 36,000 fish were estimated to have been impinged, with the peak rate occurring in October. Bluegill accounted for 75 percent of the total catch. In 1974, an estimated 22,000 fish were impinged during the year, primarily in June and in late August/early September. Black bullhead (33 percent) and black crappie (28 percent) were the predominant species. Black bullhead was also the major species in the 1975 survey, when an estimated total of 46,000 fish were impinged. A comparable total impingement estimate (40,000 fish) was obtained in 1976, although the principal species comprising the total were shorthead (39 percent) and silver (19 percent) redhorses. Thus, higher impingement rates were observed in most of these earlier study years, particularly in 1975 and 1976. In these years, greater rates may have been attributable to low flow conditions; flows were one-half to one-third of what were present in 2005–2006. Two of the three primary species in the 2005–2006 study, bluegill, and black crappie, were also major contributors to total impingement in at least one previous sampling year. The exception was channel catfish, which accounted for 21 percent of the total catch in 2005–2006 but was rarely encountered in the earlier studies. In the current study, as in most of the studies conducted in the 1970s, young-of-the-year (YOY) individuals comprised the majority of the total fish collected. The exception was the 1975 study, when only 20 percent of the collection was YOY fish. In that study year, however, the plant was shut down from mid-September through late November, the period when YOY impingement is typically greatest.

Three collection efficiency evaluations associated with the year-long impingement survey were performed at MNGP to evaluate the efficiency of the traveling water screens in sampling impinged fish. The tests were conducted on June 28, July 19, and September 28, 2006. The September and July tests were performed using gizzard shad large enough to be retained on the traveling screens. For the June test, however, fish collected in seine samples were used. Consequently, many of the test specimens were smaller and may have passed through the screens. The overall recovery rate was 55 percent when all three events were considered but increased to 69 percent if the June sample is excluded. In all cases, the fish used for the efficiency study were dead specimens. Since dead fish cannot be expected to behave the same as live fish, this may have influenced the results. Calculation baselines would be affected by the same circumstances, resulting in an overestimation of actual impingement mortality. Moreover, differential size vulnerability to impingement results in the collection of small specimens of many species that are nevertheless considered, and valued as, adult specimens.

The diel impingement survey did not indicate that impingement was consistently greater at certain times of the day. In winter, rates were similar among the four time periods considered. Samples in the spring and summer indicated greater collection at night (i.e., the 6:00 p.m. to midnight and midnight to 6:00 a.m. periods). In contrast, fall samples were distinguished by greatest impingement in the afternoon (noon to 6:00 p.m.), followed by the night, morning, and late night/early morning periods. While the need to describe and characterize diel variations in impingement is dictated by the Rule (40 CFR 125.95(b)(3)(ii)), at MNGP these data are not relevant to the consideration of operational measures that may opt for variations in daily water use, because MNGP is a baseload facility.

Of the fish found in impingement samples from 2005–2006, an average of 63 percent were alive upon collection. The highest levels of mortality were in August (64 percent dead), September (46 percent) and October (55 percent) of 2005. In most other months, less than 30 percent of the sample consisted of dead fish. This high rate of survival seems most attributable to two factors. First, the traveling screens are operated continuously when river temperatures exceed 50 degrees F, so fish are not held against the screen for extended periods. Additionally, the absence of gizzard shad from the community removes a species that is particularly vulnerable to impingement mortality. Most of the species in the resident assemblage near MNGP are more robust than gizzard shad.

Evaluation of Impingement Effects

Documented levels of impingement and entrainment at MNGP were low over the course of the 2005–2006 study period. Total annual impingement was estimated to be approximately 17,000 fish and 2,000 shellfish, whereas total annual entrainment from April through September was estimated to be approximately 5,702,590 larvae and eggs. These overall impingement and entrainment rates are notably low and are not likely to result in a significant adverse effect on the resident aquatic communities. In the case of impingement, this is particularly true, due the presence of a fish return system and a commitment to an operational measure consisting of continuous screen rotations when river temperatures exceed 50°F. Additionally, the composition of the overall impingement catch was noted to be dominated by more robust species (bluegill, channel catfish, etc.) expected to have high survival rates at MNGP.

The available historical data (annual electrofishing and seining surveys conducted since 1968) on fish abundance, temporal and spatial distribution, condition factors and diversity indices, and the current fish impingement and entrainment study do not indicate that impingement and entrainment associated with the operation of the MNGP cooling system are having a major impact on fish species composition and abundance in the area of the MNGP. Although the estimated number of fish larvae and eggs entrained was over 5 million, the high natural mortality of these individuals leads one to expect that a very small percentage would survive even to the age 1+ stages, and the fecundity of the resident population would easily compensate for the loss. Therefore, this evaluation will focus on the impingement data.

A total of about 17,000 fish were estimated to be impinged during the August 2005 to September 2006 impingement sampling study. Thirty-one species were identified and 13 of these species accounted for one percent or more of the impinged fish. In total, these 13 species accounted for 88 percent of the fish impinged. Bluegill (32 percent), channel catfish (19 percent), black crappie (18 percent), and black bullhead (6 percent) made up about 75 percent of the impinged fish.

The least abundant species in the 2001–2005 electrofishing and seining surveys are the most abundant in the impingement study (bluegill, black crappie, black bullhead, brown bullhead, and yellow bullhead). Conversely, fish species that were the most abundant historically were not present or not very abundant in the impingement study (bluntnose minnow, bigmouth shiner, shorthead redhorse, silver redhorse, sand shiner, and spotfin shiner). There seems to be no correlation between abundance or spatial distribution and impingement levels for the most abundant species in these three studies.

Whatever the factors making bluegill, channel catfish, black crappie, black bullhead, smallmouth bass, and yellow bullhead more susceptible to impingement, it is not obvious that impingement of these species is having an adverse impact. Smallmouth bass, blackside darter, sand shiner, and channel catfish have either increased in abundance or remained stable during the plant's operational period. Shorthead redhorse and spotfin shiner populations have remained at or near pre-operational abundance. The log perch was not collected during the pre-operational period, but its abundance levels near MNGP have remained fairly constant during the operational period. While carp, walleye, and white sucker have decreased in abundance from pre-operational levels, their populations have been reasonably consistent over the past 20 years. Carp abundance has actually been increasing since 1988. As for the black crappie, black bullhead, brown bullhead, and yellow bullhead, these species were either not collected during the pre-operational surveys or have always represented a fraction of one percent of the fish collected. In seining surveys, bluegill was not collected during the pre-operational surveys or have always had an abundance well below one percent of the fish collected. Bluegill was first collected in 1976. Since 1976, bluegill has increased in seining surveys from an average of 0.1 percent in 1973–1980 of the total catch to an average of 0.4 percent in 1981–1990 and 1991–2000.

The electrofishing and seining surveys conducted over the past 32 years do not indicate any major long-term decreases in overall fish abundance and species diversity. While there may be some changes in spatial distribution due to thermal discharges from the plant, there is no evidence to suggest that these changes or the MNGP cooling water system impingement and entrainment are having adverse effects on the local fish communities.

Economic Evaluation of Impingement

The economic value of fish lost to impingement and entrainment was calculated using both the American Fisheries Society estimation approach and the EPA approach.

American Fisheries Society Estimation

Annual impingement and entrainment losses using this method were calculated using data from August 2005 through August 2006; therefore, a degree of conservatism is built into this calculation. Entrained individuals were added to the numerical data, but not the biomass data. Since most of these organisms were not identified to species, taxonomic categories were assigned to distinct species, based on the species in the group that had been collected most frequently in the study area. American Fisheries Society costs for these species are provided on a per fish basis, regardless of size or life stage, and a per pound basis. Finally, costs for each species are generated based on the total number and total weight of each species collected.

Using this method, the annual replacement costs of the impinged fish would be $70,412 if per fish costs were used, and $11,542 if per weight costs were used. With regard to the cost per fish method, major species contributing to the total were shorthead redhorse (51 percent) and white sucker (26 percent). Among recreationally or commercially important species, bluegill (8 percent), black crappie (4 percent), and channel catfish (3 percent) were the primary contributors. For the per weight method, shorthead redhorse and white sucker combined to account for over 80 percent of the total. Walleye (8 percent) was the primary recreational species in this analysis. The cost disparity between the per fish and per weight approaches reflected the contribution of larval fish and juvenile (YOY and/or 1+) individuals to the catch totals for most of these species.

EPA Estimation

The same numbers of annual impingement and entrainment losses used in the above approach formed the starting point for the EPA-recommended approach. The unidentified specimens were excluded, as they could not accurately be assigned to a species category and were too small to contribute to the total biomass. The numbers of each species were multiplied by 150 percent in an attempt to account for annual variation in impingement rates. In the next step, length-weight ratios were used from the impingement collection and literature research to estimate the percentage of each species that consisted of YOY fish. The YOY numbers of each species were corrected to account for mortality, using information from life history tables. Numbers were added to the portion of each species that did not include YOY fish to obtain a number of adult fish (termed age 1+ equivalents) estimated to be impinged in a year. Each species was assigned as either a recreational species (including ictalurids, trout-perch, centrarchids, yellow perch, and walleye) or a forage species (e.g., cyprinids, catostomids, sticklebacks, silversides, and small percids). For recreational species, numbers were adjusted to account for mortality prior to attainment of harvestable age. For the forage species, the numbers were converted to weights and the total was considered an available food source for a recreationally important predator. The total biomass was divided by 10 to account for an estimated 90 percent loss as a trophic transfer. This weight value was converted back to a number per species; smallmouth bass were used since they were the most numerous piscivore in impingement collections. To the numbers of recreational species and the number of smallmouth bass (derived from the numbers of forage species), dollar amounts were obtained from the EPA. Finally, the total dollar amounts for all species were summed.

The total estimated benefit of installation of impingement monitoring and entrainment controls using the EPA approach was $13,009 based on 2006 data. The major contributors to this total were, in order, channel catfish (21 percent), black bullhead (13 percent), black crappie (13 percent), walleye (13 percent), and smallmouth bass (8 percent). Thus, the annual value of estimated recreational benefits from impingement controls at MNGP, to which costs of engineering and/or operational modifications should be compared, is relatively low. In this analysis, production foregone valuations were not performed, but considering the low cost associated with direct valuations, their totals would not be expected to be substantial.

3.7.7.1.2 2017–2018 Entrainment Study

A 2-year 316(b) entrainment characterization study was conducted at MNGP by Xcel Energy environmental services staff from March 2017 to December 2018. The primary purpose of the study was to determine the abundance, seasonality, and species composition of entrained fish eggs and larvae. Entrainment samples were collected from the discharge structure sluice gate area, the cooling tower discharge area, and the plant intake. Pump samples were collected from two locations at the discharge structure at two separate depths during each sampling period.

Ichthyoplankton net samples were also collected from two locations at the cooling tower discharge and two locations in front of the MNGP river intake.

Methodology

Entrainment samples were collected by mechanically pumping MNGP discharge water from the two outlet bays of the plants discharge structure. Each pump setup consisted of a low-speed submersible electric pump with a vortex type recessed impeller and a 2-inch flex hose and piping system equipped with an in-line flow meter and butterfly valve. Pump samples were collected from the two discharge structure bays at two separate depths during each sampling period. To conduct sampling, pumps were started which then conveyed water to two separate sampling containers equipped with ichthyoplankton nets. Each ichthyoplankton net consisted of 500 μm mesh, tapering to a removable cod-end filter. The nets were suspended within an 80-gallon barrel to reduce damage of sampled organisms. Each barrel contained a main outlet and overflow drain to redirect all filtered water back into the discharge canal.

Each sample event targeted the collection and filtration of approximately 100 m^3 of river water. Sample flow rates and volume were measured using digital flow meters. Once sufficient sample volume was obtained, the nets were removed from the barrel and washed down. Each net was rinsed individually by running filtered river water over the outside (from top to bottom) of the net until all detritus and biological materials were retained in the plastic cod end. The cod ends were then separated from the net and all contents thoroughly transferred to single-liter plastic jars labeled with the appropriate nomenclature. Samples were preserved with a 10 percent formalin solution. A chain of custody was initiated, and the samples were transported to Xcel Energy's environmental lab for processing.

Entrainment sampling at the discharge structure was conducted for a 2-year period starting in March 2017 and concluding in December 2018. Sampling events were conducted monthly in January, February, March, October, November, and December, and twice a month during the primary fish reproduction months of April, May, June, July, August, and September. Entrainment sampling could not be conducted during a period of approximately 30 days in April-May 2017 because circulating water pumps were out of service for a refueling outage.

Entrainment samples were collected over a 24-hour period according to the following time intervals: 0000–6000, 0600–1200, 1200–1800, 1800–2400, such that samples were obtained within each six-hour interval. The number of sampling intervals was reduced during the fall and winter months (October to March), such that a single day sample was collected from 0600–1800 and a single night sample from 1800–0600. Sample duration was documented on the field sampling data sheet.

Cooling Tower Discharge Net Sampling Methodology

Entrainment samples were collected at the cooling tower discharge by deploying ichthyoplankton nets within the discharge flow from the two cooling towers. Nets were deployed at two locations within the area where both the cooling towers discharge into the discharge canal to analyze entrainment variation at two depths (surface and mid-water column). The ichthyoplankton nets were 0.5-meter diameter with 300–500 µm mesh equipped with a flow meter attached in the mouth of the net, anchors as necessary and removable cod ends. Nets were suspended at different depths when possible.

Nets were submerged in the cooling tower discharge flow until a volume of approximately 100 m^3 was sampled. Sample volume was determined utilizing the mechanical counter recorded on the flow meter. Once sufficient collection volume was obtained, nets were retrieved and washed down. All concentrate from the nets was localized in the removable cod-end and transferred to properly labeled single-liter plastic bottles. Samples were preserved using a 10 percent formalin solution. After all necessary field data were recorded, a chain of custody was initiated, and the samples were transported to Xcel Energy's environmental lab for processing.

Entrainment sampling at the cooling tower discharge was conducted during the months in which the cooling towers were in service. In 2017, cooling tower sampling was conducted starting in June and concluding in September. In 2018, cooling tower sampling was conducted starting in May and lasted through September. Sampling events were conducted twice a month on the same days in which discharge structure sampling was conducted. Entrainment sampling could not be conducted during a period of approximately 30 days in April-May 2017 because circulating water pumps were out of service for a refueling outage.

Entrainment samples were collected over a 24-hour period according to the following time intervals: 0000–6000, 0600–1200, 1200–1800, 1800–2400, such that samples were obtained within each 6-hour interval. Sample duration was documented on the field sampling data sheet.

River Intake Net Sampling Methodology

Entrainment samples were collected by deploying ichthyoplankton nets at the MNGP river intake. The nets were deployed from two locations from a bridge suspended above the floating log boom. Nets were sampled in the intake flow in front of the trash racks prior to the intake travelling screens. Ichthyoplankton nets were 0.5-meter diameter with 300–500 µm mesh equipped with a flow meter attached in the mouth of the net, anchors as necessary, and removable cod ends. Nets were suspended at different depths where possible.

Nets were submerged in the intake flow until a volume of approximately 100 m^3 was sampled. Sample volume was determined utilizing the mechanical counter recorded on the flow meter. Once sufficient collection volume was obtained, nets were retrieved and washed down. All concentrate from the nets was localized in the removable cod-end and transferred to properly labeled single-liter plastic bottles. Samples were preserved using a 10 percent formalin solution. After all necessary field data were recorded, a chain of custody was initiated, and the samples were transported to Xcel Energy's environmental lab for processing.

Entrainment sampling using nets at the river intake was conducted twice a month during the months of April, May, June, July, August, and September. Sampling events were conducted twice a month on the same days in which discharge structure sampling was conducted. Entrainment sampling could not be conducted during a period of approximately 30 days in April-May 2017 because circulating water pumps were out of service for a refueling outage.

Entrainment data collected at the intake were used to assist in identification of taxonomic groups collected at the discharge structure and cooling tower discharge locations due to anticipated poor physical condition of the specimens passing through the cooling water system. Final entrainment estimates were calculated solely on data collection at the discharge structure and cooling tower discharge sampling locations.

Entrainment samples were collected over a 24-hour period according to the following time intervals: 0000–6000, 0600–1200, 1200–1800, 1800–2400, such that samples were obtained during each 6-hour interval. Sample duration was documented on the field sampling data sheet.

Entrainment Estimate Extrapolation Methodology

Entrainment data for each sample period were adjusted using sample volumes and the actual MNGP intake flows to calculate daily, monthly, and annual entrainment estimates. Fish and egg numbers and sample volumes collected from both discharge structure pump and cooling tower net samples were combined to calculate the discharge entrainment estimate for sample periods in which both discharge structure and cooling tower samples were collected.

The monthly estimates were summed to provide an annual entrainment estimate for each year. An average annual entrainment estimate was also created using the average estimate of each species, by month.

Water Quality Measurements

Water quality data (temperature and dissolved oxygen) were collected during each sampling interval at each location. A YSI ProODO meter was used for water quality measurements. Parameters were measured by lowering the probe into the water column within the vicinity of each sample location during each sampling event.

Results

Entrainment Estimate at MNGP Based on Actual Intake Flow

A total of 2,022 fish eggs and larvae representing 23 taxa were collected at MNGP in entrainment samples from the discharge structure and cooling tower discharge locations during the 2-year entrainment characterization study. In 2017, a total of 786 eggs and larvae were collected, comprising a total of 11 taxa. In 2018, a total of 1,236 eggs and fish were collected, representing 21 taxa. The relative abundance of each taxonomic family group collected in 2017 and 2018 was calculated to determine species composition of entrained organisms for each year. Relative abundance is the proportion of a specific taxonomic group compared to the total collection number, expressed as a percentage.

Based on the 2017 entrainment data collected at the discharge and cooling tower discharge sampling locations, entrainment of fish and eggs was estimated to be 19,616,797. Of the life stages encountered, fish eggs represented 31 percent of the total entrainment estimate (6,090,666 individuals), while fish larvae accounted for the remaining 69 percent (13,536,130 individuals). No other life stages (e.g., juveniles or adults) were collected in these samples. Relative abundance was calculated by family to assess the species composition of entrained organisms at a broader taxonomic level. While unidentified fish eggs and larvae represented 64.7 percent of the total estimate (12,393,948 individuals), suckers (Catostomidae) accounted for 25.7 percent (5,048,916 individuals), followed by minnows (Cyprinidae) with 5.9 percent (1,157,642 individuals), perches (Percidae) with 2 percent (394,530 individuals), sunfish (Centrarchidae) with 1.3 percent (253,362 individuals), and catfish (Ictaluridae) with 0.4 percent (69,398 individuals).

Aside from unidentified fish eggs and larvae, white sucker (*Catostomus commersonii*) was the most abundant taxa, accounting for 23.2 percent of the 2017 total entrainment estimate (4,545,318 individuals). The second most abundant taxa consisted of specimens keyed only to the minnow family (Cyprinidae), which represented 5.8 percent of the total (1,143,103 individuals). Redhorse (*Moxostoma* sp.) represented 2.6 percent (503,598 individuals), followed by darters (*Eheostoma* sp.) with 1.4 percent (275,958 individuals). The remaining 2.3 percent of the total entrainment estimate (454,871 individuals) consisted of seven other taxa, each of which represented 0.7 percent or less of the total. These species included smallmouth bass, green sunfish (*Lepomis cyanellus*), perches (Percidae), channel catfish, yellow perch, sunfish (*Lepomis* sp.), and shiners (*Notropis* sp.).

In 2017, the highest estimated entrainment rates occurred in the months of May and June, cumulatively accounting for 98.2 percent of the total entrainment estimate. There was one primary peak in May 2017, which accounted for 78.2 percent of the estimate (15,337,294 individuals). June 2017 represented 20 percent of the total (3,928,314 individuals), followed by July 2017 with 1.2 percent (239,379 individuals); April 2017 with 0.3 percent (50,237 individuals); August 2017 with 0.2 percent (46,992 individuals); and September 2017 with 0.1 percent of the total estimate (14,581 individuals).

In 2018, entrainment of fish and eggs was estimated to be 26,377,801. By life stage, fish eggs accounted for 0.7 percent of the total (183,706 individuals), while larvae represented the remaining 99.3 percent (26,194,095 individuals). Relative abundance was calculated by family to assess the species composition of entrained organisms at a broader taxonomic level. While unidentified fish eggs and larvae represented 43.2 percent of the total entrainment estimate (11,381,983 individuals), minnows (Cyprinidae) accounted for 26.1 percent (6,875,451 individuals), followed by suckers (Catostomidae) with 18.8 percent (4,958,436 individuals); sunfishes (Centrarchidae) with 4.3 percent (1,143,868 individuals); eelpouts (Zoarcidae) with 3.9 percent (1,022,231 individuals); and perches (Percidae) with 2.3 percent (602,759 individuals). Four other families accounted for the remaining 1.2 percent (318,667 individuals), which included catfish (Ictaluridae), pikes (Esocidae), trout-perches (Percopsidae), and sculpins (Cottidae).

Of the specimens identified, minnows (Cyprinidae) were the most abundant taxa group, accounting for 26 percent (6,859,904 individuals). The second most abundant taxa was white sucker with 17.6 percent (4,642,779 individuals), followed by eelpout (burbot) (*Lota lota*) with 3.9 percent (1,022,231 individuals); smallmouth bass with 1.5 percent (391,353 individuals); redhorse (*Moxostoma* sp.) with 1.1 percent (288,110 individuals); and sunfish (*Lepomis* sp.) with 1 percent of the total entrainment estimate (266,212 individuals). The remaining 5.5 percent

(1,450,823 individuals) consisted of fifteen other taxa, each accounting for less than 1 percent of the total. In descending order, these taxa include walleye, bluegill, logperch (*Percina* sp.), darter (*Etheostoma* sp.), channel catfish, pike (*Esox* sp.), trout perch (*Percopsis omiscomaycus*), crappie (*Pomoxis* sp.), largemouth bass, darter (Percidae), green sunfish, sucker (Catostomidae), sunfishes (Centrarchidae), mottled sculpin (*Cottus bairdi*), and spotfin shiner.

Similar to peak entrainment periods exhibited in 2017, the highest estimated entrainment rates in 2018 occurred in May and June, cumulatively accounting for 90.2 percent of the total entrainment estimate. There was one large peak in May 2018, representing 61.4 percent of the total (16,203,081 individuals). Estimates in June 2018 represented 28.7 percent (7,577,041 individuals), followed by April 2018 with 4.9 percent (1,290,809 individuals); July 2018 with 3.1 percent (806,346); September 2018 with 1.3 percent (350,218 individuals); and August 2018 with 0.6 percent (150,307 individuals).

Entrainment Estimate at MNGP Based on Design Intake Flow

MNGP entrainment estimates were also calculated using design intake flow (DIF) to determine the reduction in annual entrainment achieved by current plant operations. The DIF at MNGP is 317,500 gpm, or 457.2 MGD, which is made up by two circulating water pumps with a combined rated capacity of 292,000 gpm, three service water pumps with a total rated capacity of 24,000 gpm, and one screenwash pump with a rated capacity of 1,500 gpm. The DIF (457.2 MGD) was applied to each of the days that MNGP was in operation in 2017 and 2018. The hypothetical intake flows were then used to extrapolate the actual entrainment data collected during each year of the study to develop an estimated entrainment total based on the DIF.

Based on DIF extrapolation calculations, the total entrainment estimate at MNGP in 2017 and 2018 was approximately 36,885,501 and 31,154,482 individuals, respectively. In comparison to 2017 actual intake flows, entrainment of aquatic organisms was reduced by 88 percent in 2017. Entrainment reductions observed in 2017 were primarily attributed to the refueling outage during April-May 2017 when circulating water pumps were out of service for approximately 30 days. Entrainment was reduced by 18.1 percent in 2018 compared to potential design operations.

Of the 2,022 organisms collected during the 2-year entrainment study, unidentified fish eggs accounted for 10.1 percent of the total (206 specimens), while fish larvae comprised the remaining 89.9 percent (1,816 individuals). Of these larvae, 50.1 percent (613 specimens) could not be distinguished for stage in larval development (e.g., yolk sac, post yolk sac). Yolk sac larvae comprised 42.9 percent (516 individuals), while post yolk sac larvae accounted for the remaining 57.1 percent (687 individuals). No juvenile or adult life stages were exhibited in discharge and cooling tower discharge entrainment samples during the 2-year study.

3.7.7.1.3 Thermal Studies

A thermal effluent discharge analysis study was completed for the MNGP site in September 2009 as part of the analysis for an EPU. The purpose of the analysis was to estimate the effect on river water temperature if the plant thermal effluent temperature is increased.

Several field measurements of temperatures at two transects upstream of the thermal discharge outfall and at 17 transects downstream of the thermal effluent discharge. The temperature data obtained during the period from 1981–1987 were used in the analysis. The field data were obtained at one-foot depth intervals along verticals located 50 feet apart across the river at each transect. Data collected included river and plant effluent flowrates, river and plant effluent temperatures, and the maximum temperature recorded at each transect.

The maximum temperature increase for the effluent temperature increase of 4.5°F (90°F to 94.5°F) ranged from 2.8°F at near the discharge canal to about 1.1°F downstream near the TH 25 Bridge. For the effluent temperature increase of 2°F (90°F to 92°F), the maximum temperature rise varied from 1.2°F near the discharge canal to about 0.5°F downstream near the TH 25 Bridge.

In addition to the above analysis, the field data were reviewed to assess the effect of increasing the effluent temperature on the lateral spread of the thermal plume. Three sets of data with nearly same river flow rates, but with different effluent and river water temperatures, were chosen to study this effect. As effluent temperature changes, the lateral spread remains essentially constant. The maximum river temperatures occur close to the right bank (looking downstream) of the river. The temperature increases estimated above are the maximum values, and the temperature rise decreases in the lateral direction to a value of zero at the plume boundary.

3.7.7.1.4 Electrofishing Surveys

As part of the current NPDES permit requirements, MNGP is required to conduct annual electrofishing surveys to assess relative abundance and seasonal distribution of fish in the Mississippi River in response to MNGP's thermal discharge. The monitoring requires electrofishing studies be conducted four times each year in May, July, September, and October in two sectors of the Mississippi River (Special Permit No. 30309). Sector 1 encompasses an area of approximately 21 hectares and extends from the discharge structure upstream 1.7 km to the north end of Cedar Island. Sector 2 extends 1.5 km downstream from the discharge structure to Boy Scout Rapids and includes an area of approximately 21 hectares. The thermal plume generally covers less than half the area of Sector 2 throughout most of the sampling period.

Sampling was conducted during daylight hours with a Smith-Root SR-18 Electrofisher. The 18-foot flat-bottom boat includes a 5.0-GPP (5,000-watt) electrofishing unit. The anode consists of two umbrella arrays with six dropper cables, and the cathode consists of boat-hull dropper cables. The unit has a maximum output of 16 amps, a range of 0-1,000 volts, and capabilities to be operated in either alternating current (AC) or direct current (DC) mode with a pulse frequency of 7.5, 15, 30, 60, or 120 Hertz. During the survey, the Electrofisher was operated as pulsed-DC, generally at 60 pulses per second, within a preferred output range of four to six amps. Control settings and output are varied to enhance effectiveness, depending on river conditions, such as river flow.

The entire shoreline in each sector was sampled. The field was energized intermittently to prevent avoidance by fish herding ahead of the electrical field. Elapsed shocking time was recorded for each run by a timer, which only counts the seconds that the electrical field is energized. Stunned fish were captured with 1-inch mesh landing nets equipped with 8-foot insulated handles and placed in a circulating holding tank until the completion of each run.

The most recent electrofishing studies were conducted from 2016–2021 and summarized in biennial reports. A total of 1,568 fish, comprising 14 species, were collected during the 2016–2017 electrofishing surveys. In 2016, 739 fish were collected; in 2017, 829. The dominant species overall, in descending order of abundance, were shorthead redhorse, smallmouth bass, silver redhorse, common carp, white sucker, bigmouth buffalo, walleye, and channel catfish. Collectively, these species represent approximately 98 percent of all fish sampled in the electrofishing survey. The remaining species collected in the survey include black crappie, bluegill, bowfin, largemouth bass, northern hogsucker, and northern pike. The 2016–2017 CPUE in Sector 1 totaled 202.42 fish/hour and the Sector 2 CPUE totaled 277.08 fish/hour.

A total of 1,105 fish, comprising 13 species, were collected during the 2018–2019 electrofishing surveys. In 2018, 855 fish were collected; in 2019, 250 fish were recorded. In all, 26 species from eight families have been identified during the MNGP electrofishing studies. The dominant species overall, in descending order of abundance, were shorthead redhorse, common carp, smallmouth bass, silver redhorse, white sucker, bigmouth buffalo, walleye, and channel catfish. Collectively, these species represent approximately 99 percent of all fish sampled in the electrofishing survey. The remaining species collected in the survey include bluegill, flathead catfish, northern hogsucker, northern pike, and rock bass. The CPUE in Sector 1 for totaled 181.04 fish/hour, while Sector 2 CPUE totaled 251.59 fish/hour. A total of 769 fish, comprising 12 species, were collected during the 2020-2021 electrofishing surveys. During 2020, 603 fish were collected and in 2021, 166 fish were recorded. In all, 27 species from nine families have been identified during the MNGP electrofishing studies. The dominant species overall, in descending order of abundance: shorthead redhorse, common carp, channel catfish, smallmouth bass, silver redhorse, white sucker, walleye, and bigmouth buffalo. Collectively, these species represent approximately 97 percent of all fish sampled in the electrofishing survey. The remaining species that were collected in the survey include: bluegill, muskellunge, northern hogsucker, and northern pike. CPUE in Sector 1 for 2020-2021 totaled 167.30 fish/hr, while Sector 2 CPUE totaled 189.08 fish/hr.

In all biennial studies conducted thus far, the persistence and stability indices for the two sectors indicate relatively stable species assemblages.

3.7.7.1.5 Seining Studies

As part of the current NPDES permit requirements, MNGP is required to conduct annual fish seining studies to observe the relative abundance and species composition of the small fish community in the vicinity of MNGP. Seining was conducted six times at approximately 2-week intervals between the months of June and September. A 20-foot seine with 1/8-inch mesh was used for sampling. Haul length varied based on location but ranged from 30–100 feet in distance. Fish captured were identified, tabulated, and released near the area where they were collected. Fish species assemblages from the upstream and downstream sectors were analyzed and compared on the basis of species persistence and stability.

A total of 6,534 fish were collected and identified during the 2016–2017 seining surveys. Sector 1 had a total of 4,697 fish, while Sector 2 had 1,837 fish. In 2016 and 2017, 18 and 26 species were identified, respectively. The most abundant species collected were sand shiner, spotfin shiner, suckers, and smallmouth bass.

The abundance of selected common species (those present nearly every year) in both sectors was examined for trends. Based on dominance rankings from 1994 to 2017, it is apparent that the spotfin shiner, sand shiner, and bluntnose minnow are consistently the major forage fish in this section of the river. Projected trends for the selected fish species were evaluated. A total of 3,924 fish were collected and identified during the 2018–2019 seining surveys. Sector 1 had a total of 2,023 fish, while Sector 2 had 1,901 fish. In 2018 and 2019, 26 and 23 species were identified, respectively. The most abundant species were sand shiner, spotfin, shiner, spottail shiner, and bluegill. A total of 4,466 fish were collected and identified during the 2020-2021 seining surveys. There were 2,843 and 1,623 fish collected in 2020 and 2021 respectively. Sector 1 had a total of 1,247 fish, while Sector 2 had 3,219 fish. In 2020 and 2021, 26 and 21 species were identified, respectively. In all, 45 total species have been identified in the seining studies at MNGP since 1998.

An index of persistence was calculated from 20 plus years of seining data at MNGP. The calculated values are similar to values reported by other investigators. The 2020 indices for persistence from Sector 1 and Sector 2 were 0.6486 and 0.4571, respectively. Persistence indices for 2021 were 0.7647 and 0.7179 for Sectors 1 and 2 respectively. Based on historical CPUE values from 1998 to 2021, it is apparent that the spotfin and sand shiners are consistently the major forage fish in this section of the river.

3.7.8 Threatened, Endangered, and Protected Species, and Essential Fish Habitat

The USFWS maintains current lists of threatened or endangered species on its website (USFWS 2022). The MDNR also maintains county lists of state protected species on its website (MDNR 2022a). No designated critical habitat is listed for Sherburne or Wright counties (USFWS 2022). Species located onsite or potentially occurring within Sherburne or Wright counties listed as threatened or endangered by these agencies are described below and summarized in Table 3.7-5. Consultation letters with state and federal agencies are included as Attachment B.

3.7.8.1 Federally Listed Species

3.7.8.1.1 Northern Long-Eared Bat

The northern long-eared bat is federally, and state listed as threatened. On January 28, 2020, in the Center for Biological Diversity v. Everson, No. 15-477 decision, the U.S. District Court for the District of Columbia remanded the federal listing decision to the USFWS to make a new decision whether the northern long-eared bat should be listed as endangered. However, the threatened listing currently remains in effect (DCDC 2020; USFWS 2022). During the summer, northern long-eared bats use cavities under bark on both dead and live trees as well as mines and caves to roost. Females will roost in small colonies of 30–60 bats and on average give birth to one pup per female. During the winter, bats hibernate in small crevices and cracks in caves and mines that have constant temperatures, high humidity, and no air currents. Changes to any wintering site microclimates can make that habitat unsuitable for the bats. Threats to this species include white-nose syndrome, impacts to roost sites, loss of habitat, and wind farm operations (USFWS 2015). Compliance with all regulatory requirements associated with protected species will continue to be an administrative control practiced by MNGP for the licensed life of the facility. Adherence to these controls, as well as compliance with applicable laws and regulations, should prevent potentially negative impacts to northern long-eared bats.

MDNR NHI data indicate no occurrences of northern long-eared bat documented within 6 miles of the MNGP site. Suitable roosting and maternity habitat for the northern long-eared bat is present on the MNGP site; however, MNGP does not have any records of this species being observed onsite.

3.7.8.1.2 Monarch Butterfly

The monarch butterfly (*Danus plexippus*) is a common insect that lives throughout Minnesota during the summer. It's seen in backyards, parks, and in rural areas. Its large size, wide range, and bright orange and black wings make it one of Minnesota's most well-known insects. Monarchs live in fields and parks where milkweed and native plants are common. (MDNR 2021m)

Monarch butterflies migrate annually over long distances to overwinter as adults at forested locations in Mexico and California. The North American migratory populations account for more than 90 percent of the worldwide number of monarch butterflies. Overwintering sites provide protection from the elements (for example, rain, wind, hail, and excessive radiation) and moderate temperatures, as well as nectar and clean water sources. (USFWS 2020)

Adult monarch butterflies feed on nectar from a wide variety of flowers. Reproduction is dependent on the presence of milkweed, the sole food source for larvae. The primary threats to the monarch's biological status include loss and degradation of habitat from conversion of grasslands to agriculture, widespread use of herbicides, logging and thinning at overwintering sites in Mexico, senescence, and incompatible management of overwintering sites in California, urban development, drought, exposure to insecticides, and the effects of climate change. (USFWS 2020)

In December 2020, the USFWS found that listing the monarch butterfly as an endangered or threatened species is warranted but precluded by higher priority actions to amend the lists of endangered and threatened wildlife and plants. When a petitioned action is found to be warranted but precluded, the USFWS is required by the Endangered Species Act (ESA) to treat the petition as resubmitted on an annual basis until a proposal or withdrawal is published. Thus, the monarch butterfly is currently listed as a candidate species for protection under the ESA. (USFWS 2020)

Suitable habitat for the monarch butterfly is likely present in undeveloped portions of the MNGP site that are not maintained by mowing. Additionally, suitable habitat is present in the vicinity of the MNGP site. However, according to USFWS IPac data, the monarch is considered unlikely to occur within 6 miles of the MNGP site. (USFWS 2022) Additionally, MDNR NHI data show no recorded occurrences of the monarch butterflies within 6 miles of the MNGP site.

3.7.8.1.3 Rusty Patched Bumble Bee

The rusty patched bumble bee (*Bombus affinis*) lives in a variety of habitats, including prairies, woodlands, marshes, farms, parks, and gardens. Rusty patched bumble bees are habitat generalists but are typically found in areas that contain natural and semi-natural upland grassland, shrubland, woodlands, and forests. They may also be found in urban or suburban areas that contain nesting habitat, nectar and pollen resources, and overwintering habitat. In the spring they are often found in and near woodland habitats. Once found in 29 states and two Canadian provinces, its current range is limited to scattered locations within 10 states, including Minnesota. (USFWS 2021c)

The rusty patched bumble bee has declined by 87 percent in the last 20 years. This bee is likely present in only 0.1 percent of its historical range. There are many potential reasons for this decline, including disease, habitat loss and degradation, pesticide use, and climate change. These issues, plus competition with non-native bees and the effects of small population dynamics, are threats to the rusty patched bumble bee's survival, and it is listed as endangered under the ESA. (USFWS 2021c)

Rusty patched bumble bees eat nectar and pollen from a wide variety of flowering plant species. They typically forage within 0.6 miles of their nest. The rusty patched bumble bee is one of the first bumble bees to emerge early in the spring and the last to go into hibernation, and it needs pollen and nectar during that entire time. The number of queens a colony can produce is directly related to the amount of pollen available. Nectar provides carbohydrates and pollen provides protein. The primary food of larvae is pollen. Bumble bee superfoods and/or immune building plants include wild bergamot (*Monarda fistulosa*), prairie clover (*Dalea* sp.), hyssop (*Agastache* sp.), goldenrod (*Solidago* sp.), asters (*Symphyotrichum* sp.), leadplant (*Amorpha canescens*), Joe Pye weed (*Eutrochium* sp.), coneflowers (*Echinacea* sp.), sunflowers (*Helianthus* sp.), white turtlehead (*Chelone glabra*), and native wild blueberries and cranberries (*Vaccinium* sp.). Diverse flowering plants are required to ensure that nectar and pollen are available throughout the colony's long active flight season (from March or April through October). Rusty patched bumble bees may depend on woodland spring ephemeral flowers because of their early spring emergence. (USFWS 2021c)

Queens typically establish their nests in abandoned rodent burrows or other similar cavities, one to four feet below ground. Occasionally nests have been observed above ground. Bumble bees overwinter in small chambers in loose soil and/or leaf litter just a few centimeters below the surface, or in compost or rodent hills/mounds. Little is known about the specific overwintering habitats of rusty patched bumble bee queens. Overwintering habitat is often associated with woodland edges, which provide proximity to woodland spring ephemeral wildflowers and early blooming trees and shrubs. (USFWS 2021c)

Suitable habitat for the rusty patched bumble bee is likely present in undeveloped portions of the MNGP site that are not maintained by mowing; however, they may also use flowering plants in landscape features around the site, if present. Additionally, suitable habitat is present in the vicinity of the MNGP site. However, according to USFWS IPaC data, the rusty patch bumble bee is considered unlikely to occur within 6 miles of the MNGP site (USFWS 2022). Additionally, MDNR NHI data show no recorded occurrences of the rusty patch bumble bee within six miles of the MNGP site.

3.7.8.2 State Listed Species

3.7.8.2.1 Birds

Common Tern

The MDNR has listed the common tern (*Sterna hirundo*) as an endangered species (MDNR 2022a). In North America, it occurs primarily as a transitory migrant; however, nesting occurs in three areas: the northern and mid-Atlantic Coast, the Great Lakes, and the northern Great Plains (Cornell 2021; MDNR 2022a). Common terns select isolated, sparsely vegetated islands in large lakes for nesting. Open edges of sandy or gravelly beaches or dredge spoil areas are also used. Optimal breeding sites are isolated from predators by natural barriers, have a constant nearby food source, have stable or falling water levels during the nesting season, and have topography that allows nesting common terns to see and hear potential predators (MDNR 2022a).

Common terns nest in large colonies. Nests are shallow indentations in the sand or wracks of dead vegetation on beaches. An average clutch contains three eggs. Both parents incubate the eggs during the day. The parents have been known to fly to the mainland during the night at several island sites in Minnesota, leaving the eggs or chicks unguarded. Parents who incubate their nests during the night are especially vulnerable to predators, as they are on the ground and in the open. Nesting common tern colonies tend to be highly susceptible to nocturnal predation because of the high density of eggs and chicks in a small area. Common tern chicks do not start to fly until approximately 21 days of age, but they usually leave the nest after several days and hop around on the beach or hide in vegetation while waiting for their parents to return with food (MDNR 2022a).

There are six primary breeding areas for common terns in Minnesota. These include Pine/Curry Island, NW Angle, Mille Lacs Lake, Lake Superior in Duluth, Leech Lake, and Cotton Lake (MDNR 2022a). None of these areas are within 6 miles of the MNGP site. The closest area is Mille Lacs Lake, approximately 53 miles north of the MNGP site. MDNR NHI data indicate no occurrences of the common tern have been documented within 6 miles of the MNGP site. Lake habitat is not present on the MNGP site. MNGP does not have any records of the common tern being observed onsite.

Loggerhead Shrike

The MDNR has listed the loggerhead shrike (*Lanius ludovicianus*) as endangered. The loggerhead shrike is a summer resident of Minnesota. Loggerhead shrikes are believed to be solitary migrants, moving short distances every day but sometimes staying in an area for several days to feed. They overwinter in the southern U.S. and Mexico, returning to Minnesota and the northern part of their range in March. Pairs defend territories of 5–62 acres. Nests are well hidden in trees or brush and are usually less than 6.6 feet above the ground. Females lay 3–7 eggs and incubate them for approximately 16 days. While on the nest, the female is fed by the male. Once the eggs hatch, both parents participate equally in feeding the chicks until they fledge at about 16 days old. The young practice hunting and manipulating objects for several weeks and are usually able to precisely impale prey at 2 months of age. Loggerhead shrikes use their sharply hooked bill and falcon-like tomial tooth (a sharp projection on the cutting edge of the bill) to subdue vertebrate prey by biting their necks and severing their cerebral vertebrae. They often impale prey on thorns or barbed wire, an adaptation that allows them to eat large prey without the benefit of strong feet and talons. Smaller prey, such as grasshoppers or beetles, may be impaled or eaten whole, but larger animals, including large invertebrates, amphibians, lizards, small snakes, mice, and small birds, are always impaled first, or wedged into a forked branch and then eaten. (MDNR 2022a)

Habitat destruction is partly responsible for the decline of this species, as loggerhead shrikes require relatively large areas of grassland habitat with scattered shrubs or small trees for nesting. Many of the sites currently used by this species in Minnesota are threatened by rural residential construction. Intensive farming practices do not leave much grassland and often preclude shelterbelts and hedgerows, making the habitat unsuitable for loggerhead shrikes. Additionally, as predators, shrikes are vulnerable to environmental contamination via reduced food supply and ingestion of contaminated prey. In one study, the decrease in loggerhead shrike numbers corresponded to the treatment of grasshoppers with an insecticide. (MDNR 2022a)

The reproductive rate and success of the loggerhead shrike is high, so the overall population could increase if factors responsible for the species' decline were identified and eliminated. Some loggerhead shrike habitat has become overgrown with trees, particularly red cedar. While red cedar is often an important nest tree for loggerhead shrikes, dry grassland slopes can become so covered by the dense growth of this tree that they become unsuitable shrike habitat. Loss of habitat on loggerhead shrike overwintering grounds is likely a large factor in the species decline as well, especially as migrating shrikes from northern breeding areas increasingly encounter habitats already saturated by resident, non-migratory shrikes. (MDNR 2022a)

MDNR NHI data indicate 12 occurrences of loggerhead shrikes within 6 miles of the MNGP site. Grassland habitat on the MNGP site may provide suitable habitat for loggerhead shrikes; however, MNGP does not have any records of this species being observed onsite.

Horned Grebe

The MDNR has listed the horned grebe (*Podiceps auritus*) as endangered. Horned grebes nest in marshes and on lakes with emergent vegetation. They build floating nests and prefer to use bays and inlets that provide protection from wind and wave action. Nests are constructed in shallow water, usually within emergent vegetation. During migration, horned grebes can be observed on a variety of lakes, even those without emergent vegetation (MDNR 2022a).

Since 1996, reports of horned grebes in suitable habitat during the breeding season have been scarce, and no persistent breeding populations are known in Minnesota. The only documented nesting in Minnesota in the past 20 years was in 2013 when two pairs, including one pair with several young, were found at Agassiz National Wildlife Refuge. Horned grebes are a relatively common migrant in the state, and non-breeding individuals are occasionally observed during the summer, though typically not in suitable nesting habitat. Horned grebes observed during summer on wastewater treatment ponds are most likely non-breeding individuals, as no actual breeding has been confirmed at these sites (MDNR 2022a).

MDNR NHI data show one occurrence of a horned grebe documented within 6 miles of the MNGP site. Suitable lake habitat is not present on the MNGP site but may be present in the vicinity. Marsh habitat may be present on the MNGP site due to the presence of the Mississippi River and could be used by this species during migration. MNGP does not have any records of horned grebes being observed onsite.

3.7.8.2.2 Mammals

Eastern Spotted Skunk

MDNR has listed the eastern spotted skunk (*Spilogale putorius*) as threatened. Eastern spotted skunks are generally found in open lands with sufficient cover, such as fencerows, shelterbelts, thickets, brush, and riparian woodlands. In agricultural areas they use buildings, corncribs, trash piles, rock piles, and haystacks for cover and den sites (MDNR 2022a). Dens are usually above ground, in a cavity or crevice under a rock pile, hollow log, or stump. Mating usually takes place in April, and litters of four to six young are born in July. The young are weaned after about 54 days. Eastern spotted skunks are generally insectivorous but are also opportunistic feeders and will eat almost anything they can find, including carrion, birds, eggs, small mammals, lizards, snakes, frogs, fruits, corn, and garbage. During the winter, small rodents are their primary food source. Eastern spotted skunk is primarily a nocturnal species (MDNR 2022a).

The reported trapping harvest in Minnesota peaked at 19,400 animals in 1946, when the eastern spotted skunk was regularly taken throughout all but the northeastern corner of the state. Since then, the population in Minnesota and throughout the species' range has declined sharply, and by 1965 fewer than 1,000 eastern spotted skunks were taken in the state annually. Despite intensive efforts to locate them, a maximum of six eastern spotted skunks have been documented in the last 20 years in Minnesota. Reasons for the population decline are unclear, but the consolidation of farms, the modernization of farming practices, and the use of pesticides are thought to be contributing factors. Changes in grain handling practices and modifications of building and storage facilities have also eliminated many den sites and reduced food sources for skunks (MDNR 2022a).

MDNR NHI data indicate no occurrences of eastern spotted skunk documented within 6 miles of the MNGP site. Riparian woodland and thick brush habitat within the MNGP site and in the immediate vicinity may provide potential habitat for the eastern spotted skunk. MNGP does not have any records of eastern spotted skunk being observed on site.

3.7.8.2.3 Fish

Pugnose Shiner

The MDNR has listed the pugnose shiner (*Notropis anogenus*) as threatened. In Minnesota, the pugnose shiner inhabits clear glacial lakes and low gradient small-to-moderate-sized streams in areas of little current. Rooted aquatic plants or muskgrass (*Chara* spp.) is almost always present and is a more important limiting factor than substrate type. In Minnesota and Wisconsin, the species has been collected over bottoms of sand, gravel, mud, marl, and detritus. In Fish Lake (Le Sueur County) and Little Swan Lake (Todd County), the species migrates into water 4–6 feet deep by mid-May. As summer progresses, they move shoreward into waters 3–4 feet deep. They remain at this depth in the areas of thickest vegetation until late July, when they begin a slow migration back to deeper waters (MDNR 2022a).

The pugnose shiner is rare throughout its range and is often absent in apparently suitable habitat. While Minnesota remains the center of abundance for this species, at least 17 extirpations have occurred at historical locations in Minnesota. The species is widely distributed across the north central two-thirds of Minnesota. The pugnose shiner is extremely intolerant of turbidity and siltation. Removal of littoral vegetation from lakes and an increase in turbidity in lakes and streams are linked to its demise in other states. Both of these phenomena have occurred at many of the historic Minnesota sites (MDNR 2022a).

MDNR NHI data indicate two occurrences of pugnose shiner documented within 6 miles of the MNGP site. Glacial lake or small-to-moderate-sized stream habitat is not present on the MNGP site; however, it is present within the project vicinity. MNGP does not have any records of pugnose shiner being observed onsite.

3.7.8.2.4 Mussels

Elktoe Mussel

The MDNR has listed the elktoe mussel (*Alasmidonta marginata*) as threatened. The elktoe mussel is an inhabitant of medium to large rivers. Suitable habitats include sand and gravel substrates in areas with moderate to fast velocities (MDNR 2022a). Males release sperm into the water, which is drawn in by females through their incurrent siphon. Fertilized eggs are brooded in the female's gills, where they develop into tiny larvae called glochidia. Once the glochidia are expelled from the female's gills, they attach to fish gills or fins by clamping onto them with their valves. The glochidia live as parasites on the host fish until they develop into juvenile mussels, at which point they detach from the fish and fall to the streambed as free-living mussels. Fish hosts for the elktoe's glochidia include suckers (*Moxostoma* spp.) and rockbass (*Ambloplites rupestris*) (MDNR 2022a).

The elktoe mussel originally inhabited many rivers in Minnesota, including the Mississippi, Minnesota, and St. Croix. However, it is now common only in the St. Croix River and some of its tributaries and less so in the upper Root River system. It is still found occasionally in the Mississippi, upper Iowa, and Zumbro rivers of southeastern Minnesota. Historically, the elktoe is considered to have been a minor component of the Minnesota River fauna, and it is currently on the verge of extirpation in the Minnesota, Pomme de Terre, and Yellow Medicine rivers. It is likely extirpated from the Cedar, Cottonwood, LeSueur, Wontanwan, and Blue Earth rivers. The elktoe mussel has recently been found inhabiting only a small number of drainages, making it vulnerable to catastrophic events (MDNR 2022a).

The continued persistence of the elktoe mussel in Minnesota is threatened by the hydrologic alteration of streams and their watersheds and non-point and point source water and sediment pollution. Dams, channelization, and dredging increase siltation physically alter habitat conditions, and block the movement of fish hosts. The elktoe mussel is also being impacted by the infestation of non-native zebra mussels in the Mississippi River and its tributaries. Zebra mussels can attach themselves in large numbers to the shells of native mussels, eventually causing death by suffocation (MDNR 2022a).

Riverine habitat (the Mississippi River) on the MNGP site may provide suitable habitat for elktoe mussels. MDNR NHI data indicate no occurrences of elktoe mussel have been documented within 6 miles of the MNGP site. MNGP does not have any records of elktoe being observed onsite.

3.7.8.2.5 Plants

Annual Skeletonweed

The MDNR has listed the annual skeletonweed (*Shinnersoseris rostrata*) as threatened. Annual skeletonweed is an insect-pollinated annual with a very distinct morphology. In fact, it has been moved to its own monotypic genus Shinnersoseris. The species presumably depends on a persistent seed bank to maintain populations, and seed germination requires scarification in the form of physical abrasion. This is believed to happen as a result of the seed tumbling over the sand, or possibly by the sand blowing over the seed. (MDNR 2022a)

In Minnesota, annual skeletonweed has only been found on open sand dunes in a prairie landscape. It requires conditions that are sunny and dry, becoming quite severe in late summer when heat and lack of water cause most species to shrivel and die. The plants survive only in unstabilized blowouts where the sand is constantly shifting and there is little, if any, competing vegetation. This is true whether the encroaching vegetation is comprised of trees and shrubs or of a dense cover of sod, even if the sod is comprised of native grass species. (MDNR 2022a)

This distinctive annual is largely restricted to sand dunes in the Great Plains, and it is local or uncommon over most of its range. In Minnesota, annual skeletonweed is extremely rare. Prior to 1986, the sole known occurrence was in Norman County. In 1986 it was discovered at two additional locations in adjacent Polk County, but all of the locations are part of the same population (Red River Prairie and Aspen Parklands subsections). Annual skeletonweed was also discovered in a sand dune in Sherburne County, but that occurrence is believed to have resulted from an old-field restoration effort using a seed mix from Nebraska, which could have contained seeds of this species. (MDNR 2022a)

MDNR NHI data indicate no occurrences of annual skeletonweed documented within 6 miles of the MNGP site. Sand dune habitat is not present on the MNGP site or in the immediate vicinity. Additionally, MNGP does not have any records of annual skeletonweed being observed onsite.

Beach Heather

The MDNR has listed the beach heather (*Hudsonia tomentosa*) as threatened. In MN, beach heather is sometimes found on high and sandy beaches of large lakes, well beyond the reach of normal wave action. Most occurrences are on active bare sand dunes that are not directly associated with lakes. Dunes are dynamic habitats, with high crests and bowl-shaped depressions. Depressions are referred to as blowouts and are generally devoid of vegetation except for beach heather and a small group of other rare species. If these blowouts are not kept open by wind, they become overgrown by grasses and other plants. Beach heather will disappear if this happens. On active dunes, beach heather can become nearly buried by blowing sand. Beach heather produces new roots (adventitious roots) along the buried portions of the stem, allowing continual upward growth in the event of becoming submerged. (MDNR 2022a)

There are a few active sand dunes in the northwestern counties which all formed from sand deposited on the shores of Lake Agassiz. There is also an active dune system along Lake Superior, near Duluth. Dunes have also formed on terraces of the Mississippi River from sand deposited by streams of glacial meltwater originating from the Grantsburg Sublobe. Most dunes in Minnesota are found on the Anoka Sandplain, a large outwash plain in the east-central counties that also formed from sand carried by glacial meltwater (MDNR 2022a).

All the populations of beach heather in Minnesota are small and restricted to active sand dunes. Dune systems in Minnesota are rare, and dunes with active blowouts are rarer still. Beach heather, however, is found in most, if not all, dune systems with active blowouts in Minnesota. Because sand dunes are so rare in Minnesota, they harbor a disproportionate number of rare or highly specialized plant species. This has always attracted the attention of botanists, so it is unlikely that a significant number of sites have gone undiscovered (MDNR 2022a).

MDNR NHI data indicate no occurrences of beach heather documented within 6 miles of the MNGP site. Sand dune habitat is not present on the MNGP site or in the immediate vicinity. MNGP does not have any records of beach heather being observed on-site.

Blunt-Lobed Grapefern

The MDNR has listed the blunt-lobed grapefern (*Botrychium oneidense*) as threatened. In Minnesota, blunt-lobed grapefern occurs in mesic hardwood forests of sugar maple, yellow birch, black ash, northern red oak, and basswood. It occasionally occurs with red maple, green ash, aspen, pine, bur oak, and northern white cedar. In these forests, blunt-lobed grapefern typically grows in moist loam in low areas, swamp edges, or between the high and low water marks of vernal pools. It most often occurs as a few scattered plants, although as many as a hundred plants have been observed at one location. It often occurs with other *Botrychium* species, most commonly leathery grapefern. Most of the populations are confined to moist depressions in mesic hardwood forests in the east-central part of Minnesota (Western Superior Uplands and Northern Minnesota Drift & Lake Plains sections). A few populations have also been recorded in mesic hardwood forests in extreme southeastern Minnesota (Paleozoic Plateau Section) (MDNR 2022a).

Most populations are small and localized around small forest wetlands called vernal pools. These habitats are vulnerable to any activity that would create significant gaps in the canopy. Such gaps could alter the habitat by allowing excessive light and heat to reach the ground layer, which is likely to change the floristic composition of the community. Any significant damage to the forest floor, such as soil compaction or rutting that might occur during a logging operation, could alter the habitat and threaten existing plants (MDNR 2022a).

MDNR NHI data indicate no occurrences of blunt-lobed grapefern documented within 6 miles of the MNGP site. Forested habitat on the MNGP site and in the immediate vicinity may provide habitat for blunt-lobed grapefern. MNGP does not have any records of blunt-nosed grapefern being observed on-site.

Butternut

The MDNR has listed the butternut (*Juglans cinerea*) as endangered. Butternut occurs in northern and central mesic hardwood forests in the Laurentian Mixed Forest Province and southern mesic hardwood forests in the Eastern Broadleaf Forest Province. The species occurs in loamy or alluvial soils or in sandy soil if the water table is relatively near the surface. It is most common on river terraces elevated several feet or more above the active floodplain, where it is protected from siltation and flood scouring (MDNR 2022a).

Until recently, butternut was a common forest tree in the eastern half of the United States and Canada. Butternut is very susceptible to butternut canker (*Sirococcus clavigignenti-juglandacearum*), a lethal fungal disease of unknown origin. The disease was first reported in Wisconsin in 1967 and reached southeastern Minnesota in the 1970s. It has since spread throughout the state and throughout the North American range of butternut. The fungus attacks the cambium, leaving a blackened elliptical area of dead cambium just beneath the bark. When the number of cankers becomes too great, the branch or trunk is essentially girdled and dies. There is no known treatment or control for butternut canker. This situation has progressed to the point where nearly all butternuts in Minnesota are now dead or dying (MDNR 2022a).

MDNR NHI data indicate no occurrences of butternut documented within 6 miles of the MNGP site. Forested habitat on the MNGP site and in the immediate vicinity may provide suitable habitat for the butternut. MNGP does not have any records of butternut being observed onsite.

Clinton's Bulrush

The MDNR has listed Clinton's bulrush (*Trichophorum clintonii*) as threatened. Clinton's bulrush occurs in a variety of habitats in Minnesota. Optimal conditions are usually sunny or partially shaded and range from dry to moist. Soils are often sandy or sandy-loams, though sometimes heavy clay-loams. In the southeast portion of the state, typical habitats of Clinton's bulrush would be considered prairie or savannah communities or sometimes openings or edges in fire-dependent oak forests. Habitats in the northwest portion of the state are in aspen parkland communities, which are also fire dependent. There is only one record from the northeast portion of the state, which appears to be within a fire-dependent forest system (MDNR 2022a).

Despite its wide distribution in Minnesota, Clinton's bulrush is very rare. The reason for its rarity is not entirely clear. Clinton's bulrush appears to be small and ecotonal in nature. This means they occur as small inclusions in larger habitat mosaics. Habitats are being lost at both the ecotonal level and the landscape level, especially in the northwestern and southeastern portions of the state (Tallgrass Aspen Parklands and Eastern Broadleaf Forest provinces). Land "development" is thought to be the major cause for loss of habitat (MDNR 2022a).

MDNR NHI data indicate no occurrences of Clinton's bulrush documented within 6 miles of the MNGP site. Edge habitat on MNGP site and in the immediate vicinity may provide suitable habitat for Clinton's bulrush; however, fire suppression would limit the potential for occurrence on the MNGP site. MNGP does not have any records of Clinton's bulrush being observed onsite.

Cross-Leaved Milkwort

The MDNR has listed the cross-leaved milkwort (*Polygala cruciata*) as endangered. Cross-leaved milkwort is a small, inconspicuous plant that occurs primarily in the Atlantic and Gulf coastal plains but has scattered and infrequent occurrences inland. Flowers are insect-pollinated, and seeds are gravity-dispersed. There is a discrete secondary range in the Great Lakes region (including Minnesota) that is disjunct from the main range. This isolated range is likely a relic of a larger continuous range that existed shortly after deglaciation. Populations in the Great Lakes region have always been small and scattered but have recently suffered significant declines from habitat loss. A published study conducted on a wet pine savanna in Mississippi suggested that cross-leaved milkwort is fire-dependent and that populations declined during an extended absence of fire. The known habitats in Minnesota are also fire dependent. (MDNR 2022a)

The Minnesota populations have occurred primarily on wet sandy shores of shallow lakes in the Anoka Sand Plain, and in sandy or peaty meadows or swales. These habitats may be in low depressions or at the margins of emergent wetlands. Habitats are typically open and sunny with acidic soils and fluctuating water tables. (MDNR 2022a)

In Minnesota, cross-leaved milkwort has a long collection history, providing clear evidence of decline. Heavy development pressures in the northern suburbs of the Twin Cities metropolitan area and in rural areas of east-central Minnesota have nearly eliminated this species in the state. (MDNR 2022a)

MDNR NHI data indicate no occurrences of cross-leaved milkwort documented within six miles of the MNGP site. Emergent wetland habitat on the MNGP site and in the immediate vicinity may provide suitable habitat. MNGP does not have any records of cross-leaved milkwort being observed onsite.

Hooded Arrowhead

The MDNR has listed the hooded arrowhead (*Sagittaria calycina* var. *calycina*) as threatened. Habitats for the hooded arrowhead are found in association with lakeshores, riverbanks, ponds, and marshes, primarily in the prairie region of the state (Eastern Broadleaf Forest and Prairie Parkland Provinces), where water pH is non-acidic. Habitats that produce large, exposed mud flats in May and June are excellent habitat. Soft mud (silt), or loose and wet sand are suitable substrates; it does not grow well on firm substrates. These habitats can be short-lived or ephemeral in the sense they may not appear every year and are dependent on rainfall patterns (MDNR 2022a).

Healthy and full-functioning habitats of hooded arrowhead are typically inhabited by annual species of plants, rather than perennials. Unstable substrate, rapid siltation, and extreme seasonal fluctuations in water levels are detrimental to the persistence of most perennials. Hooded arrowhead, however, thrives under such conditions (MDNR 2022a). Hooded arrowhead is currently known to occur at only a few scattered sites in Minnesota (Eastern Broadleaf Forest and Prairie Parkland provinces). All the sites are high-quality habitats that have survived the activities of humans, with little disturbance thus far. (MDNR 2022a)

MDNR NHI data indicate no occurrences of hooded arrowhead documented within 6 miles of the MNGP site. MNGP does not have any records of hooded arrowhead being observed onsite.

Lance-Leaf Violet

The MDNR has listed the lance-leaf violet (*Viola lanceolata* var. *lanceolata*) as threatened. The lance-leaf violet occurs in low, moist meadows with a sandy substrate, moist swales in sand dunes and savannas, and occasionally on sandy lakeshores. They are self-pollinating and set seed without ever opening. Lance-leaf violet is also known by the common name white bog violet. Although it does not occur in true bogs, it is sometimes found in peaty wetlands and meadows that might be known locally as bogs. (MDNR 2022a)

The majority of the original Minnesota populations probably occurred on the Anoka Sandplain in Sherburne, Isanti, and Anoka counties. There have recently been discoveries of lance-leaf violet in northeastern Minnesota, where it appears to occur sporadically over a relatively large area. (MDNR 2022a)

The main threat to lance-leaf violet is loss or degradation of its wetland habitats. There are few habitats left on the Anoka Sandplain that still support native vegetation. Today, the greatest threat is from urban and suburban developments, particularly large residential and commercial complexes and the road and utility corridors that serve them. (MDNR 2022a)

MDNR NHI data indicate no occurrences of lance-leaf violet documented within 6 miles of the MNGP site. Wetland habitat on the MNGP site and in the immediate vicinity may provide habitat for the lance-leaf violet. MNGP does not have any records of lance-leaf violet being observed onsite.

Ram's Head Orchid

MDNR has listed the ram's head orchid (*Cypripedium arietinum*) as threatened. The Minnesota populations of ram's head orchid occur in a variety of coniferous forest habitats. Several populations occur in swamps, bogs, or lowland forests dominated by northern white cedar, tamarack, balsam fir, or black spruce. The species also occurs in the drier upland conifer forests that may be dominated by white pine, red pine, or black spruce. All these habitats appear to be weakly acidic or circumneutral but vary in their mineral composition from poor to rich. The ram's head orchid is a long-lived perennial pollinated by a variety of small bees. It reproduces only by seeds, which are spread short distances by the wind. (MDNR 2022a)

MDNR NHI data indicate no occurrences of ram's head orchid documented within 6 miles of the MNGP site. Forested habitat on the MNGP site and in the immediate vicinity may provide suitable habitat for the ram's head orchid; however, recent surveys of potential habitat and historic sites have failed to document any extant populations south of Aitkin County. Additionally, MNGP does not have any records of ram's head orchid being observed onsite. Thus, this species is unlikely to occur on the MNGP site.

Rock Sandwort

The MDNR has listed rock sandwort (*Minuartia dawsonensis*) as threatened. Rock sandwort is a loosely tufted perennial that grows to a maximum height of approximately 20 centimeters. Rock sandwort occurs in habitats that tend to become very dry and hot, especially in mid and late summer when rainfall is typically less than in the spring. The leaves are small and bristle-shaped to conserve moisture, and they remain green even during droughts. The flowers are adapted for pollination by small flying insects. The seeds are small and possess no specialized dispersal mechanism. They appear to simply fall to the ground when the ripe capsule is shaken by the wind or a passing animal (MDNR 2022a).

Occurrences of rock sandwort in the southeast are typically found on dry sedimentary bedrock outcrops (sandstone, limestone, and dolomite), where the species grows in crevices and in very shallow accumulations of organic matter over the exposed bedrock. Outcrops are generally horizontal in nature, and plants do not grow on the vertical walls of cliffs. In southeastern Minnesota, rock sandwort is occasionally found in upland prairies on sands derived from bedrock. In the northwest, rock sandwort has been found on exposed sand or gravel deposits associated with beach ridges of Lake Agassiz (an extinct glacial lake). All of the habitats are sparsely vegetated, dry, and hot, and the species is generally considered to need full sunlight (MDNR 2022a).

Rock sandwort is found in the southeastern region of the state and on sand and gravel deposits in the northwestern corner of the state. Habitats tend to be small, sometimes only a few square meters in size. They also tend to be isolated from one another and are somewhat fragile in that the plants are shallowly rooted. For unknown reasons, the vast majority of habitats that appear to be suitable do not harbor this species (MDNR 2022a).

MDNR NHI data indicate one occurrence of rock sandwort documented within 6 miles of the MNGP site. Upland habitat on the MNGP site may provide suitable habitat for this species. MNGP does not have any records of rock sandwort being observed onsite.

Seaside Three-Awn

The MDNR has listed seaside three-awn (*Aristida tuberculosa*) as threatened. Seaside three-awn is a wind-pollinated annual which requires open and sparsely vegetated habitats with dry and shifting sand. The bent awns seem to be an adaptation for catching in the fur of mammals, thereby dispersing the seeds. It is likely that wind is involved in the process of dispersion. It has been reported that the awns have hygroscopic properties that allow the seeds to bury themselves; seeds that do not get buried usually do not germinate or, if they do germinate, the resulting seedlings fail to become established. (MDNR 2022a)

In Minnesota, seaside three-awn occurs exclusively in dry and loose sand in sand savannas, sand prairies, and dunes, where vegetation is sparse. The plants typically grow in full sunlight, though there may be scattered oak trees or oak groves in the vicinity, especially bur oak, northern pin oak, or black oak. (MDNR 2022a)

In Minnesota, seaside three-awn occurs in a relatively small number of very small and isolated prairie and savanna habitats in the southeastern part of the state. These habitats are fragile and easily converted to agricultural, commercial, recreational, or residential uses. More than 98 percent of the prairie and savanna habitat formerly present in the state before settlement has already been destroyed or degraded. Any further habitat loss or degradation seriously jeopardizes the viability of seaside three-awn in Minnesota (MDNR 2022a).

MDNR NHI data indicate one occurrence of seaside three-awn documented within 6 miles of the MNGP site. Sand savanna/prairie, and sand dune habitat is not present on the MNGP site; however, sand savanna/prairie may be found within the project vicinity. MNGP does not have any records of seaside three-awn being observed onsite.

Swamp Blackberry

The MDNR has listed swamp blackberry (*Rubus semisetosus*) as threatened. Scattered outlying populations of swamp blackberry have been found as far north as Aitkin and Cook counties, some of them in tamarack swamps. Most occurrences, however, are in savanna remnants farther south, particularly on sand plains in Anoka, Isanti, and Sherburne counties (Anoka Sand Plain Subsection). Savanna populations usually grow in moist sand along the margins of groundwater-fed swales or marshes, but also in surface-dry uplands just above the water table. These are usually grass- or sedge-dominated habitats, often with scattered brush, such as American hazel and prairie willow or groves of trembling aspen or oaks. Because of the low nutrient content of the sandy soil, vegetation is often sparse, which seems to suit swamp blackberry. It does best in direct sunlight or partial shade. The flowers of swamp blackberry are insect-pollinated, and seeds are dispersed when animals eat the fruit and pass the seeds through their digestive tracts. Birds are typical vectors, which means dispersal patterns likely follow the feeding and roosting patterns of frugivorous birds during the month of August. (MDNR 2022a)

MDNR NHI data indicate no occurrences of swamp blackberry documented within 6 miles of the MNGP site. Suitable habitat for the swamp blackberry may be found along the edges of emergent wetlands on the MNGP site and in the immediate vicinity. MNGP does not have any records of swamp blackberry being observed onsite.

Tall Nutrush

The MDNR has listed tall nutrush (*Scleria triglomerata*) as endangered. All Minnesota populations of tall nutrush occur in remnants of native sand savannas on, or closely associated with, the Anoka Sandplain. Specific conditions required to sustain populations are usually associated with small wet swales or wet meadows influenced by a shallow water table. Soils are typically sandy, though there may be a thin layer of organic material on the surface. The rooting zone is usually wet or moist in the spring, but typically dry by mid-summer. Such conditions are most often found along the moisture gradients that circle shallow depressional wetlands or swales, though the gradients may be slight and difficult to see (MDNR 2022a).

Tall nutrush reproduces only by seeds, which are dispersed short distances by gravity and perhaps wind or the actions of small ground-foraging animals. Long-distance dispersal likely happens infrequently and may be mediated by seed-eating birds. Like most sedges and grasses, this species does not produce showy flower parts for attracting insect pollinators. It is pollinated by wind. Recruitment is slow, so sustaining viable populations seems to rely on maintaining a low mortality rate (MDNR 2022a).

MDNR NHI data indicate no occurrences of tall nutrush documented within 6 miles of the MNGP site. Riverine edges and wetlands on the MNGP site and in the immediate vicinity may provide suitable habitat for the tall nutrush. MNGP does not have any records of tall nutrush being observed onsite.

Tubercled Rein Orchid

The MDNR has listed the turbercled rein orchid (*Platanthera flava* var. *herbiola*) as threatened. The normal habitat of tubercled rein orchid is moist or wet meadows or sunny swales in savannas. It also occurs at the margins of shallow marshy lakes, especially where there is a turf of low-growing native grasses or sedges. Some of the habitats resemble small patches of prairie, though the habitats under discussion are well within the forested region of the state and are perhaps better described as permanent and natural openings in an otherwise wooded or savanna landscape. Habitats tend to be oriented along some transitional edge, rather than in any homogeneous or easily categorized community. Soils are generally moist acidic sand, with a thin layer of organic material or duff on the surface and sometimes a clay layer below the surface. Groundwater is usually at or near the surface. Sunlight is either direct for most of the day or lightly filtered through trees or shrubs. Tubercled rein orchid will slowly disappear if its habitat becomes completely shaded. (MDNR 2022a)

The best habitats for tubercled rein orchid are to be found on the broad sandy lake plain known as the Anoka Sandplain, just north of the Twin Cities. Fire and drought were important factors influencing the vegetation of the Sand Plain. Perhaps not surprisingly, dormant-season fires in the spring can result in a flush of tubercled rein orchid above ground, a response very rare among orchids, even prairie orchids. (MDNR 2022a)

Flowers of tubercled rein orchid are structurally and behaviorally complex and have highly specialized relationships with insect pollinators. An orchid fruit is a dry capsule with several thousand seeds. The seeds are nearly microscopic and disperse on wind currents. Germination of seeds can be difficult; the right combination of factors, such as temperature, sunlight, soil moisture, and especially soil fungi are required to trigger the development of orchid seed. (MDNR 2022a)

With one notable exception, the habitats of this species can be considered high-quality remnants of native habitats that have somehow survived being drained, plowed, or invaded by nonnative plant species, especially reed canary grass and smooth brome. The exception is the drained sediment basins on the iron range in Itasca County, far from its native habitat. (MDNR 2022a)

MDNR NHI data indicate no occurrences of tubercled rein orchid documented within 6 miles of the MNGP site. Wetland edges and openings in moist forest habitat on the MNGP site and in the immediate vicinity may provide suitable habitat for the tubercled rein orchid. MNGP does not have any records of tubercled rein orchid being observed onsite.

3.7.8.2.6 Insects

Uncas Skipper

The MDNR has listed the Uncas skipper (*Hesparia uncas*) as endangered. The Uncas skipper inhabits dry native prairie or barrens prairie on sand dune forms. More sparsely vegetated slopes and summits are especially critical. Adults range more widely in search of nectar. The central Minnesota Uncas skipper population is confined to a large complex of sand dunes covered with a mosaic of dry sand prairie and open bur oak savanna or scrub, separated by wet prairies and oak brushland. The presence of the Uncas skipper was not discovered in Minnesota until 1961, after a state forest was created to include much of the dune areas and the planting of pines and other conifers on the dunes was well underway (MDNR 2022a).

The Uncas skipper in central Minnesota appears to have only a single generation in a year. Adults have been observed from mid-June to mid-July, but in any given year the flight period is rarely more than three weeks. Larvae reach the fourth or fifth stage before hibernating for the winter and finish larval development the following spring (MDNR 2022a).

The occurrence of Uncas skipper in Minnesota is restricted to an isolated outlier population in Sherburne County, about 185 miles east of its closest established populations in eastern South

Dakota. The Minnesota population is possibly a relic of the post-glacial thermal maximum (ca. 8000-4000 B.P.) when major vegetation zones shifted well east of their present positions. The Uncas skipper has been recorded as a rare stray into southwestern Minnesota, but there is no evidence of establishment there. (MDNR 2022a).

MDNR NHI data indicate no occurrences of the Uncas skipper documented within 6 miles of the MNGP site. No sand dune habitat for Uncas skipper is present on the MNGP site or in the immediate vicinity. MNGP does not have any records of Uncas skipper being observed onsite.

3.7.8.2.7 Reptiles

Blanding's Turtle

The MDNR has listed the Blanding's turtle (*Emydoidea blandingii*) as threatened. Blanding's turtles typically overwinter in muddy bottoms of deep marshes, backwater pools, ponds, and streams. They emerge from overwintering sites in late March to early April. Small, temporary wetlands are frequently used by Blanding's turtles in spring and early summer, when these habitats provide basking sites and mating opportunities. Shallow pools provide ideal amphibian and invertebrate breeding habitat, which in turn provide an important food source. Blanding's turtles have delayed maturation, reaching sexual maturity at approximately 12 years of age. Females lay one clutch of eggs each year. Clutch size varies widely, ranging from 10–26 eggs, with older, larger females often laying larger clutch sizes. (MDNR 2022a)

Blanding's turtle is restricted to a small number of states and provinces in the upper Midwest, New England, and southeastern Canada. Minnesota lies on the northwestern periphery of its range and the species is relatively widespread in the state. Wetland complexes and adjacent sandy uplands are necessary to support viable populations of Blanding's turtles. Calm, shallow waters, including wetlands associated with rivers and streams with rich aquatic vegetation, are especially preferred. In Minnesota, Blanding's turtles use a wide variety of wetland types and riverine habitats in different regions of the state. In central Minnesota, shrub wetlands are utilized throughout the summer and serve as over-wintering sites. In southeastern Minnesota, open marshes and bottomland wetlands provide summer and winter habitat. Ephemeral wetlands are utilized in spring and early summer, while deeper marshes and backwater pools are utilized in both the summer and winter. In southwestern Minnesota, meandering streams and rivers, fens, prairie marshes, backwaters, and oxbows are important aquatic habitats, and upland habitats include adjacent agricultural lands. Female Blanding's turtles often nest in agricultural fields. This may be hazardous to both adult females and nests in the form of chemicals, disking, machinery usage, increased nest predation, and shade produced by growing crops. (MDNR 2022a)

MDNR NHI data indicate 20 occurrences of Blanding's turtles documented within 6 miles of the MNGP site. The Mississippi River, as well as wetlands on the MNGP site and in the immediate vicinity, provides suitable habitat for the Blanding's turtle. MNGP does not have any records (observations or incident reports) of Blanding's turtle being observed onsite.

3.7.8.3 Species Protected Under the Bald and Golden Eagle Protection Act

Bald eagles are protected under the Bald and Golden Eagle Protection Act (BGEPA). The BGEPA was enacted in 1940 (16 USC 668-668c) and prohibits anyone without a permit issued by the Secretary of the Interior from "taking" bald eagles, including their parts, nests, eggs, or feathers. The BGEPA provides criminal penalties for persons who "take, possess, sell, purchase, barter, offer to sell, purchase or barter, transport, export, or import, at any time or any manner, any bald eagle … [or any golden eagle], alive or dead, or any part, nest, or egg thereof." The BGEPA defines "take" as "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb." (USFWS 2021d).

"Disturb" means: "to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available, 1) injury to an eagle; 2) a decrease in its productivity by substantially interfering with normal breeding, feeding, or sheltering behavior; or 3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior." In addition to immediate impacts, this definition also covers impacts resulting from human-induced alterations initiated around a previously used nest site during a time when eagles are not present, if, upon the eagle's return, such alterations agitate or bother an eagle to a degree that interferes with or interrupts normal breeding, feeding, or sheltering habits, and causes injury, death, or nest abandonment (USFWS 2021d).

No surveys for eagles or eagle nests have been conducted for the MNGP site subsequent to the 2006 license renewal. Golden eagles are known to occur throughout the state through the spring, fall, and winter; however, they are not known to nest in Minnesota (MDNR 2021n). MDNR NHI data indicate no occurrences of golden eagles within 6 miles of the MNGP site. Bald eagles are known to nest on the MNGP site and in the vicinity (MDNR 2021o). One nest is known to exist on Cedar Island, upstream from the power block; however, recent use of this nest and nesting success has not been confirmed. (NMC 2005; NRC 2006b) MDNR NHI data indicate five known occurrences of bald eagles within 6 miles of the MNGP site. No eagle take permitting requirements are currently associated with MNGP site operations or in-scope transmission lines.

3.7.8.4 Species Protected Under the Migratory Bird Treaty Act

In addition to species protected under federal and state endangered species acts, there are numerous bird species protected under the Migratory Bird Treaty Act (MBTA) that may visit MNGP. The MBTA makes it illegal for anyone to take, possess, import, export, transport, sell, purchase, barter or offer for sale, or purchase or barter, any migratory bird, or the parts, nests, or eggs of such a bird except under the terms of a valid permit issued pursuant to federal regulations.

According to the USFWS, 17 birds of conservation concern have the potential to occur in Sherburne and Wright counties, Minnesota: black tern (*Chlidonias niger*), black-billed cuckoo (*Coccyzus erythropthalmus*), bobolink (*Dolichonyx oryzivorus*), Canada warbler (*Cardellina canadensis*), cerulean warbler (*Dendroica cerulea*), eastern whip-poor-will (*Antrostomus vociferus*), golden-winged warbler (*Vermivora chrysoptera*), Henslow's sparrow (*Ammodramus* *henslowii*), Le Conte's sparrow (*Ammodramus leconteii*), lesser yellowlegs (*Tringa flavipes*), long-eared owl (*Asio otus*), marbled godwit (*Limosa fedoa*), red-headed woodpecker (*Melanerpes erythrocephalus*), ruddy turnstone (*Arenaria interpres morinella*), rusty blackbird (*Euphagus carolinus*), short-billed dowitcher (*Limnodromus griseus*), and wood thrush (*Hylocichla mustelina*) (USFWS 2022).

Suitable habitat is potentially present on the MNGP site and in the immediate vicinity for all of the species listed above. The short-billed dowitcher, ruddy turnstone, lesser yellowlegs occur as migrants through Minnesota and may utilize stop-over habitat available onsite and in the immediate vicinity. The black tern, black billed-cuckoo, bobolink, Canada warbler, cerulean warbler, eastern whip-poor-will, golden winged warbler, Heslow's sparrow, Le Conte's sparrow, long-eared owl, marbled godwit, red-headed woodpecker, rusty blackbird, and wood thrush are known to breed in Minnesota. (Cornell 2021)

3.7.8.5 Essential Fish Habitat

Essential fish habitat (EFH) is defined under the Magnuson-Stevens Fishery Conservation and Management Act and refers to waters and substrate necessary for fish to spawn, breed, feed or grow to maturity. NOAA is responsible for identifying and describing EFH for sharks, tuna, and other highly migratory species that cross regional boundaries. NOAA only provides EFH for federally managed fish and invertebrates.

A review of the NOAA EFH was conducted to determine the location of EFH within 6 miles of MNGP. No EFH is located within the vicinity of MNGP, nor were any EFH areas protected from fishing. As habitat areas of particular concern (HAPC) are derived from EFH, there were also no HAPCs located within the 6-mile vicinity of MNGP (NOAA 2021b)

Table 3.7-1 Primary Producers and Zooplankton near the MNGP Site

Common Name	Scientific Name
Periphyton[a]	
	Gomphonema olivaceum
	Diatoma vulgare
	Synedra ulna
	Navicula gracilis
	Cocconeis placentula
	Cocconeis pediculus
Macrophytes	
American wild celery	*Vallisneria americana*
American pondweed	*Potamogeton americanus*
Sago pondweed	*Potamogeton pectinatus*
Water moss	*Fontinalis antipyretica*
Green Alga[a]	
	Cladophora glomerata
Zooplankton[a]	
	Keratella cochlearis

a. No common name for these species

(NMC 2005; NRC 2006b)

Table 3.7-2 Benthic Invertebrates in the Mississippi River in the Vicinity of the MNGP Site

Common Name	Scientific Name
Aquatic Worms	
Class Oligochhaeta	
Insects	
Order Ephemeroptera	
Order Coleoptera	
Order Trichoptera	
Order Diptera	
Mussels	
Mucket	*Actinonaias carinata*
	Anodonta grandis plana[a]
Black sandshell	*Ligumia recta*
Fatmucket	*Lampsilis siliquoidea*
	Lampsilis ventricose[a]

a. No common name for these species

(NMC 2005; NRC 2006b)

Table 3.7-3 Aquatic Vertebrate Species in the Mississippi River in the Vicinity of the MNGP Site

Common Name	Scientific Name
Fish	
Bigmouth buffalo	*Ictiobus cyprinellus*
Bigmouth shiner	*Notropis dorsalis*
Black bullhead[(a)]	*Ameiurus melas*
Black crappie[(a)]	*Pomoxis nigromaculatus*
Blackside darter	*Percina maculate*
Bluegill	*Lepomis macrochirus*
Bluntnose minnow	*Pimephales notatus*
Bullhead catfish	*Ameiurus* spp.
Channel catfish	*Ictalurus punctatus*
Common carp	*Cyprinus carpio*
Common shiner	*Luxilus cornutus*
Johnny darter	*Etheostoma nigrum*
Muskellunge[(a)]	*Esox masquinongy*
Northern pike[(a)]	*Esox lucius*
Sand shiner	*Notropis stramineus*
Shorthead redhorse	*Moxostoma macrolepidotum*
Silver redhorse	*Moxostoma anisurum*
Smallmouth bass[(a)]	*Micropterus dolomieu*
Spotfin shiner	*Cyprinella spiloptera*
Spottail shiner	*Notropis hudsonius*
Suckers	*Moxostoma* sp.
Trout perch	*Percopsis omiscomaycus*
Walleye[(a)]	*Stizostedion vitreum*
White sucker	*Catostomus commersoni*
Yellow perch[(a)]	*Perca flavescens*
Reptiles	
Northern map turtle	*Graptemys geographica*
Northern water snake	*Nerodia sipedon*
Snapping turtle	*Chelydra serpentina*
Spiny softshell turtle	*Apalone spinifera*
Amphibians	
Mudpuppy	*Necturus maculosus*
Green frog	*Lithobates clamitans*

a. Recreational sportfish.
(NMC 2005; NRC 2006b)

Table 3.7-4 Terrestrial Species Likely to be Observed in Sherburne and Wright Counties, Minnesota (Sheet 1 of 3)

Common Name	Scientific Name
Mammals	
Beaver	*Castor canadensis*
Chipmunk	*Tamias striatus*
Coyote	*Canis latrans*
Fox squirrel	*Sciurus niger*
Gray fox	*Urocyon cinereoargenteus*
Grey squirrel	*Sciurus carolinensis*
Least weasel	*Mustela nivalis*
Long tailed weasel	*Mustela frenata*
Meadow vole	*Microtus pennsylvanicus*
Mink	*Mustela vison*
Muskrat	*Ondatra zibethicus*
Pocket Gopher	*Geomys bursarius*
Racoon	*Procyon lotor*
Red fox	*Vulpes*
Red squirrel	*Tamiasciurus hudsonicus*
Short-tailed shrew	*Blarina brevicauda*
Southern red backed vole	*Clethrionomys gapperi*
Stoat	*Mustela ermina*
Striped skunk	*Mephitis*
Thirteen lined ground squirrel	*Ictidomys tridecemlineatus*
White tailed deer	*Odocoileus virginianus*
White tailed jack rabbit	*Lepus townsendii*
Woodchuck	*Marmota monax*
Birds	
Acadian flycatchers	*Empidonax virescens*
Bald eagle	*Haliaeetus leucocephalus*
Barn swallow	*Hirundo rustica*
Black capped vireo	*Poecile atricapillus*
Blue jay	*Cyanocitta cristata*
Canada goose	*Branta canadensis*
Cerulean warblers	*Setophaga cerulea*

Table 3.7-4 Terrestrial Species Likely to be Observed in Sherburne and Wright Counties, Minnesota (Sheet 2 of 3)

Common Name	Scientific Name
Cliff swallow	*Petrochelidon pyrrhonota*
Common loon	*Gavia immer*
Eastern bluebird	*Sialia sialis*
Eastern meadowlark	*Sturnella magna*
European starling	*Sturnus vulgaris*
Flicker	*Colaptes auratus*
Goldfinch	*Carduelis tristis*
Grackle	*Quiscalus quiscula*
House sparrow	*Passer domesticus*
Kestrel	*Falco sparverius*
Killdeer	*Charadrius vociferus*
Loggerhead shrike	*Lanius ludovicianus*
Mallard	*Anas platyrhynchos*
Mourning dove	*Zenaida macroura*
Peregrine falcons	*Falco peregrinus*
Prothonary warbler	*Protonotaria citrea*
Purple martin	*Progne subis*
Red shouldered hawk	*Buteo lineatus*
Red tailed hawk	*Buteo jamaicensis*
Red-winged blackbird	*Agelaius phoeniceus*
Robin	*Turdus migratorius*
Rose-breasted grosbeak	*Pheucticus ludovicianus*
Sandhill crane	*Antigone canadensis*
Trumpeter swan	*Cygnus buccinator*
Vesper sparrow	*Pooecetes gramineus*
Western kingbird	*Tyrannus verticalis*
Western meadowlark	*Sturnella neglecta*
Wild turkey	*Meleagris gallopavo*
Wood duck	*Aix sponsa*

Table 3.7-4 Terrestrial Species Likely to be Observed in Sherburne and Wright Counties, Minnesota (Sheet 3 of 3)

Common Name	Scientific Name
Reptiles	
Eastern hognose snake	*Heterodon platirhinos*
Garter snake	*Thamnophis sirtalis*
Plains garter snake	*Thamnophis radix*
Prairie skink	*Plestiodon septentrionalis*
Blanding's turtle	*Emydoidea blandingii*
Amphibians	
American toad	*Anaxyrus americanus*
Boreal chorus frog	*Pseudacris maculate*
Gray tree frog	*Hyla versicolor*
Green frog	*Lithobates septentrionalis*
Tiger salamander	*Ambystoma tigrinum*

(ARSM 2021; iNaturalist 2021; MDNR 2021f; NMC 2005; NRC 2006b; Pfannmuller 2017)

Table 3.7-5 Threatened and Endangered Species Listed within Sherburne and Wright Counties, Minnesota

Common Name	State Status	Federal Status	Habitat within Six Miles of MNGP Site
Mammals			
Northern long-eared bat	NA	Threatened	Yes
Eastern spotted skunk	Threatened	NA	Yes
Insects			
Monarch butterfly	NA	Candidate	Yes
Rusty patched bumble bee	NA	Endangered	Yes
Uncas skipper	Endangered	NA	No
Birds			
Common tern	Threatened	NA	No
Loggerhead shrike	Endangered	NA	Yes
Horned grebe	Endangered	NA	Yes
Fish			
Pugnose shiner	Threatened	NA	Yes
Mussels			
Elktoe	Threatened	NA	Yes
Plants			
Annual skeletonweed	Threatened	NA	No
Beach heather	Threatened	NA	No
Blunt-lobed grapefern	Threatened	NA	Yes
Butternut	Endangered	NA	Yes
Clinton's bulrush	Threatened	NA	Yes
Cross-leaved milkwort	Endangered	NA	Yes
Hooded arrowhead	Threatened	NA	Yes
Lance-leaf violet	Threatened	NA	Yes
Ram's head orchid	Threatened	NA	Yes
Rock sandwort	Threatened	NA	Yes
Seaside three-awn	Threatened	NA	Yes
Swamp blackberry	Threatened	NA	Yes
Tall nutrush	Endangered	NA	Yes
Tubercled rein orchid	Threatened	NA	Yes
Reptiles			
Blanding's turtle	Threatened	NA	Yes

NA – agency does not regulate this species in the review area (MDNR 2022a; USFWS 2022)

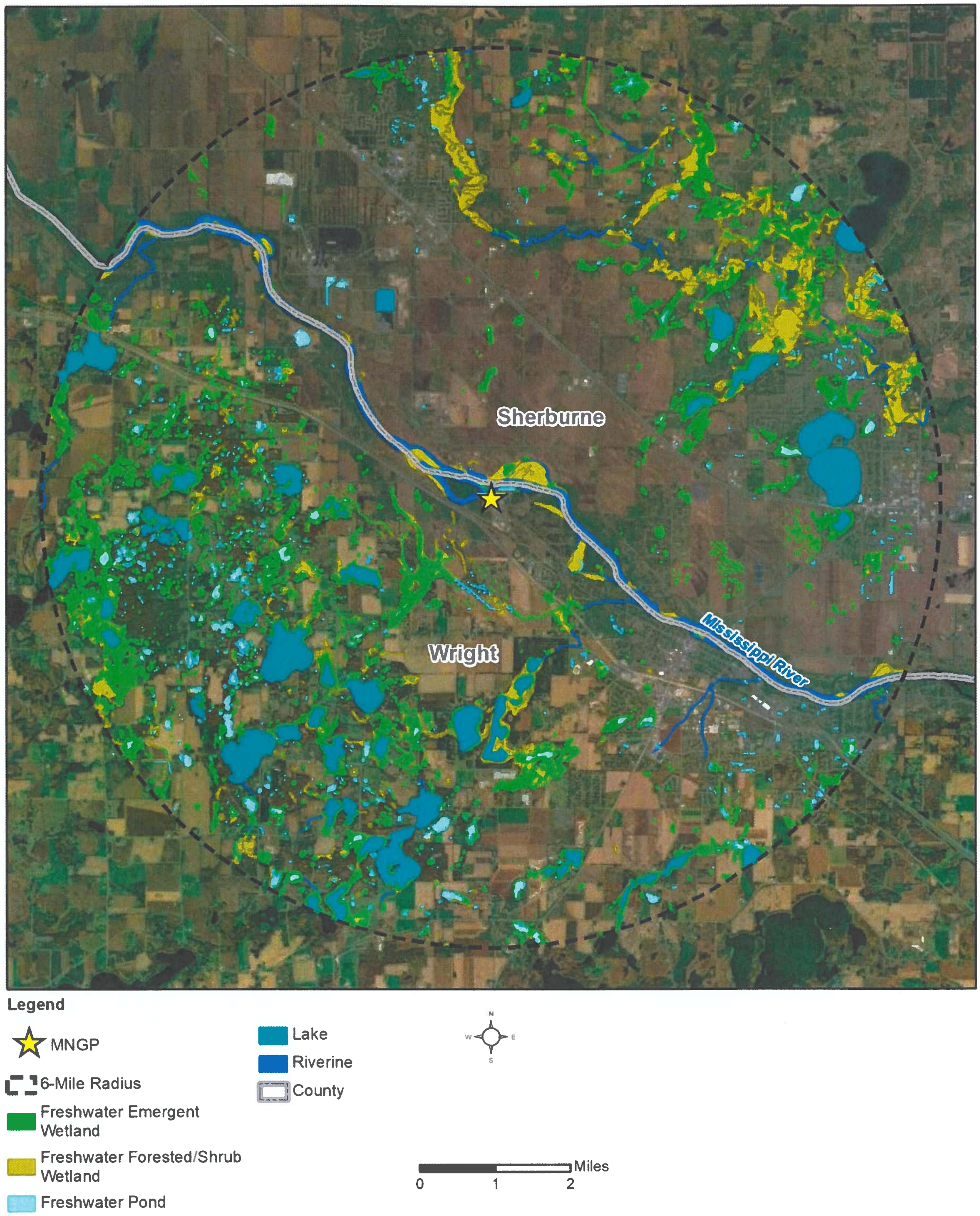


Figure 3.7-1 NWI Mapped Wetlands within a 6-Mile Radius of the MNGP Site

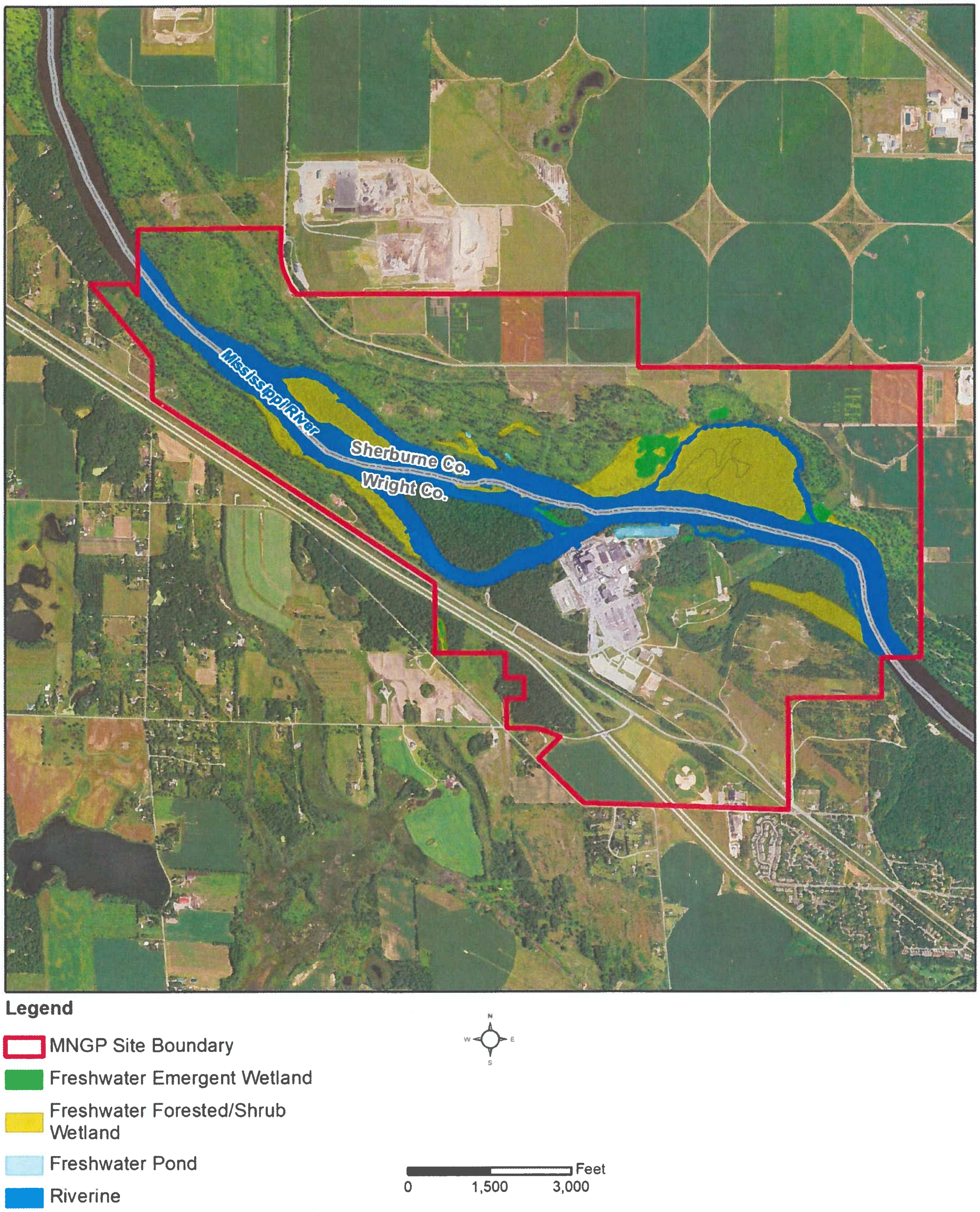


Figure 3.7-2 NWI Mapped Wetlands within the MNGP Site

3.8 Historic and Cultural Resources

Cultural resources include prehistoric era and historic era archaeological sites and objects, architectural properties and districts, and traditional cultural properties, which are defined as significant objects or places important to Native American tribes for maintaining their culture (USDOI 1998). Of particular concern are those cultural resources that may be considered eligible for listing on the National Register of Historic Places (NRHP). Any cultural resources listed on or eligible for the NRHP are considered historic properties under the National Historic Preservation Act of 1966 (NHPA) [Public Law 89-665; 54 USC 300101 et seq.].

Prior to taking any action to implement an undertaking, Section 106 of the NHPA requires the NRC as a federal agency to do the following:

- Take into account the effects of an undertaking (including issuance of a license) on historic properties, including any district, site, building, structure, or object included in or eligible for inclusion in the NRHP.
- Afford the Advisory Council on Historic Preservation a reasonable opportunity to comment on such undertaking.

To provide early consultation for the Section 106 process, Xcel Energy contacted the Minnesota Historical Society for informal consultation concerning the MNGP SLR and potential effects on cultural resources within the approximately 2,000-acre site and on historic properties within a 6-mile radius of MNGP. Native American groups recognized as potential stakeholders were also consulted by Xcel Energy with the opportunity for comment. Xcel Energy correspondence is included in Attachment C.

This ER identifies all known cultural resources within a 6-mile radius of MNGP, as well as properties listed on the NRHP within that same radius. The site consists of approximately 2,000 acres and is bordered by the Mississippi River to west, north, and east of the plant. Of the 2,000 acres, about 175 acres, or approximately 12 percent, are pre-empted by the plant for purposes of plant operation. Undeveloped areas of the site are occupied by pasture, the Mississippi River, and gallery forest characteristic of the St. Croix outwash plain ecoregion. For the purpose of this SLR, the aboveground area of potential effects (APE) is defined as the entire MNGP site and everything within a 6-mile radius of MNGP. The aboveground APE considers the potential proximity effects to historical properties in relation to continued MNGP operation. The archaeological APE is considered bounded by the approximately 2,000 acres, where ground disturbance might compromise the physical integrity of archaeological data.

There are no refurbishment activities or other construction activities currently planned to support SLR operations, and therefore no identified ground disturbance associated with SLR.

The literature review for the SLR of previously recorded archaeological sites included the area within a 6-mile radius of MNGP. The Minnesota Office of the State Archaeologist Portal (MOSAP) was reviewed for the 6-mile APE. The purpose of the literature review was to help develop an understanding of the local context by conducting an inventory of all previously and newly recorded archaeological sites on the 2,000-acre MNGP property and within a 6-mile radius of MNGP, regardless of NRHP status.

The results of the literature and map review showed that there are 35 recorded archaeological resources, 9 architectural resources, and 8 cemeteries listed within 6 miles of MNGP. There are 4 resources listed on the NRHP, 5 architectural resources certified eligible for the NRHP by the state historic preservation officer (SHPO), 2 archaeological resources listed as destroyed, 1 archaeological resource that is not eligible, 2 archaeological resources listed as not a site, and 30 archaeological resources with undetermined eligibility (Tables 3.8-1 and 3.8-2).

3.8.1 Land Use History

The land use history for MNGP and the surrounding region was developed as part of a Phase 2A literature review and archaeological sensitivity assessment of the MNGP site and is summarized here. Section 3.8.2 provides a more detailed discussion of historical land use as part of cultural history. Early maps provide information on how the area was used in the past. The 1867 General Land Office map depicts Monticello as largely unmapped as the map depicts only the areas of the MNGP site south of the Mississippi River (Figure 3.8-1). The USGS 1961 Monticello topographic map depicts the MNGP site as generally undeveloped with only the Great Northern Railway, State Highway 152, and an electric transmission line depicted within the MNGP site boundary, while the remaining site area is predominantly galley forest with the Mississippi River bisecting the MNGP site (Figure 3.8-2). The USGS 1991 Monticello topographic map depicts the northern portion of the MNGP site as remaining largely undeveloped, with large areas of gallery forest adjacent to the Mississippi River. South of the river, the MNGP site is developed with the MNGP plant and associated structures and roads, County Road 75 NE, and U.S. Highway 52/Interstate 94 (Figure 3.1-2).

Photographs taken during and after the construction of the MNGP facility are useful in showing the environmental context during that period. Prior to construction, the MNGP site consisted of undeveloped galley forest and outwash from the Mississippi River, which runs east to west of the center of the MNGP site. The trees and brush were removed, and initial grading occurred in 1966 (Figures 3.8-4 and 3.8-5). Construction of the MNGP facility components progressed to the aboveground structures by 1968 (Figure 3.8-6). Near final construction of the MNGP facility, most of buildings and structures had been completed (Figure 3.8-7). The site as it exists currently is a mix of native woodlands and the MNGP facility (Figure 3.8-8).

The region surrounding the MNGP site holds evidence of both prehistoric and historic occupation by Native Americans and Euro-Americans. Archaeological records suggest that the general vicinity of the MNGP site was potentially occupied by Native American populations during the Paleoindian Period (prior to 7000 BC), Archaic Period (7000 BC to 500 BC), the Woodland Period (500 BC to 1650 AD), the Contact Period (1650 AD to 1837 AD), and the Post-Contact Period (1837 AD to present).

3.8.2 Cultural History

3.8.2.1 Paleoindian Period (Prior to 7000 BC)

The Paleoindian period is the earliest substantiated cultural adaptation in MN. Due to lower global temperatures, more water was trapped in glaciers. During the maximum extent of the last glaciation, all of Minnesota was covered with ice except the southeastern and southwestern portions of the state. Although the climate was warmer than the previous glaciation, all northern Minnesota remained covered with ice and thus unsuitable for human settlements. The southern half of Minnesota was uncovered and the precursors to glacial Lake Agassiz was present in southwestern Minnesota. The newly uncovered land was quickly re-vegetated with spruce forest and tundra grassland, which provided food for woodland browsers such as mastodon and grassland species such as caribou and mammoth. Paleoindian peoples tended to live in small bands which travelled seasonally within set territories. The material culture is characterized by large, fluted points such as the Clovis, Folsom, and Plano. Paleoindian components are not common in Minnesota and are limited to the central and southeastern portions of the state. The great majority of points are surface finds made by avocational artifact collectors. These surface finds are the totality of the Paleoindian data for Minnesota as no Paleoindian period sites are known within the state. Overall, the scarcity of material culture from this period is likely because glaciers still covered the north and large ice blocks were buried in glacial gravels in the south, travel would have been difficult in many areas as the landscape was unstable due to melting ice and rushing rivers. (MOSA 2021)

3.8.2.2 Archaic Period (7000 BC to 500 BC)

The Archaic Period was a time in which the climate was warming and drying up, this led to a change in settlement and subsistence. With exception of the northeast, the majority of Minnesota was covered by prairie grassland and subsistence was centered around grassland species such as bison. (MOSA 2021) Due to an increase in temperature and dryness, all lakes that were less than 30 feet in depth were dry or greatly reduced in size.

The Archaic Period is generally divided into three sub-periods: Early, Middle, and Late; however, in Minnesota the Archaic is divided by the type of environmental adaptation. The four Archaic environmental adaptations in Minnesota are the Prairie Archaic in the west, the Lake Forest Archaic in central and north central regions, the Shield Archaic in the far northeast, and the Riverine Archaic in the southeast. The Archaic Period is the longest cultural period in Minnesota, but it is poorly documented in much of Minnesota. (MOSA 2021)

The Prairie Archaic in Minnesota is represented by a grassland environment with subsistence centered around grassland species such as bison. One of the earliest sites in Minnesota during this time is a bison kill and butchering site located in Itasca State Park which is radiocarbon dated to between 7600 and 6000 BC. The site uncovered several remains of bison and side-notched points. Another site with similar findings is a bison processing site that was found near Granite Falls in Minnesota and is dated between 5900 and 5300 BC. The environment during the Late Prairie Archaic was more like that of today with more diverse economies and the introduction of copper tools, but with subsistence remaining focused on bison. (MOSA 2021)

The Lake Forest Archaic located in the central portion of Minnesota is represented by a slightly wetter climate than the Prairie Archaic to the west. Due to an increase in moisture, many lakes in this area were much deeper than 30 feet and woodland forest would have been present, despite most the area remaining prairie grassland. Economies of the Lake Forest Archaic were broader in comparison to the bison-centric Prairie Archaic, due to a more diverse environment which provided more diverse subsistence opportunities. The site that best represents the Lake Forest Archaic is Petaga Point, which is located at Kathio State Park and possesses a collection of copper artifacts. (MOSA 2021)

The Shield Archaic in Minnesota is represented by an environment consisting of mixed boreal and deciduous forest and igneous rock outcroppings, making for shallow soils throughout the region of northeastern Minnesota. The majority of what is known about the Shield Archaic is based on Canadian archaeological sites, which are largely found at the narrows or rivers and lakes. The archaeological site of Fowl Lake, located on an island south of the Canadian border, best represents the Shield Archaic, with most cultural resources found on the surface. The preservation of cultural resources within the Shield Archaic is poor due to the shallow soils of the region as well as the acidic soils of the forests, thus making it unlikely for the survival of bone and wood artifacts. (MOSA 2021)

The Riverine Archaic in Minnesota is represented by an environment centered around the Mississippi River within the Mississippi River Valley. The river valley provided a vast number of animal and plant resources such as fish, waterfowl, aquatic tubers, and freshwater mussels. Subsistence within this region also consisted of floodplains fertile for gardening crops such as tubers and uplands possessing animals such as elk, deer, and bison. (MOSA 2021) There are very few Riverine Archaic archaeological sites that possess much information apart from King Coulee, a site located in Wabasha County, which is represented by cultural material such as stemmed projectile points, a slate gorget, mussels shells, squash seeds, and nuts. (MOSA 2021)

3.8.2.3 Woodland Period (500 BC to 1000 AD [1650 AD in Northern Minnesota])

The Woodland Period in Minnesota is represented by the introduction of the bow and arrow and intensive plant cultivation such as corn, pottery production, smaller projectile points, and the construction of burial mounds. (MOSA 2021) The Woodland Period is usually divided into three sub-periods: Early, Middle, and Late. In Minnesota these sub-periods are not utilized, instead individual Woodland complexes are defined by the types of ceramics present. Thus, the Woodland Period in Minnesota has been divided into four complexes: Cahokia Complex, Oneota Complex, Plains Village Complex, and Psinomani Complex. (MOSA 2021)

The Cahokia Complex is based on the prehistoric city of Cahokia, which is located across the Mississippi River from modern-day St. Louis, Missouri. The Cahokia Complex is represented by an increase in dependence on corn horticulture and the production of finely made globular shell-tempered ceramics, large, palisaded villages, and square earthen mounds. (MOSA 2021)

The Oneota Complex can be found in southeastern, southcentral, and central Minnesota and appears at about 1000 AD and last into the time of French contact. The Oneota Complex is represented by shell-tempered ceramics featuring globular vessels with high rims as well as Mississippian influences such as intensive corn horticulture. (MOSA 2021)

The Plains Village Complex located in western Minnesota, characterized by a mixture of corn horticulture and bison hunting, villages with large earthen lodges and wooden palisades, and ceramics characterized by globular jars that were tempered with crushed rock. An example of one of the Minnesota Plains Village Complex cultures is a concentration of sites known as Cambria, which features one large village and several smaller villages, rock-tempered ceramics and large variety of globular jars, earthen burial mounds, and subsistence based on corn horticulture and hunting of animals such as fish, bison, deer, and mussels. (MOSA 2021)

The Psinomani Complex is represented by ceramic bowls rather than the neck-jars of the Oneota Complex with temper derived from shell or rock with smooth or cord-marked bodies, vessels resembling those of the Oneota Complex of the southeast are also present. The Psinomani people are suspected to be the ancestors of today's Dakota people, the Psinomani were living in east-central Minnesota during the 1600s when the French arrived in the area. (MOSA 2021)

3.8.2.4 The Contact Period (1650 to 1837)

The Contact Period is represented by the initial contact between Europeans and Native Americans in Minnesota, which was a time dominated by the economy of fur trading, first by the French, then the British, and then the Americans. In the mid-1600s French fur traders and missionaries entered the upper Midwest through southern Great Lakes routes and by the 1700s, French fur posts were built in northern Minnesota along the Canadian border and Mississippi River in southeastern Minnesota. The British began to dominate the fur trade and reoccupied French fur posts in northern Minnesota after the end of the French and Indian War of 1760. After American sovereignty over the 1803 Louisiana Purchase, American fur traders moved into Minnesota, but no American fur posts were established until after the War of 1812. The Contact Period concluded after the first major Indian treaty ceded east-central Minnesota to the United States, leading to the beginning of Euro-American settlement of Minnesota. (MOSA 2021)

3.8.2.5 The Post-Contact Period (1837 to Present)

The Post-Contact Period begins in the early 1800s when the first major Indian land cession of 1837 was made by eastern Dakota and southern Ojibwe peoples, which opened the land east of the Mississippi River to Euro-American settlement in Minnesota and the remaining lands of southern Minnesota ceded by the Dakota people in 1851. Minnesota commercial lumbering began shortly after the initial land cession and peaked at the start of the 1900s, but quickly decreased after the 1920s due to the depletion of pine forests which led to the closure of several lumber mills. In the mid-1800s, before the American Civil War, farming in Minnesota was represented by subsistence farming with residences that were crude log cabins, sod houses, or dugouts. Euro-American settlement and commercial farming greatly increased in the 1860s after the Civil War due to the passage of the Homestead Act in 1862. Minnesota farming increased and diversified due to the construction of railroads, which provided greater access to markets. Cash crops such as wheat dominated, but animal production, primarily dairy, increased as well. In the early 1900s wheat production began to decrease, but farm prosperity continued to increase until the stock market crash of 1929 and the 1930s, when drought spread across the majority of Minnesota. Conditions stabilized after the introduction of the New Deal programs and further increased with the subsistence needs brought on by World War II. (MOSA 2021)

After World War II, the economy in Minnesota remained reliant on commercial agriculture and continues to do so today. For example, in Wright County, agriculture represents over 50 percent of land use today, with the remaining land comprised of rivers, lakes, residential and metropolitan development. (WC 2021c)

3.8.3 Onsite Cultural Resources

Onsite cultural resources are those located within the 2,000-acre MNGP site. That site includes the entirety of the archaeological APE, which is also the onsite portion of the aboveground APE. The MOSAP and the SHPO database list no cultural resources within the MNGP 2,000-acre site. No historic structures within the MNGP site have been recorded on the MOSAP or documented through the Historic American Buildings Survey or the Historic American Engineering Record programs. Following up on the SHPO comments (Attachment C), MNGP continues to work towards addressing their consultation response for onsite cultural resources.

3.8.4 Offsite Cultural Resources

Offsite cultural resources are those outside the 2,000-acre MNGP site boundary. There are 44 offsite resources within 6 miles of the MNGP. Lists of known archaeological sites and historic properties within a 6-mile radius of MNGP are presented in Tables 3.8-1 and 3.8-2. There are 35 archaeological resources listed in the MOSAP files, and nine architectural resources listed on the NRHP or certified eligible for the NRHP in the MSHPO files. Additionally, eight cemeteries were noted on the topographic maps within the 6-mile APE of MNGP. Of these 53 cultural resources, 3 structures are listed on the NRHP, 5 structures are listed as certified eligible findings (CEF) by the SHPO. One structure, the Simpson Methodist Church (WR-WCC-014), is listed in MSHPO files as on the NRHP, but does not have an NRHP listing number. The MSHPO database includes an additional 224 structures which have no listed eligibility status and are considered of undetermined eligibility for the NRHP. Of the 35 archeological sites, 30 sites have undetermined NRHP eligibility, 2 sites are listed as destroyed, 1 site is ineligible, and 2 sites are noted as "not a site" in the MOSAP files. The eight cemeteries have not been listed on SHPO records. However, the cemeteries are protected by state burial laws (Tables 3.8-1 and 3.8-2).

The David Hannaford Farmstead (79001273), Nicherson/Tarbox House, Shed and Barn (79001274), and Rand, Rufus, Summer House, and Carriage Barn (79001274) are listed on the NRHP (Table 3.8-1). The David Hannaford Farmstead (79001273) is a frame federal farmstead constructed in 1870 located approximately 4.5 miles from the MNGP site. Due to topography and vegetation, it is unlikely that MNGP is visible from David Hannaford Farmstead. The Nicherson/Tarbox House, Shed and Barn (79001274) is a frame Queen Anne and shingle house, shed, and barn built in 1889 and is located approximately 4 miles from the MNGP site. Due to topography and vegetation, it is unlikely that MNGP is visible from the Nicherson/Tarbox House, Shed and Barn. The Rand, Rufus, Summer House, and Carriage Barn (79001274) is a frame Queen Anne built in 1884 and is located approximately 4 miles from the MNGP site. Due to topography and vegetation, it is unlikely that MNGP is visible from the Rand, Rufus, Summer House, and Carriage Barn. As no refurbishment activities are a part of the SLR, there is no potential for the undertaking to adversely affect the viewshed of these three NRHP-listed resources beyond the current viewshed impact.

Based on a desktop evaluation and data provided by the Minnesota SHPO, there are five structures within the 6-mile APE which are eligible for the NRHP, and the Simpson Methodist Church, which is list by MSHPO as on the NRHP. The Minnesota Hwy 10 (SH-XXX-002), Knights of Maccabees Hall (SH-BLC-003), Big Lake School (SH-BLC-008), Great Northern Railway Branch Line (SH-BLT-009), Northern Pacific Railway Branch Line (SH-BLT-010), and Simpson Methodist Church (WR-WCC-014) are all structures which have CEF by the SHPO that are located less than 6 miles from MNGP and are potentially within, or in, the viewshed of MNGP. As no refurbishment activities are a part of the SLR, there is no potential for the undertaking to adversely affect the viewshed of these five CEF resources, or the Simpson Methodist Church, beyond the current viewshed impact.

3.8.5 Cultural Resource Surveys

No cultural resource surveys or assessments have been performed onsite at MNGP. There have been 12 archaeological resources surveys associated with the 35 archaeological sites located within a 6-mile radius of the approximately 2,000-acre MNGP site and listed in Table 3.8-2.

An archaeological survey was conducted in the vicinity of the MNGP site in 1971. The survey recorded five archaeological sites, all Woodland burial mounds (21SH0003, 21SH0004, 21SH0005, 21SH0006, and 21SH0008). An archaeological survey was conducted in the vicinity of the MNGP site in 1983. The survey recorded one archaeological site (21 WRK), an undetermined lithic scatter. An archaeological survey was conducted in the vicinity of the MNGP site in 1990. The survey recorded two archaeological sites, an undetermined lithic scatter (21SH0035) and a Middle Woodland lithic scatter (21SH0036). An archaeological survey was conducted in the vicinity of the MNGP site in 1990. The survey recorded two archaeological sites, a Late Woodland lithic scatter (21WR0049) and an undetermined artifact scatter (21WR0052). An archaeological survey was conducted in the vicinity of the MNGP site in 1993. The survey recorded two archaeological sites, a Woodland artifact scatter (21WR0060) and an undetermined artifact scatter (21WR0061). An archaeological survey was conducted in the vicinity of the MNGP site in 1996. The survey recorded three archaeological sites, an undetermined Archaic and Woodland artifact scatter (21WR0051), a Brainerd Woodland artifact scatter (21WR0075), and a Transitional Woodland artifact scatter (21WR0076). An archaeological survey was conducted in the vicinity of the MNGP site in 2002. The survey recorded one archaeological site (21WR0117) a Middle to Late Woodland artifact scatter. An archaeological survey was conducted in the vicinity of the MNGP site in 2003. The survey recorded one archaeological site (21SH0046), a 1910–1940s farmstead trash pit and artifact scatter. Another archaeological survey was conducted in the vicinity of the MNGP site in 2003. The survey recorded one archaeological site (21SH0045), an undetermined lithic scatter consisting of a single quartz flake.

An archaeological survey was conducted in the vicinity of the MNGP site in 2006. The survey recorded one archaeological site (21WR0165), a pre-contact lithic scatter. An archaeological survey was conducted in the vicinity of the MNGP site in 2009. The survey recorded 11 archaeological sites. The survey recorded two undetermined lithic scatters (21WR0175 and 21WR0176), one pre-contact lithic scatter (21WR0178), two pre-contact lithic and artifact scatters (21WR0177 and 21WR0179), two post-contact Euro-American farmstead surface features (21WR0180 and 21WR0181), and five post-contact Euro-American farmstead surface features and artifact scatters (21WR0182, 21WR0183, 21WR0184, 21WR0185, and 21WR0186). An archaeological survey was conducted in the vicinity of the MNGP site in 2012. The survey recorded one archaeological site (21SH0068), a pre-contact lithic scatter.

3.8.6 Procedures and Integrated Cultural Resources Management Plan

There is currently no cultural resources management plan in place at the MNGP facility. Instead, MNGP has three procedures which aim to identify, protect, and minimize the potential of impact to cultural resources within the MNGP facility, which are excavation permit, excavation and trenching controls, and archaeological, cultural, and historic resources procedures. The procedures define what constitutes a cultural resource, and what actions are taken in the event of unanticipated discoveries. Work comes to a halt and the environmental coordinator is notified immediately. The environmental coordinator then evaluates the discovery and determines if a qualified archaeologist is needed; if deemed necessary, communication with the Minnesota SHPO and associated tribal governments is initiated.

The inadvertent discovery of human remains is handled by the Office of the State Archaeologist via Minnesota Statute §307.08.

Table 3.8-1 NRHP, SHPO-Certified Eligible Findings, and Cemeteries within a 6-Mile Radius of MNGP

Site ID#	Site Name	Quadrangle	Style	NRHP Status/SHPO Evaluation
79001273	David Hannaford Farmstead	Monticello	Frame Federal built 1870	Listed on the NRHP in 1979
79001274	Nicherson/Tarbox House, Shed and Barn	Monticello	Frame Queen Anne and shingle, built 1889	Listed on the NRHP in 1979
79001275	Rand, Rufus, Summer House, and Carriage Barn	Monticello	Frame Queen Anne, built 1884	Listed on the NRHP in 1979
WR-WCC-014	Simpson Methodist Church	Monticello	Not listed	SHPO lists as "on the NRHP"
SH-XXX-002	Minnesota Hwy 10	Cable	Minnesota highway, Elk River to St. Cloud	SHPO certified eligible finding
SH-BLC-003	Knights of Maccabees Hall	Big Lake	Not listed	SHPO certified eligible finding
SH-BLC-008	Big Lake School	Big Lake	Not listed	SHPO certified eligible finding
SH-BLT-009	Great Northern Railway branch line	Big Lake	Not listed	SHPO certified eligible finding
SH-BLT-010	Northern Pacific Railway branch line	Big Lake	Not listed	SHPO certified eligible finding
N/A	Riverside Cemetery	Monticello	Cemetery	Protected by state burial laws
N/A	St. Henrys/Calvary Cemetery	Monticello	Cemetery	Protected by state burial laws
N/A	Helm Cemetery	Monticello	Cemetery	Protected by state burial laws
N/A	Hillside Cemetery	Monticello	Cemetery	Protected by state burial laws
N/A	Our Lady of the Lake Catholic Cemetery	Big Lake	Cemetery	Protected by state burial laws
N/A	Big Lake Cemetery	Big Lake	Cemetery	Protected by state burial laws
N/A	Immaculate Conception Catholic Cemetery	Becker	Cemetery	Protected by state burial laws
N/A	Becker Cemetery	Becker	Cemetery	Protected by state burial laws

(USGS 2021d)

Table 3.8-2 Archaeological Sites within a 6-Mile Radius of MNGP (Sheet 1 of 2)

Site ID#	Quadrangle	Type	NRHP Status/SHPO Evaluation
21WR0176	Monticello	Undetermined lithic scatter	Undetermined
21WR0175	Monticello	Undetermined lithic scatter	Undetermined
21WR0177	Monticello	Pre-Contact lithic and artifact scatter	Undetermined
21WR0178	Monticello	Pre-Contact lithic scatter	Undetermined
21WR0179	Monticello	Pre-Contact lithic and artifact scatter	Undetermined
21WR0180	Monticello	Post-Contact Euro-American farmstead surface features	Undetermined
21WR0181	Monticello	Post-Contact Euro-American farmstead surface features	Undetermined
21WR0182	Monticello	Post-Contact Euro-American farmstead surface features and artifact scatter	Undetermined
21WR0183	Monticello	Post-Contact Euro-American farmstead surface features and artifact scatter	Undetermined
21WR0184	Monticello	Post-Contact Euro-American farmstead surface features and artifact scatter	Undetermined
21WR0185	Monticello	Post-Contact Euro-American farmstead surface features and artifact scatter	Undetermined
21WR0186	Monticello	Post-Contact Euro-American farmstead surface features and artifact scatter	Undetermined
21WRK	Monticello	Undetermined lithic scatter	Undetermined
21SH0008	Big Lake	Woodland burial mounds	Destroyed
21SH0035	Becker	Undetermined lithic scatter	Not eligible (not a site)
21SH0036	Becker	Middle Woodland lithic scatter	Not eligible (not a site)
21SH0045	Monticello	Undetermined lithic scatter consisting of a single quartz flake	Destroyed
21SH0046	Monticello	Post-Contact EuroAmerican farmstead trash pit	Undetermined
21SH0068	Silver Creek	Pre-Contact lithic	Undetermined
21WR0049	Silver Creek	Late Woodland lithic scatter	Undetermined
21WR0051	Silver Creek	Archaic and Woodland artifact scatter	Undetermined

Table 3.8-2 Archaeological Sites within a 6-Mile Radius of MNGP (Sheet 2 of 2)

Site ID#	Quadrangle	Type	NRHP Status/SHPO Evaluation
21WR0052	Silver Creek	Undetermined artifact scatter	Undetermined
21WR0060	Silver Creek	Woodland artifact scatter	Undetermined
21WR0061	Silver Creek	Undetermined lithic scatter	Undetermined
21WR0075	Silver Creek	Brainerd Woodland artifact scatter	Undetermined
21WR0076	Silver Creek	Transitional Woodland artifact scatter	Undetermined
21WR0165	Silver Creek	Pre-Contact lithic scatter	Undetermined
21WRJ	Silver Creek	Paleo, Archaic, and Woodland lithic scatters	Undetermined
21WR0117	Silver Creek	Middle to Late Woodland artifact scatter	Not eligible
21SH0028	Becker	Archaic and Woodland artifact scatter	Undetermined
21SH0003	Big Lake	Woodland burial mounds	Undetermined
21SH0004	Becker	Woodland burial mounds	Undetermined
21SH0005	Becker	Woodland burial mounds	Undetermined
21SH0006	Becker	Woodland burial mounds	Undetermined
SHp	Becker	Woodland burial mounds and a reported early post contact Euro-American cemetery	Undetermined

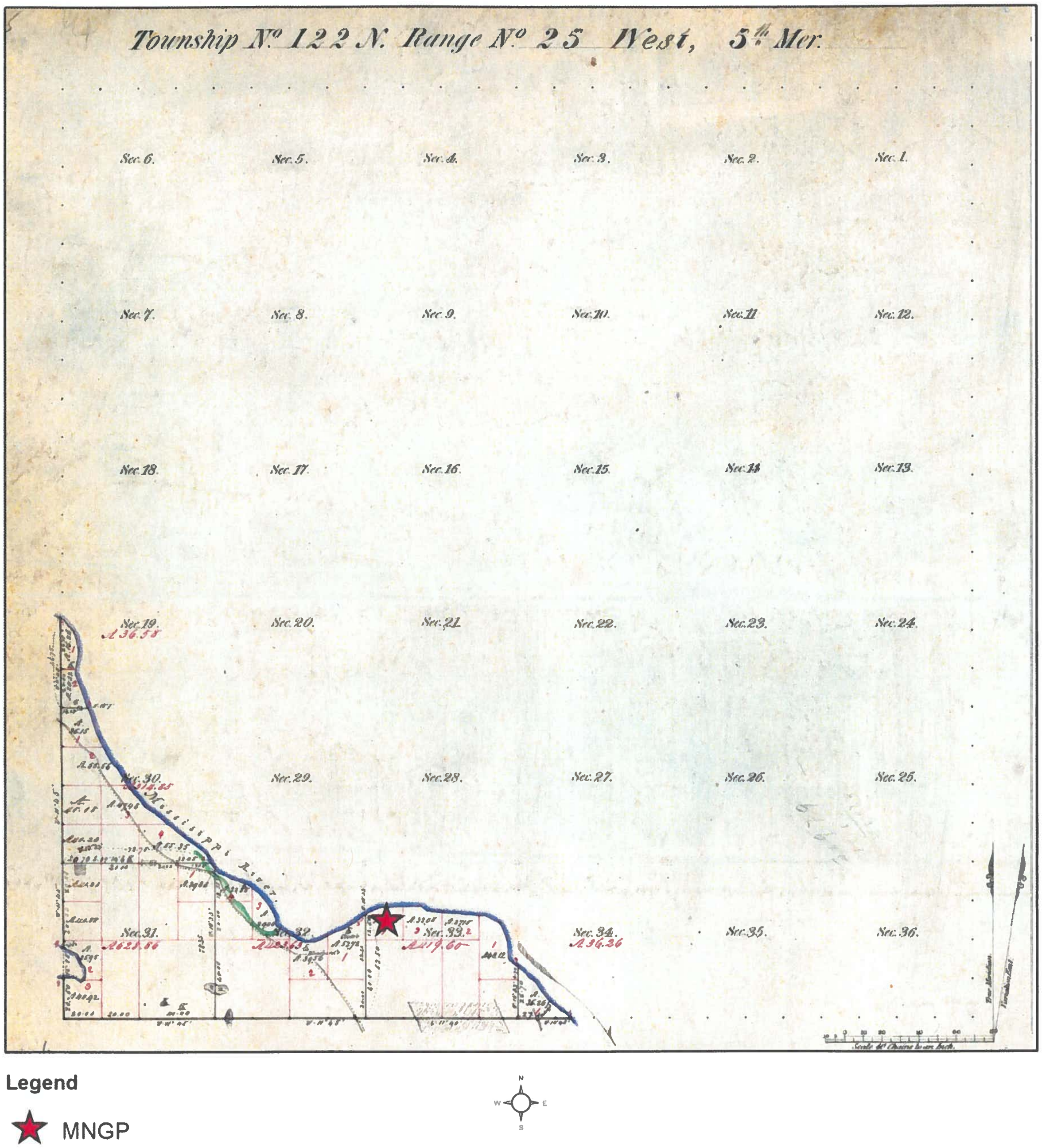


Figure 3.8-1 Government Land Office, 1867 Monticello Map

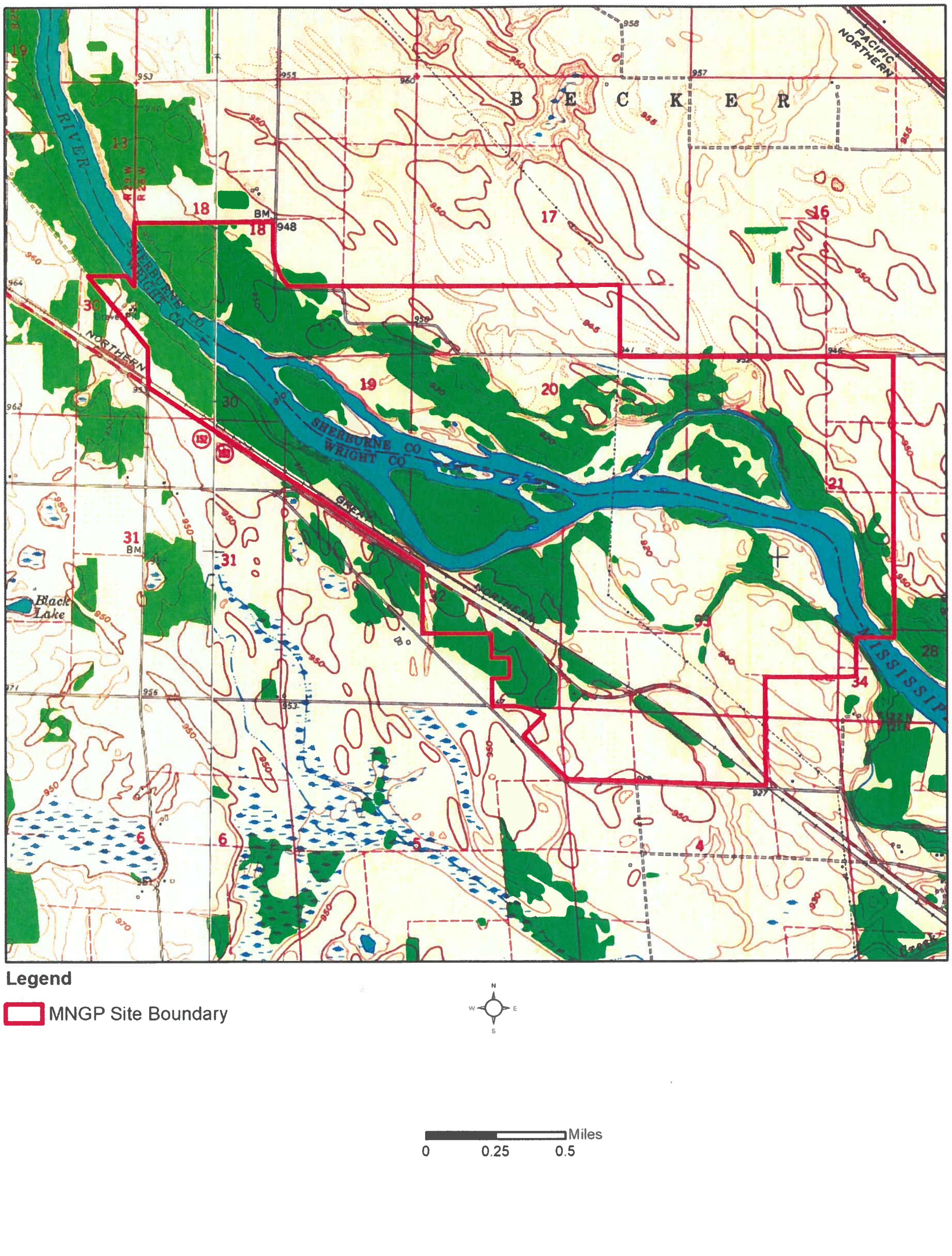


Figure 3.8-2 MNGP Site Boundary, 1961

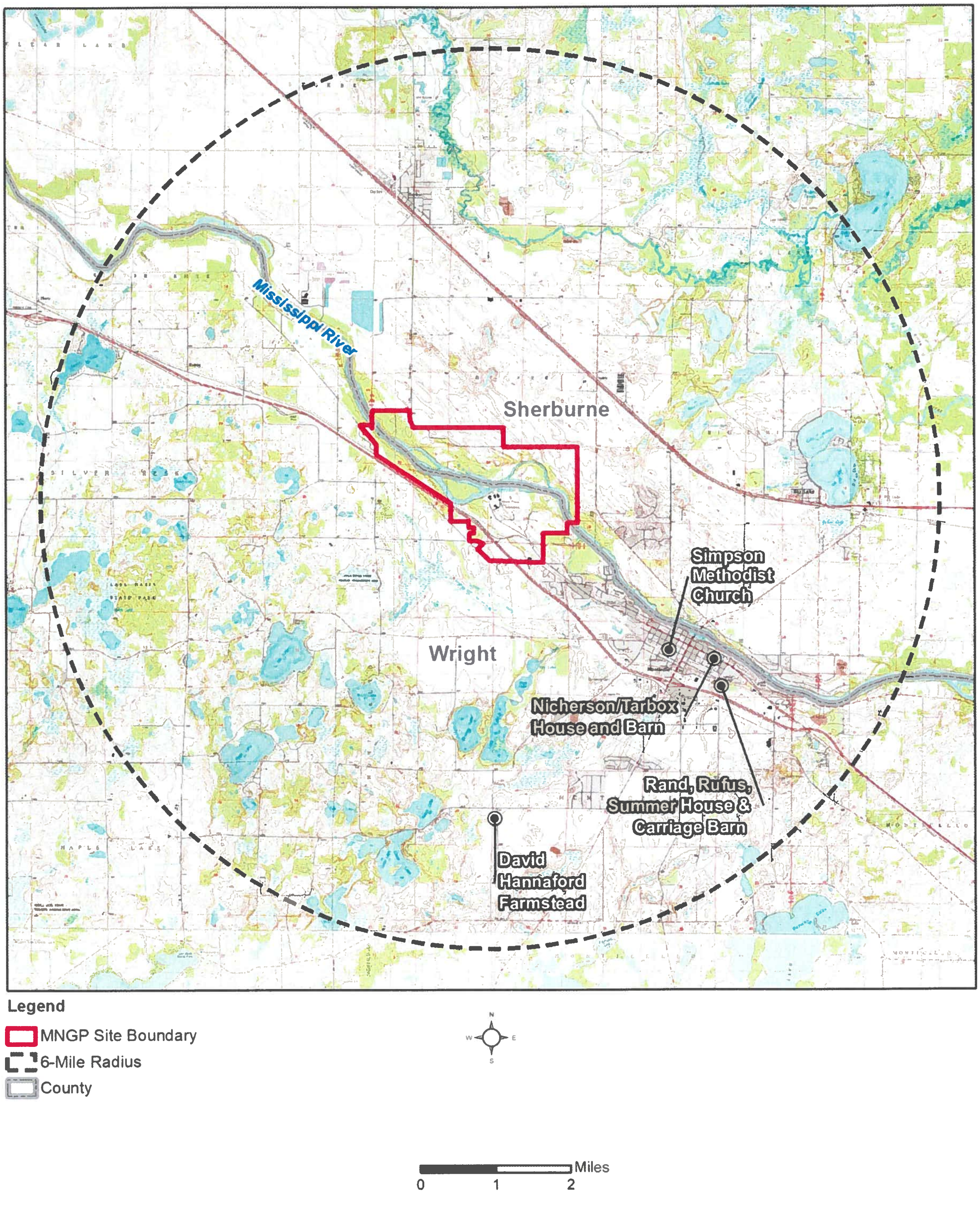


Figure 3.8-3 NRHP Resources within 6 Miles of MNGP

Figure 3.8-4 Facing Northeast During Intitial Grading and Excavation at the MNGP Site, 1966

Figure 3.8-5 Facing West-Northwest During Later Phases of Excavation for the Reactor Building, 1966

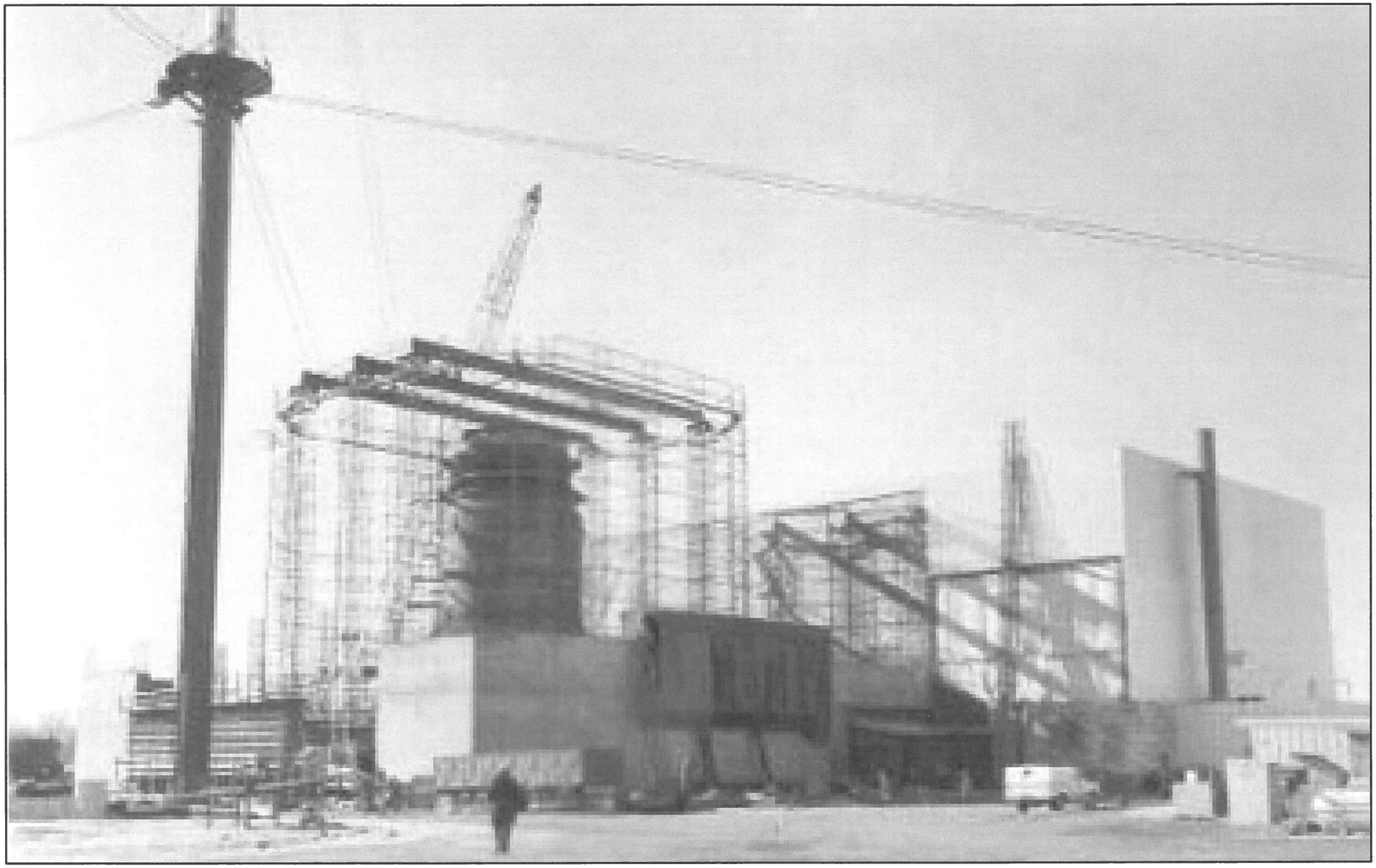


Figure 3.8-6 MNGP Reactor Building Facing West-Northwest, During Construction, 1968

Figure 3.8-7 MNGP Reactor Building Facing West-Northwest near Completion of Construction, 1969

Figure 3.8-8 MNGP Plant Facing East-Southeast, 2017

3.9 Socioeconomics

Socioeconomic descriptions focus on Sherburne and Wright counties because, as presented in Section 2.5, approximately 66 percent of the MNGP permanent workforce is located in these two counties, while the remaining workforce is dispersed throughout the state of Minnesota and across the United States.

During refueling outages, which last from 25–33 days, there are typically an additional 650 contract employees onsite. Refueling and maintenance outages for MNGP are on a two-year cycle and occur on odd numbered years from April through May (see Section 2.5). As seen in Figure 3.1-4, within the 50-mile radius of MNGP are several nearby Minnesota cities, including Monticello, Becker, and Big Lake, and larger urban areas such as St. Cloud and Minneapolis-St. Paul. These communities offer numerous motels, campgrounds, and food service conveniences for contract workers who provide temporary staffing support to MNGP. Transportation corridors such as I-94 and various local roads provide commuter access to County Road 75 NE and MNGP.

3.9.1 Employment and Income

The two geographic areas most influenced by MNGP operations are Sherburne and Wright counties. Additionally, MNGP is an Xcel Energy asset with assessed property taxes distributed to various taxing jurisdictions within Wright County. As presented in Section 3.11.1, the populations of these counties are expected to increase during the SPEO. Low-income populations and poverty thresholds for the counties are described in Section 3.11.2.

As discussed in Section 3.1.1, both Sherburne and Wright counties fall within the Minneapolis-St. Paul-Bloomington metropolitan statistical area. The estimated employed population in Sherburne County in 2020 was 36,433 persons. The leading reported occupational sector was retail trade, with approximately 12.8 percent, or 4,649 persons, employed. This was followed by government and government enterprises with 12.2 percent, or 4,431 persons employed, and manufacturing with 11.7 percent, or 4,259 persons, employed. The annual personal income in Sherburne County was approximately $5.0 billion in 2020, and the average wage per job was $49,688. In 2020, per capita personal income was $50,710. (BEA 2022). The annual average unemployment rate in 2011 was 7.2 percent, and 3.5 percent in 2021. (BLS 2022). The top employers for Sherburne County in 2020 include Independent School District (ISD) 728 (Elk River), Fairview Northland, and Sherburne County (SC 2022).

The estimated employed population in Wright County in 2020 was 62,087 persons. The leading reported occupational sector was retail trade, with approximately 14.1 percent, or 8,765 persons, employed. This was followed by government and government enterprises with 10.9 percent, or 6,765 persons employed, and health care and social assistance (6,683 persons) and manufacturing (6,440 persons) employed 10.8 and 10.4 percent of county workers, respectively. The annual personal income in Wright County was approximately $7.7 billion in 2020, and the average wage per job was $48,779. In 2020, per capita personal income was $55,218. (BEA 2022). The annual average unemployment rate in 2011 was 6.8 percent, and 3.1 percent in 2021. (BLS 2022). The top employers for Wright County in 2021 include ISD 877 (Buffalo-Hanover-Montrose), ISD 855 (St. Michael-Albertville), and Wright County (WC 2022).

3.9.2 Housing

Between 2010 and 2020, both Sherburne County and Wright County saw an increase in population and are expected to continue to grow throughout the SPEO (see Table 3.11-3).

As presented in Table 3.9-1, between 2010–2020 the availability of vacant housing units fell in both Sherburne and Wright counties, although the 2020 percentage of available housing does indicate there is sufficient vacant housing available to keep up with current population increases. In 2020, housing availability in Sherburne County was 4.6 percent and Wright County was 6.6 percent. (USCB 2022)

Table 3.9-1 also details the rise in median housing values that has taken place over the years. Between 2010–2020, the median housing value rose by 27.3 percent in Sherburne County ($244,700 in 2020). From 2010–2020, the median housing value rose by 25.3 percent in Wright County ($250,800 in 2020). (USCB 2022)

Between 2010–2020, median monthly rent grew by 16.1 percent in Sherburne County and was $982 per month in 2020. Median rent reportedly grew by 28.8 percent in Wright County between 2010–2020 ($988 per month in 2020). (USCB 2022)

3.9.3 Water Supply and Wastewater

The following community water supply and wastewater discussion focuses primarily on Sherburne and Wright counties, where the majority of MNGP staff resides. Local municipalities provide public potable water service to residents who do not have individual onsite wells. There are eight public water systems serving communities in Sherburne County, and 19 public water systems in Wright County (MDH 2021c). Along with municipal wastewater treatment facilities, individual onsite septic systems are utilized in both counties. (WCSWCD 2021; SSWCD 2021)

The Soil and Water Conservation Districts in Sherburne County and in Wright County are the respective water planning authorities, although water resource management is shared with a number of local and state agencies and partners. Both counties have established water management plans and an ongoing evaluation process to identify priority issues regarding their water resources. Every 5 years, both counties reevaluate their county water programs and priorities. Over the years, both counties have experienced a continued progression of development, and as the population of Sherburne and Wright counties continues to grow, it is anticipated that rural residential and urban developments will slowly replace portions of agricultural land. Groundwater is heavily utilized as a drinking water source, a cooling agent in some manufacturing plants, and for irrigation of agricultural crops. In Wright County, there has not been a documented problem with groundwater conflicts. Groundwater seems to be readily available in sufficient quantities. Sherburne County also likely has substantial water supplies given its geology. In 2007, the Environmental Quality Board produced a report which estimated water use as a percent of the local Sherburne County water supply. Using 2005 data, it was estimated that 45 percent of Sherburne County's water was being withdrawn for various use purposes. Extrapolating across 2030 population and water use consumption estimates, Sherburne County would be at 77 percent usage. At this rate, recharge of county-specific aquifers would still occur. (WCSWCD 2021; SSWCD 2021)

In both Sherburne County and Wright County, the planning and zoning departments are responsible for the regulation of onsite sewage treatment, or subsurface sewage treatment systems, for county unincorporated areas. Non-conforming septic systems are a source of potential pollution for both lakes and groundwater. Property owners whose septic systems fail to protect groundwater and/or are deemed an imminent threat to public health (in accordance with Minnesota Rules chapter 7080) are required to repair or replace their systems within a certain period of time. (WCSWCD 2021; SSWCD 2021)

Both Sherburne and Wright Soil and Water Conservation Districts have proposed priority concerns for their water management plans, such as surface water quality, groundwater quality and quantity, aquatic invasive species, and development pressure and agricultural issues. Goals, objectives, and action items have been identified for implementation for the duration of each plan. (WCSWCD 2021; SSWCD 2021)

The closest public water supply wells to MNGP are the city of Monticello wells. These wells are 16 inches in diameter and approximately 250 feet deep. The 1,200-gpm capacity is limited by the installed pumps. The wells have been tested to 2,000 gpm and are located in the main part of the city. Monticello's wastewater treatment facility is designed and permitted to treat an average wet weather flow of 2.36 MGD. The actual current annual average daily flow received in the past 12 months (2019–2020) for the facility is 1.28 MGD which is approximately 54.24 percent of the design capacity. (CM 2021c)

Section 3.6.3.2 describes MNGP's domestic water supply system, which relies on onsite groundwater supply wells. As described in Section 3.6.1.2.3, MNGP sanitary wastewater is discharged to the City of Monticello wastewater treatment plant.

3.9.4 Community Services and Education

For Sherburne County emergency services, law enforcement is provided through various agencies, including the county sheriff's office, and the cities of Becker, Big Lake, and Elk River police departments (USACOPS 2021). Sherburne County is served by 5 community fire departments, with 8 stations and 166 active and volunteer firefighters (USFA 2021).

Wright County public safety is provided through the County Sheriff's office, and the cities of Annandale, Buffalo, and Howard Lake police departments (USACOPS 2021). Wright County is served by 15 community fire departments, with 17 stations and 476 active and volunteer firefighters (USFA 2021).

As of 2021, there were five community hospitals with inpatient acute care facilities located within 25 miles of the city of Monticello and MNGP. As of 2019, Wright County's Centracare Health–

Monticello had 39 licensed beds available, and the Buffalo Hospital had 65 licensed beds. As of 2019, Sherburne County's Fairview Northland Regional Hospital, located in the city of Princeton, had 54 licensed beds. Nearby, the Maple Grove Hospital had 130 licensed beds as of 2019 and Mercy Hospital in the city of Coon Rapids had 546 licensed beds as of 2019. (Medicare 2021; MDH 2021d)

As of the 2020–2021 school year, Sherburne County had five public school districts with 20,732 students and 42 schools. Within the county, the Elk River School District is the largest district with 29 schools and 13,921 students (grades pre-kindergarten through 12). The Elk River School District student/teacher ratio was 25.53. For the 2017–2018 school year, there were four private schools within Sherburne County with 238 students. (NCES 2021)

During the 2020–2021 school year, Wright County reported 15 public school districts with 28,475 students and 83 schools. The St. Michael-Albertville School District is the largest district in the county with nine schools and 6,557 students. The St. Michael-Albertville student teacher ratio was 21.95. For the 2017–2018 school year, there were eight private schools in the county with 1,052 students in attendance. (NCES 2021)

Within the MNGP 50-mile region, there are 37 public and private four-year higher education facilities and 19 two-year schools. Approximately 25 miles from the city of Monticello, the nearest four-year schools are Saint Cloud State University, Rasmussen University-Minnesota (St. Cloud), and Rasmussen College-Brooklyn Park. The Anoka Technical College in the city of Anoka (approximately 18 miles from MNGP) is the nearest two-year public higher education facility. (NCES 2021)

3.9.5 Local Government Revenues

On behalf of MNGP, Xcel Energy provides annual property tax payments to the state of Minnesota and various tax jurisdictions in Wright County. These property tax payments are distributed to Wright County, the city of Monticello, Monticello Public School District (PSD) #882-01, and the Economic Development Authority (EDA) in support of Monticello Housing Redevelopment Authority (MHRA) initiatives.

The Minnesota Department of Revenue annually releases a list of preliminary maximum property tax levies for the coming year for cities, counties, townships, schools, and special taxing districts. Following a public "truth in taxation" hearing on these preliminary levies, the county board sets the final tax levies by December of each year. The final levies can be set lower, but not higher, than preliminary levies. Property taxes are payable in two installments for real estate, due annually by May 15 and October 15. (MNDOR 2019; WC 2021a).

See Table 3.9-2a for MNGP total annual property tax payments to the state of Minnesota and Wright County tax jurisdictions for the years 2017–2021 (payments for 2022 are not yet available). The MNGP total annual property tax payment to tax jurisdictions in 2021 was $18,258,065. Overall, Xcel Energy's annual property tax payments have remained consistent throughout the reported years, with no notable increases and decreases due to reassessments and other actions. Neither does Xcel Energy anticipate any changes in state and local tax laws, rates, and assessed property value or any other anticipated tax payment adjustments that could result in future increases or decreases in property taxes or other payments inconsistent with the recent tax payments shown in Table 3.9-2a.

A breakdown of Xcel Energy property tax payments to the individual Wright County applicable tax jurisdictions for the years 2017–2021 are provided in Table 3.9-2b, along with an evaluation of property tax as a percent of tax jurisdiction total revenues for 2017–2021. Annual financial reporting is available for the various tax jurisdictions through 2021.

As seen in Table 3.9-2b, total reported revenues for the city of Monticello and Monticello PSD #882-01 have increased between 2017–2021, but total reported revenues for Wright County and the EDA/MHRA increased from 2017–2020, then decreased in 2021. In Wright County, total annual revenues decreased by 8.7 percent between 2020 and 2021. The increase for Wright County and the EDA/MHRA in 2020 was primarily attributable to federal CARES Act funding and property taxes. Some of the program expense areas receiving funding include public safety, highways and streets, and human services. Also receiving CARES Act funding along with property tax revenue, the city of Monticello total revenues increased by 5.7 percent between 2019 and 2020 and funded several program expense categories, including public works, sanitation, recreation and culture, and public safety. The EDA acts as the city of Monticello's housing redevelopment authority and is responsible for evaluation and implementation of housing policy and programs. The EDA's total revenues rose by 12.6 percent between 2019 and 2020, then decreased by 14.8 percent in 2021, primarily due to decreased activity in 2020 and the reclassification of the EDA fund in 2021. For reporting purposes, the Monticello PSD #882-01 annual fiscal year (FY) runs from July through June. There was an increase of 3.5 percent in total revenues between FY 2020-2021 and FY 2019–2020. Program expense categories include student instruction, instruction and pupil support services, administration, transportation, facilities, and operations and maintenance. (CM 2021d; CM 2022, MPSD 2021; MPSD 2022, WC 2021a; WC 2022)

According to Wright County annual financial reporting, in 2021 Xcel Energy was the largest taxpayer in the county with an estimated market value of $881 million (WC 2022). Property taxes paid by Xcel Energy to the individual jurisdictions on behalf of MNGP have fluctuated slightly between 2017–2022, generally as a result of Wright County assigned property tax levies (see Table 3.9-2b). Over the years, tax jurisdictions located in Wright County have also increased their financial total revenues through other means, and consequently, the Xcel Energy property tax payments represent an increasingly smaller percentage of the individual tax jurisdictions' total revenues.

For the state of Minnesota, Xcel Energy annually pays into the state general tax revenue fund on behalf of MNGP. In 2020, state of Minnesota total tax revenues was approximately $37 billion, and the state provided a forecast indicating it expects an increase in total tax receipts between 2021–2025. Annual tax payments made to the state of Minnesota on behalf of MNGP would be approximately <1 percent of state tax revenues (see Table 3.9-2a and Table 3.9-2b). (MNDOR 2021; NRC 2006b).

The Xcel Energy "Giving Back in Minnesota" 2019 community charitable campaign includes MNGP; however, Xcel does not track individual plant contributions in this effort. Through the Minnesota statewide campaign, Xcel Energy staff contributed 33,400 hours of volunteering to 300 nonprofits ($330,600 in economic impact). Also $3 million in charitable donations were made to United Way and other community organizations through grants and matching gifts. Finally, Xcel Energy provided $24 million in energy assistance to Minnesota residents. The 2019 level of charitable giving effort is similar to previous years, although 2020 charitable giving was impacted due to the ongoing pandemic. The United Way campaign and MNGP staff raised approximately $134,000 in 2020 and $125,000 in 2021 for Wright County. In 2021, approximately $125,000 was raised for Wright County through Xcel's United Way campaign, primarily from MNGP.

Each year Xcel Energy provides approximately $1.3 million for emergency planning and preparedness funding to the State of Minnesota Homeland Security and Emergency Management. The annual support payment is distributed to local governmental jurisdictions and organizations on behalf of MNGP.

3.9.6 Transportation

As discussed in Section 3.1, transportation in the MNGP region includes a rural and urbanized road network, plus rail and air travel (see Figures 3.1-3 and 3.1-4). South of MNGP, I-94 moves traffic between Minneapolis and St. Cloud through the city of Monticello and provides commuter access to the plant from communities in the region. County Road 75 NE is a two-lane paved road that runs roughly parallel to I-94 through Monticello and routes local and commuter traffic to MNGP plant entrance roads and area businesses.

The Minnesota Department of Transportation average annual daily traffic (AADT) volumes for County Road 75 NE are listed in Table 3.9-3. Over the years, the traffic volume counts on County Road 75 NE have been consistent and reveal little fluctuation of commuter plant access. On County Road 75 NE, the most recent 2016 AADT count northwest of the plant entrance was 1,600. On County Road 75 NE, the most recent 2016 AADT count southeast of the plant entrance was 3,350. (MNDOT 2021d).

The U.S. Transportation Research Board developed a commonly used indicator called level of service (LOS) to measure how well a road accommodates traffic flow. LOS is a qualitative assessment of traffic flow and how much delay the average vehicle might encounter during peak hours. LOS categories are listed and defined Table 3.9-4.

No recent Minnesota Department of Transportation traffic studies specific to County Road 75 NE in the MNGP area were available. To provide a current evaluation of LOS for County Road 75 NE, the known AADT traffic volumes were compared to the estimated capacity of a two-lane highway, as presented in the U.S. Transportation Research Board highway capacity manual. The manual notes that the capacity of a two-lane highway under base conditions is 1,700 passenger cars per hour (pc/h) in one direction, with a limit of 3,200 pc/h for the total of the two directions. Because of the interactions between directional flows, when a capacity of 1,700 pc/h is reached in one direction, the maximum opposing flow would be limited 1,500 pc/h. Based on 2016 AADT recorded volumes, County Road 75 NE northwest of the plant access road would have a reported flow rate of approximately 67 pc/h on average. The 2016 AADT recorded volumes for County Road 75 NE southeast of the plant access road would have a reported flow rate of approximately 140 pc/h on average. Because traffic flow has stayed consistent over the years, and the base condition capacities for a two-lane road are not exceeded by the current average traffic conditions, there should be ample traffic capacity on County Road 75 NE in the road areas associated with plant access. Applying the LOS traffic conditions defined in Table 3.9-4, County Road 75 NE should fall within the LOS "A" to "C" range of conditions.

No new road improvement projects specific to the city of Monticello and the MNGP plant area were identified (MNDOT 2021e). The city of Monticello 2040 community vision and comprehensive plan has identified working with regional and state partners on future transportation initiatives such as construction of a second point of access bridge across the Mississippi River from Sherburne County into the city of Monticello to ease congestion on State Highway 25. Also, a proposal has been discussed regarding the addition of another interchange off I-94 which would provide additional access to the city of Monticello. (CM 2020b)

3.9.7 Recreational Facilities

As discussed in Section 3.1, a list of federal, state, and local lands that fall within the MNGP vicinity can be found in Table 3.1-1 (see Figure 3.1-5). While there are a number of popular regional and local parks and recreational opportunities located within the vicinity of MNGP in Wright and Sherburne counties, no data on present and projected percentage of visitor use was available.

Sherburne County is home to thousands of acres of unique recreational land, local parks, public multi-use trails, wildlife management areas, and scientific and natural areas, including the Sherburne National Wildlife Refuge (see Figure 3.1-6). Located outside the MNGP 6-mile vicinity, the Sand Dunes State Forest (Ann Lake Campground) is the nearest public camping facility within Sherburne County. (SC 2021a) Located north of the Mississippi River within the 6-mile vicinity, but outside the MNGP site boundary, is the Xcel Energy Oaks on the River campground (non-public), that is exclusively available for current and retired Xcel employee recreational use (see Figure 3.1-1). The Oaks on the River campground is 300 acres with 42 campsites available by reservation. (ORC 2021)

Wright County Parks & Recreation Department maintains 33 facilities across the county, encompassing over 4,700 acres of open space, with water sports, fishing, canoeing, day use picnicking and playgrounds, and over 80 miles of multi-use trails. Within the MNGP vicinity, Bertram Chain of Lakes Regional Park offers overnight camping with 6 camper cabins and 38 camping sites. Montissippi Regional Park is located next to the MNGP boundary and offers Mississippi River access and camping at park canoe sites (by permit). (WC 2021d) The Minnesota portion of the Mississippi River Trail follows the Mississippi River from Itasca State Park to the Iowa border on a combination of roadway shoulders and off-street trails. The Mississippi River Trail is primarily a bicycle route and enters the city of Monticello from the north on County Road 75 NE and passes through Montissippi Regional Park following the Mississippi River through Monticello on existing trails and road segments. In 2020, Wright County proposed development of the Great River Regional Trail, a paved, nonmotorized destination trail that will link Monticello to Clearwater, Otsego, and the Minnesota regional trail network via a route that roughly follows the path of the Mississippi River. (CM 2020b)

Within the site boundary, there are city of Monticello public multi-use trails and the softball facility. The MNGP Training and Conference Center has in the past been used by public organizations for community meetings, including groups such as the local chamber of commerce, higher education science department faculty and students, legislative groups, and public safety agencies, etc. While no public visitors were allowed onsite at MNGP for most of 2020 and none in 2021 due to the Covid-19 pandemic, in recent years annual public visitor use of the MNGP conference facility could range as high as an estimated 147 persons in 2016 to an estimated 71 persons in 2019. Currently there are no plans to increase public use at the MNGP site. There is no hunting, camping or Mississippi River shoreline fishing allowed within the MNGP site boundary. As discussed in Section 3.1.2, MNGP "No Trespassing" signs are posted on the site and along the Mississippi River shoreline.

Table 3.9-1 Housing Statistics, 2010 and 2020

Name	2010	2020	2010 to 2020 Change (%)
Sherburne County			
Total Housing Units	32,393	34,356	6.1
Occupied Units	29,977	32,791	9.4
Vacancy Units	2,416	1,565	-35.2
Vacancy (percent)	7.5	4.6	-2.9
Median House Value ($)	192,200	244,700	27.3
Median Rent ($/month)	846	982	16.1
Wright County			
Total Housing Units	49,039	52,587	7.2
Occupied Units	45,203	49,097	8.6
Vacancy Units	3,836	3,490	-9.0
Vacancy (percent)	7.8	6.6	-1.2
Median House Value ($)	200,200	250,800	25.3
Median Rent ($/month)	767	988	28.8

(USCB 2022)

Table 3.9-2a MNGP Total Property Tax Payments in USD, 2017–2021

Year	Wright County	City of Monticello	State of Minnesota	Monticello PSD #882-01	Other (EDA/MHRA)	Total
2017	6,589,558	5,520,060	1,165,259	4,469,195	168,903	17,912,974
2018	7,013,061	5,676,495	1,262,606	4,551,474	192,066	18,695,702
2019	7,058,266	5,462,252	1,277,085	4,450,457	190,833	18,438,892
2020	6,988,007	5,500,769	1,129,160	4,040,190	186,888	17,845,014
2021	7,103,919	5,794,246	1,091,042	4,076,957	191,901	18,258,066

Table 3.9-2b MNGP Total Property Tax Payment by Tax Jurisdiction, 2017–2021

Tax Jurisdictions	2017	2018	2019	2020	2021
Wright County					
Total Jurisdiction Revenue ($)	119,225,722	138,724,187	151,084,235	187,838,242	171,533,344
MNGP Total Property Tax Paid ($)	6,589,558	7,013,061	7,058,266	6,988,007	7,103,919
Property Tax as % of Total Revenues	5.5	5.1	4.7	3.7	4.1
City of Monticello					
Total Jurisdiction Revenue ($)	25,030,313	26,313,579	32,500,261	34,347,195	37,051,766
MNGP Total Property Tax Paid ($)	5,520,060	5,676,495	5,462,252	5,500,769	5,794,246
Property Tax as % of Total Revenues	22.1	21.6	16.8	16.0	15.6
Monticello PSD #882-01					
Total Jurisdiction Revenue ($)	50,631,365	55,184,742	56,195,029	58,533,716	60,609,014
MNGP Total Property Tax Paid ($)	4,469,195	4,551,474	4,450,457	4,040,190	4,076,957
Property Tax as % of Total Revenues	8.8	8.2	7.9	6.9	6.7
Other EDA/MHRA					
Total Jurisdiction Revenue ($)	1,012,481	1,007,703	1,174,749	1,323,022	1,126,638
MNGP Total Property Tax Paid ($)	168,903	192,066	190,833	186,888	191,901
Property Tax as % of Total Revenues	16.7	19.1	16.2	14.1	17.0

Note: State of Minnesota total tax revenues were approximately $37 billion in 2020. Annual tax payments made to the state of Minnesota on behalf of MNGP would be <1 percent of state tax revenues.

(CM 2018; CM 2019; CM 2020a; CM 2021d; CM 2022; MNDOR 2021; MPSD 2018; MPSD 2019; MPSD 2020; MPSD 2021; MPSD 2022; WC 2018; WC 2019; WC 2020b; WC 2021a; WC 2022)

Table 3.9-3 Total Average Annual Daily Traffic Counts on County Road 75 NE

Route	Location	2000	2004	2008	2012	2016
County Road 75 NE	NW of MNGP plant entrance (NW of 120th St NE)	1,050	3,300	3,650	NC	1,600
County Road 75 NE	SE of MNGP plant entrance (NW of W River St)	3,250	3,700	3,350	3,500	3,350

NC = no count

(MNDOT 2021d)

Table 3.9-4 Level of Service Definitions

Level of Service	Conditions
A	Free flow of the traffic stream; users are mostly unaffected by the presence of other vehicles.
B	Free flow of the traffic stream, although the presence of other vehicles becomes noticeable. Drivers have slightly less freedom to maneuver.
C	The influence of the traffic density on operations becomes marked and queues may be expected to form. The ability to maneuver with the traffic stream is clearly affected by other vehicles.
D	The ability to maneuver is severely restricted due to traffic congestion. Travel speed is reduced by the increasing volume. Only minor disruptions can be absorbed without extensive queues forming and the service deteriorating.
E	Operations at or near capacity, an unstable level. The densities vary, depending on the free-flow speed. Vehicles are operating with the minimum spacing (or gaps) for maintaining uniform flow. Disruptions cannot be dissipated readily, often causing queues to form and service to deteriorate to LOS F.
F	Forced or breakdown of flow. It occurs either when vehicles arrive at a rate greater than the rate at which they are discharged or when the forecast demand exceeds the computed capacity. Queues form behind these breakdowns. Operations within queues are highly unstable, with vehicles experiencing brief periods of movement followed by stoppages.

3.10 Human Health

This section describes site conditions likely to contribute to the occurrence of pathogenic thermophilic microbiological organisms; methodology and procedures designed to meet the regulatory requirements and standards for limiting potential induced current hazards arising from energized in-scope transmission lines; and a description of the plant's radiological health environment and preventative measures necessary to reduce potential exposure levels to plant workers and visitors during plant operations.

3.10.1 Microbiological Hazards

In the GEIS, the NRC considered health impacts from thermophilic microorganisms posed to both the public and plant workers because ideal conditions for thermophilic microorganisms can result from nuclear facility operations and discharges. Microorganisms of particular concern include several types of bacteria (*Legionella* species, *Salmonella* species, *Shigella* species, and *Pseudomonas aeruginosa*) and the free-living amoeba *Naegleria fowleri*. The public can be exposed to the thermophilic microorganisms *Salmonella*, *Shigella*, *P. aeruginosa*, and *N. fowleri* during swimming, boating, or other recreational uses of freshwater. If a nuclear plant's thermal effluent enhances the growth of thermophilic microorganisms in waters open for recreational use, recreational users could experience an elevated risk of exposure when using waters near the plant's discharge. (NRC 2013e; NRC 2020a)

Legionella is a genus of common warm water bacteria that occurs in lakes, ponds, and other surface waters, as well as some groundwater sources and soils. *Legionella* optimally grow in stagnant surface waters with biofilms or slimes that range in temperature from 95°F to 113°F, although the bacteria can persist in waters from 68°F to 122°F. The bacteria are only pathogenic to humans when aerosolized and inhaled into the lungs. As such, human infection is often associated with complex water systems housed within buildings or structures, such as cooling towers. (NRC 2020a)

N. fowleri is ubiquitous in nature and thrives in water bodies at temperatures ranging from 95°F to106°F or higher and is rarely found in water cooler than 95°F. Infection rarely occurs in water temperatures of 95°F or less (NRC 2013e). Infections occur when *N. fowleri* penetrates the nasal tissue through direct contact with water in warm lakes, rivers, or hot springs and migrates to the brain tissues (CDC 2020a). There have been only two cases of primary amebic meningoencephalitis, the infection caused by *N. fowleri*, in Minnesota from 1962 to 2019 (CDC 2020b).

The other human pathogens mentioned above have infection routes of contact with infected persons or contaminated water, food, soil, or other contaminated material. The exposure route of concern would be contact with contaminated water containing a population of microorganisms sufficient for human infection. The pathogens can grow at a range of temperatures, but as human pathogens, have an optimal growth temperature around the human body temperature. From 2009 to 2018, there were 56 reported recreational water illness outbreaks in Minnesota resulting in 731 known illnesses. Outbreaks occurred primarily from exposure in swimming pools. Only nine outbreaks occurred from exposure in lakes and rivers. More than half (52 percent) of the outbreaks were caused by *Cryptosporidium*. Other agents associated with outbreaks were *E. coli*, *Legionella*, norovirus, *Pseudomonas*, *Giardia*, and chemicals. From 2009 to 2018, there were six reported outbreaks in Minnesota associated with waterborne exposure other than drinking water, resulting in 46 known illnesses. The outbreaks were due to *Legionella* and *Giardia*. Of the three outbreaks due to *Legionella*, one was associated with exposure to a cooling tower. (MDH 2019)

As discussed in Section 2.2.3, MNGP releases heated condenser cooling water to a discharge canal which discharges to the Mississippi River. MNGP utilizes two MDCTs, as needed, to meet surface water appropriation limits and thermal discharge limits. Operational modes include no cooling tower use in once-through circulation of river water and cooling tower use for closed cycle, helper mode, and partial recirculation mode. A plant computer chooses the optimal operating mode based on prevailing river flow, river temperature, and status of critical plant equipment. Cooling towers are normally used from May through September (when river temperatures have historically exceeded 68°F) or during periods of extremely low flow when state minimum flow standards for the Mississippi River limit the plant's cooling water withdrawal. The condenser cooling water discharges to the Mississippi River are governed by NPDES Permit No. MN0000868 and the discharge is through Outfall SD001. The permitted daily maximum temperature limits for this outfall as measured in the discharge canal are 80°F from December through February; 85°F in March and November; and 95°F from April through October. (Attachment A)

Chemical disinfection of various waste systems is authorized by the NPDES permit to control microbiological activity and zebra mussels. The NPDES permit sets limits for total residual chlorine and total residual bromine. (Attachment A)

The cooling towers and discharge canal are within the plant's fenced area. Buoys in the river mark the discharge area. The land side of the discharge area lies outside the plant's fence; however, it is posted as a restricted area and monitored by plant security. The Mississippi River near MNGP is too shallow for large vessels, limiting its use for commercial barge traffic. The river near MNGP is used for recreational purposes, including fishing and boating.

MNGP implemented a power uprate following the NRC's 2013 approval. Xcel Energy projected that the power uprate would increase the temperature of the heated water released to the discharge canal by a maximum of 4.5°F over the pre-uprate temperature range of circulated cooling water released to the discharge canal of 66 to 95°F (75 FR 2565). Xcel Energy did not propose a change in NPDES discharge limits in its current permit renewal application. For the 2010 environmental impact assessment for the proposed power uprate, the NRC considered the projected temperature increase and its potential to affect the length, width, and duration of the thermal plume within the Mississippi River. The NRC determined that thermophilic organisms are not likely to occur as a result of discharges by MNGP into the Mississippi River, concluding the impact would not be significant (i.e., SMALL) because the daily maximum temperature at the discharge canal would remain within the NPDES discharge limits and well below the maximum growth rate temperature for thermophilic organisms. (75 FR 2565)

A review of daily maximum temperatures of condenser cooling water released to the discharge canal from 2016 through July 25, 2021, indicates a daily maximum temperature of 94.8°F. Therefore, the temperature of releases to the discharge canal remains below the NPDES permit limit. The monthly average temperature recorded at the plant's CWIS, which represents the river's ambient temperature, is presented in Figure 3.6-4. The monthly average temperature recorded within the discharge canal is presented in Figure 3.6-5. Peak summer ambient river water temperatures are between 75°F and 79°F. The average discharge canal temperatures from May to September peaked at about 92.5°F and are generally 90°F and below.

To ensure that the NPDES permit limit is not challenged, MNGP replaced its two cooling towers after many years of service with new, upgraded ones with slightly greater cooling capacity. They were placed into operation in May 2021 and May 2022. Use of the new cooling towers with greater cooling capacity during the summer months will result in lower discharge temperatures than with the old cooling towers.

As mentioned above, human infection of *Legionella* is often associated with complex water systems housed within buildings or structures, such as cooling towers. MNGP has two MDCTs; the plant's annual right-to-know training includes information on infectious agents including *Legionella* and the symptoms of Legionnaire's disease. Work on the MNGP site is governed by a comprehensive industrial safety program. Entry into the cooling water system's waterboxes, where exposure to *Legionella* is possible, is governed by a procedure which requires all personnel entering the waterbox to wear a disposable respirator when water temperatures are greater than 68°F.

3.10.2 Electric Shock Hazards

The electric field created by high-voltage lines can extend from the energized conductors on the lines to other conducting objects, such as the ground, vegetation, buildings, vehicles, and persons if appropriate clearances are not maintained, posing a shock hazard for the public and workers. To minimize the shock that could be experienced by someone touching an object that is capacitively charged, the clearance between the power lines and the object must limit the induced current to a low enough electrical charge. The National Electrical Safety Code (NESC) contains the basic provisions considered necessary for the safety of workers and the public.

The in-scope transmission lines at MNGP are located between the turbine building and the switchyard and are wholly within the owner-controlled area (Figures 2.2-3 and 3.1-1). Thus, any risk to the public is minimized due to restricted site access. Portions of the in-scope transmission lines are within the fenced protected area. Other portions cross over an internal site roadway and parking areas.

The in-scope transmission lines were designed to meet the requirements of the NESC in effect at the time of construction. Per Section 0.13.B.2 of the current code (2017), existing installations, including maintenance and replacement that currently comply with prior editions of the code, need not be modified to comply with these rules except as may be required for safety reasons by administrative authority. Xcel conducted a study in 2021 to determine compliance with the current NESC of the in-scope transmission lines using LiDAR data and plant drawings to model the line segments for analysis. The analysis indicated no clearance issues and the NESC clearance requirements are satisfied.

Work on the MNGP site is governed by a comprehensive industrial safety program consisting of a safety handbook, industrial safety directives, and topic and task-specific procedures (e.g., electrical safety and operations tagging procedures). Xcel Energy uses and follows OSHA standards for electric power generation, transmission, and distribution (29 CFR 1910.269). MNGP's industrial safety program is inclusive of a workplace hazards identification process and performs jobsite analysis of workplace hazards, focusing on mitigation activities to eliminate risk and potential for both injury and human error. Instructions are provided for using ladders, scaffolds, lifts, rigging, and cranes for safe placement and operation. MNGP also has electrical safety procedures that address proper clearances and safe work approaches.

3.10.3 Radiological Hazards

As required by NRC regulations at 10 CFR 20.1101, "Radiation protection programs," Xcel Energy designed a radiation protection program to protect onsite personnel (including employees and contractor employees), visitors, and offsite members of the public from radiation and radioactive material at MNGP. NRC regulations require that gaseous and liquid radioactive releases from nuclear power plants must meet radiation dose-based limits specified in 10 CFR Part 20, "Standards for Protection Against Radiation," and the as low as reasonably achievable (ALARA) criteria in 10 CFR Part 50, Appendix I, "Numerical Guides for Design Objectives and Limiting Conditions for Operation to Meet the Criterion 'As Low as is Reasonably Achievable' for Radioactive Material in Light- Water-Cooled Nuclear Power Reactor Effluents." Through these release limits, the NRC places regulatory limits on the radiation dose that members of the public can receive from a nuclear power plant's radioactive effluent. Xcel Energy uses its ODCM, which contains the methods and parameters for calculating offsite doses resulting from liquid and gaseous radioactive effluents. These methods ensure that radioactive material discharges from MNGP meet NRC and EPA regulatory dose standards.

MNGP's ARERRs contain a detailed presentation of the releases from MNGP and the resultant calculated doses. The plant releases small quantities of radioactive materials in gaseous form and does not make routine releases of radioactive liquids. There were no radioactive liquid releases in 2016, 2018, 2019, or 2020. An abnormal radioactive liquid release occurred on April 27, 2017, resulting in a dose between 0.01 and 0.02 percent of limits. One abnormal liquid release occurred in 2021 due to contamination of the clean Turbine Building Normal Waste Sump which resulted in a small release of tritium. The total dose was estimated to be 4.69 E-9 mrem. Radioactive effluent release data from 2016–2021 showed that radiation doses to members of the public were a very small fraction of the limits of the NRC's and EPA's radiation protection standards contained in Appendix I to 10 CFR Part 50, 10 CFR Part 20, and 40 CFR Part 190. (Xcel 2017; Xcel 2018; Xcel 2019; Xcel 2020b; Xcel 2021d, Xcel 2022a)

MNGP's REMP provides additional assurance that there are no significant dose or radiological environmental impacts due to operation of the plant. The REMP measures the aquatic, terrestrial, and atmospheric environment for ambient radiation and radioactivity. Monitoring is conducted for the following: direct radiation, air, drinking water, river water, groundwater, vegetation (when milk samples are not available), milk, fish, and shoreline sediment. The REMP results and trending for 2021 are as follows:

- Ambient radiation was measured in 2021 for the site boundary, at an inner ring, and at on outer ring using thermoluminescent dosimetry. Dose rates measured at the inner and outer ring locations in 2021 were similar to those observed from 1999 through 2020 and no MNGP effect on ambient gamma radiation was indicated.
- Monitoring results indicate airborne particulate samples had levels similar to those of control stations for 2021. Data from 2009–2021 do not show an increasing trend attributable to plant operations.
- Drinking water samples for 2021 indicated no effect from MNGP operations.
- River water samples for 2021 showed tritium and gamma isotopic results all below detection limits.
- Groundwater samples for 2021 showed tritium and gamma isotopic results all below detection limits and consistent with the results from previous years.
- Broadleaf vegetation samples for 2021 showed gamma isotopic and iodine-131 concentrations below the detection limit.
- Fish samples for 2021 showed results with no gamma emitting radionuclides attributable to MNGP operations. Results from 2021 were consistent with historical results.
- Shoreline sediment samples for 2021 indicated no MNGP effect. (Xcel 2022b)

In addition to the REMP, MNGP has an onsite groundwater protection program designed to monitor the onsite plant environment. Groundwater monitoring indicates that low levels of tritium are detected in two monitoring wells, MW-9A and MW-10. Results for 2020 indicate that tritium levels in MW-9A ranged from <223 pCi/l to 8,220 ± 409 pCi/l, well under the drinking water standard of 20,000 pCi/L. Historically, MW-9A has indicated elevated tritium levels that vary seasonally since 2009. Tritium in MW-9A is understood to likely stem from a stagnant plume under the turbine building. Tritium levels in MW-10 are significantly lower than those of MW-9A. During 2021, two samples from MW-10 had tritium levels above background with an average concentration of 164 ± 119 pCi/L. All other monitoring wells indicated activity below the lower limit of detection, <300 pCi/L. No gamma-emitting isotopes were identified in groundwater sampling during 2020. (Xcel 2022a)

Occupational exposure at nuclear power plants is monitored by the NRC. The 3-year (2017–2019) average occupational dose per individual [total effective dose equivalent (TEDE)] was 0.128 roentgen equivalent man (rem) for MNGP. The annual TEDE limit is 5 rem [10 CFR 20.1201(a)(1)]. The average annual collective dose per reactor for BWRs was 91 person-rem. In comparison, MNGP had a 3-year (2017–2019) TEDE collective dose per reactor of approximately 113 person-rem. (NRC 2022a)

3.11 Environmental Justice

This section characterizes the population and demographic characteristics, including the identification of minority and low-income individuals, within a 50-mile radius of MNGP.

3.11.1 Regional Population

The GEIS presents a population characterization method based on two factors: "sparseness" and "proximity" (NRC 1996b). Sparseness measures population density and city size within 20 miles of a site and categorizes the demographic information as follows.

Demographic Categories Based on Sparseness

		Category
Most sparse	1.	Less than 40 persons per square mile and no community with 25,000 or more persons within 20 miles.
	2.	40 to 60 persons per square mile and no community with 25,000 or more persons within 20 miles.
	3.	60 to 120 persons per square mile or less than 60 persons per square mile with at least one community with 25,000 or more persons within 20 miles.
Least sparse	4.	Greater than or equal to 120 persons per square mile within 20 miles.

(NRC 1996b)

"Proximity" measures population density and city size within 50 miles and categorizes the demographic information as follows.

Demographic Categories Based on Proximity

		Category
Not close proximity	1.	No city with 100,000 or more persons and less than 50 persons per square mile within 50 miles.
	2.	No city with 100,000 or more persons and between 50 and 190 persons per square mile within 50 miles.
	3.	One or more cities with 100,000 or more persons and less than 190 persons per square mile within 50 miles.
Close proximity	4.	Greater than or equal to 190 persons per square mile within 50 miles.

(NRC 1996b)

The GEIS then uses the following matrix to rank the population in the region of the plant as low, medium, or high.

GEIS Sparseness and Proximity Matrix

		Proximity			
		1	**2**	**3**	**4**
Sparseness	**1**	1.1	1.2	1.3	1.4
	2	2.1	2.2	2.3	2.4
	3	3.1	3.2	3.3	3.4
	4	4.1	4.2	4.3	4.4

Low Population Area

Medium Population Area

High Population Area

(NRC 1996b)

The 2020 census population and TIGER/Line data from the United States Census Bureau (USCB) were used to determine demographic characteristics in the vicinity of the site (USCB 2021a). The data were processed at the state, county, and census block levels using ESRI ArcGIS software (USCB 2021g; USCB 2021c). Census data include people living in group quarters such as institutionalized and non-institutionalized populations. Examples of institutional populations living in group quarters are correctional institutions (i.e., prisons, jails, and detention centers); nursing homes; mental (psychiatric) hospitals; hospitals or wards for the chronically ill; and juvenile institutions. Examples of non-institutional populations living in group quarters are group homes; college dormitories; military quarters; soup kitchens; shelters for abused women (shelters against domestic violence or family crisis centers); and shelters for children who are runaways, neglected, or without conventional housing. (USCB 2021h)

The 2020 census data indicate that approximately 258,805 people live within a 20-mile radius of the MNGP site, which equates to a population density of approximately 206 persons per square mile (USCB 2021g). Based on the GEIS sparseness index, the site is classified as Category 4 with greater than or equal to 120 persons per square mile within 20 miles.

The 2020 census data indicate that approximately 3,285,866 people live within a 50-mile radius of the site, which equates to a population density of approximately 418 persons per square mile (USCB 2021g). There are two cities within a 50-mile radius that have a population greater than 100,000 residents (Table 3.11-1). Based on the GEIS proximity index, the site is classified as Category 4, greater than or equal to 190 persons per square mile within 50 miles. As illustrated in the GEIS sparseness and proximity matrix, the combination of "sparseness" Category 4 and "proximity" Category 4 results in the conclusion that MNGP is located in a "high" population area.

The area within a 50-mile radius of the MNGP site totally or partially includes 23 counties within the state of Minnesota (Table 3.11-2). A portion of Polk County, Wisconsin, is also included in the 50-mile radius; however, this portion is in and near the St. Croix River and the 2020 USCB block data does not record any permanent population for this area. According to the 2020 census, the permanent population (not including transient populations) of the entire 23 counties was 3,963,152 (Table 3.11-2). By 2050, the end of the proposed MNGP operating term, the permanent population (not including transient populations) of the entire 23 counties is projected to be approximately 4,852,018. Based on 2020–2050 population projections, an annual growth rate of approximately 0.7 percent is anticipated for the permanent population in the 23 counties wholly or partially within a 50-mile radius (MSDC 2021).

As shown in Table 3.11-2, the total population (including transient populations) of the 23 counties, which are totally or partially included within a 50-mile radius, is projected to be approximately 5,222,246 in 2050. The total population (including transient populations) within the 50-mile radius is projected to be 4,387,329 in 2050. (EMTI 2021; MSDC 2021; USCB 2021g; USCB 2021c; USTA 2021)

The latest permanent population projections for Minnesota were obtained from the Minnesota State Demographic Center (MSDC 2021). County-level permanent population values for the counties within a 50-mile radius are shown in Table 3.11-2. Transient data for the state of Minnesota was obtained from "Explore Minnesota." The average length of stay for domestic and overseas visitors is 3 and 18 nights, respectively. (EMTI 2021; USTA 2021)

The MNGP facility is located in Wright County. As shown in Table 3.11-2, the population of Wright County, Minnesota, as reported in the 2020 census, was 141,337. Based on Minnesota's population projection data, Wright's projected permanent population for 2050 is expected to be 175,236. (MSDC 2021; USCB 2021c). Estimated projected populations and average annual growth rates for Wright County are shown in Table 3.11-3.

Cities with their centers falling within a 50-mile radius of MNGP are listed in Table 3.11-1. As seen in Figure 3.1-3, portions of the cities of Becker, Big Lake, and Monticello fall within the 6-mile vicinity of MNGP. The 2020 population counts for the cities of Becker, Big Lake, and Monticello were 4,877; 11,686; and 14,455, respectively (USCB 2021d).

As listed in Table 3.11-1, there are two cities with populations greater than 100,000 in the region. The largest of these is Minneapolis, with its city center located 38 miles southeast of MNGP, which has a 2020 population of 429,954. St. Paul (46 miles southeast) has a 2020 population of 311,527. A total of 34 communities, within a 50-mile radius, have a population greater than 25,000 as of 2020 (Table 3.11-1).

3.11.2 Minority and Low-Income Populations

3.11.2.1 Background

The NRC performs environmental justice analyses utilizing a 50-mile radius around the plant as the environmental "impact area." LIC-203 Revision 4 (NRC 2020b) defines a geographic area for comparison as a 50-mile radius (also referred to as "the region" in this discussion) centered on the nuclear plant. An alternative approach is also addressed that uses an individual state encompassing the 50-mile radius for comparative analysis as the "geographic area." Both approaches were used to assess the minority and low-income population criteria for MNGP.

LIC-203 guidance suggests using the most recent USCB decennial census data. However, low-income data are collected separately from the decennial census and are available in 5-year averages. The 2019 American Community Survey (ACS) 5-year data low-income, 2020 minority census population data, and TIGER/Line data for Minnesota were obtained from the USCB website and processed using ArcGIS software (USCB 2021d; USCB 2021i; USCB 2021j). Census population data were used to identify the minority and low-income populations within a 50-mile radius of MNGP. Environmental justice evaluations for minority and low-income populations are based on the use of USCB block groups for minority and low-income populations.

3.11.2.2 Minority Populations

NRC procedural guidance defines a "minority" population as Black or African American, American Indian, or Alaska Native, Asian, Native Hawaiian and Other Pacific Islander, some other race, two or more races, the aggregate of all minority races, Hispanic or Latino ethnicity, and the aggregate of all minority races and Hispanic ethnicity (NRC 2020b). The guidance indicates that a minority population is considered present if either of the following two conditions exists:

1) The minority population in the census block group exceeds 50 percent; or
2) The minority population percentage is more than 20 percentage points greater in the census block group than the minority percentage of the geographic area chosen for the comparative analysis.

To establish minimum thresholds for each minority category, the non-white minority population total for each state was divided by the total population in the state. This process was repeated with a 50-mile radius total minority population and 50-mile radius total population. As described in the second criterion, 20 percentage points were added to the minority percentage values for each geographic area. The lower of the two NRC conditions for a minority population was selected as defining a minority area (i.e., census block group minority population exceeds 50 percent, or minority population is more than 20 percentage points greater than the minority population of the geographic area). Any census block group with a percentage exceeding this value was considered a minority population. Minority percentages for MN, the 50-mile radius, and the corresponding criteria, are shown in Table 3.11-4.

A minority category of "Aggregate of All Races" is created when the populations of all the 2020 USCB minority categories are summed. As shown in Table 3.11-4, the 2020 "Aggregate of All Races" category, when compared to the total population, indicates 22.5 percent of MN's population are minorities. The 2020 "Aggregate of All Races" category, when compared to the total population of the 50-mile radius (region), indicates 27.7 percent of the population in the region are minorities. These percentages do not exceed the 50 percent noted for Condition 1, defined above. As such, the criteria calculated using Condition 2, 42.5 and 47.7 percent respectively, were used for the threshold.

The "Aggregate of All Races and Hispanic" population percentages for Minnesota and the region are 23.7 and 28.8 percent, respectively. Using the Condition 1 approach, both criteria for the "Aggregate of All Races and Hispanic" categories, at 43.7 and 48.8 percent respectively, would not exceed the 50 percent noted for Condition 1. Therefore, the Condition 2 approach producing the lower criterion of 43.7 and 48.8 percent would be used for the threshold and any census block group with an "Aggregate and Hispanic" population exceeding those percentages would be considered a minority population.

Because Hispanic is not considered a race by the USCB, Hispanics are already represented in the census-defined race categories. However, because Hispanics can be represented in any race category, some white Hispanics not otherwise considered minorities become classified as a minority when categorized in the "Aggregate and Hispanic" category.

The number of census block groups contributing to the minority population count were evaluated using the criteria shown in Table 3.11-4 and summarized in Table 3.11-5. The results of the evaluation are census block groups flagged as having a minority population(s). The resulting maps (Figures 3.11-1, 3.11-2, 3.11-3, 3.11-4, 3.11-5, 3.11-6, 3.11-7, 3.11-8, 3.11-9, 3.11-10, 3.11-11, 3.11-12, 3.11-13, 3.11-14, 3.11-15 and 3.11-16) depict the location of minority population census block groups flagged accordingly for each race or aggregate category. Because no block group met the criteria for the "Native Hawaiian and Other Pacific Islander" race category, no figures illustrating that race category were produced.

The percentage of census block groups exceeding the "Aggregate of All Races" minority population criterion was 17.7 percent when a 50-mile radius (region) was used and 21.1 percent when the state was used as the geographic area (Table 3.11-5). For the "Aggregate and Hispanic" category, 18.0 percent of the census block groups contained a minority population when the region was used as the geographic area and 21.6 percent when the state was used as the geographic area (Table 3.11-5). The minority population values of the block groups were significantly reduced when races were analyzed individually.

The identified minority populations closest to the MNGP center point are located approximately 18.5 miles from the plant in Block Group 270530269104. In 2020, using both the regional and state criteria, the block group contains a "Some Other Race" population, a Hispanic or Latino population, an "Aggregate of all Races" population, and an "Aggregate and Hispanic" population. (USCB 2021g; USCB 2021c)

There are no identified block groups within a 6-mile radius that meet the criteria for a minority population. There are 598 identified minority population block groups located in the 50-mile region. The majority are associated with cites, municipalities, or USCB defined urban areas. (USCB 2021d; USCB 2021g)

As presented in Section 3.1.3, there are 11 federally recognized American Indian tribes with reservations located throughout Minnesota. The Shakopee Mdewakanton Sioux tribal lands are located within the MNGP 50-mile region in Scott County. Outside the 50-mile region, the Mille Lacs Reservation is located approximately 53 miles north of MNGP in Mille Lacs County. Native American groups, recognized as potential stakeholders, are consulted by Xcel Energy providing the opportunity for comment. Xcel Energy correspondence is included in Attachment C.

3.11.2.3 Low-Income Populations

NRC guidance defines "low-income" using USCB statistical poverty thresholds for individuals or families (NRC 2020b). As addressed above with minority populations, two alternative geographic areas (the state of Minnesota and the region) were used as the geographic areas for comparison in this analysis. The guidance indicates that a low-income population is considered present if either of the two following conditions exists:

1) The low-income population in the census block group exceeds 50 percent; or
2) The percentage of households below the poverty level in a block group is significantly greater (typically at least 20 percentage points) than the low-income population percentage of the geographic area chosen for the comparative analysis (i.e., state and region's combined average).

To establish minimum thresholds for the individual low-income category, the population with an income below the poverty level for the state was divided by the total population for whom poverty status is determined in the state. To establish minimum thresholds for the family low-income category, the family population count with an income below the poverty level for the state was divided by the total family population count in the state. This process was repeated for the regional population with an income below the poverty level and regional total population for whom poverty status is determined. As described in Condition 2, above, 20 percentage points were added to the low-income values for individuals and families and each geographic area. None of the low-income criteria for the geographic areas described in the first condition exceeded 50 percent.

As shown in Table 3.11-6, Minnesota has an estimated 207,898 families living below poverty level. When the 2019 ACS census data family category "income in the past 12 months below poverty level" is compared to total family count in the state, 9.5 percent of the families within the state have an income below poverty level. In the 50-mile region, an estimated 115,219 families are living below poverty level in 2019, or 9 percent of the total families in the region. These percentages do not exceed the 50 percent criteria noted for Condition 1. Using Condition 2, the criteria calculated for low-income families living in poverty are 29.5 percent using the state as the geographic area for comparison and 29 using the region as the geographic area for comparison. As such, the criteria calculated using Condition 2 were used to identify block groups containing identified low-income family populations.

As seen in Table 3.11-7, using the low-income family state criteria there were 128 census block groups identified as containing low-income families. Using the family regional criteria, 130 census block groups were identified as having low-income families. These census block groups are illustrated in Figures 3.11-19 and 3.11-20. (USCB 2021c; USCB 2021i)

The state of Minnesota has an estimated 526,065 individuals identified as living below the poverty level (see Table 3.11-6). When the 2019 ACS census data "income in the past 12 months below poverty level" (individual) is compared to "total population for whom poverty status is determined," 9.7 percent of the individuals within the state have an income below poverty level. In the 50-mile region, an estimated 305,042 individuals are living below the poverty level in 2019, or 9.5 percent of the "total population for whom poverty status is determined" in the region. These percentages do not exceed the 50 percent criteria noted for Condition 1. Using Condition 2, the criteria calculated for low-income individuals living in poverty are 29.7 percent using the state as the geographic area for comparison, and 29.5 using the region as the geographic area for comparison. As such, the criteria calculated using Condition 2 were used to identify block groups containing identified low-income individual populations.

Using this criterion for Condition 2, 157 of the 2,263 census block groups (6.9 percent) were identified as low-income populations using the state as the geographic area for comparison (see Table 3.11-7). Using the MNGP region as the geographic area for comparison, 160 of the 2,263 census block groups (7.1 percent) were identified as low-income populations. These census block groups are illustrated in Figures 3.11-17 and 3.11-18. (USCB 2021c; USCB 2021i)

The closest low-income block group that meets the guidance criteria for both individuals or families, using the state or the region as the geographic area for comparison, is located 19.2 miles northwest of MNGP (Block Group 271410315004). (USCB 2021i)

3.11.3 Subsistence Populations and Migrant Workers

3.11.3.1 Subsistence Populations

Subsistence refers to the use of natural resources as food for consumption and for ceremonial and traditional cultural purposes, usually by low-income or minority populations. Specific examples of subsistence use include gathering plants for direct consumption (rather than produced for sale from farming operations), for use as medicine, or in ritual practices. Fishing or hunting activities associated with direct consumption or use in ceremonies, rather than for sport, are other examples.

Determining the presence of subsistence use can be difficult, as data at the county or block group level are aggregated and not usually structured to identify such uses on or near the site. Frequently, the best means of investigating the presence of subsistence use is through dialogue with the local population who are most likely to know of such activity. This may include county officials, community leaders, and landowners in the vicinity who would have knowledge of subsistence activity.

The area surrounding MNGP is characterized by residential subdivisions and agricultural areas interspersed with local lakes, streams, and the Mississippi River. As reported in the 2006 NUREG-1437 Supplement 26, the NRC found that a specific ethnic group, the Hmong, identified within the Asian minority population, depends on fishing and consuming fish from local rivers at a disproportionately higher level than other populations. However, the staff did not identify any significant effects from MNGP on local fish. The NRC did not identify any location-dependent disproportionate impacts affecting minority and low-income populations and concluded that offsite impacts from MNGP to minority and low-income populations are SMALL, and no mitigation actions are warranted (NRC 2006b).

The latest available U.S. census Hmong population data, in geographic areas smaller than counties, was the 2015 census tract estimates. When analyzed, the nearest Hmong populations were identified 29 miles southeast of the site (USCB 2021j). An initiative on Asian Americans and Pacific Islanders conducted by the White House in 2009 indicate that 27.4 percent of the Hmong population in the United States was in poverty (WH 2021). MNGP conducted a literature review for more recent publicly available subsistence information regarding the Minnesota Hmong populations. No publicly available studies were identified. Xcel Energy staff who live and work in the MNGP region, were interviewed and no knowledge of subsistence activities were identified. Furthermore, MNGP implements a REMP program that includes sampling fish populations. The REMP program has not identified any significant effects to local fish populations, therefore no potential impact pathways to the Hmong population were identified.

3.11.3.2 Migrant Workers

Migrant labor, or migrant worker, is defined by the USDA as "a farm worker whose employment required travel that prevented the migrant worker from returning to his/her permanent place of residence the same day." In 2017, Sherburne County reported that 101 out of 501 total farms employed farm labor. Wright County reported 278 out of 1,338 total farms employed farm labor. The 2017 census of agriculture reported that 13 of the Sherburne County farms employed migrant farm workers. Five farms in Wright County reported employing migrant workers. For Sherburne County, an estimated total of 1,121 farm laborers were hired, of which 861 were estimated to work fewer than 150 days per year. For Wright County, an estimated total of 1,606 farm laborers were hired, of which 1,190 were estimated to work fewer than 150 days per year. (USDA 2021b)

Table 3.11-1 Cities Located Totally or Partially within a 50-Mile Radius of MNGP (Sheet 1 of 7)

Minnesota City	County	2010 Census Population[(a)]	2020 Census Population[(a)]	Distance to MNGP (miles)[(b)(c)]	Direction[(b)(c)]
Albany	Stearns	2,561	2,780	41	WNW
Albertville	Wright	7,044	7,896	12	SE
Andover	Anoka	30,598	32,601	28	ESE
Annandale	Wright	3,228	3,330	14	WSW
Anoka	Anoka	17,142	17,921	24	ESE
Apple Valley	Dakota	49,084	56,374	52	SE
Arden Hills	Ramsey	9,552	9,939	39	ESE
Atwater	Kandiyohi	1,133	1,124	47	WSW
Avon	Stearns	1,396	1,618	35	NW
Becker	Sherburne	4,538	4,877	4	NNW
Belle Plaine	Scott	6,661	7,395	49	S
Bethel	Anoka	466	476	29	E
Big Lake	Sherburne	10,060	11,686	5	E
Birchwood Village	Washington	870	863	47	ESE
Biscay	McLeod	113	113	41	SSW
Blaine	Anoka	57,186	70,222	32	ESE
Bloomington	Hennepin	82,893	89,987	43	SE
Bock	Mille Lacs	106	78	34	NNE
Bowlus	Morrison	290	279	43	NW
Braham	Isanti	1,793	1,769	42	NE
Brooklyn Center	Hennepin	30,104	33,782	31	SE
Brooklyn Park	Hennepin	75,781	86,478	29	SE
Brownton	McLeod	762	731	48	SSW
Buckman	Morrison	270	307	41	NNW
Buffalo	Wright	15,453	16,168	11	S
Burnsville	Dakota	60,306	64,317	48	SE
Cambridge	Isanti	8,111	9,611	35	ENE
Carver	Carver	3,724	5,829	41	SSE
Cedar Mills	Meeker	45	62	43	SW
Center City	Chisago	628	629	50	E
Centerville	Anoka	3,792	3,896	40	ESE
Champlin	Hennepin	23,089	23,919	24	ESE
Chanhassen	Carver	22,952	25,947	36	SSE
Chaska	Carver	23,770	27,810	39	SSE
Chisago City	Chisago	4,967	5,558	47	E

Table 3.11-1 Cities Located Totally or Partially within a 50-Mile Radius of MNGP (Sheet 2 of 7)

Minnesota City	County	2010 Census Population[(a)]	2020 Census Population[(a)]	Distance to MNGP (miles)[(b)(c)]	Direction[(b)(c)]
Circle Pines	Anoka	4,918	5,025	36	ESE
Clear Lake	Sherburne	545	641	11	NW
Clearwater	Wright	1,735	1,922	11	WNW
Cokato	Wright	2,694	2,799	24	SW
Cold Spring	Stearns	4,025	4,164	29	WNW
Cologne	Carver	1,519	2,047	39	S
Columbia Heights	Anoka	19,496	21,973	35	SE
Columbus	Anoka	3,914	4,159	39	E
Coon Rapids	Anoka	61,476	63,599	30	ESE
Corcoran	Hennepin	5,379	6,185	22	SE
Cosmos	Meeker	473	507	50	WSW
Crystal	Hennepin	22,151	23,330	32	SE
Darwin	Meeker	350	348	32	WSW
Dassel	Meeker	1,469	1,472	28	SW
Dayton	Hennepin	4,671	7,262	17	ESE
Deephaven	Hennepin	3,642	3,899	32	SSE
Delano	Wright	5,464	6,484	20	S
Dellwood	Washington	1,063	1,171	46	ESE
Eagan	Dakota	64,206	68,855	49	SE
East Bethel	Anoka	11,626	11,786	30	E
Eden Prairie	Hennepin	60,797	64,198	38	SSE
Eden Valley	Meeker	1,042	1,027	34	W
Edina	Hennepin	47,941	53,494	39	SE
Elk River	Sherburne	22,974	25,835	14	E
Elmdale	Morrison	116	114	47	NW
Excelsior	Hennepin	2,188	2,355	33	SSE
Falcon Heights	Ramsey	5,321	5,369	41	SE
Foley	Benton	2,603	2,711	23	N
Forest Lake	Washington	18,375	20,611	42	E
Foreston	Mille Lacs	533	559	28	NNE
Freeport	Stearns	632	675	47	WNW
Fridley	Anoka	27,208	29,590	33	ESE
Gem Lake	Ramsey	393	528	44	ESE
Genola	Morrison	75	70	45	NNW
Gilman	Benton	224	226	28	N

Table 3.11-1 Cities Located Totally or Partially within a 50-Mile Radius of MNGP (Sheet 3 of 7)

Minnesota City	County	2010 Census Population[(a)]	2020 Census Population[(a)]	Distance to MNGP (miles)[(b)(c)]	Direction[(b)(c)]
Glencoe	McLeod	5,631	5,744	42	SSW
Golden Valley	Hennepin	20,371	22,552	33	SE
Grant	Washington	4,096	3,966	49	ESE
Grasston	Kanabec	158	154	47	NE
Green Isle	Sibley	559	591	46	S
Greenfield	Hennepin	2,777	2,903	18	SSE
Greenwood	Hennepin	688	726	32	SSE
Grove City	Meeker	635	624	43	WSW
Ham Lake	Anoka	15,296	16,464	30	ESE
Hamburg	Carver	513	566	42	S
Hanover	Wright	2,938	3,548	15	SE
Harris	Chisago	1,132	1,111	46	ENE
Hillman	Morrison	38	23	46	N
Hilltop	Anoka	744	958	35	SE
Holdingford	Stearns	708	743	41	NW
Hopkins	Hennepin	17,591	19,079	35	SE
Howard Lake	Wright	1,962	2,071	22	SSW
Hugo	Washington	13,332	15,766	43	ESE
Hutchinson	McLeod	14,178	14,599	40	SW
Independence	Hennepin	3,504	3,755	22	SSE
Inver Grove Heights	Dakota	33,880	35,801	52	SE
Isanti	Isanti	5,251	6,804	31	ENE
Jordan	Scott	5,470	6,656	47	SSE
Kimball	Stearns	762	799	22	W
Kingston	Meeker	161	184	25	WSW
Lake Elmo	Washington	8,069	11,335	53	ESE
Lake Henry	Stearns	103	72	47	WNW
Lakeville	Dakota	55,954	69,490	56	SSE
Landfall	Washington	686	843	50	ESE
Lastrup	Morrison	104	120	50	NNW
Lauderdale	Ramsey	2,379	2,271	39	SE
Lester Prairie	McLeod	1,730	1,894	32	SSW
Lexington	Anoka	2,049	2,248	36	ESE
Lilydale	Dakota	623	809	46	SE
Lindstrom	Chisago	4,442	4,888	49	E

Table 3.11-1 Cities Located Totally or Partially within a 50-Mile Radius of MNGP (Sheet 4 of 7)

Minnesota City	County	2010 Census Population[a]	2020 Census Population[a]	Distance to MNGP (miles)[b][c]	Direction[b][c]
Lino Lakes	Anoka	20,216	21,399	39	ESE
Litchfield	Meeker	6,726	6,624	36	WSW
Little Canada	Ramsey	9,773	10,819	43	ESE
Little Falls	Morrison	8,343	9,140	51	NNW
Long Lake	Hennepin	1,768	1,741	28	SSE
Loretto	Hennepin	650	646	22	SSE
Mahtomedi	Washington	7,676	8,138	47	ESE
Maple Grove	Hennepin	61,567	70,253	26	SE
Maple Lake	Wright	2,059	2,159	10	SW
Maple Plain	Hennepin	1,768	1,743	24	SSE
Maplewood	Ramsey	38,018	42,088	49	ESE
Mayer	Carver	1,749	2,453	31	S
Medicine Lake	Hennepin	371	337	32	SE
Medina	Hennepin	4,892	6,837	24	SSE
Mendota	Dakota	198	183	45	SE
Mendota Heights	Dakota	11,071	11,744	47	SE
Milaca	Mille Lacs	2,946	3,021	31	NNE
Minneapolis	Hennepin	382,578	429,954	38	SE
Minnetonka	Hennepin	49,734	53,781	33	SSE
Minnetonka Beach	Hennepin	539	546	30	SSE
Minnetrista	Hennepin	6,384	8,262	29	SSE
Monticello[d]	Wright	12,759	14,455	0	SE
Montrose	Wright	2,847	3,775	19	S
Mora	Kanabec	3,571	3,665	46	NE
Mound	Hennepin	9,052	9,398	29	SSE
Mounds View	Ramsey	12,155	13,249	35	ESE
New Auburn	Sibley	456	411	49	SSW
New Brighton	Ramsey	21,456	23,454	37	ESE
New Germany	Carver	372	464	32	SSW
New Hope	Hennepin	20,339	21,986	30	SE
New Munich	Stearns	320	356	48	WNW
North Branch	Chisago	10,125	10,787	44	ENE
North Oaks	Ramsey	4,469	5,272	41	ESE
North St. Paul	Ramsey	11,460	12,364	47	ESE

Table 3.11-1 Cities Located Totally or Partially within a 50-Mile Radius of MNGP (Sheet 5 of 7)

Minnesota City	County	2010 Census Population[(a)]	2020 Census Population[(a)]	Distance to MNGP (miles)[(b)(c)]	Direction[(b)(c)]
Norwood Young America	Carver	3,549	3,863	39	S
Nowthen	Anoka	4,443	4,536	18	E
Oak Grove	Anoka	8,031	8,929	25	E
Oakdale	Washington	27,378	28,303	50	ESE
Ogilvie	Kanabec	369	388	40	NNE
Orono	Hennepin	7,437	8,315	28	SSE
Osseo	Hennepin	2,430	2,688	26	SE
Otsego	Wright	13,571	19,966	13	ESE
Paynesville	Stearns	2,432	2,388	42	W
Pease	Mille Lacs	242	238	27	NNE
Pierz	Morrison	1,393	1,418	46	NNW
Pine Springs	Washington	408	377	48	ESE
Plato	McLeod	320	329	40	SSW
Plymouth	Hennepin	70,576	81,026	29	SE
Princeton	Mille Lacs	4,698	4,819	21	NE
Prior Lake	Scott	22,796	27,617	48	SSE
Ramsey	Anoka	23,668	27,646	20	ESE
Regal	Kandiyohi	34	43	49	W
Rice	Benton	1,275	1,975	34	NNW
Richfield	Hennepin	35,228	36,994	42	SE
Richmond	Stearns	1,422	1,475	34	WNW
Robbinsdale	Hennepin	13,953	14,646	32	SE
Rock Creek	Pine	1,628	1,682	52	NE
Rockford	Wright	4,316	4,500	18	SSE
Rockville	Stearns	2,448	2,382	26	WNW
Rogers	Hennepin	8,597	13,295	18	SE
Roscoe	Stearns	102	130	39	W
Roseville	Ramsey	33,660	36,254	41	SE
Royalton	Morrison	1,242	1,281	40	NNW
Rush City	Chisago	3,079	3,228	49	ENE
Sartell	Stearns	15,876	19,351	26	NW
Sauk Rapids	Benton	12,773	13,862	24	NW
Savage	Scott	26,911	32,465	46	SSE
Scandia	Washington	3,936	3,984	51	E

Table 3.11-1 Cities Located Totally or Partially within a 50-Mile Radius of MNGP (Sheet 6 of 7)

Minnesota City	County	2010 Census Population[(a)]	2020 Census Population[(a)]	Distance to MNGP (miles)[(b)(c)]	Direction[(b)(c)]
Shakopee	Scott	37,076	43,698	40	SSE
Shoreview	Ramsey	25,043	26,921	38	ESE
Shorewood	Hennepin	7,307	7,783	32	SSE
Silver Lake	McLeod	837	866	34	SSW
Sobieski	Morrison	195	210	50	NW
South Haven	Wright	187	185	18	W
South St. Paul	Dakota	20,160	20,759	50	SE
Spring Hill	Stearns	85	68	49	WNW
Spring Lake Park	Anoka	6,412	7,188	34	ESE
Spring Park	Hennepin	1,669	1,734	29	SSE
St. Anthony	Stearns	86	91	44	NW
St. Anthony	Hennepin	8,226	9,257	38	SE
St. Augusta	Stearns	3,317	3,497	18	NW
St. Bonifacius	Hennepin	2,283	2,307	30	S
St. Cloud	Stearns	65,842	68,881	22	NW
St. Francis	Anoka	7,218	8,142	24	E
St. Joseph	Stearns	6,534	7,029	28	NW
St. Louis Park	Hennepin	45,250	50,010	36	SE
St. Martin	Stearns	308	312	42	WNW
St. Michael	Wright	16,399	18,235	12	SE
St. Paul	Ramsey	285,068	311,527	46	SE
St. Rosa	Stearns	68	58	50	NW
St. Stephen	Stearns	851	797	33	NW
Stacy	Chisago	1,456	1,703	42	E
Sunfish Lake	Dakota	521	522	49	SE
Tonka Bay	Hennepin	1,475	1,442	32	SSE
Upsala	Morrison	427	487	48	NW
Vadnais Heights	Ramsey	12,302	12,912	42	ESE
Victoria	Carver	7,345	10,546	34	SSE
Waconia	Carver	10,697	13,033	33	S
Waite Park	Stearns	6,715	8,341	24	NW
Watertown	Carver	4,205	4,659	26	S
Watkins	Meeker	962	991	27	W
Waverly	Wright	1,357	1,900	19	SSW
Wayzata	Hennepin	3,688	4,434	30	SSE

Table 3.11-1 Cities Located Totally or Partially within a 50-Mile Radius of MNGP (Sheet 7 of 7)

Minnesota City	County	2010 Census Population[a]	2020 Census Population[a]	Distance to MNGP (miles)[b][c]	Direction[b][c]
West St. Paul	Dakota	19,540	20,615	47	SE
White Bear Lake	Ramsey	23,797	24,883	44	ESE
Willernie	Washington	507	515	48	ESE
Winsted	McLeod	2,355	2,240	27	SSW
Woodbury	Washington	61,961	75,102	52	ESE
Woodland	Hennepin	437	384	32	SSE
Wyoming	Chisago	7,791	8,032	41	E
Zimmerman	Sherburne	5,228	6,189	15	ENE

a. USCB 2021d

b. USCB 2021b; USDOT 2021b

c. Reported distances and directions were calculated from the MNGP center point to the city center.

d. MNGP is located within the city limits of Monticello, Minnesota.

Table 3.11-2 County Populations Totally or Partially Included within a 50-Mile Radius of MNGP

State and County	2010 Population[(a)]	2020 Population[(a)]	2050 Projected Permanent Population[(a)(b)]	2050 Projected Total Population[(a)(b)(c)]
Minnesota (23 counties)	3,606,887	3,963,152	4,852,018	5,222,246
Anoka	330,844	363,887	421,967	454,165
Benton	38,451	41,379	45,481	48,951
Carver	91,042	106,922	155,685	167,564
Chisago	53,887	56,621	58,629	63,103
Dakota	398,552	439,882	503,687	542,120
Hennepin	1,152,425	1,281,565	1,644,277	1,769,742
Isanti	37,816	41,135	43,516	46,836
Kanabec	16,239	16,032	16,032	17,255
Kandiyohi	42,239	43,732	43,732	47,069
McLeod	36,651	36,771	36,771	39,577
Meeker	23,300	23,400	23,400	25,186
Mille Lacs	26,097	26,459	26,459	28,478
Morrison	33,198	34,010	34,010	36,605
Pine	29,750	28,876	28,876	31,079
Ramsey	508,640	552,352	689,641	742,263
Renville	15,730	14,723	14,723	15,846
Scott	129,928	150,928	218,468	235,138
Sherburne	88,499	97,183	120,188	129,359
Sibley	15,226	14,836	14,836	15,968
Stearns	150,642	158,292	185,476	199,629
Todd	24,895	25,262	25,262	27,190
Washington	238,136	267,568	325,666	350,516
Wright	124,700	141,337	175,236	188,607

a. (USCB 2021d)

b. (MSDC 2021)

c. (EMTI 2021; USTA 2021)

Table 3.11-3 County Population Growth, 2010–2050

Minnesota		2010	2020	2030	2040	2050
Sherburne County	Population	88,499	97,183	106,065	113,712	120,188
	Average Annual Growth %	N/A	0.94	0.88	0.70	0.56
Wright County	Population	124,700	141,337	152,493	164,652	175,236
	Average Annual Growth %	N/A	1.26	0.76	0.77	0.62

Note: Projected population values are based on the population projection growth trend for the years reported by the Minnesota State Demographic Center (MSDC 2021; USCB 2021d).

Table 3.11-4 Minority Populations Evaluated Against Criterion

Geographic Area	Minnesota[a]			50-Mile Radius (Region)[b]		
Total Population	5,706,494			3,368,795		
Census Categories	State Population by Census Category[a]	Percent[c]	Criteria	Regional Population by Census Category[b]	Percent[c]	Criteria
Black or African American	398,434	7.0	27.0	329,771	9.8	29.8
American Indian or Alaska Native	68,641	1.2	21.2	25,844	0.8	20.8
Asian	299,190	5.2	25.2	241,773	7.2	27.2
Native Hawaiian/Other Pacific Islander	2,918	0.1	20.1	1,260	0.0	20.0
Some Other Race	168,444	3.0	23.0	114,568	3.4	23.4
Two or More Races	345,721	6.1	26.1	218,806	6.5	26.5
Aggregate of All Races	1,283,348	22.5	42.5	932,022	27.7	47.7
Hispanic or Latino	345,640	6.1	26.1	224,037	6.7	26.7
Aggregate and Hispanic[d]	1,352,614	23.7	43.7	971,727	28.8	48.8

a. USCB 2021c

b. USCB 2021g

c. Percent values were calculated by dividing each census categories' population by the state's or region's total population values.

d. Includes everyone except persons who identified themselves as White, Not Hispanic or Latino (NRC 2020b).

Table 3.11-5 Minority Census Block Group Counts, 50-Mile Radius of MNGP

Total Number of Block Groups within a 50-mile Radius	Individual State Method		50-Mile Radius (Region)	
	2,674		2,674	
Census Categories	**Number of Block Groups with Identified Minority Category**	**Percent of Block Groups within Region**	**Number of Block Groups with Identified Minority Category**	**Percent of Block Groups within Region**
Black or African American	246	9.2	206	7.7
American Indian or Alaska Native	5	0.2	6	0.2
Asian	149	5.6	135	5
Native Hawaiian/Other Pacific Islander	0	0	0	0
Some Other Race	36	1.3	33	1.2
Two or More Races	23	0.9	21	0.8
Aggregate of All Races	563	21.1	472	17.7
Hispanic or Latino	83	3.1	82	3.1
Aggregate and Hispanic	578	21.6	480	18

(USCB 2021d; USCB 2021g)

Table 3.11-6 Low-Income Population Criteria Using Two Geographic Areas

	Minnesota			50-Mile Radius (Region)		
Total Population (Income)	5,440,087			3,227,060		
Total Families (Income)	2,185,603			1,274,607		
Census Category	**State Population**	**Percent**	**Criteria**	**Region Population**	**Percent**	**Criteria**
Low Income – Number of Persons Below Poverty Level (Individuals)	526,065	9.7	29.7	305,042	9.5	29.5
Low Income – Number of Families Below Poverty Level (Households)	207,898	9.5	29.5	115,219	9.0	29.0

(USCB 2021i)

Percent values were calculated by dividing each census categories' population by the state and regional total population values.

Table 3.11-7 Low-Income Census Block Group Counts, 50-Mile Radius of MNGP

Total Number of Block Groups within a 50-mile Radius	Individual State Method		50-Mile Radius (Region)	
	2,263		2,263	
Census Categories	**Number of Block Groups with Identified Low-Income Category**	**Percent of Block Groups within Region**	**Number of Block Groups with Identified Low-Income Category**	**Percent of Block Groups within Region**
Low Income Individuals	157	6.9	160	7.1
Low Income Families (Households)	128	5.7	130	5.7

(USCB 2021d; USCB 2021i)

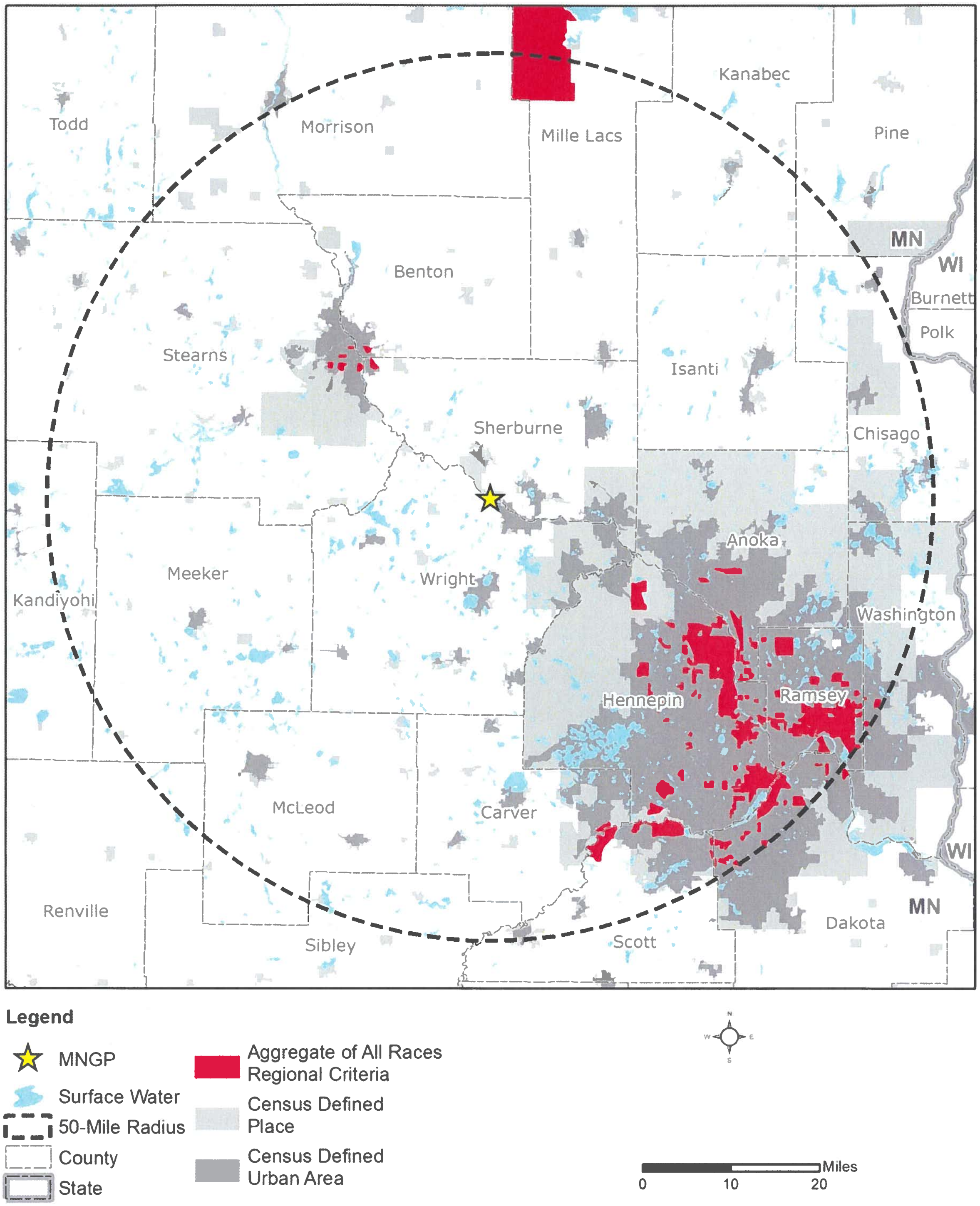


Figure 3.11-1 Aggregate of All Races Populations (Regional)

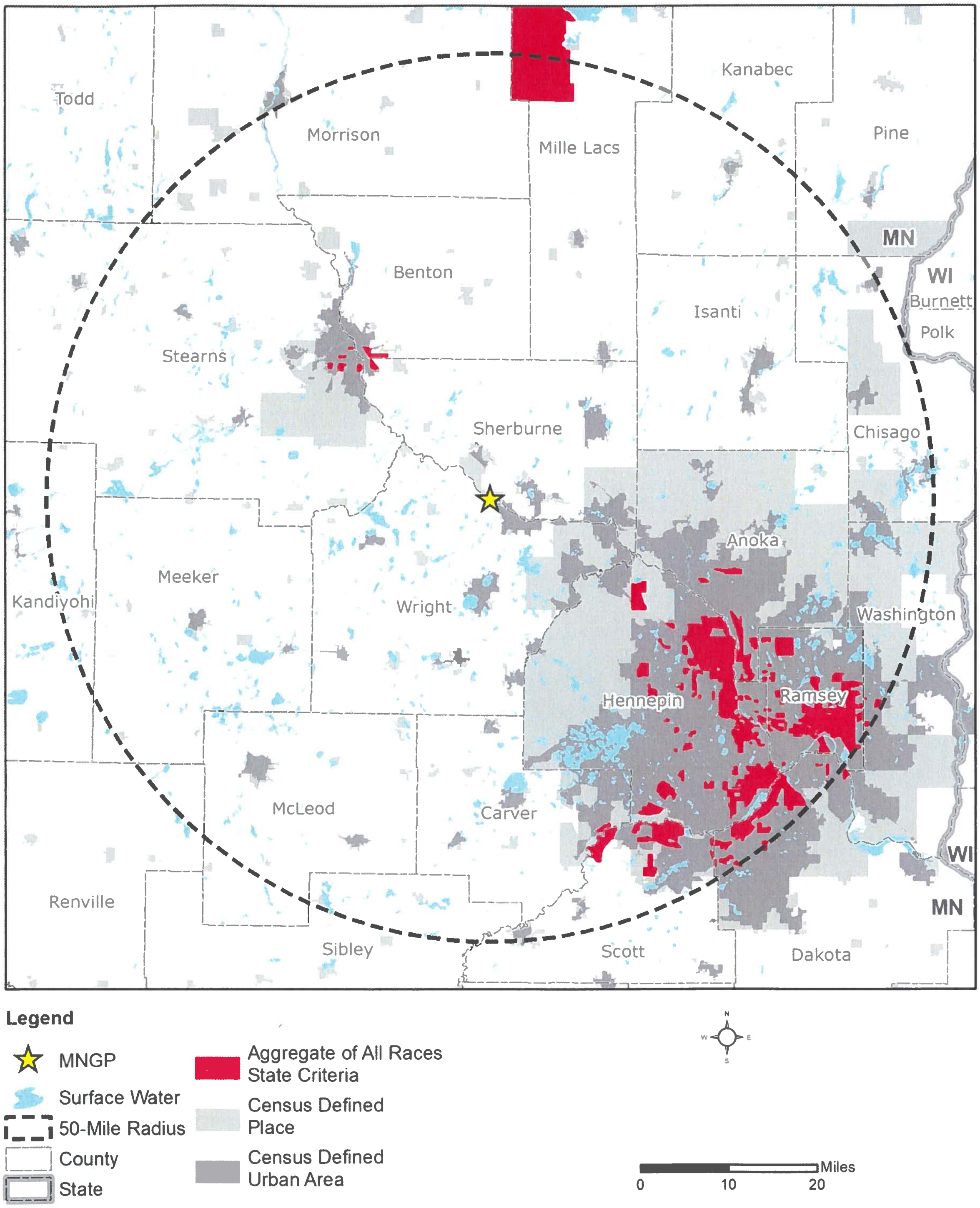


Figure 3.11-2 Aggregate of All Races Populations (Individual State)

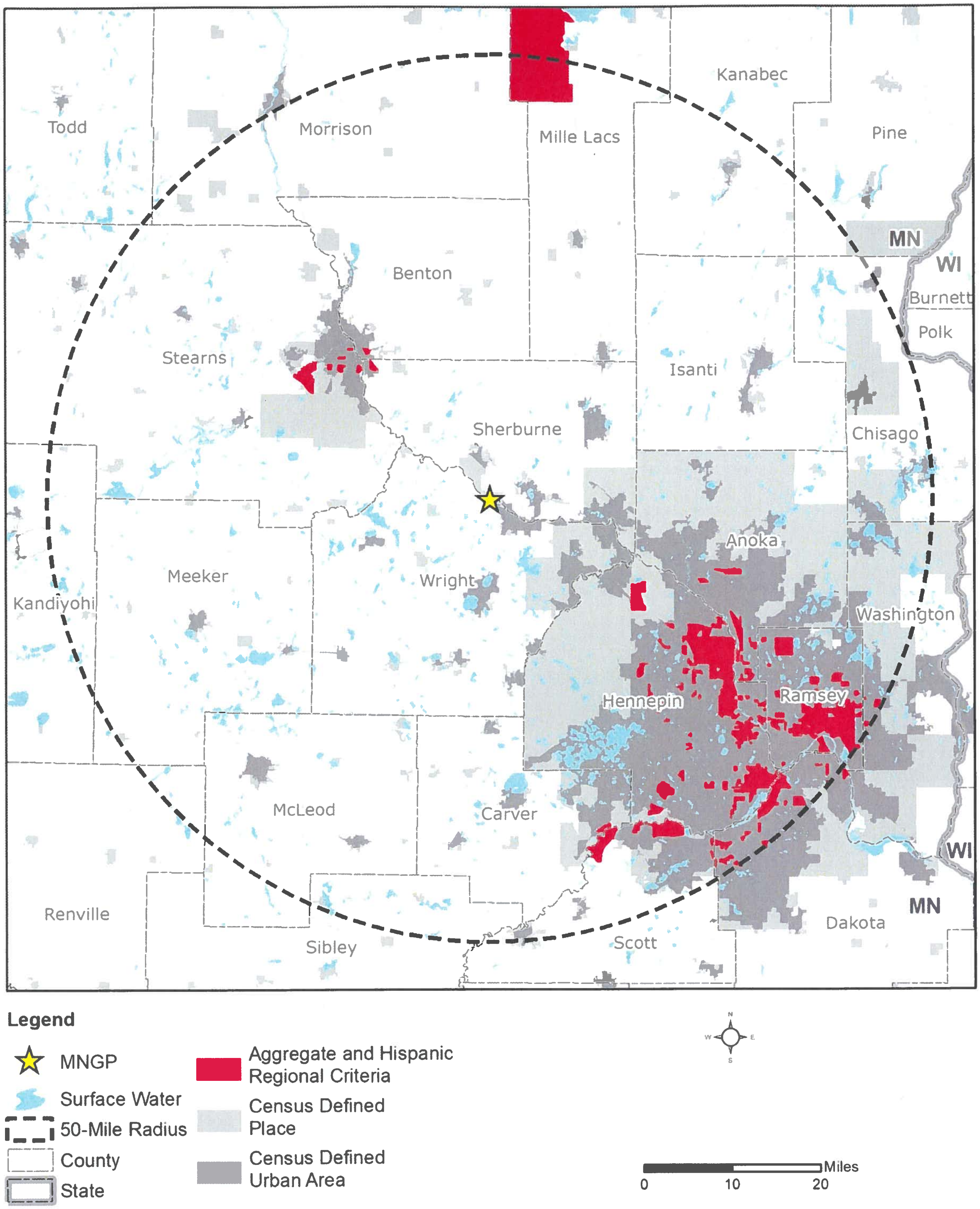


Figure 3.11-3 Aggregate and Hispanic Populations (Regional)

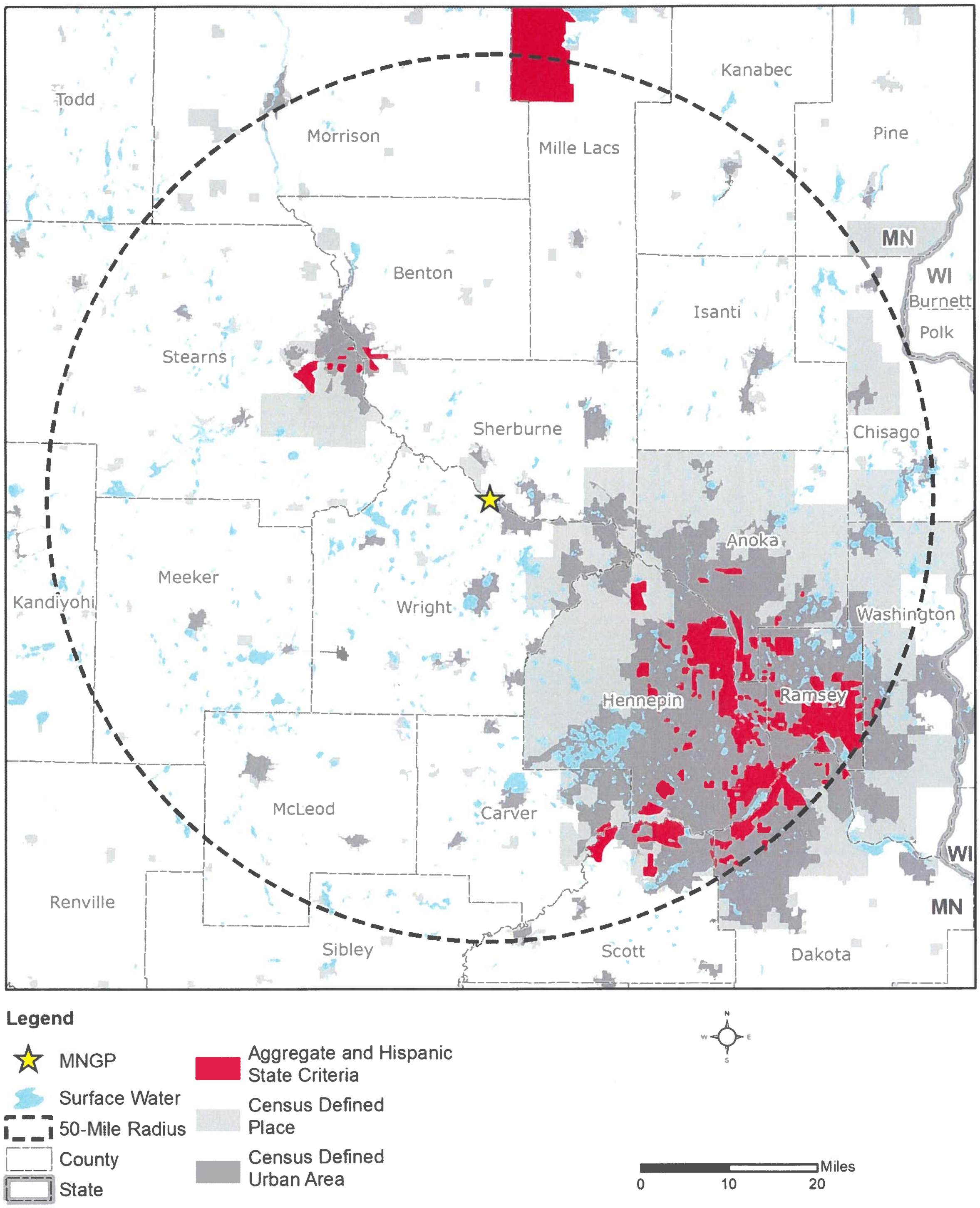


Figure 3.11-4 Aggregate and Hispanic Populations (Individual State)

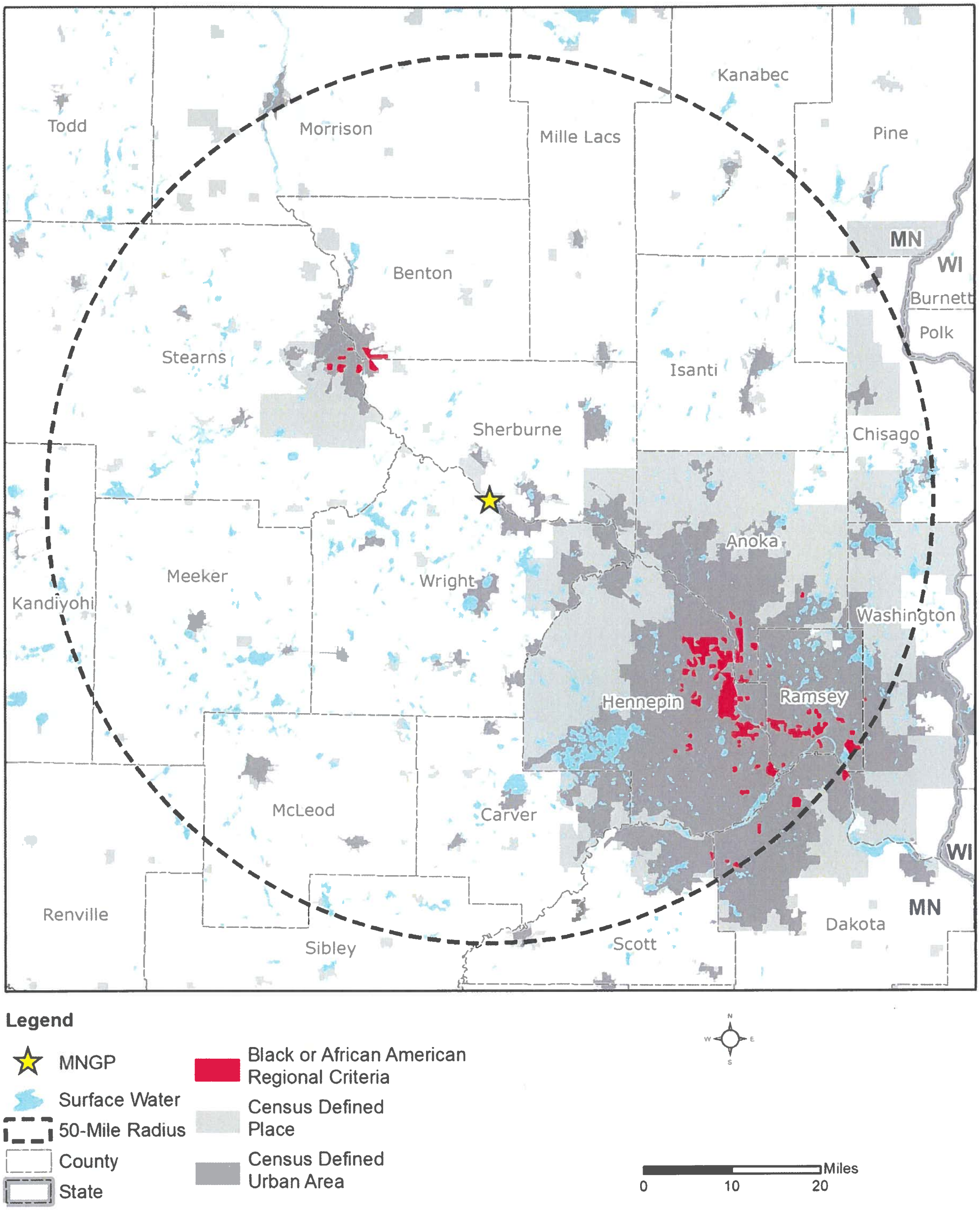


Figure 3.11-5 Black or African American Populations (Regional)

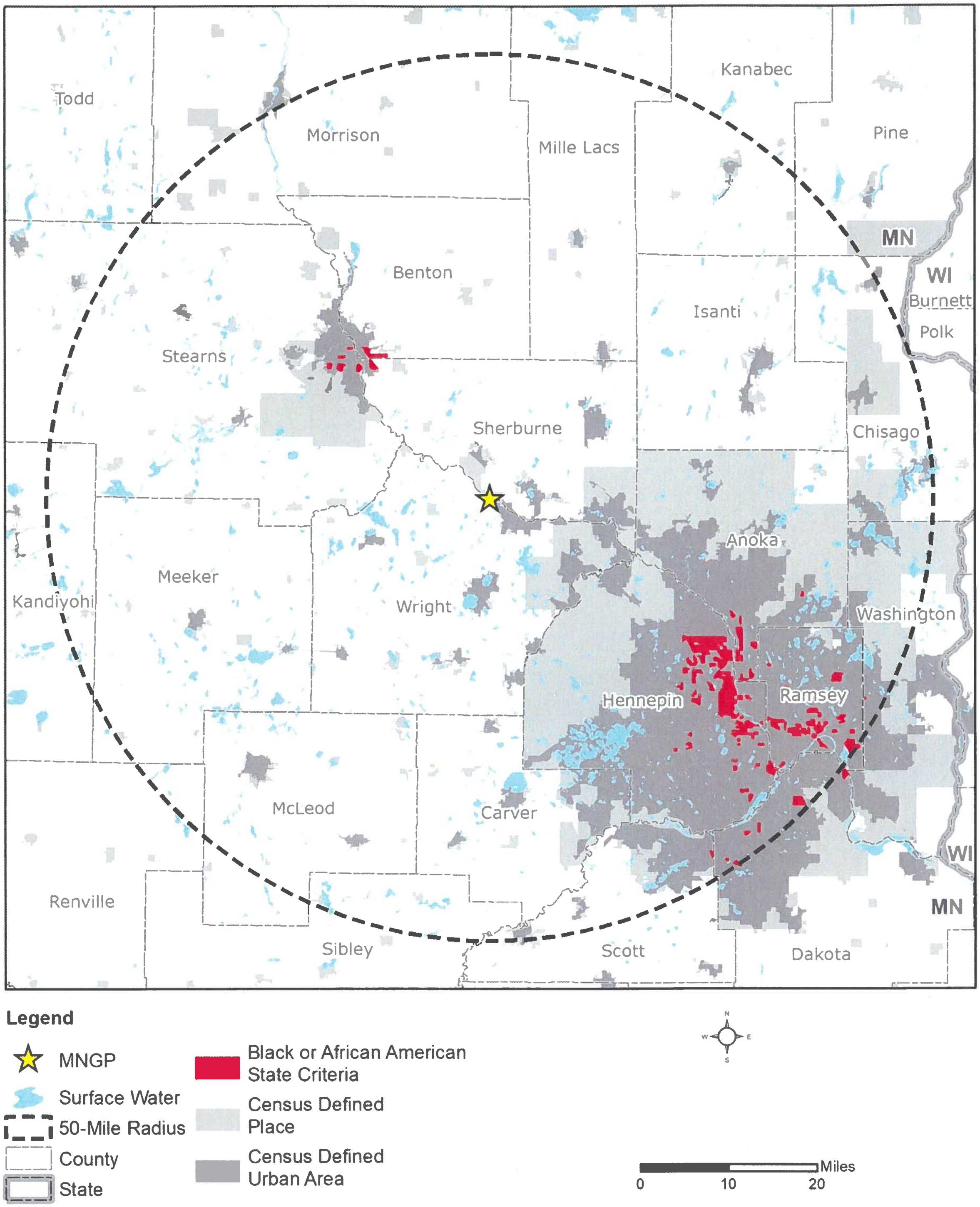


Figure 3.11-6 Black or African American Populations (Individual State)

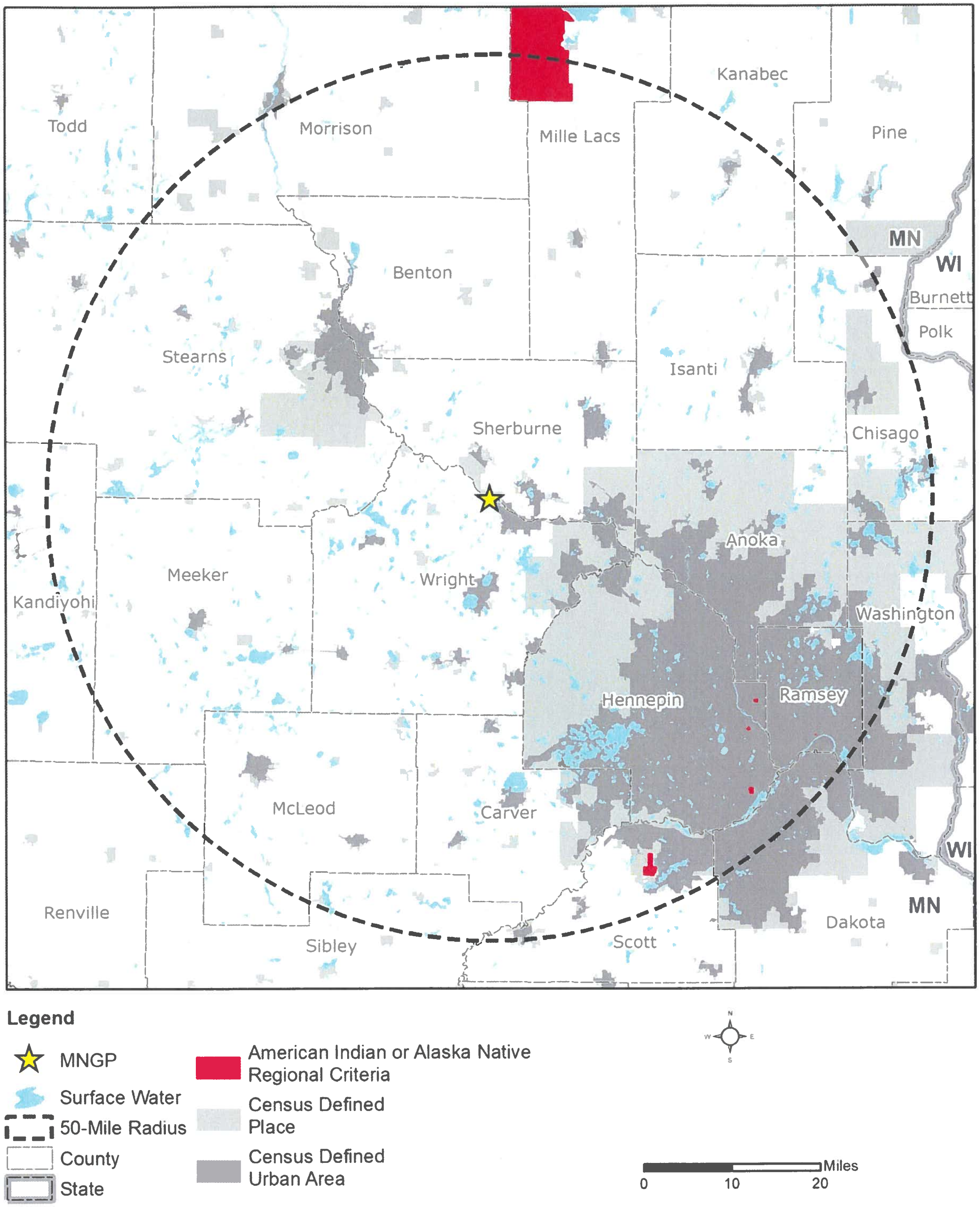


Figure 3.11-7 American Indian or Alaska Native Populations (Regional)

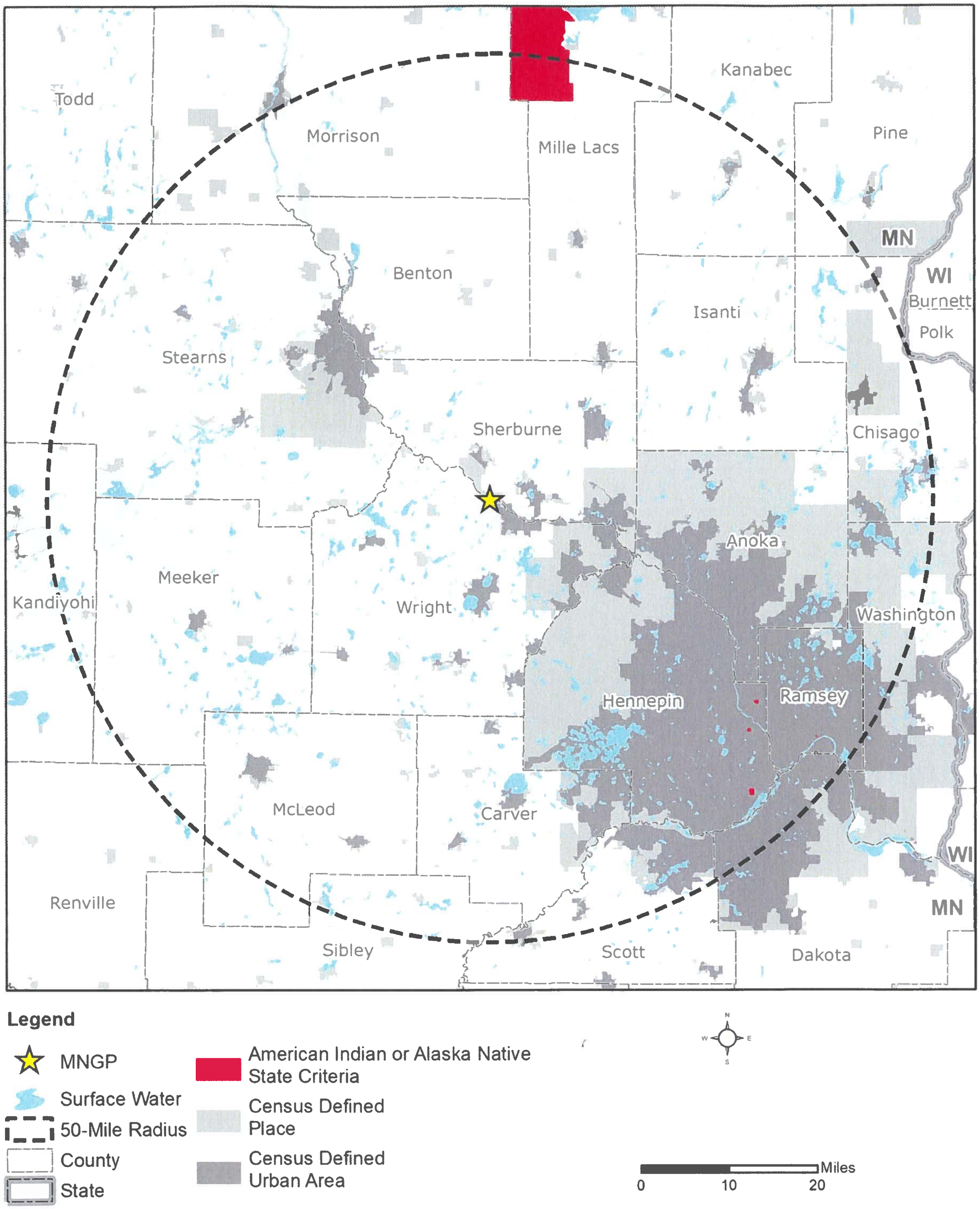


Figure 3.11-8 American Indian or Alaska Native Populations (Individual State)

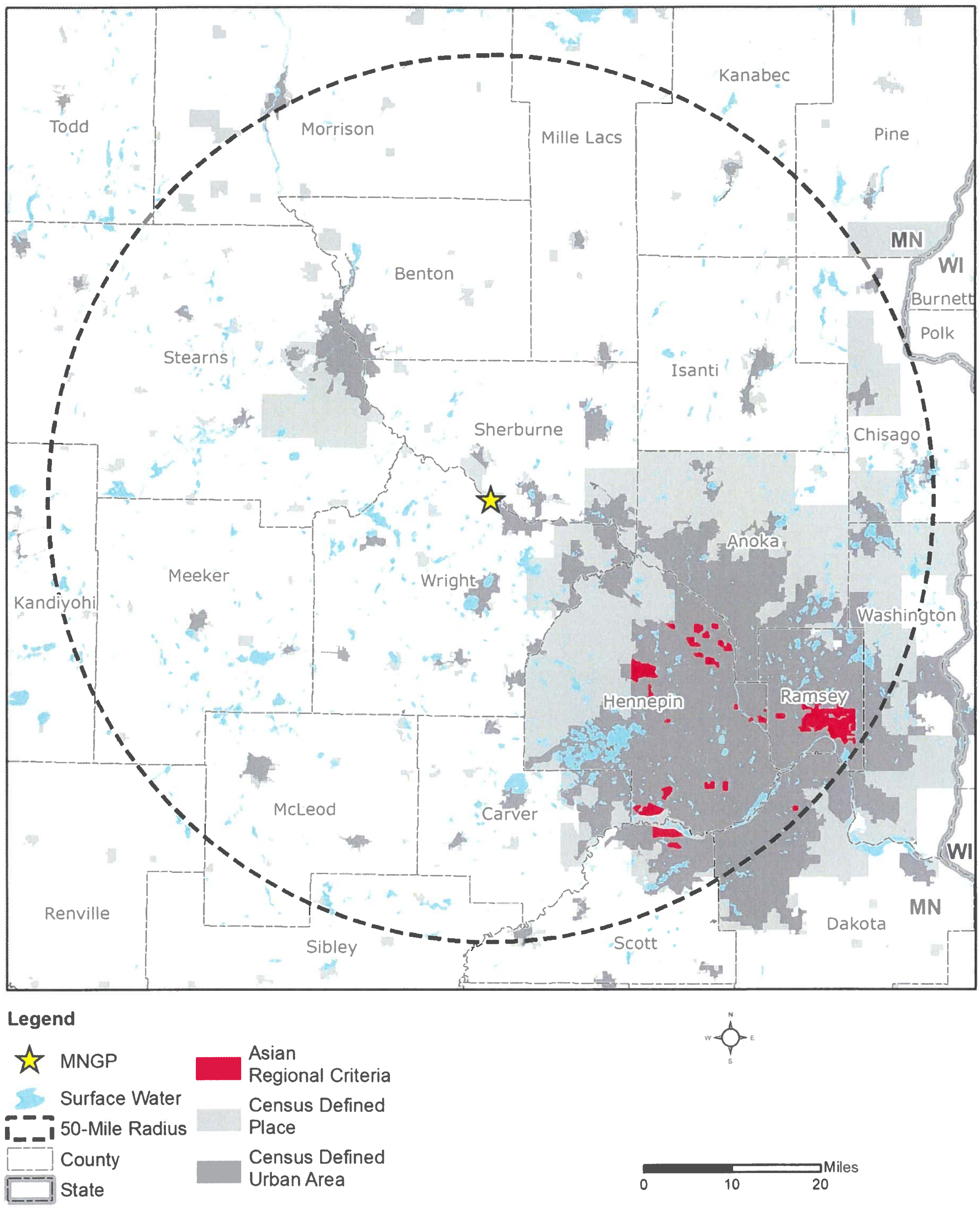


Figure 3.11-9 Asian Populations (Regional)

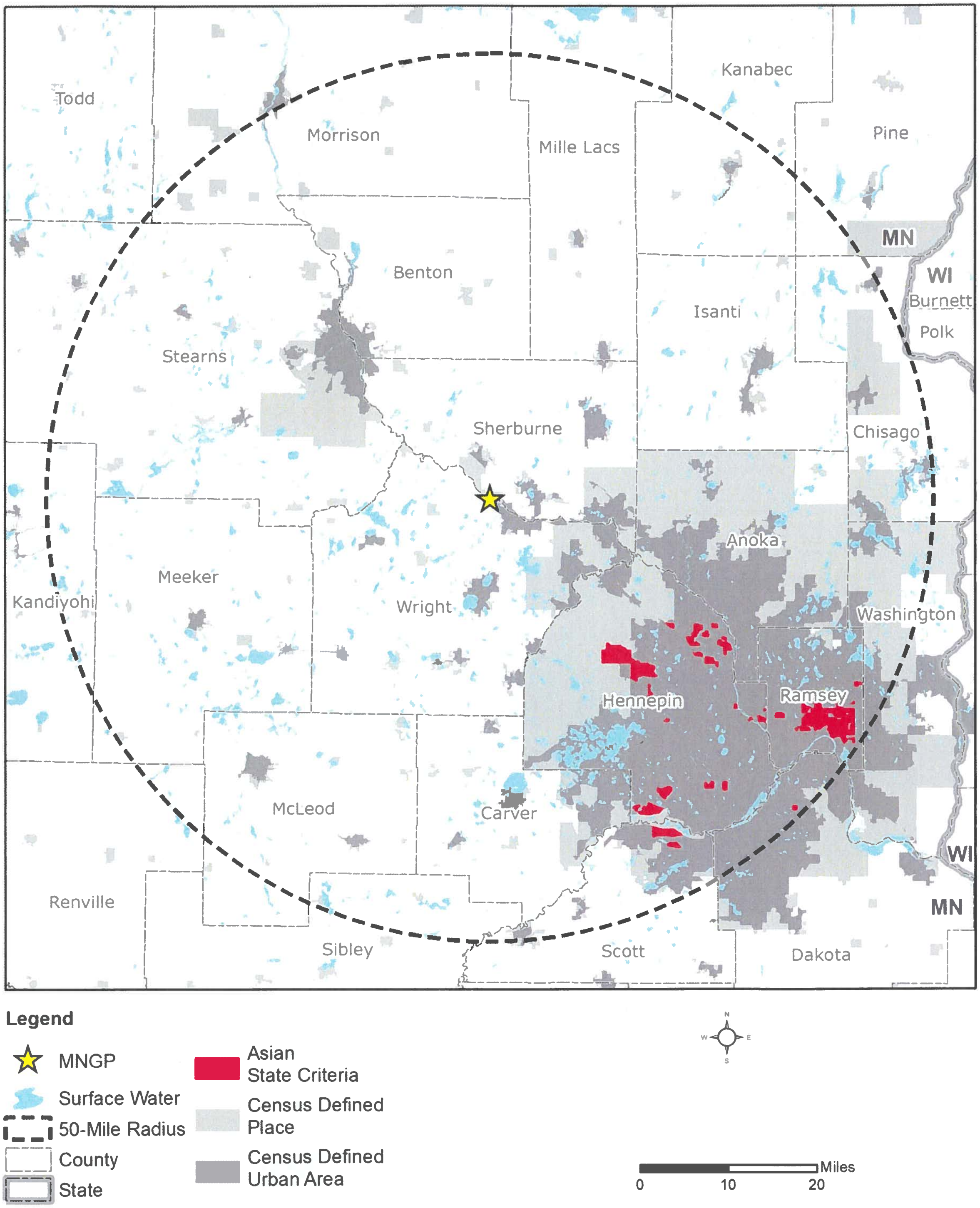


Figure 3.11-10 Asian Populations (Individual State)

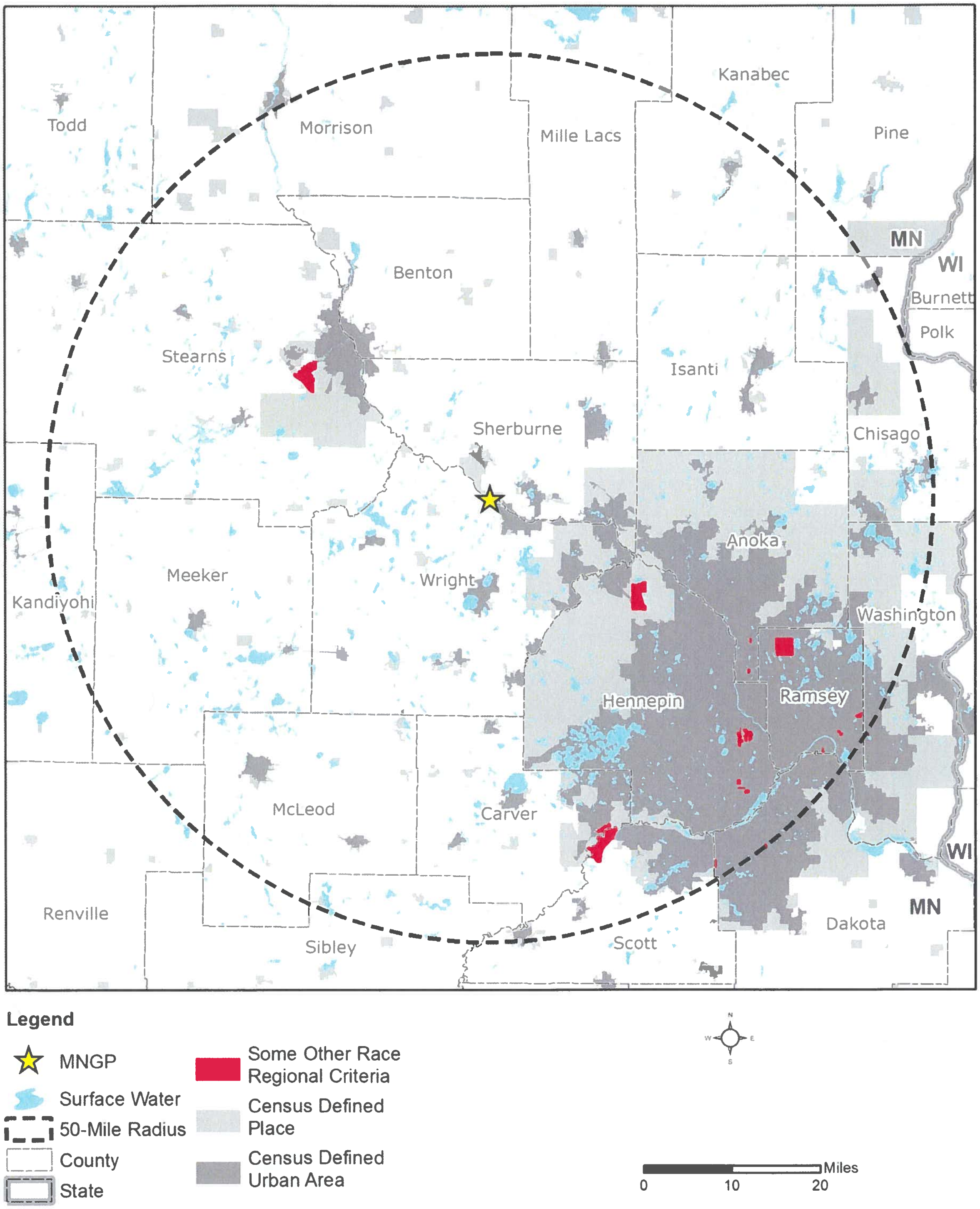


Figure 3.11-11 Some Other Race Populations (Regional)

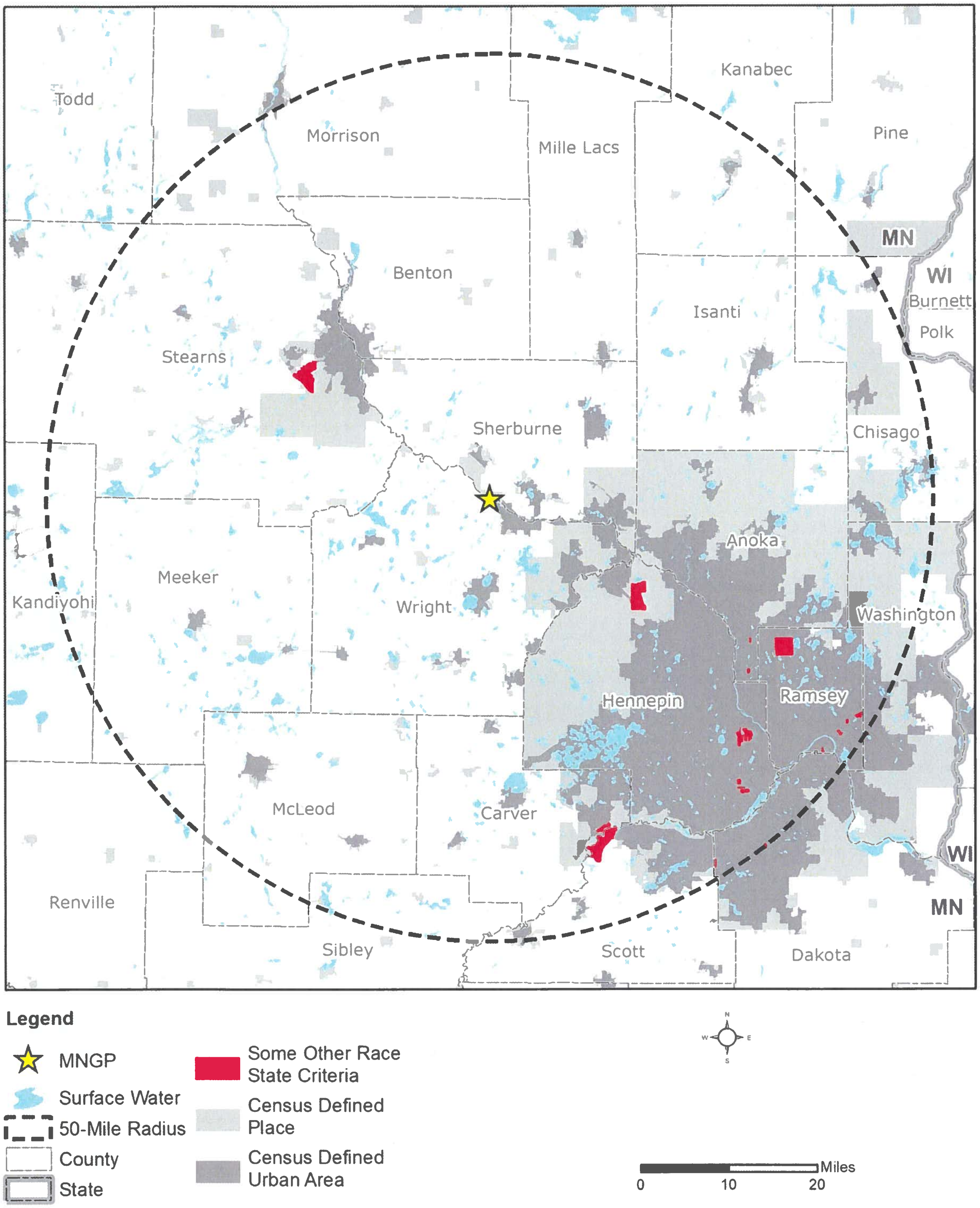


Figure 3.11-12 Some Other Race Populations (Individual State)

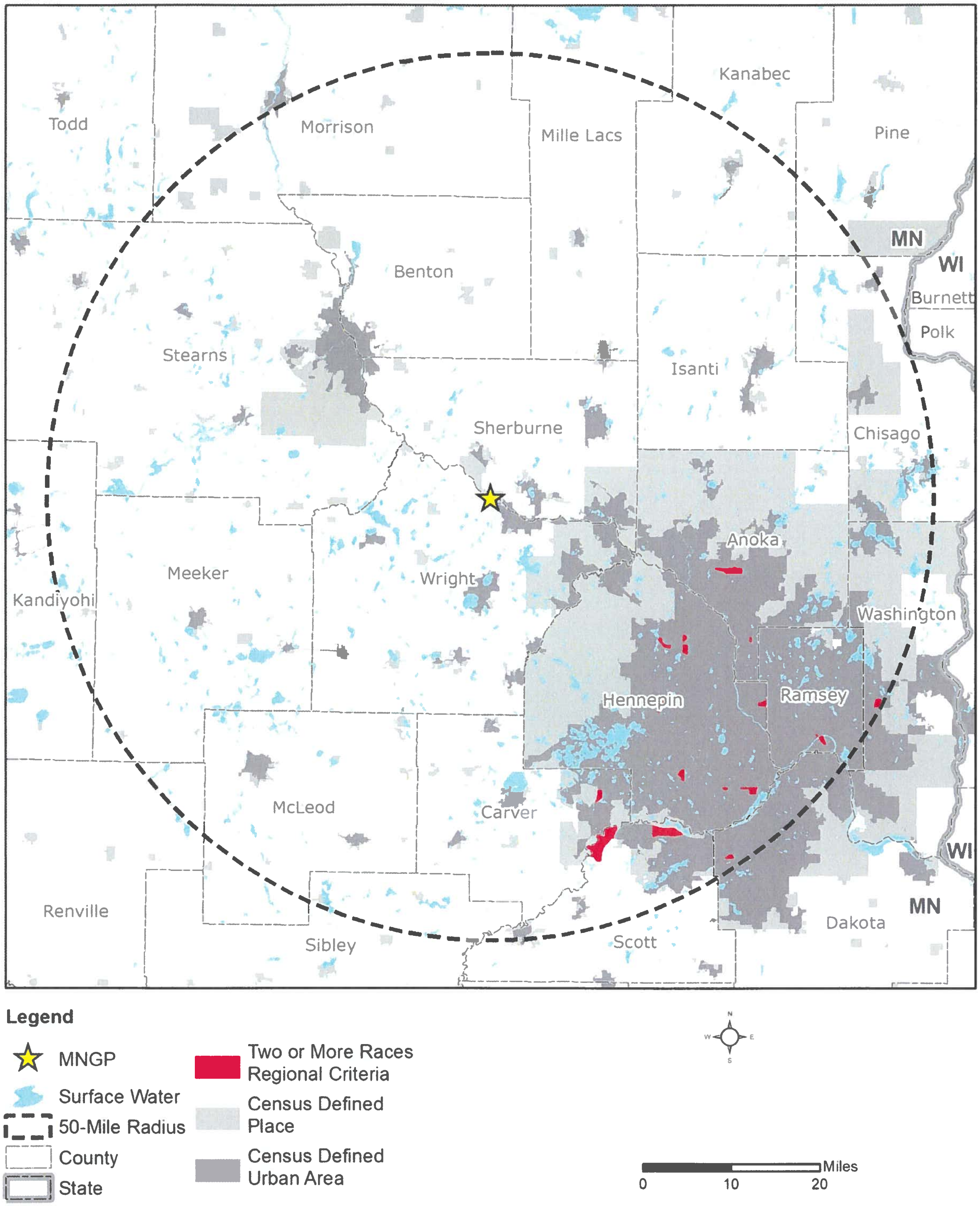


Figure 3.11-13 Two or More Races Populations (Regional)

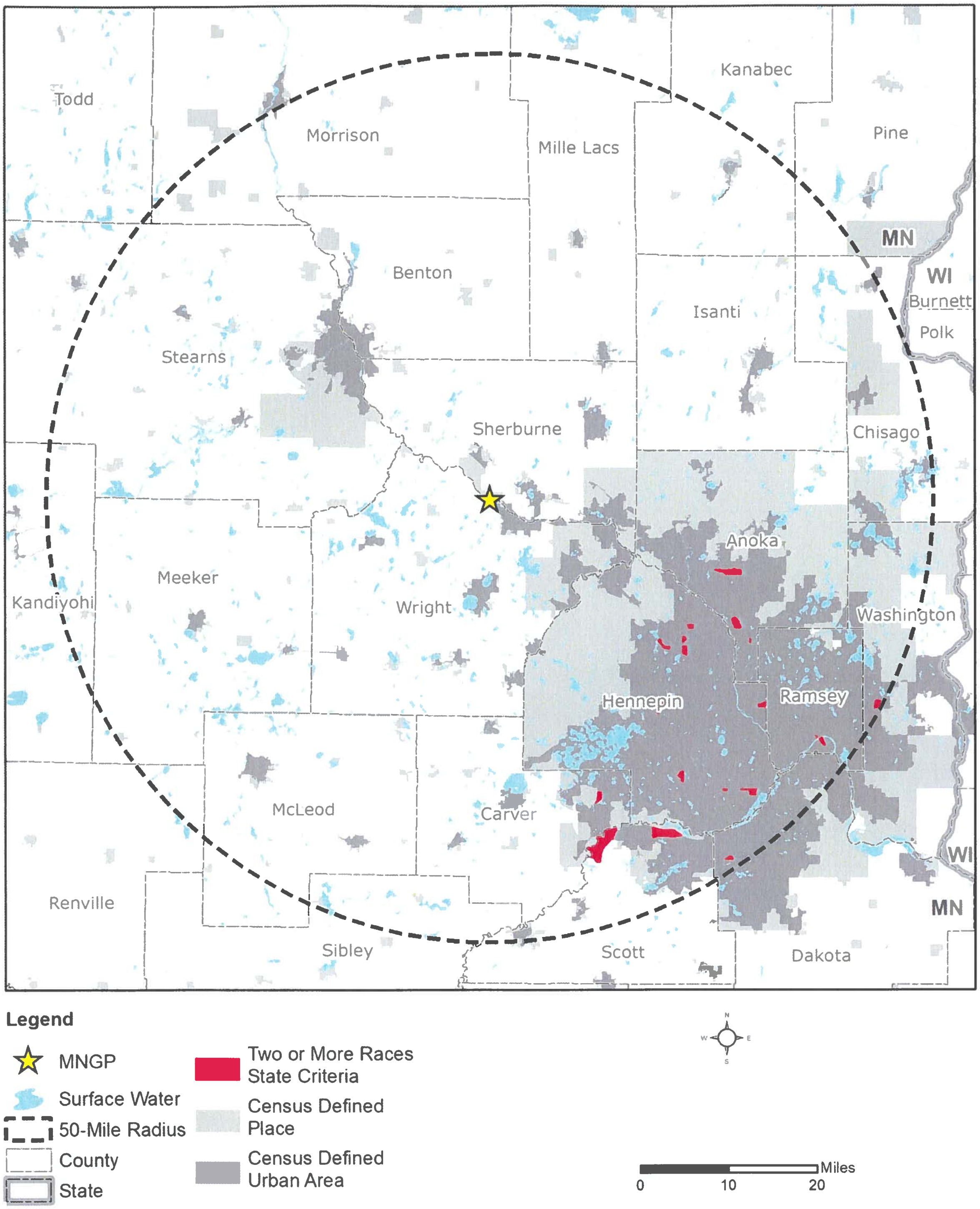


Figure 3.11-14 Two or More Races Populations (Individual State)

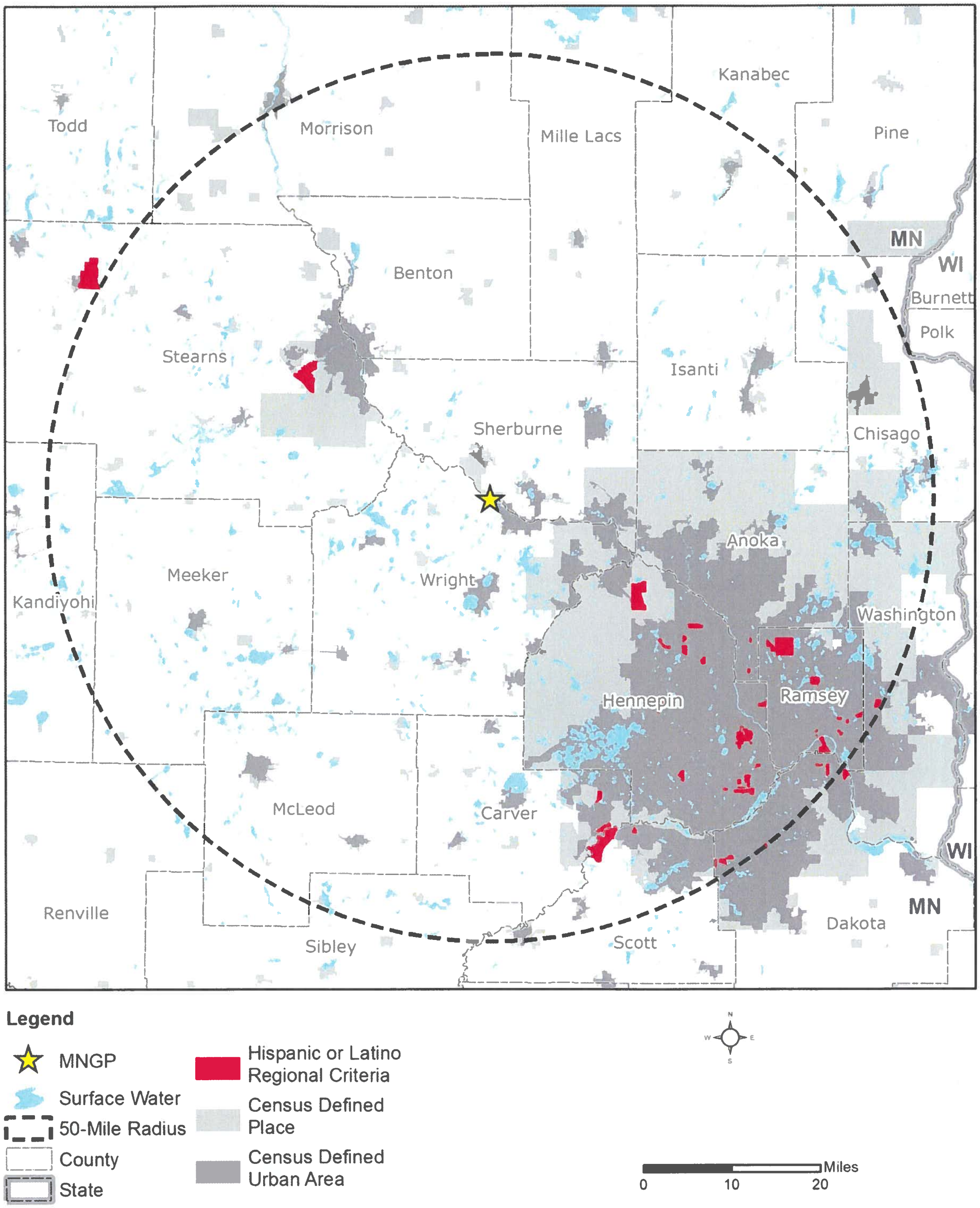


Figure 3.11-15 Hispanic or Latino Populations (Regional)

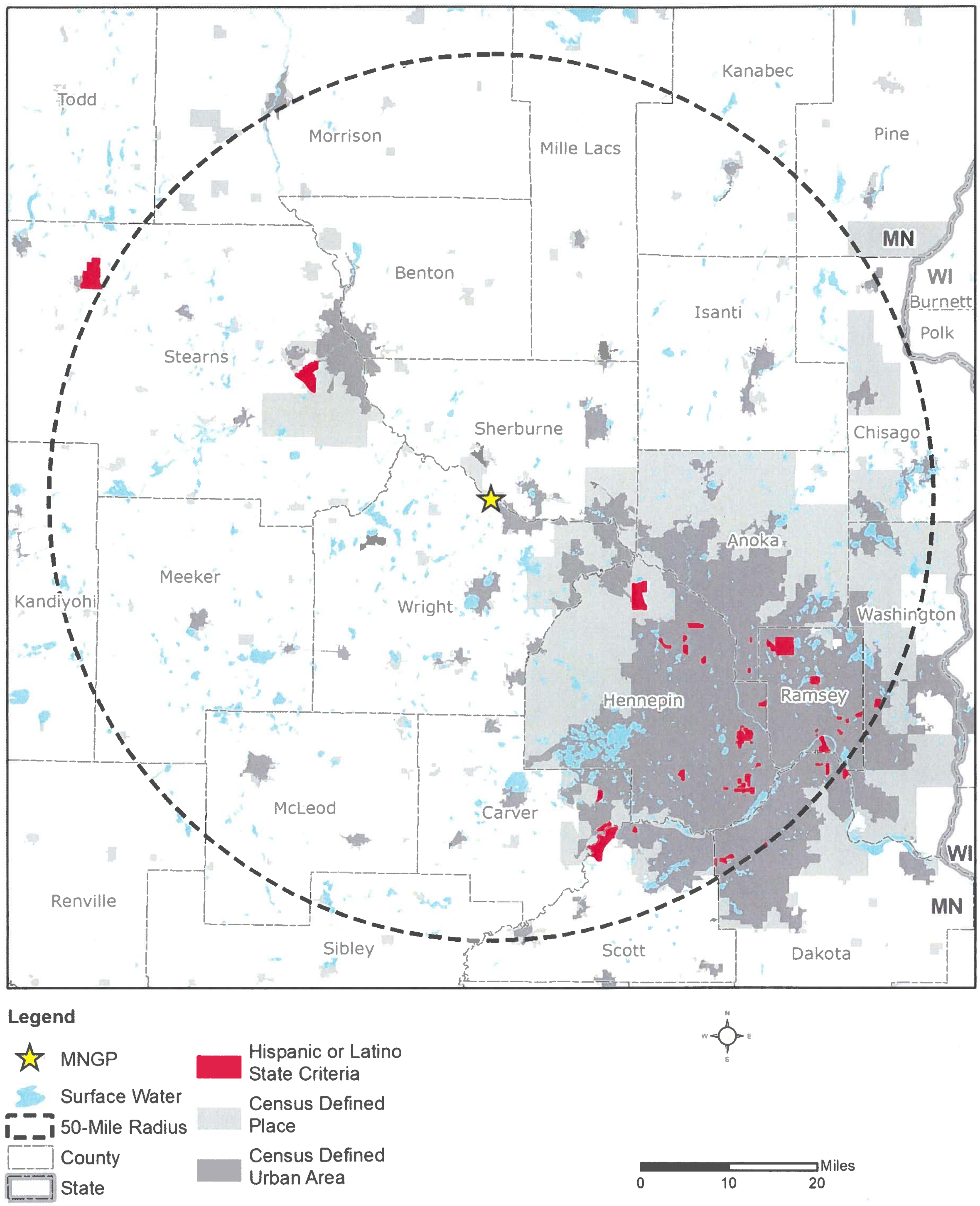


Figure 3.11-16 Hispanic or Latino Populations (Individual State)

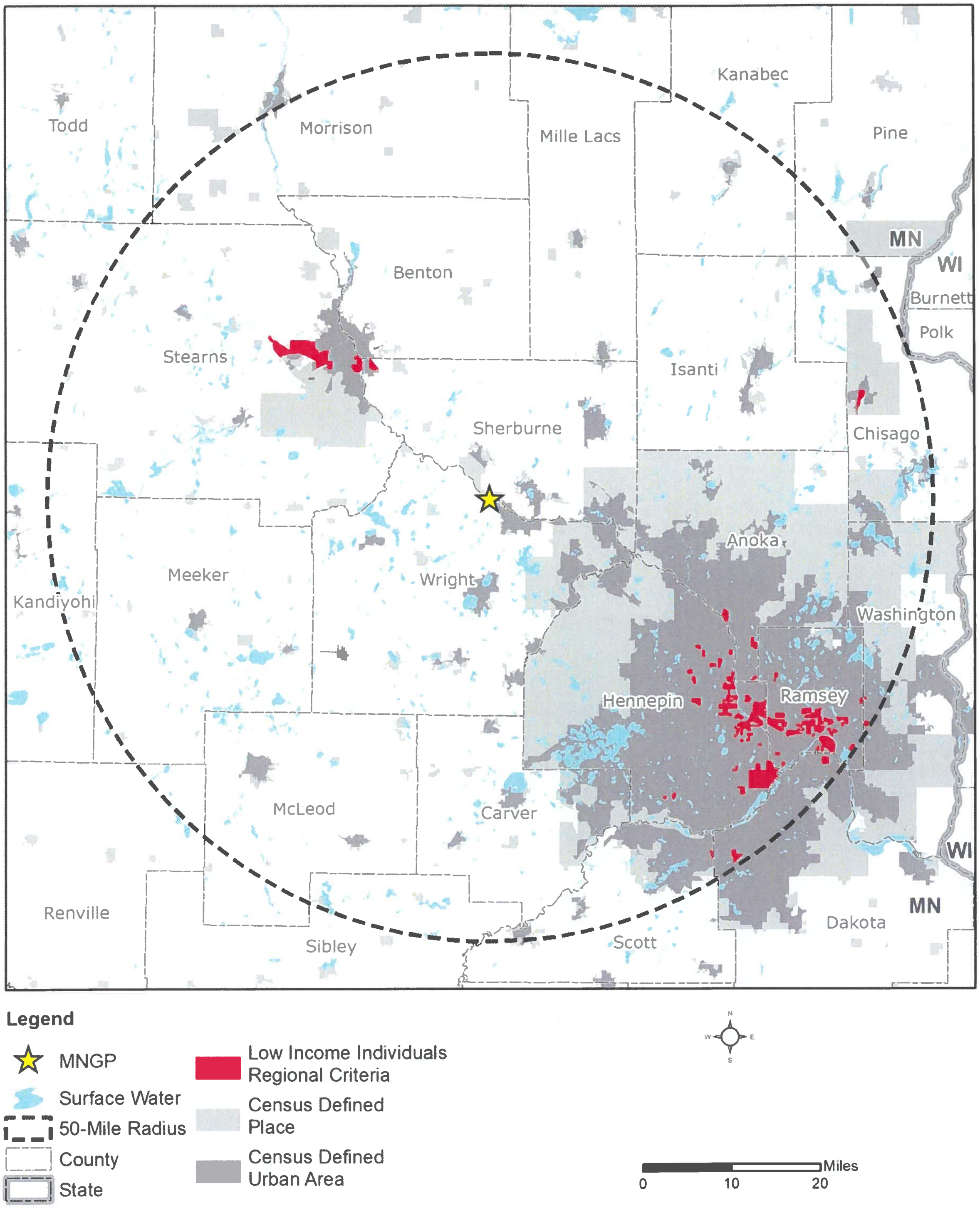


Figure 3.11-17 Low Income Individuals (Regional)

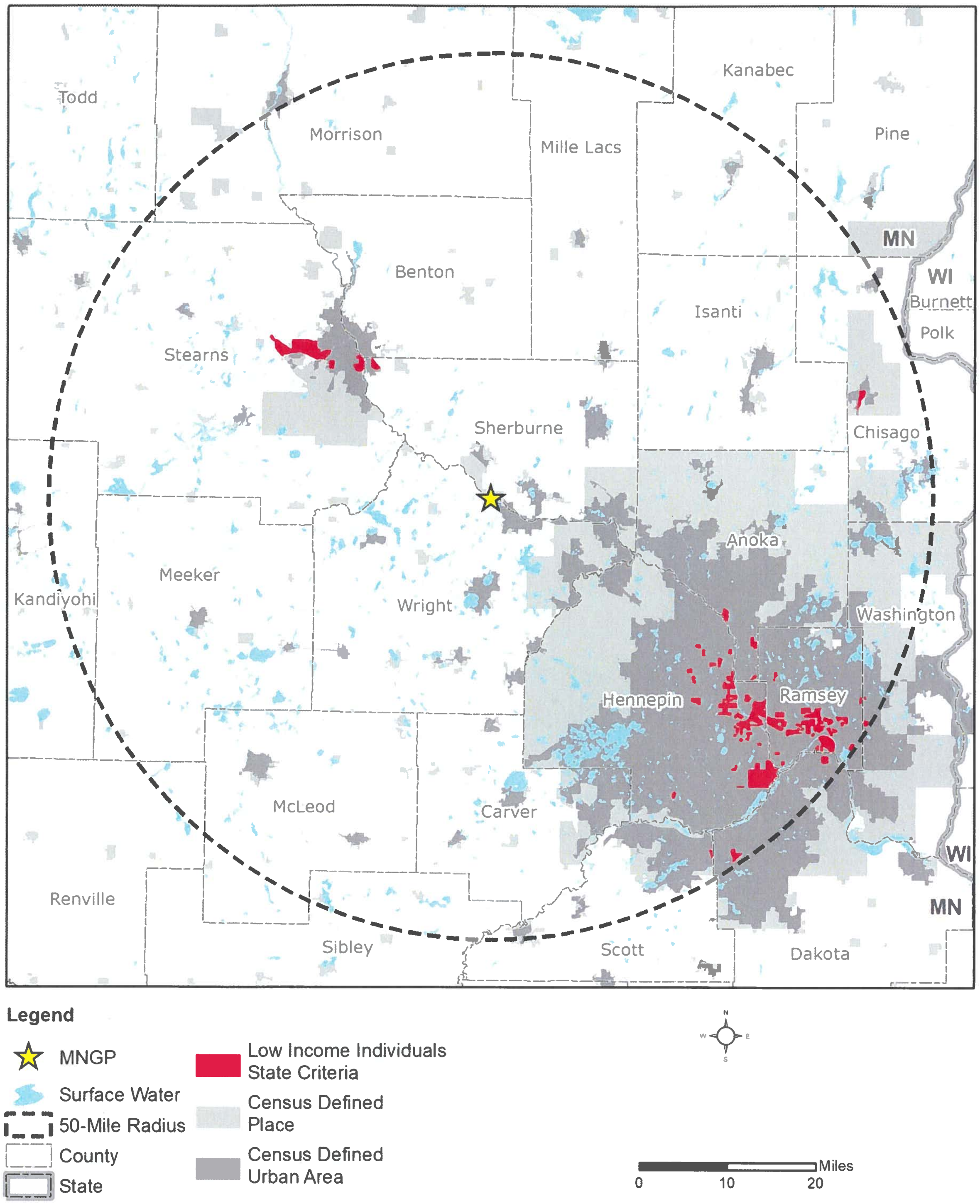


Figure 3.11-18 Low Income Individuals (Individual State)

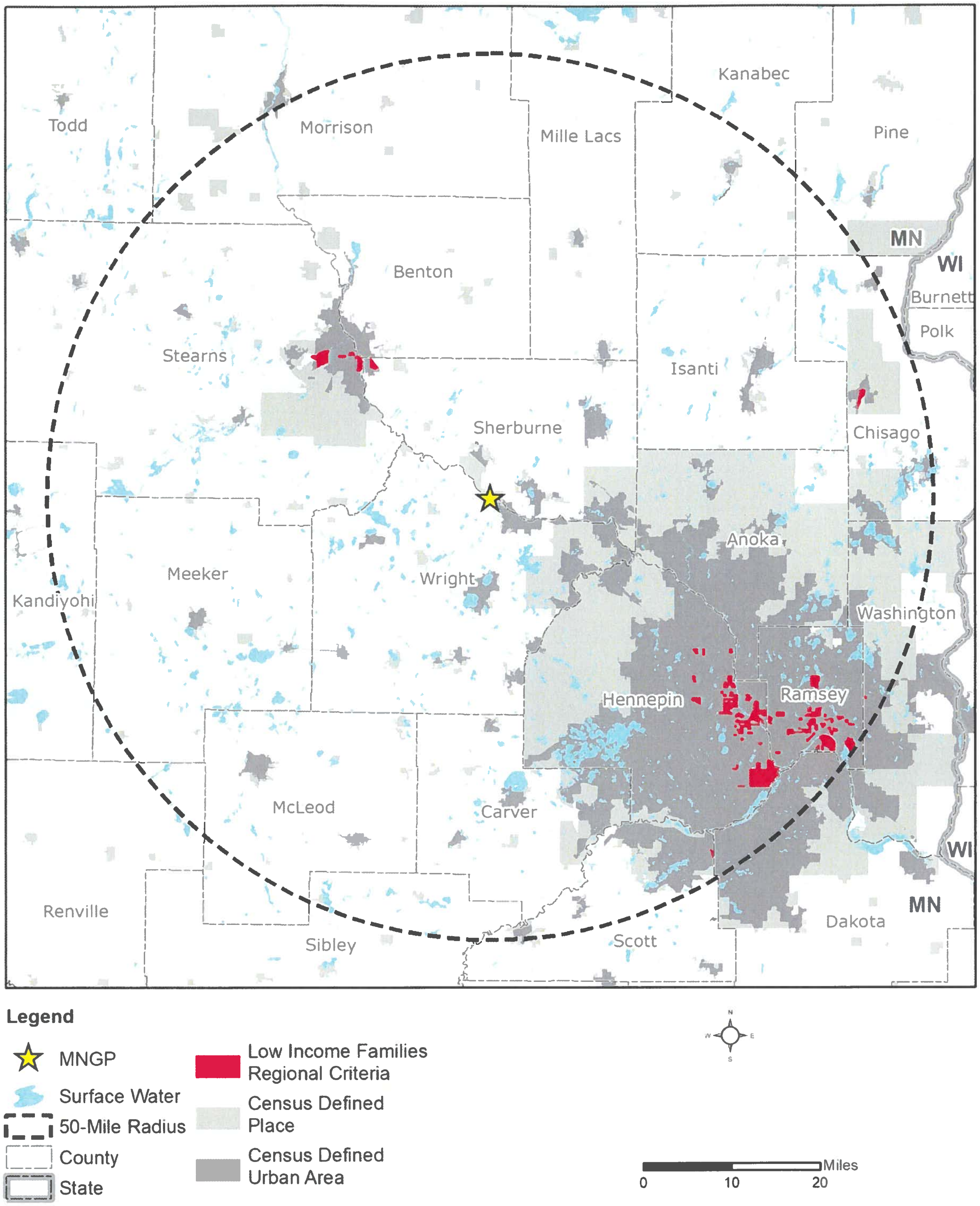


Figure 3.11-19 Low Income Families (Regional)

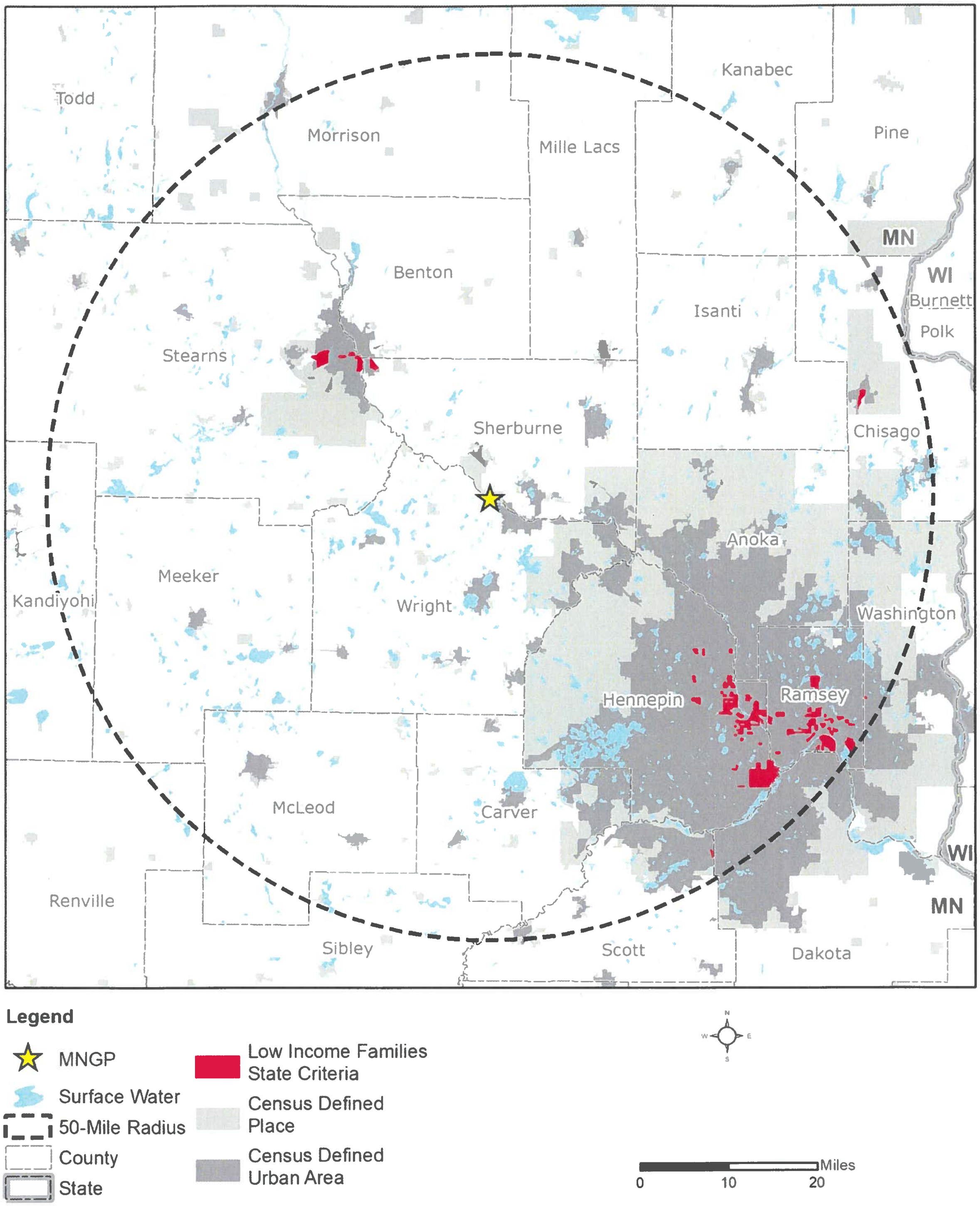


Figure 3.11-20 Low Income Families (Individual State)

3.12 Waste Management

In addressing the plant's radioactive and nonradioactive waste management systems and programs, NRC Regulatory Guide 4.2, Supplement 1, Revision 1, specifies that the information being requested in this section can be incorporated by reference to Section 2.2 of the ER (NRC 2013b). Therefore, consistent with NRC Regulatory Guide 4.2, Xcel Energy is providing the information below to address MNGP's radioactive and nonradioactive waste management systems and program.

3.12.1 Radioactive Waste Management

Section 2.2.6 includes a discussion of MNGP's liquid, gaseous, and solid radwaste systems. The section provides a description of the systems, management of low-level mixed waste, radwaste storage, spent fuel storage, and permitted facilities currently utilized for offsite processing and disposal of radioactive wastes.

3.12.2 Nonradioactive Waste Management

Section 2.2.7 includes a discussion of MNGP's RCRA nonradioactive waste management program, types of wastes generated, waste minimization practices, and permitted facilities currently utilized for disposition of wastes.

4.0 ENVIRONMENTAL CONSEQUENCES OF THE PROPOSED ACTION AND MITIGATING ACTIONS

The environmental report must contain analyses of the environmental impacts of the proposed action, including the impacts of refurbishment activities, if any, associated with license renewal and the impacts of operation during the renewal term.

> *The environmental report must include an analysis that considers . . . the environmental effects of the proposed action . . . and alternatives available for reducing or avoiding adverse environmental effects. [10 CFR 51.45(c)]*

> *The environmental report shall . . . discuss . . . the impact of the proposed action on the environment. Impacts shall be discussed in proportion to their significance. [10 CFR 51.45(b)(1)]*

> *The information submitted . . . should not be confined to information supporting the proposed action but should also include adverse information. [10 CFR 51.45(e)]*

In the 2013 GEIS, the NRC identified and analyzed 78 environmental issues that it considers to be associated with nuclear power plant license renewal. The NRC also codified conclusions for those issues in 10 CFR Part 51, Subpart A, Appendix B, Table B-1. Table 4.0-1 presents the 78 environmental issues contained in the 2013 GEIS, noting there are 7 issues not applicable to MNGP because they result from design or operational features that do not exist at MNGP.

In CLI-22-2 and CLI-22-3, the Commission determined that those 2013 GEIS analyses and codified conclusions were applicable to initial license renewals, and that additional site- and SLR-specific analyses are needed to support environmental reviews in SLR proceedings (NRC 2022b; NRC 2022c). For issues that are applicable to MNGP, the site- and SLR-specific analyses presented in Chapter 4 sections incorporate the corresponding generic analysis from the 2013 GEIS, considers whether that analysis materially differs from initial license renewal to SLR, and supplements that analysis with a further site- and SLR-specific analysis. The site- and SLR-specific analyses consider whether there is any new site-specific information not considered in the GEIS that would lead to a substantially different conclusion of the environmental consequences of license renewal than previously considered, such as (1) an environmental impact finding different from that codified in Table B-1, or (2) any new activity or aspect associated with MNGP that can act upon the environment in a manner, scope, or intensity not considered in the GEIS. Together, those analyses satisfy the requirements of 10 CFR 51.53(c)(2) and 51.45.

With the exception of threatened and endangered species/EFH, historic and cultural resources, environmental justice, and chronic effects of electromagnetic fields (EMFs), Xcel Energy has identified the significance of the impacts associated with each issue as SMALL, MODERATE, or LARGE, consistent with the criteria that the NRC established in 10 CFR 51, Subpart A, Appendix B, Table B-1, Footnote 3 as follows:

SMALL: Environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource. For the purposes of assessing radiological impacts, the NRC has concluded that those impacts that do not exceed permissible levels in the NRC's regulations are considered small.

MODERATE: Environmental effects are sufficient to alter noticeably, but not to destabilize, important attributes of the resource.

LARGE: Environmental effects are clearly noticeable and are sufficient to destabilize important attributes of the resource. For issues where probability is a key consideration (i.e., accident consequences), probability was a factor in determining significance.

Consistent with NRC guidance, Xcel Energy identified the significance of the impacts for the environmental resource issues, of threatened and endangered species/EFH, historic and cultural resources, environmental justice, and EMFs, as follows:

- Consistent with the ESA, for threatened and endangered species, the significance of the effects from license renewal is characterized based on a determination of whether continued nuclear power plant operations, including refurbishment, (1) would have no effect on federally listed species; (2) are not likely to adversely affect federally listed species; (3) are likely to adversely affect federally listed species; or (4) are likely to jeopardize a federally listed species or adversely modify designated critical habitat. For EFH (Magnuson Stevens Fishery Conservation and Management Act), the significance of effects from license renewal can be characterized based on a determination of whether continued nuclear power plant operations, including refurbishment, would have: (1) no adverse impact; (2) minimal adverse impact; or (3) substantial adverse impact to the essential habitat of federally managed fish populations. (NRC 2013a)
- Consistent with the NHPA, for historic and cultural resources, the significance of the effects from license renewal can be characterized based on a determination that: (1) no historic properties are present (no effect); (2) historic properties are present but would not be adversely affected (no adverse effect); or (3) historic properties are adversely affected (adverse effect). (NRC 2013b)
- For environmental justice, impacts are based on disproportionately high and adverse human health and environmental effects on minority and low-income populations. (NRC 2013b)
- Because there is no national scientific consensus on the potential impacts from chronic exposure to EMFs, NRC did not categorize this issue and does not require applicants to present an impact analysis for human health impacts of EMFs (10 CFR Part 51, Subpart A, Appendix B, Table B-1).

In accordance with NEPA practice, Xcel Energy considered ongoing and potential additional mitigation in proportion to the significance of the impact to be addressed (i.e., impacts that are SMALL receive less mitigation consideration than impacts that are LARGE).

4.0.1 Format of Issues Reviewed

Chapter 4 generally follows Regulatory Guide 4.2, Supplement 1, Revision 1 (NRC 2013b) regarding content for the license renewal issues identified in 10 CFR Part 51, Subpart A, Appendix B, Table B-1, modified, as described below, consistent with the Commission's ruling in CLI-22-2.

- *Issue*: Title of the issue.
- *Generic Analysis for Initial License Renewals:* A background excerpt from the applicable section of the GEIS. The specific section of the GEIS is referenced for the convenience of the reader.
- *Site-Specific Analysis for MNGP SLR*: An analysis of the environmental impact, taking into account information provided in the GEIS and 10 CFR Part 51, Subpart A, Appendix B, as well as current site-specific information. If an issue is not applicable, the analysis presents the explanation. The analysis section also provides a summary conclusion of the environmental impacts and identifies, as applicable, either ongoing or additional planned mitigation measures to reduce adverse impacts.

Table 4.0-1 Environmental Resource Issues Evaluated for MNGP (Sheet 1 of 4)

Resource Issue	Applicability	ER Section
Land Use		
Offsite Land Use in Transmission Line Rights of Way (ROW)[3]	Not Applicable	NA
Onsite Land Uses[1]	Applicable	4.1.1
Offsite Land Uses[1]	Applicable	4.1.2
Visual Resources		
Aesthetic Impacts[1]	Applicable	4.1.3
Air Quality		
Air Quality Impacts (All Plants)[1]	Applicable	4.2.1
Air Quality Effects of Transmission Lines[1]	Applicable	4.2.2
Noise		
Noise Impacts[1]	Applicable	4.3.1
Geologic Environment		
Geology and Soils[1]	Applicable	4.4.1
Surface Water Resources		
Surface Water Use Conflicts (Plants with Cooling Ponds or Cooling Towers Using Makeup Water from a River)	Applicable	4.5.1
Surface Water Use and Quality (Non-Cooling System Impacts)[1]	Applicable	4.5.5
Altered Current Patterns at Intake and Discharge Structures[1]	Applicable	4.5.6
Scouring Caused by Discharged Cooling Water[1]	Applicable	4.5.7
Discharge of Metals in Cooling System Effluent[1]	Applicable	4.5.8
Discharge of Biocides, Sanitary Wastes, and Minor Chemical Spills[1]	Applicable	4.5.9
Surface Water Use Conflicts (Plants with Once-Through Cooling Systems)[1]	Applicable	4.5.10
Effects of Dredging on Surface Water Quality[1]	Applicable	4.5.11
Temperature Effects on Sediment Transport Capacity[1]	Applicable	4.5.12
Altered Salinity Gradients[3]	Not Applicable	NA
Altered Thermal Stratification of Lakes[3]	Not Applicable	NA
Groundwater Resources		
Groundwater Use Conflicts (Plants that Withdraw More than 100 GPM)[4]	Not Applicable	NA
Groundwater Use Conflicts (Plants with Closed-Cycle Cooling Systems that Withdraw Makeup Water from a River)	Applicable	4.5.2
Groundwater Quality Degradation (Plants with Cooling Ponds at Inland Sites)[3]	Not Applicable	NA

Table 4.0-1 Environmental Resource Issues Evaluated for MNGP (Sheet 2 of 4)

Resource Issue	Applicability	ER Section
Groundwater Use Conflicts (Plants that Withdraw Less than 100 GPM) [1]	Applicable	4.5.3
Radionuclides Released to Groundwater	Applicable	4.5.4
Groundwater Contamination and Use (Non-Cooling System Impacts) [1]	Applicable	4.5.13
Groundwater Quality Degradation Resulting from Water Withdrawals[1]	Applicable	4.5.14
Groundwater Quality Degradation (Plants with Cooling Ponds in Salt Marshes) [3]	Not Applicable	NA
Terrestrial Resources		
Water Use Conflicts with Terrestrial Resources (Plants with Cooling Ponds or Cooling Towers Using Makeup Water from a River)	Applicable	4.6.4
Effects on Terrestrial Resources (Non-Cooling System Impacts)	Applicable	4.6.5
Exposure of Terrestrial Organisms to Radionuclides[1]	Applicable	4.6.7
Cooling System Impacts on Terrestrial Resources (Plants with Once-Through Cooling Systems or Cooling Ponds) [1]	Applicable	4.6.8
Cooling Tower Impacts on Vegetation (Plants with Cooling Towers) [1]	Applicable	4.6.9
Bird Collisions with Plant Structures and Transmission Lines[1]	Applicable	4.6.10
Transmission Line Right-of-Way Management Impacts on Terrestrial Resources[1]	Applicable	4.6.11
Electromagnetic Fields on Flora and Fauna (Plants, Agricultural Crops, Honeybees, Wildlife, Livestock) [1]	Applicable	4.6.12
Aquatic Resources		
Impingement and Entrainment of Aquatic Organisms (Plants with Once-Through Cooling Systems or Cooling Ponds)	Applicable	4.6.1
Thermal Impacts on Aquatic Organisms (Plants with Once-Through Cooling Systems or Cooling Ponds)	Applicable	4.6.2
Water Use Conflicts with Aquatic Resources (Plants with Cooling Ponds or Cooling Towers Using Makeup Water from a River)	Applicable	4.6.3
Impingement and Entrainment of Aquatic Organisms (Plants with Cooling Towers) [1]	Applicable	4.6.13
Entrainment of Phytoplankton and Zooplankton (All Plants) [1]	Applicable	4.6.14
Thermal Impacts on Aquatic Organisms (Plants with Cooling Towers) [1]	Applicable	4.6.15

Table 4.0-1 Environmental Resource Issues Evaluated for MNGP (Sheet 3 of 4)

Resource Issue	Applicability	ER Section
Infrequently Reported Thermal Impacts (All Plants) [1]	Applicable	4.6.16
Effects of Cooling Water Discharge on Dissolved Oxygen, Gas Supersaturation, and Eutrophication[1]	Applicable	4.6.17
Effects of Non-Radiological Contaminants on Aquatic Organisms[1]	Applicable	4.6.18
Exposure of Aquatic Organisms to Radionuclides[1]	Applicable	4.6.19
Effects of Dredging on Aquatic Organisms[1]	Applicable	4.6.20
Effects on Aquatic Resources (Non-Cooling System Impacts) [1]	Applicable	4.6.21
Impacts of Transmission Line Right-of-Way Management on Aquatic Resources[1]	Applicable	4.6.22
Losses from Predation, Parasitism, and Disease Among Organisms Exposed to Sub-Lethal Stresses[1]	Applicable	4.6.23
Special Status Species and Habitats		
Threatened, Endangered, and Protected Species and Essential Fish Habitat	Applicable	4.6.6
Historic and Cultural Resources		
Historic and Cultural Resources	Applicable	4.7.1
Socioeconomics		
Employment and Income, Recreation, and Tourism[1]	Applicable	4.8.1
Tax Revenues[1]	Applicable	4.8.2
Community Services and Education[1]	Applicable	4.8.3
Population and Housing[1]	Applicable	4.8.4
Transportation[1]	Applicable	4.8.5
Human Health		
Microbiological Hazards to the Public (Plants with Cooling Ponds or Canals, or Cooling Towers that Discharge to a River).	Applicable	4.9.1
Electric Shock Hazards	Applicable	4.9.2
Radiation Exposures to the Public[1]	Applicable	4.9.3
Radiation Exposures to Plant Workers[1]	Applicable	4.9.4
Human Health Impact from Chemicals[1]	Applicable	4.9.5
Microbiological Hazards to Plant Workers[1]	Applicable	4.9.6
Physical Occupational Hazards[1]	Applicable	4.9.7
Chronic Effects of Electromagnetic Fields[2]	Not Applicable	NA
Postulated Accidents		
Design-Basis Accidents[1]	Applicable	4.15.1
Severe Accident Consequences[5]	Applicable	4.15.2
Severe Accident Mitigation Alternatives	Applicable	4.15.3
Environmental Justice		
Minority and Low-Income Populations	Applicable	4.10.1

Table 4.0-1 Environmental Resource Issues Evaluated for MNGP (Sheet 4 of 4)

Resource Issue	Applicability	ER Section
Waste Management		
Low-Level Waste Storage and Disposal[1]	Applicable	4.11.1
Onsite Storage of Spent Nuclear Fuel[1]	Applicable	4.11.2
Offsite Radiological Impacts of Spent Nuclear Fuel and High-Level Waste Disposal[1]	Applicable	4.11.3
Mixed-Waste Storage and Disposal[1]	Applicable	4.11.4
Nonradioactive Waste Storage and Disposal[1]	Applicable	4.11.5
Cumulative Impacts		
Cumulative Impacts	Applicable	4.12
Uranium Fuel Cycle		
Offsite Radiological Impacts—Individual Impacts from Other than the Disposal of Spent Fuel and High-Level Waste[1]	Applicable	4.13.1
Offsite Radiological Impacts—Collective Impacts from Other than the Disposal of Spent Fuel and High-Level Waste[1]	Applicable	4.13.2
Nonradiological Impacts of the Uranium Fuel Cycle[1]	Applicable	4.13.3
Transportation[1]	Applicable	4.13.4
Termination of Nuclear Power Plant Operations and Decommissioning		
Termination of Plant Operations and Decommissioning[1]	Applicable	4.14.1

1. Note that these environmental resource issues were previously considered Category 1 issues in the GEIS, Revision 1.
2. This issue is not categorized and is considered not applicable.
3. Associated design and operational features not present at MNGP.
4. Groundwater withdrawals at MNGP are less than 100 gpm.
5. The 2013 GEIS presents this issue as one issue in combination with the Severe Accident Mitigation Alternative as described in Table 2.1-1 (NRC 2013a). It is presented as a separate issue here for clarity.

4.1 Land Use and Visual Resources

Impacts to land use and visual resources are evaluated in the GEIS and are considered to be generic (the same or similar at all plants). The following sections address the land use issues applicable to MNGP, providing background and environmental analyses representing the proposed SPEO.

4.1.1 Onsite Land Uses

4.1.1.1 Generic Analysis for Initial License Renewals [GEIS Section 4.2.1.1]

Operational activities at a nuclear power plant during the license renewal term would be similar to those occurring during the current license term. Generally, onsite land use conditions would remain unchanged. However, additional spent nuclear fuel and LLRW generated during the license renewal term could require the construction of new or expansion of existing onsite storage facilities. Should additional storage facilities be required, this action would be addressed in separate license reviews conducted by the NRC. Refurbishment activities, such as steam generator and vessel head replacement, have not permanently changed onsite land use conditions.

For initial license renewals, the NRC codified its conclusion that changes in onsite land use from continued operations and refurbishment associated with license renewal would be a small fraction of the nuclear power plant site and would involve only land that is controlled by the licensee. The NRC found the impact for this issue to be SMALL.

4.1.1.2 Site-Specific Analysis for MNGP SLR

As part of the Site-Specific Analysis, Xcel Energy considered relevant new information on onsite land use since initial license renewal. Onsite land use information is discussed in Section 3.2.1 of this ER. No license renewal-related refurbishment activities have been identified, as presented in Section 2.3. As discussed in Section 3.1.4, the only currently planned project is the installation of a new ISFSI pad within the existing ISFSI fenced area. This project does not change existing onsite land uses. Continued operation of MNGP during the proposed SPEO is not expected to change and no refurbishment activities are anticipated, and therefore no changes to onsite land use are projected. Xcel Energy finds that impacts to onsite land uses for the proposed SPEO are SMALL.

4.1.2 Offsite Land Uses

4.1.2.1 Generic Analysis for Initial License Renewals [GEIS Section 4.2.1.1]

The impacts of continued plant operation during the license renewal term and refurbishment on offsite land use were evaluated separately in the 1996 GEIS. License renewal reviews have shown no power plant-related population changes or significant tax revenue changes due to license renewal. Non-outage employment levels at nuclear power plants have remained relatively unchanged or have decreased. With no increase in the number of workers, there has been no increase in housing, infrastructure, or demand for services beyond what has already occurred. Therefore, the NRC concluded in the 2013 GEIS that operation activities during the license renewal term would be similar to those occurring during the current license term and would not affect offsite land use beyond what has already been affected.

For plants that have the potential to impact a coastal zone or coastal watershed, as defined by each state participating in the national Coastal Zone Management Program (CZMP), applicants for license renewal must submit to the affected state a certification that the proposed license renewal is consistent with the state CZMP. Applicants must coordinate with the state agency that manages the state CZMP to obtain a determination that the proposed nuclear plant license renewal would be consistent with the state program.

For initial license renewals, the NRC codified its conclusion that offsite land use would not be affected by continued operations and refurbishment associated with license renewal. The NRC found the impact for this issue to be SMALL.

4.1.2.2 Site-Specific Analysis for MNGP SLR

As part of the Site-Specific Analysis, Xcel Energy considered relevant new information on offsite land use since initial license renewal. Offsite land use information is discussed in Section 3.2.2 of this ER. As presented in Section 2.5, there are no plans to add workers to support plant operations during the proposed SPEO, nor are any significant changes to tax payments anticipated (see Section 4.8.2). As presented in Section 2.3, no license renewal-related refurbishment activities have been identified. Because the workforce is expected to remain constant, MNGP has determined that no change in housing, infrastructure, or demand for services is anticipated beyond what has already occurred. Therefore, no changes in offsite land use during the proposed SPEO are anticipated.

As presented in Section 9.5.10, MNGP is not located in or near a coastal zone under the national CZMP and does not have the potential to impact a coastal zone or coastal watershed.

Xcel Energy finds that impacts to offsite land use for the proposed SPEO are SMALL.

4.1.3 Aesthetic Impacts

4.1.3.1 Generic Analysis for Initial License Renewals [GEIS Section 4.2.1.2]

A case study performed for the 1996 GEIS found a limited number of situations where nuclear power plants had a negative effect on visual resources. Negative perceptions were based on aesthetic considerations (for instance, the plant is out of character or scale with the community or the viewshed), physical environmental concerns, safety and perceived risk issues, an anti-plant attitude, or an anti-nuclear orientation. It is believed that these negative perceptions would persist regardless of mitigation measures.

In addition, the visual appearance of transmission lines is not expected to change during the license renewal term. After the containment building and cooling towers, transmission line towers are probably the most frequently observed structure associated with nuclear power plants. Transmission lines from nuclear power plants are generally indistinguishable from those from other power plants. Because electrical transmission lines are common throughout the United States, they are generally perceived with less prejudice than the nuclear power plant itself. Also, the visual impact of transmission lines tends to wear off when viewed repeatedly.

For initial license renewals, the NRC codified its conclusion that no important changes to the visual appearance of plant structures or transmission lines are expected from continued operations and refurbishment associated with license renewal. The NRC found the impact for this issue to be SMALL.

4.1.3.2 Site-Specific Analysis for MNGP SLR

As part of the Site-Specific Analysis, Xcel Energy considered relevant new information on aesthetic impacts since initial license renewal. The visual appearance of the plant and in-scope transmission lines is presented in Section 3.2.3. As presented in Section 3.2.3, the MNGP plant is located on the Mississippi River in a rural area that is primarily agricultural with interspersed natural areas, small cities, and rural residential development. Predominant visual features at MNGP are the reactor containment buildings, the turbine buildings, radwaste building, EDG building, Off-Gas Stack, mechanical cooling towers, and transmission lines and corridors. Though views of the plant are offered from portions of Interstate 94 (I-94), nearby service roads, and the Mississippi River, the majority of MNGP is not visible to local communities. Therefore, MNGP would have minimal visual impact on these areas. As noted in Section 2.3, no refurbishment activities have been identified that would change the aesthetics of the MNGP facility, and there are no plans to add transmission lines during the proposed SPEO.

Xcel Energy finds that aesthetic impacts for the proposed SPEO are SMALL.

4.2 Air Quality

Impacts to air quality are evaluated in the GEIS and are considered to be generic (the same or similar at all plants). The following sections address the air quality issues applicable to MNGP, providing background on the issues and the analyses regarding the proposed SPEO.

4.2.1 Air Quality Impacts (All Plants)

4.2.1.1 Generic Analysis for Initial License Renewals [GEIS Section 4.3.1.1]

Impacts on air quality during normal plant operations can result from operations of fossil fuel-fired equipment needed for various plant functions. Each licensed plant typically employs EDGs for use as a backup power source. EDGs and fire pumps typically require state or local operating permits. These diesel generators are typically tested once a month with several test burns of various durations (e.g., one to several hours). In addition to these maintenance tests, longer-running endurance tests are typically conducted at each plant. Each generator is typically tested for 24 hours on a staggered test schedule (e.g., once every refueling outage).

In addition to the EDGs, fossil fuel (i.e., diesel-, oil-, or natural-gas-fired) boilers are used primarily for evaporator heating, plant space heating, and/or feedwater purification. These units typically operate at a variable load on a continuous basis throughout the year unless end use is restricted to one application, such as space heating. The utility boilers at commercial plants are relatively small when compared with most industrial boilers and are typically regulated through state-level operating permits.

As presented in Section 3.3 of the GEIS, cooling tower drift can increase downwind PM concentrations, impair visibility, ice roadways, cause drift deposition, and damage vegetation and painted surfaces. Thus, although there is the potential for some air quality impacts to occur as a result of equipment and cooling tower operations, even in the worst-case situation (Hope Creek), the impacts have been SMALL, and licensees would be required to operate within state permit requirements.

In the 1996 GEIS, the NRC concluded that the impacts from plant refurbishment associated with license renewal on air quality could range from SMALL to LARGE, although these impacts were expected to be SMALL for most plants. However, findings from license renewal supplemental environmental impact statements (SEISs) published since the 1996 GEIS have shown that refurbishment activities, such as steam generator and vessel head replacement, have not required the large numbers of workers and months of time, as well as the degree of land disturbance that was conservatively estimated in the 1996 GEIS. Presumed air pollutant emissions, including levels of fugitive dust, have therefore not been realized.

For initial license renewals, the NRC codified its conclusion that air quality impacts from continued operations and refurbishment associated with license renewal are expected to be SMALL at all plants. Emissions resulting from refurbishment activities at locations in or near air quality nonattainment or maintenance areas would be short-lived and would cease after these refurbishment activities are completed. Operating experience has shown that the scale of refurbishment activities has not resulted in exceedance of the *de minimis* thresholds for criteria pollutants, and BMPs, including fugitive dust controls and the imposition of permit conditions in state and local air emissions permits, would ensure conformance with applicable state or tribal implementation plans.

Emissions from EDGs and fire pumps, and routine operations of boilers used for space heating, would not be a concern, even for plants located in or adjacent to nonattainment areas. Impacts from cooling tower particulate emissions, even under the worst-case situations, have been SMALL.

4.2.1.2 Site-Specific Analysis for MNGP SLR

As part of the Site-Specific Analysis, Xcel Energy considered relevant new information on air quality impacts since initial license renewal. Air quality information is presented in Section 3.3.3. No license renewal-related refurbishment activities have been identified, as presented in Section 2.3. As stated in the GEIS, BMPs, including fugitive dust controls and the imposition of permit conditions in MPCA air emissions permits, would ensure conformance with applicable state implementation plans. As presented in Section 3.3.3.1, Wright County is in attainment with the NAAQS for all criteria air pollutants and is a maintenance area for CO (1971 Standard).

As presented in Section 3.3.3.2, no future upgrade or replacement activities (e.g., diesel generators, diesel pumps) that would increase or decrease air emissions over the SPEO were identified as necessary for plant operations. There have been no NOVs or non-compliances associated with the MNGP Air Emission Permit (Permit No. 17100019-004) from 2016 to April 2022.

During the proposed SPEO, appropriate permit conditions would regulate and mitigate any potential MNGP activities that could increase air pollutants.

Xcel Energy finds that air quality impacts for the proposed SPEO are SMALL.

4.2.2 Air Quality Effects of Transmission Lines

4.2.2.1 Generic Analysis for Initial License Renewals [GEIS Section 4.4.3.1.1]

Small amounts of ozone and substantially smaller amounts of oxides of nitrogen are produced by transmission lines during corona, a phenomenon that occurs when air ionizes near isolated irregularities on the conductor surface such as abrasions, dust particles, raindrops, and insects. Several studies have quantified the amount of ozone generated and concluded that the amount produced by even the largest lines in operation (765 kV) is insignificant.

Ozone concentrations generated by transmission lines are therefore too low to cause any significant effects. The minute amounts of oxides of nitrogen produced are similarly insignificant. A finding of SMALL significance for transmission lines within this scope of review is supported by the evidence that production of ozone and oxides of nitrogen are insignificant and does not measurably contribute to ambient levels of those gases.

For initial license renewals, the NRC codified its conclusion that production of ozone and oxides of nitrogen is insignificant and does not contribute measurably to ambient levels of these gases. The NRC found the impact for this issue to be SMALL.

4.2.2.2 Site-Specific Analysis for MNGP SLR

As part of the Site-Specific Analysis, Xcel Energy considered relevant new information on air quality effects of transmission lines since initial license renewal. Transmission lines subject to evaluation of environmental impacts for license renewal are those that connect the nuclear power plant to the switchyard where electricity is fed into the regional power distribution system and power lines that feed the plant from the grid during outages (NRC 2013b, Section 2.2). As described in Section 2.2.5.1, MNGP is connected to a 345-, 230-, 115-, 13.8-kV switchyard through onsite transmission corridors illustrated in Figure 2.2-3.

Studies have shown the amount of ozone generated by even the largest transmission lines in operation (765 kV) would be insignificant. Two years of monitoring near the Bonneville Power Administration's 1,200-kV prototype line resulted in no increase in ambient ozone levels caused by the line (NRC 2013a, Section 4.3.1.1). Furthermore, because transmission line emissions associated with corona discharge are so small when compared with emissions from other sources of air pollution, these emissions are not a regulated source of air pollution in the United

States (NRC 2013a). As MNGP's in-scope transmission lines range from 115 kV to 345 kV and there are no anticipated changes to the system, the amount of ozone generated from the in-scope transmission lines is anticipated to be minimal.

Xcel Energy finds that impacts to air quality effects of transmission lines for the proposed SPEO are SMALL.

4.3 Noise

Impacts to noise are evaluated in the GEIS and are considered to be generic (the same or similar at all plants). The following sections address the noise issues applicable to MNGP, providing background on the issues and the analyses regarding the proposed SPEO.

4.3.1 Noise Impacts

4.3.1.1 Generic Analysis for Initial License Renewals [GEIS Section 4.3.1.2]

Major sources of noise at operating nuclear power plants are cooling towers, turbines, transformers, large pumps, and cooling water system motors. Nuclear plant operations have not changed appreciably with time, and no change in noise levels or noise-related impacts is expected during the license renewal term. Since no change is expected in the amount of noise generated during the license renewal term, the only issue of concern is the number of people now living close to the nuclear power plant who are exposed to operational noise.

Given the industrial nature of the power plant and the number of years of plant operation, noise from a nuclear plant is generally nothing more than a continuous minor nuisance. However, noise levels may sometimes exceed the 55 dBA level that the EPA uses as a threshold level to protect against excess noise during outdoor activities. However, according to the EPA, this threshold does "not constitute a standard, specification, or regulation," but was intended to provide a basis for state and local governments establishing noise standards. Nevertheless, noise levels at the site boundary are expected to remain well below regulatory standards for offsite residents.

Noise would also be generated by construction-related activities and equipment used during refurbishment. However, this noise would occur for relatively short periods of time (several weeks) and is not expected to be distinguishable from other operational noises at the site boundary nor create an adverse impact on nearby residents.

For initial license renewals, the NRC codified its conclusion that noise levels would remain below regulatory guidelines for offsite receptors during continued operations and refurbishment associated with license renewal. The NRC found the impact for this issue to be SMALL.

4.3.1.2 Site-Specific Analysis for MNGP SLR

As part of the Site-Specific Analysis, Xcel Energy considered relevant new information on noise impacts since initial license renewal. Industrial background noise at MNGP is generally from EDGs, turbine generators, transformers, loudspeakers, transmission lines, and the firing range.

As discussed in Section 3.4, the loudest sound emitted from MNGP plant systems is from a limited-duration monthly testing of EDGs. Noise sampling, which is conducted monthly for the EDGs, indicate peak noise levels of 101-103 dBA are generated during EDG operations. At this level, based on MNGP's hearing conservation program, personnel working near the EDGs are required to wear double hearing protection. It is unlikely noise from the EDGs would affect offsite residences as the nearest residence is approximately 0.52 miles in the southwest direction.

Section 3.4 describes the land surrounding MNGP as primarily rural with heavily wooded areas along the Mississippi River and cultivated areas on the bluffs away from the river. Land uses are not anticipated to change during the SPEO, and it is unlikely that noise levels from MNGP would affect offsite sensitive receptors (e.g., residences, schools, churches, etc.). Additionally, no noise complaints have been received from offsite residences as it relates to MNGP's operation and outage activities from 2016-2021, and as of development, no noise complaints have been received in 2022.

People living in the vicinity of MNGP will not experience any changes in noise levels during the proposed SPEO beyond what is currently experienced. Therefore, the impact of continued reactor operations during the proposed SPEO will not exceed the noise impacts predicted in the GEIS.

Xcel Energy finds that noise impacts for the proposed SPEO are SMALL.

4.4 Geologic Environment

4.4.1 Geology and Soils

4.4.1.1 Generic Analysis for Initial License [GEIS Section 4.4.1]

The impact of continued operations and refurbishment associated with license renewals on geologic and soil resources would consist of soil disturbance, including sediment and/or any associated bedrock, for projects, such as replacing or adding buildings, roads, parking lots, and belowground and aboveground utility structures. Implementing BMPs would reduce soil erosion and subsequent impacts on surface water quality. These practices include, but are not limited to, minimizing the amount of disturbed land; stockpiling topsoil before ground disturbance; mulching and seeding disturbed areas; covering loose materials with geotextiles; using silt fences to reduce sediment loading to surface water; using check dams to minimize the erosive power of drainages; and installing proper culvert outlets to direct flows in streams or drainages.

Detailed geotechnical analyses would be required to address the stability of excavations, foundation footings, and slope cuts for building construction, road creation, or other refurbishment-related construction projects. Depending on the plant location and design, riverbank or coastline protection might need to be upgraded, especially at water intake or discharge structures if natural flows, such as storm surges, cause an increase in erosion. In addition, the Farmland Protection Policy Act requires federal agencies to consider agency actions affecting the preservation of farmland, including prime and other important farmland soils, as described in Section 3.4 of the GEIS.

For initial license renewals, the NRC codified its conclusion that the effect of geologic and soil conditions on plant operations and the impact of continued operations and refurbishment activities on geology and soils would be SMALL for all nuclear power plants and would not change appreciably during the proposed license renewal term.

4.4.1.2 Site-Specific Analysis for MNGP SLR

As part of the Site-Specific Analysis, Xcel Energy considered relevant new information on geology and soils since initial license renewal. Construction and maintenance activities undertaken during the SPEO that would involve ground disturbance of greater than 6 inches would be required to follow the MNGP excavation permit procedure and could also trigger an environmental review to determine any impacts.

Soils could also be impacted by infiltration of pollutants in stormwater and spills of oil and hazardous materials. In compliance with the NPDES permit, MNGP maintains and implements a SWPPP that identifies potential sources of pollution, such as erosion, that would reasonably be expected to affect the quality of stormwater and identifies BMPs that will be used to prevent or reduce the pollutants in stormwater discharges. MNGP has spill prevention, control, and countermeasure (SPCC) and hazardous substance spill contingency plans and a chemical control program procedure.

The information Xcel Energy reviewed indicated that MNGP has controls in place for projects that involve ground disturbance, stormwater controls in place to reduce the potential for stormwater run-off to contaminate soils, and procedures in place to minimize the potential for spills.

Xcel Energy finds that impacts to geology and soils for the proposed SPEO are SMALL.

4.5 Water Resources

Site-specific impacts to water resources are discussed below.

4.5.1 Surface Water Use Conflicts (Plants with Cooling Ponds or Cooling Towers Using Makeup Water from a River)

4.5.1.1 Generic Analysis for Initial License Renewals [GEIS Section 4.5.1.1]

Nuclear power plant cooling systems may compete with other users relying on surface water resources, including downstream municipal, agricultural, or industrial users. Closed-cycle cooling is not completely closed, because the system discharges blowdown water to a surface water body and withdraws water for makeup of both the consumptive water loss due to evaporation and drift (for cooling towers) and blowdown discharge. For plants using cooling towers, the makeup water needed to replenish the consumptive loss of water to evaporation can be significant and is reported at 60 percent or more of the condenser flow rate. Cooling ponds will also require makeup water as a result of naturally occurring evaporation, evaporation of the warm effluent, and possible seepage to groundwater.

Consumptive use by plants with cooling ponds or cooling towers using makeup water from a river during the license renewal term is not expected to change unless power uprates, with associated increases in water use, are proposed. Such uprates would require an environmental assessment by the NRC. In the 1996 GEIS, application of this issue applied only to rivers with low flow to define the difference between plants located on "small" versus "large" rivers. However, any river, regardless of size, can experience low flow conditions of varying severity during periods of drought and changing conditions in the affected watershed such as upstream diversions and use of river water. The NRC subsequently determined that use of the term "low flow" in categorizing river flow is of little value considering that all rivers can experience low flow conditions.

Population growth around nuclear power plants has increased demand on municipal water systems, including systems that rely on surface water. Municipal intakes located downstream from a nuclear power plant could experience water shortages, especially in times of drought. Similarly, water demands upstream from a plant could impact the water availability at the plant's intake.

Water use conflicts associated with plants with cooling ponds or cooling towers using makeup water from a river with low flow were considered to vary among sites because of differing site-specific factors, such as makeup water requirements, water availability (especially in terms of varying river flow rates), changing or anticipated changes in population distributions, or changes in agricultural or industrial demands.

For initial license renewals, the NRC codified its conclusion that impacts could be of small or moderate significance, depending on makeup water requirements, water availability, and competing water demands. The NRC found the impact for this issue to be SMALL to MODERATE.

4.5.1.2 Site-Specific Analysis for MNGP SLR

As part of the Site-Specific Analysis, Xcel Energy considered relevant new information on surface water use conflicts since initial license renewal. As discussed in Section 3.6.1, the Mississippi River has the third largest drainage basin in the world and near MNGP is a broad turbulent river with a drainage area of 13,700 square miles. USGS flows were scaled from nearby gaging stations to the MNGP, most recently for a period from 1971 to 2001. The annual average Mississippi River flow was 7,217 cfs, whereas monthly mean flows varied between 4,135 cfs in February to 14,140 cfs in April. A 1-in-10-year, 7-day duration low flow (7Q10) based on this 31-year historical period was 1,294 cfs (NMC 2005). Based on available data for the past 10 years at the upstream USGS gage (Station 05270700), the maximum and minimum daily flows were 28,200 cfs occurring on June 25, 2012, and 553 cfs on August 19, 2021 (USGS 2021c).

As presented in Section 2.2.3.1, MNGP utilizes a once-through cooling system and utilizes two MDCTs, as needed, to meet surface water appropriation limits and thermal discharge limits. The circulating water system operational modes include once-through circulation of river water, recirculation in a closed cycle with cooling towers, and variations of these two basic modes. Operations selects the optimal operating mode based on prevailing river flow, river temperature, and status of critical plant equipment. This ensures safe and efficient plant operation as well as compliance with state water use permits and the NPDES permit discharge limits.

MNGP's surface water appropriations permit authorizes the pumping of water from the Mississippi River at a rate varying up to 645 cfs for a maximum total annual appropriation of 467,000-acre feet. The conditions of the permit are as follows (NMC 2005):

- A maximum of 645 cfs may be appropriated for cooling in an "open cycle" or "once through" mode when river flows exceed 860 cfs and cooling of circulating water meets NPDES permit limits.
- A maximum of 645 cfs may be appropriated for a "helper" cycle mode of operation that utilizes cooling towers when river flow at the site exceeds 860 cfs and river temperatures approach permit limits.
- A "partial recirculation" mode of operation recirculates cooling tower water to the intake and the appropriated flow shall not exceed 75 percent of the river flow when the river flow is less than 860 cfs but greater than 240 cfs.
- A "closed cycle" mode of operation with appropriated flow not to exceed 75 percent of the river flow is authorized when the river flow is less than 240 cfs.
- At river flows less than 240 cfs, MNGP shall comply with special operating conditions which the commissioner of the MDNR may prescribe.

This water is returned to the Mississippi River, except for such waters as may be evaporated in the discharge canal and lost to evaporation and drift from operation of the cooling towers. To support the 13 percent power uprate implemented in 2010, Xcel Energy projected increased water consumption. Xcel Energy conservatively assumed a 20 percent increase in open cycle consumption evaporate losses and an increase in days of cooling tower operation to 150 days per year from 130 days per year (Xcel 2008). The increased evaporation from open cycle and cooling tower operation and the increased drift from more days of cooling tower operation resulted in an estimated consumption of 10.6 cfs (Xcel 2008). As a worst-case scenario, maximum consumption based on the permit limit would result in consumption of 12 cfs (Xcel 2008). Prior to the uprate, MNGP's consumption was estimated at 9.9 cfs under the lowest flow conditions (NMC 2005).

The NRC's environmental assessment of surface water consumption for the power uprate was that the increased volume of circulation water would continue to have an insignificant effect on the total consumptive use of surface water at MNGP (NRC 2010). This 2010 assessment considered the Mississippi River flow data provided for the initial license renewal. The Mississippi River is very seldom below the 860 cfs flow referred to in the permit. For the 1971–

2001 record, the maximum monthly average flow of 30,561 cfs occurred in April 2001, the lowest monthly average flow was 853 cfs in September 1976, and the lowest daily river flow was 586 cfs, also in September (NMC 2005, Section 4.2.1). Using the USGS flow gage at St. Cloud, Minnesota (this gage was the raw data source for the initial license renewal ER's flows following 1988) and without scaling for the MNGP site, the 2002–September 2020 record shows the maximum monthly average flow of 22,900 cfs occurred in June 2014, the lowest monthly average flow was 1,263 cfs in August 2006, and the lowest daily river flow was 909 cfs, also in August (USGS 2021e; USGS 2021f). In addition for 2021, as presented earlier in this section, the minimum daily flow at the upstream USGS gage occurring in August 2021 was 553 cfs. Given that minimal river flow statistics for the years since 2001 do not indicate that the 10.6 cfs consumption would represent a substantially greater impact on surface water availability, the NRC's previous assessment of no significant impact remains valid. MNGP is in compliance with both the surface water appropriations permit and the NPDES permit; future compliance with these water use permits, and regulations will ensure an insignificant (small) impact on surface water use. As stated in Section 3.6.3.1, MDNR issued 26 water appropriation permits limiting surface water withdrawals from this reach of the river. Therefore, MDNR appropriation permits for facilities near MNGP ensure a small impact on surface water use.

Xcel Energy finds that impacts to surface water use conflicts for the proposed SPEO are SMALL.

4.5.2 Groundwater Use Conflicts (Plants with Closed-Cycle Cooling Systems that Withdraw Makeup Water from a River)

4.5.2.1 Generic Analysis for Initial License [GEIS Section 4.5.1.2]

In the case of plants with cooling towers or cooling ponds that rely on a river for makeup of consumed (evaporated) cooling water, it is possible water withdrawals from the river could lead to groundwater use conflicts with other users. This situation could occur because of the interaction between groundwater and surface water, especially in the setting of an alluvial aquifer in a river valley. Consumptive use of the river water, if significant enough to lower the river's water level, would also influence water levels in the alluvial aquifer. Shallow wells of nearby groundwater users could therefore have reduced water availability or go dry. During times of drought, the effect would occur naturally, although withdrawals for makeup water would increase the effect.

For initial license renewals, the NRC codified its conclusion that water use conflicts could result from water withdrawals from rivers during low-flow conditions, which may affect aquifer recharge. The significance of impacts would depend on makeup water requirements, water availability, and competing water demands. The NRC found the impact for this issue to be SMALL, MODERATE, or LARGE.

4.5.2.2 Site-Specific Analysis for MNGP SLR

As part of the Site-Specific Analysis, Xcel Energy considered relevant new information on groundwater use conflicts for plants with closed-cycle cooling systems that withdraw makeup water from a river since initial license renewal. As presented in Section 2.2.3, MNGP utilizes a once-through cooling system and two MDCTs which are placed in a closed-cycle cooling system for condenser cooling purposes, as needed.

In Section 4.5.1.2, the effects of MNGP consumptive use on Mississippi River flows and river stage were discussed. At the lowest daily river flow of 586 cfs for the 1971–2001 record, MNGP would be allowed to withdraw up to 439.5 cfs of water and would be operating in the helper cycle mode. At the higher 2.25 percent evaporative loss rate during use of the cooling towers, a 439.5-cfs circulating water flow results in a 9.9-cfs consumptive use which would result in an estimated change in river surface elevation of 0.02 feet. Thus, even under worst-case low-flow conditions, the consumptive use of river water by MNGP has no significant impact on Mississippi River levels. (NMC 2005, Sec. 4.2.1) The minimal river flow statistics for the years since 2001 presented in Section 4.5.1.2 are similar to those of 1971–2001 and do not indicate a substantially different picture of flow near the MNGP site.

The Site-Specific Analysis for MNGP SLR demonstrates that even under worst-case low-flow conditions, the consumptive use of river water by MNGP would not be expected to have a significant impact on groundwater availability potentially leading to groundwater use conflicts.

Xcel Energy finds that impacts to groundwater use conflicts (plants with closed-cycle cooling systems that withdraw makeup water from a river) for the proposed SPEO are SMALL.

4.5.3 Groundwater Use Conflicts (Plants that Withdraw Less than 100 GPM)

4.5.3.1 Generic Analysis for Initial License Renewals [GEIS Section 4.5.1.2]

Water wells are used by nuclear power plants for their potable water system, landscape watering, and at some plants, groundwater is the source for the makeup and service water systems. The pumping of groundwater creates a cone of depression in the potentiometric surface around the pumping well. The amount the water table or potentiometric surface declines and the overall extent of the cone depend on the pumping rate, characteristics of the aquifer (e.g., its permeability), whether the aquifer is confined or unconfined, and certain boundary conditions (including the nearby presence of a hydrologically connected surface water body). Generally, plants with a peak withdrawal rate of less than 100 gpm do not have a significant cone of depression. Their potential for causing conflict with other groundwater users would depend largely on the proximity of the other wells.

For initial license renewals, the NRC codified its conclusion that plants that withdraw less than 100 gpm are not expected to cause any groundwater use conflicts. The NRC found the impact for this issue to be SMALL.

4.5.3.2 Site-Specific Analysis for MNGP SLR

As part of the Site-Specific Analysis, Xcel Energy considered relevant new information on groundwater use conflicts (for plants that withdraw less than 100 gpm) since initial license renewal. Groundwater supplies MNGP domestic water system and groundwater withdrawals are well under the 100-gpm threshold considered by NRC as not contributing to groundwater use conflicts. Groundwater withdrawals at two of the groundwater wells are limited by water appropriations permit No. 67-0083 to 200 gpm with an annual limit of 20 million gallons (approximately 38 gpm). As stated in Section 3.6.3.2, each water supply well is equipped with a 100-gpm maximum capacity pump. Actual usage averaged less than 11.5 million gallons per year from 2016 to 2021 (Section 3.6.3.2). As discussed in Section 3.6.3.2, other groundwater wells are used as needed and their withdrawals are not required to be permitted under a MDNR water appropriation permit. The closest well to the MNGP property is 0.6 miles from the MNGP center point and is listed as a domestic water well.

In the GEIS, NRC acknowledges that cones of depression usually do not extend past the property boundary, reducing the possibility of a groundwater use conflict (NRC 2013a). NRC determined that the impact on groundwater use conflicts from continued operations during the license renewal term for all nuclear plants that withdraw less than 100 gpm would be SMALL. As stated in Section 3.6.3.2, the MNGP pump configuration cannnot withdraw groundwater at a rate greater than 100 gpm. Xcel Energy anticipates that groundwater withdrawals will remain less than 100 gpm during the proposed SPEO because no operational changes are proposed.

Xcel Energy finds that impacts of groundwater use (withdrawals less than 100 gpm) to other groundwater users for the proposed SPEO are SMALL.

4.5.4 Radionuclides Released to Groundwater

4.5.4.1 Generic Analysis for Initial License Renewals [GEIS Section 4.5.1.2]

The issue is relevant to license renewal because all commercial nuclear power plants routinely release radioactive gaseous and liquid materials into the environment. These radioactive releases are designed to be planned, monitored, documented, and released into the environment at designated discharge points. But over the years, there have been numerous events at nuclear power reactor sites which involved unknown, uncontrolled, and unmonitored releases of liquids containing radioactive material into the groundwater.

The majority of the inadvertent liquid release events involved tritium, which is a radioactive isotope of hydrogen. However, other radioactive isotopes, such as cesium and strontium, have also been inadvertently released into the groundwater. The types of events include leakage from spent fuel pools, buried piping, and failed pressure relief valves on an effluent discharge line.

In 2006, the NRC's executive director for operations chartered a task force to conduct a lessons learned review of these incidents. On September 1, 2006, the task force issued its report: Liquid Radioactive Release Lessons Learned Task Force Report.

The most significant conclusion dealt with the potential health impacts on the public from the inadvertent releases. Although there were numerous events during which radioactive liquid was released to the groundwater in an unplanned, uncontrolled, and unmonitored fashion, based on the data available, the task force did not identify any instances where public health and safety were adversely impacted.

On the basis of the information and experience with these leaks, the NRC concludes that the impact to groundwater quality from the release of radionuclides could be SMALL or MODERATE, depending on the magnitude of the leak, the radionuclides involved, hydrogeologic factors, the distance to receptors, and the response time of plant personnel in identifying and stopping the leak in a timely fashion.

For initial license renewals, the NRC codified its conclusion that leaks of radioactive liquids from plant components and pipes have occurred at numerous plants. GWPPs have been established at all operating nuclear power plants to minimize the potential impact from any inadvertent releases. The magnitude of impacts would depend on site-specific characteristics. The NRC found the impact for this issue to be SMALL to MODERATE.

4.5.4.2 Site-Specific Analysis for MNGP SLR

As part of the Site-Specific Analysis, Xcel Energy considered relevant new information on radionuclides released to groundwater since initial license renewal. A description of the MNGP GWPP is presented in Section 3.6.2.4. Table 3.6-2 presents well construction details for the MNGP groundwater monitoring wells, while Figure 3.6-6 shows the location of the wells. Table 3.6-6 presents information on 129 registered water supply wells located within a 2-mile radius from the MNGP center point, while Figure 3.6-9 shows the location of these offsite wells.

As discussed in Section 3.6.4.2, the extent of tritium in groundwater is confined to the MNGP site. As presented in Section 3.6.4.2.1, since at least 2009, tritium has been measured in the groundwater at MNGP. Tritium detections for groundwater samples, collected in 2016–2020, ranged from non-detect to 8,220 pCi/L (Well 9A in 2021) far below the drinking water limit of 20,000 pCi/L limit. As discussed in Section 3.6.4.2, corrective actions were taken in 2011 to prevent future releases from this source. In addition, no gamma-emitting isotopes or hard-to-detect radionuclides were detected in groundwater samples.

Xcel Energy finds that impacts of radionuclides released to groundwater for the proposed SPEO are SMALL.

4.5.5 Surface Water Use and Quality (Non-Cooling System Impacts)

4.5.5.1 Generic Analysis for Initial License Renewals [GEIS Section 4.5.1.1]

Surface Water Use

The NRC considered water use during refurbishment activities for concrete production, dust control, washing stations, facility and equipment cleaning, and soil compaction and excavation backfilling. Surface water consumption for non-cooling water-related operational activities is limited to such uses as facility and equipment cleaning. The use of public domestic water would reduce the direct consumptive use impacts on surface water resources. The impacts due to the volume of water consumed from a surface water source would be insignificant when compared with that used and consumed by a plant's cooling system. No surface use conflicts would be expected.

Surface Water Quality

The NRC considered the potential impacts of land disturbing activities, industrial wastewater, stormwater, residual chlorine due to domestic water runoff, and inadvertent spills resulting from nuclear plants' operations on surface water quality in its GEIS for license renewal. The NRC considered the mitigation measures of NPDES permits, SWPPPs, BMPs, and pollution control structures such as detention and infiltration basins. The NRC concluded that nuclear power plants' operation under NPDES permits and the implementation of BMPs would mitigate surface water quality impacts from non-cooling systems to be SMALL.

For initial license renewals, the NRC codified its conclusion that impacts are expected to be SMALL if BMPs are employed to control soil erosion and spills. Surface water use associated with continued operations and refurbishment associated with license renewal would not increase significantly or would be reduced if refurbishment occurs during a plant outage.

4.5.5.2 Site-Specific Analysis for MNGP SLR

As part of the Site-Specific Analysis, Xcel Energy considered relevant new information on surface water use and quality (non-cooling system impacts) since initial license renewal.

Surface Water Use

Surface water used at MNGP is withdrawn from the Mississippi River and governed by water appropriation limits in water appropriations permit No. 66-1172. MNGP may withdraw a maximum of 645 cfs [approximately 290,000 gpm] of water from the Mississippi River. Special operating conditions are applicable if the river flow at MNGP is less than 860 cfs, and further restrictions apply if river flow is less than 240 cfs. While the Mississippi River withdrawals are primarily used for condenser cooling, a small portion of the withdrawal is used for service water cooling, screen wash, and fire protection. (Section 3.6.3.1).

Surface Water Quality

Non-cooling water discharges at MNGP are discharged via the four NPDES-permitted internal outfalls (SD003, SD004, SD005, and SD006) to the Mississippi River. (Attachment A) These permitted outfalls have limits for constituents of concern such as oil and grease, total suspended solids, and monitoring requirements (Section 3.6.1.2.1, Table 3.6-1). The NPDES permit for MNGP requires MNGP to comply with these and other measures to protect surface water and groundwater from non-cooling water. Future NPDES permits would be at least as stringent in their requirements.

Surface water could also be impacted by infiltration of pollutants in stormwater and spills of oil and hazardous materials. As discussed in Section 3.6.1.2.2, stormwater discharges associated with MNGP industrial activities are regulated and controlled through the NPDES

Permit. Xcel Energy also maintains and implements an SWPPP that identifies potential sources of pollution, such as erosion, that would reasonably be expected to affect the quality of stormwater and identifies BMPs that will be used to prevent or reduce the pollutants in stormwater discharges. MNGP documents in an annual report all stormwater management issues, and corrective measures taken throughout the reporting period. As presented in Section 9.5.3.5, MNGP maintains an SPCC plan that identifies and describes the procedures, materials, equipment, and facilities that are utilized at the station to minimize the frequency and severity of oil spills. In addition, MNGP has a hazardous substance spill contingency plan and a chemical control program.

MNGP has not proposed any refurbishment activities related to SLR (Section 2.3). Land disturbance for continued operations at MNGP would be related to routine infrastructure maintenance and renovation activities to maintain and upgrade or replace infrastructure and structures as needed to support MNGP operations. MNGP's Excavation & Trenching Controls procedure addresses construction and maintenance activities that would involve ground disturbance of 6 inches or more. Such ground-disturbing activities would be required to follow MNGP excavation permit procedure and could also trigger an environmental review to determine any impacts. For MNGP activities that could require a construction stormwater permit, MNGP would obtain the required permit and comply with the stormwater management and BMPs requirements.

Xcel Energy finds that impacts to surface water use and quality (non-cooling systems impacts) for the proposed SPEO are SMALL.

4.5.6 Altered Current Patterns at Intake and Discharge Structures

4.5.6.1 Generic Analysis for Initial License Renewals [GEIS Section 4.5.1.1]

The large flow rates associated with cooling system water use have the potential to alter current patterns. The degree of influence depends on the design and location of the intake and discharge structures and the characteristics of the surface water body. The size of large rivers, lakes, or reservoirs precludes significant current alterations, except in the vicinity of the structures. The effect on currents near the intake and discharge locations is expected to be localized, and any problems would have been mitigated during the early operational period of a plant. Impacts from altered current patterns at intake and discharge structures during the license renewal term were considered to be SMALL for all plants.

For initial license renewals, the NRC codified its conclusion that altered current patterns would be limited to the area in the vicinity of the intake and discharge structures. These impacts have been small at operating nuclear power plants. The NRC found the impact for this issue to be SMALL.

4.5.6.2 Site-Specific Analysis for MNGP SLR

As part of the Site-Specific Analysis, Xcel Energy considered relevant new information on altered current patterns at intake and discharge structures since initial license renewal. There are no modifications associated with the proposed action that would alter the existing current pattern; therefore, existing current patterns are expected to continue during the proposed SPEO.

Xcel Energy finds that impacts to altered current patterns at intake and discharge structures for the proposed SPEO are SMALL.

4.5.7 Scouring Caused by Discharged Cooling Water

4.5.7.1 Generic Analysis for Initial License Renewals [GEIS Section 4.5.1.1]

The high flow rate of water from a cooling system discharge structure has the potential to scour sediments and redeposit them elsewhere. While scouring is possible during reactor startup, operational periods would typically have negligible scouring. Scouring is expected to occur only in the vicinity of the discharge structure where flow rates are high. Scouring has been observed at only three nuclear power plants and the effects were localized and minor. The NRC reviewed the impacts of scouring caused by discharged cooling water and found the impacts during the license renewal term would be SMALL for all plants.

For initial license renewals, the NRC codified its conclusion that scouring effects would be limited to the area in the vicinity of the intake and discharge structures. These impacts have been SMALL at operating nuclear power plants.

4.5.7.2 Site-Specific Analysis for MNGP SLR

As part of the Site-Specific Analysis, Xcel Energy considered relevant new information on scouring caused by discharged cooling water since initial license renewal. The discharge canal is separated from the Mississippi River by a discharge weir. The discharge weir consists of an earth-filled dike and a vertical sheet-pile overflow section. The crest level of the 54-foot-wide weir structure is at 910 feet msl. The water elevation in the discharge canal is at 912.5 feet msl; therefore, the height of the overflow is 2.5 feet. When the water is at this level, the overflow section discharges at a rate of 645 cfs to the river. To prevent scouring below the discharge, a 20-foot-long concrete apron was built on the downstream side of the sheet pile wall, and a 50-foot-long rip-rap apron was built downstream of the concrete apron. (Section 2.2.3.1)

There are no plant operations or modifications planned for the proposed SPEO that would alter discharge patterns and flow rates. (Section 2.2)

Xcel Energy finds that impacts to scouring caused by discharged cooling water for the proposed SPEO are SMALL.

4.5.8 Discharge of Metals in Cooling System Effluent

4.5.8.1 Generic Analysis for Initial License Renewals [GEIS Section 4.5.1.1]

Heavy metals such as copper, zinc, and chromium can be leached from condenser tubing and other components of the heat exchange system by circulating cooling water. These metals are normally addressed in NPDES permits because high concentrations of them can be toxic to aquatic organisms. During normal operations, concentrations are normally below laboratory detection levels. However, plants occasionally undergo planned outages for refueling with stagnant water remaining in the heat exchange system. Impacts from the discharge of metals in cooling system effluent during the license renewal term would be SMALL for all plants.

For initial license renewals, the NRC codified its conclusion that discharges of metals have not been found to be a problem at operating nuclear power plants with cooling tower-based heat dissipation systems and have been satisfactorily mitigated at other plants. Discharges are monitored and controlled as part of the NPDES permit process. The NRC found the impact for this issue to be SMALL.

4.5.8.2 Site-Specific Analysis for MNGP SLR

As part of the Site-Specific Analysis, Xcel Energy considered relevant new information on discharge of metals in cooling system effluent since initial license renewal. Condenser tubes are stainless steel at MNGP and would not contribute leached metals to the cooling water discharge.

Xcel Energy finds that impacts of discharge of metals in cooling system effluent for the proposed SPEO are SMALL.

4.5.9 Discharge of Biocides, Sanitary Wastes, and Minor Chemical Spills

4.5.9.1 Generic Analysis for Initial License Renewals [GEIS Section 4.5.1.1]

In the 2013 license renewal GEIS, the NRC reviewed the discharge of biocides, sanitary wastes, and minor chemical spills. The use of biocides is common and is required to control biofouling and nuisance organisms in plant cooling systems. However, the types of chemicals, their amounts or concentrations, and the frequency of their use may vary. Ultimately, any biocides used in the cooling system are discharged to surface water bodies. The discharge of treated sanitary waste also occurs at plants. Discharge may occur via onsite wastewater treatment facilities, via an onsite septic field, or through a connection to a municipal sewage system. Minor chemical spills collected in floor drains are associated with industry in general and are a possibility at all plants. Each of these factors represents a potential impact on surface water quality. The NRC considered the potential impacts of these factors resulting from nuclear plant operations of surface water quality in its GEIS for license renewal. The NRC concluded that nuclear power plant operation under NPDES permits would mitigate impacts from biocides, sanitary wastes, and minor chemical spills to SMALL significance.

For initial license renewals, the NRC codified its conclusion that the effects of these discharges are regulated by federal and state environmental agencies and found the impact for this issue to be SMALL. Discharges are monitored and controlled as part of the NPDES permit process. These impacts have been SMALL at operating nuclear power plants.

4.5.9.2 Site-Specific Analysis for MNGP SLR

As part of the Site-Specific Analysis, Xcel Energy considered relevant new information on the discharge of biocides, sanitary wastes and minor chemical spills since initial license renewal. The plant's NPDES permit governs water treatment chemicals and biocides use (Section 3.6.1). The NPDES permit establishes limits for chloride and bromine concentrations at internal outfalls for condenser cooling water, service water, and the discharge canal. Biocide and scale control chemicals are utilized in accordance with all use and discharge requirements, including provisions of the NPDES permit issued to the MNGP site, as well as provisions established in plant-specific requests approved by the MPCA under the NPDES permit. Compliance with NPDES permit limits for discharge of these biocides and associated residuals is ensured through controlled application protocols and monitoring. The MPCA has reviewed and approved of these chemical additives, which are on file at the facility. New chemical additives or changes in dosages of chemicals additives must be approved by the MPCA in accordance with the permit. (Section 3.6.1.2.1)

As presented in ER Section 3.6.1.2.3, site sanitary wastewater is discharged to the City of Monticello sanitary sewage disposal system.

Surface water could also be impacted by infiltration of pollutants in stormwater and spills of oil and hazardous materials. As mentioned previously in Section 4.5.5, MNGP has a SWPPP, an SPCC plan, a hazardous substance spill contingency plan, and a chemical control program. There were no reportable spills associated with MNGP during the period from August 2019–March 2022.

MNGP has a comprehensive environmental protection program for the non-radiological hazards of plant operations guided by compliance with state, district, and local environmental permits and requirements. The comprehensive regulatory controls and permits in place and MNGP's compliance with them, guided by their internal procedures, would mitigate impacts to surface waters from MNGP's continued operations during the proposed SPEO.

MNGP operates the cooling system under NPDES/Industrial Wastewater Permit No. MN00000868. The permit includes specific biocides and chemicals allowed to be used and requires any changes to be addressed by a change in the permit. Discharges are monitored and constituents are controlled in compliance with the permit.

Xcel Energy finds that impacts of discharge of biocides, sanitary wastes, and minor chemical spills for the proposed SPEO are SMALL.

4.5.10 Surface Water Use Conflicts (Plants with Once-Through Cooling Systems)

4.5.10.1 Generic Analysis for Initial License Renewals [GEIS Section 4.5.1.1]

Nuclear power plant cooling systems may compete with other users relying on surface water resources, including downstream municipal, agricultural, or industrial users. Once-through and closed-cycle cooling systems have different water consumption rates. Once-through cooling systems return most of their withdrawn water to the same surface water body, with evaporative losses of less than 3 percent. Consumptive use by plants with once-through cooling systems during the license renewal term is not expected to change unless power uprates, with associated increases in water use, are proposed. Such uprates would require an environmental assessment by the NRC. The NRC considered that future water availability could be impacted by climate change and drought. Because future agricultural, municipal, and industrial users would continue to share their demands for surface water with power plants, conflicts might arise if the availability of this resource decreased. This situation would then necessitate decisions by local, state, and regional water planning officials. The NRC concluded that the impact on water use conflicts from the continued operation and refurbishment activities would be SMALL for plants that utilize once-through cooling.

For initial license renewals, the NRC codified its conclusion that these conflicts have not been found to be a problem at operating nuclear power plants with once-through heat dissipation systems. The NRC found the impact for this issue to be SMALL.

4.5.10.2 Site-Specific Analysis for MNGP SLR

As part of the Site-Specific Analysis, Xcel Energy considered relevant new information on surface water use conflicts for plants with once-through cooling systems since initial license renewal. MNGP operates primarily with once-through cooling. Section 4.5.1.2 analyzes the surface water use conflict issue considering MNGP use of the once-through cooling and cooling tower use in compliance with its NPDES and water appropriation permits. The analysis considered compliance with these permits, the power uprate's water consumption estimate, and recent Mississippi River flow data, concluding that surface water use is a small impact. MNGP returns the majority of the surface water withdrawals to the Mississippi River. As discussed in Section 4.5.1.2, the cooling towers are used as needed, approximately 150 days per year. It was determined that cooling tower use has an insignificant effect on the total consumptive use of surface water at MNGP. Compliance with current and future NPDES regulatory requirements and water appropriation permits will ensure the impact on water use conflicts from the continued operation continues to be limited to a SMALL impact. These findings are consistent with the GEIS findings and confirms that the NRC's generic assessment for this issue is valid for MNGP.

Xcel Energy finds that impacts of surface water use conflicts for plants with once-through cooling systems for the proposed SPEO are SMALL.

4.5.11 Effects of Dredging on Surface Water Quality

4.5.11.1 Generic Analysis for Initial License Renewals [GEIS Section 4.5.1.1]

Dredging activities and the discharge of dredged and/or fill material have the potential to impact surface water quality. Nuclear power plants conduct maintenance dredging to remove accumulated sediments in the vicinity of water intakes, canals, and discharge structures, and to maintain barge shipping lanes. The issue does not concern maintenance dredging of onsite cooling ponds and onsite disposal of dredged material (e.g., mud). In the 2013 license renewal GEIS, the NRC reviewed the potential impacts to surface water quality from dredging operations to support nuclear power plant operations and found the issue to have SMALL impacts to all plants. In general, the NRC found maintenance dredging affects localized areas for a brief period of time. The NRC also recognized that dredging operations are performed under permits issued by the USACE and possibly state or local agencies.

For initial license renewals, the NRC codified its conclusion that dredging to remove accumulated sediments in the vicinity of intake and discharge structures and to maintain barge shipping has not been found to be a problem for surface water quality. Dredging is performed under permit from the USACE and possibly from other state or local agencies. The NRC found the impact for this issue to be SMALL.

4.5.11.2 Site-Specific Analysis for MNGP SLR

As part of the Site-Specific Analysis, Xcel Energy considered relevant new information on the effects of dredging on surface water quality since initial license renewal. MNGP conducts maintenance dredging in the Mississippi River. This dredging has been permitted in conjunction with both the MDNR and USACE and is conducted under a USACE permit. USACE authorized the 2022 dredging activity under Nationwide Permit No. 3 which has been extended until March 18, 2023.

MNGP's dredging operations are conducted in compliance with regulatory and permitting requirements.

Xcel Energy finds that the impacts from the effects of dredging on surface water quality for the proposed SPEO are SMALL.

4.5.12 Temperature Effects on Sediment Transport Capacity

4.5.12.1 Generic Analysis for Initial License Renewals [GEIS Section 4.5.1.1]

The GEIS discusses this issue by stating: "Increased temperature and the resulting decreased viscosity have been hypothesized to change the sediment transport capacity of water, leading to potential sedimentation problems, altered turbidity of rivers, and changes in riverbed configuration." The NRC's review indicated that there is no evidence that temperature effects on sediment transport capacity have caused adverse environmental effects at any existing nuclear power plant and acknowledged that regulatory agencies have expressed no concerns regarding the impacts of temperature on sediment transport capacity. Furthermore, because of the small area near a nuclear power plant affected by increased water temperature, it is not expected that plant operations would have a significant impact. Effects are considered to be of SMALL significance for all plants. No change in the operation of the cooling system is expected during the license renewal term so no change in effects on sediment transport capacity is anticipated.

For initial license renewals, the NRC codified its conclusion that these effects have not been found to be a problem at operating nuclear power plants and are not expected to be a problem. The NRC found the impact for this issue to be SMALL.

4.5.12.2 Site-Specific Analysis for MNGP SLR

As part of the Site-Specific Analysis, Xcel Energy considered relevant new information on the temperature effects of sediment transport capacity since initial license renewal. As discussed in Section 4.5.7.2, the MNGP discharge is over a 54-foot discharge weir onto a 20-foot-long concrete apron with a downstream 50-foot-long rip-rap apron. Discharges are governed by MNGP's NPDES permit which established temperature discharge limits (Table 3.6-1). Thermal studies conducted for the EPU indicates rapid mixing, sharply decreasing the temperature differential between receiving waters, and ambient temperature river water. There have been no NOVs related to the NPDES permit in the past 6 years. Rapid mixing would minimize the potential for the heated water to influence the physical properties of the receiving waters and as "hypothesized to change the sediment transport capacity of water, leading to potential sedimentation problems."

There are no plant operations or modifications planned for the proposed SPEO that would alter discharge patterns (Section 2.2).

The GEIS determined continued operation during a license renewal term to have a small impact on sediment transport.

Xcel Energy finds that impacts from temperature effects on sediment transport capacity for the proposed SPEO are SMALL.

4.5.13 Groundwater Contamination and Use (Non-Cooling System Impacts)

4.5.13.1 Generic Analysis for Initial License Renewals [GEIS Section 4.5.1.2]

Among common groundwater uses are extraction or draining of groundwater for dewatering purposes and groundwater extraction for contaminant plume control. Contamination of groundwater and soil can result from leaks or spills of solvents, diesel fuel, gasoline, and other industrial chemicals; heavy metals deposited to soils from industrial activities; leaching of contaminants from wastewater ponds or lagoons; and other sources. The NRC considered the issue in light of the programs and procedures commonly implemented at nuclear plants, including proper chemical and waste storage and handling; secondary containment and leak detection; use of BMPs and SPCC plans; compliance with federal and state regulations and permits; and groundwater monitoring programs. The NRC concluded that implementation of such programs and procedures would serve to mitigate any effects to groundwater use or quality to those of a SMALL impact.

For initial license renewals, the NRC codified its conclusion that extensive dewatering is not anticipated from continued operations and refurbishment associated with license renewal. Contamination is subject to state or EPA-regulated cleanup and monitoring programs. The application of BMPs for handling any materials produced or used during these activities would reduce impacts. The NRC found the impact for this issue to be SMALL.

4.5.13.2 Site-Specific Analysis for MNGP SLR

As part of the Site-Specific Analysis, Xcel Energy considered relevant new information on groundwater contamination and use (non-cooling system impacts) since initial license renewal. As presented in Section 3.6.3.2, there are onsite water supply wells at MNGP; however, this issue does not address pumping from production wells, which is addressed by the issues concerning a pumping threshold of 100 gpm (Section 4.5.14). Also, there are no current dewatering activities occurring at the site. There are no recovery wells for nonradioactive contaminants in use at MNGP.

As discussed in Section 3.6.4, Xcel Energy implemented a GWPP in 2008. As part of this program, MNGP monitors 19 wells (including 15 water table wells and four deeper monitoring wells which are nested with a corresponding water table well). No gamma or difficult-to-detect radionuclides, other than naturally occurring radionuclides, were identified in well samples between 2016–2021.

Section 3.6.4.2.2 presents the nonradioactive releases for years 2016–2021. Carbon tetrachloride was detected at MNGP drinking water supply Well 10 during routine sampling. The source of this contaminant is unknown. Past spills or releases could not explain the presence of carbon tetrachloride at Well 10 and carbon tetrachloride is not currently being used or held in inventory at MNGP. MPCA determined that given the hydrogeologic setting and limited extent of contamination, it was unlikely that additional receptors are at risk of exposure and ordered abandonment of the well with no remediation. Well 10 was sealed at the end of 2020.

MNGP has an onsite holdup pond (also called retention pond) that is covered to prevent exposure to the elements and a discharge canal. The wastewaters received by both are governed by the MNGP NPDES permit. The holdup pond receives reverse osmosis system wastewater, building drain waters, heating boiler blowdown, diesel generator cooling water, filter backwashes, and occasional fire protection waters. After meeting permit discharge limitations, the holdup pond discharge, SD003, is routed to the discharge canal. The holdup pond and discharge pond would receive wastewaters that have chemical additives that are used in various systems at the plant including boiler feedwaters, cooling water treatment, and other miscellaneous uses. The MPCA has reviewed and approved of these chemical additives and new chemical additives or changes in dosages of chemicals additives must be approved by the MPCA in accordance with the permit. (Section 3.6.1.2.1)

As discussed in Section 4.4.1.2, MNGP has controls in place for projects that involve ground disturbance, stormwater controls in place to reduce the potential for stormwater run-off to contaminate soils and groundwater, a SWPPP to prevent the introduction of pollutants to the stormwater and collection in the MNGP stormwater basins, and procedures in place to minimize the potential for spills.

The GEIS determined continued operation of a nuclear plant in a license renewal term to have a small impact to groundwater use and quality due to non-cooling water systems based on programs and procedures commonly implemented at nuclear plants, such as chemical storage and SPCC plans. The information reviewed indicated that Xcel Energy has programs and procedures in place to minimize the potential for groundwater contamination and would maintain/secure required permits for basins and spoils areas. Compliance with current and future water withdrawal permits, NPDES permits, stormwater regulatory requirements, and implementation of the SWPPP, BMPs, and the SPCC plan will ensure insignificant (i.e., SMALL) impacts on groundwater use and quality from non-cooling systems during the proposed SPEO. In addition, as described in Section 4.5.5.2, water from plant uses would continue to be processed and monitored in compliance with licensing and permitting requirements to protect groundwater resources from radioactive exposure pathways.

Xcel Energy finds that impacts from groundwater contamination and use (non-cooling system) for the proposed SPEO are SMALL.

4.5.14 Groundwater Quality Degradation Resulting from Water Withdrawals

4.5.14.1 Generic Analysis for Initial License Renewals [GEIS Section 4.5.1.2]

In the 2013 license renewal GEIS, the NRC reviewed groundwater drawdown due to water withdrawals, which can draw water into the aquifer. If the water is of lower quality, this poses the possibility of groundwater degradation. Further, wells in a coastal setting (e.g., ocean shore or estuary) have the potential to cause saltwater intrusion into the aquifer. The degree of saltwater intrusion depends on the cumulative pumping rates of wells, their screen depths, and hydrogeologic conditions.

The NRC recognized that nuclear power plants are not the large-volume groundwater users that would be a leading driver for saltwater intrusion in the plant's locale. The NRC concluded that groundwater withdrawals by nuclear power plants would have a SMALL impact on groundwater quality.

For initial license renewals, the NRC codified its conclusion that groundwater withdrawals at operating nuclear power plants would not contribute significantly to groundwater quality degradation. The NRC found the impact for this issue to be SMALL.

4.5.14.2 Site-Specific Analysis for MNGP SLR

As part of the Site-Specific Analysis, Xcel Energy considered relevant new information on groundwater quality degradation resulting from water withdrawals since initial license renewal. As discussed in Section 3.6.2.1 and 3.6.2.3, the regional water table lies approximately 25–40 feet below the surface within the fill, terrace deposits, glacial outwash, and/or glacial till. Groundwater movement is generally from upland areas toward the Mississippi River. In the site vicinity, the general direction of deep groundwater flow is to the southeast. Over most of the site, and in the vicinity of the MNGP buildings, the water table occurs at depths of approximately 10–40 feet below ground surface within the sandy terrace or outwash deposits. On the western side of MNGP, near the river, the water table appears to occur in the lower permeability glacial till deposits. The onsite water supply wells have been developed in the surficial outwash deposits, buried outwash deposits, and in the deeper sandstone formations above the granitic bedrock.

Contour maps of the shallow groundwater, based on water level data collected in June 2020 and December 2020 as part of MNGP's participation in the NEI's GPI program, are provided as Figure 3.6-7 and Figure 3.6-8, respectively. Groundwater generally flows north across the MNGP site to the Mississippi River, regardless of the current and anticipated future groundwater withdrawal rates. No evidence of pumping-related groundwater flow reversals was indicated; therefore, groundwater quality degradation due to groundwater withdrawals is considered to be small at the current pumping rates. As stated in Section 4.5.3.2, Xcel Energy does not anticipate that groundwater withdrawal increases above the reported quantities will be required during the proposed SPEO.

Groundwater withdrawals at two of the groundwater wells are limited by amended water appropriations permit No. 67-0083 to an annual limit of 20 million gallons (approximately 38 gpm). Actual usage averaged less than 11.5 million gallons per year from 2016–2021. Other groundwater wells are used as needed and their withdrawals are not required to be permitted under an MPCA water appropriation permit. Groundwater withdrawals are far under the 100 gpm that the NRC considered as a threshold to the potential significant cone of depression (Section 4.5.3.2), minimizing the potential for drawing in water of a lower quality. In addition, MNGP is not located near saltwater bodies, eliminating saltwater intrusion as a concern regarding this issue.

Compliance with current and future groundwater use regulatory requirements and permit conditions would ensure that groundwater quality would not be degraded due to groundwater withdrawals.

Xcel Energy finds that impacts from groundwater quality degradation resulting from water withdrawals for the proposed SPEO are SMALL.

4.6 Ecological Resources

Site-specific assessments for ecological resources issues are discussed below.

4.6.1 Impingement and Entrainment of Aquatic Organisms (Plants with Once-Through Cooling Systems or Cooling Ponds)

4.6.1.1 Generic Analysis for Initial License Renewals [GEIS Section 4.6.1.2]

Impingement occurs when organisms are held against the intake screen or netting placed within intake canals. Most impingement involves fish and shellfish. At some nuclear power plants, other vertebrate species may also be impinged on the traveling screens or on intake netting placed within intake canals.

Entrainment occurs when organisms pass through the intake screens and travel through the condenser cooling system. Aquatic organisms typically entrained include ichthyoplankton (fish eggs and larvae), larval stages of shellfish and other macroinvertebrates, zooplankton, and phytoplankton. Juveniles and adults of some species may also be entrained if they are small enough to pass through the intake screen openings, which are commonly 0.38 inches (1 cm) at the widest point.

The magnitude of the impact would depend on plant-specific characteristics of the cooling system (including location, intake velocities, screening technologies, and withdrawal rates) and characteristics of the aquatic resource (including population distribution, status, management objectives, and life history).

For initial license renewals, the NRC codified its conclusion that the impacts of impingement and entrainment are small at many plants but may be moderate or even large at a few plants with once-through and cooling-pond cooling systems, depending on cooling system withdrawal rates and volumes and the aquatic resources at the site. The NRC found the impact for this issue to be SMALL, MODERATE, or LARGE.

4.6.1.2 Site-Specific Analysis for MNGP SLR

As part of the Site-Specific Analysis, Xcel Energy considered relevant new information on impingement and entrainment of aquatic organisms for plants with once-through cooling systems or cooling ponds since initial license renewal. Impacts associated with the draft cooling towers are evaluated in subsequent sections, where applicable. Cooling water is withdrawn from the Mississippi River. The MNGP CWIS consists of a small forebay, trash racks and traveling water screens. The forebay is constructed of sheet pile walls extending back from the shoreline. The mouth of the forebay is 98 feet wide. A floating trash boom spans the intake to prevent large debris from entering. A de-icing line is also located at the mouth of the forebay. The structure narrows to 62 feet wide about 16 feet upstream of the screenhouse. The invert of the forebay is dredged down to elevation 896 feet (based on plant datum).

The screenhouse is divided into two halves each with two screen bays. At the face of the screenhouse there is a curtain wall that drops down to elevation 904 feet, providing a 9.1-foot opening. Trash racks are located flush with the curtain wall. The trash racks are 3/8-inch x 3-inch steel bars at 3 inches center-to-center spacing. The trash racks extend down to the invert of the screenhouse (elevation 893.9 feet). A trash rake is used to clean the trash racks. Debris removed from the racks is disposed of.

Four traveling water screens are housed in the screenhouse. These screens are located about 20 feet downstream from the top of the trash racks. The screens are 10 feet wide and have 3/8-inch square mesh. A 6-inch-wide horizontal lip is located in the center of each screen basket to aid in debris collection and removal. The invert of the traveling water screens is at elevation 889 feet. The screens are rotated continuously when the water temperature is greater than 50°F. When the water temperature drops below 50°F, the screens are operated based on the differential pressure across the screens. Fish and debris are removed from the screens by a high-pressure front spray wash and are flushed into a trough that flows back into the river downstream of the CWIS. The flow in the trough can be diverted into a sump to allow for impingement sampling.

In accordance with the statutory guidelines set forth in the NPDES permit issued to Xcel Energy for MNGP, and to maintain compliance under Section 316(b) of the CWA, periodic monitoring of entrainment and impingement of fish and aquatic species is conducted to verify that MNGP is utilizing the BTA to reduce entrainment and impingement. The current NPDES permit was issued in October 2007 and modified in June 2009 (Attachment A).

Entrainment monitoring took place at MNGP during three time periods: 1978, 2006, and 2017–2018. Impingement studies were conducted in 1972–1975 and 2006. The 1978 entrainment and 1972–1975 impingement studies are summarized in the 2006 GEIS for MNGP (NRC 2006b). The 2006 impingement and entrainment study and 2017–2018 entrainment study results are detailed in Section 3.7.7.

During the year-long weekly impingement sampling program from August 2005 to July 2006, a total of 31 species were collected at MNGP. Additionally, three shellfish taxa were encountered in impingement samples. Of the 767 fish collected in samples, the dominant species were bluegill, channel catfish, and black crappie. These accounted for 28, 21, and 19 percent of the total catch, respectively. Of the fish found in impingement samples from 2005 to 2006, an average of 63 percent were alive upon collection. The highest levels of mortality were in August (64 percent dead), September (46 percent) and October (55 percent) of 2005. In most other months, less than 30 percent of the sample consisted of dead fish. This high rate of survival seems most attributable to two factors. First, the traveling screens are operated continuously when river temperatures exceed 50 degrees, so fish are not held against the screen for extended periods. Additionally, the absence of gizzard shad from the community removes a species that is particularly vulnerable to impingement mortality. Most of the species in the resident assemblage near MNGP are more robust than gizzard shad. A total of 109 shellfish was collected. Crayfish comprised the majority of this total (98 percent), with unionid mussels and Asiatic clams also encountered. Total annual impingement was estimated to be approximately 17,000 fish and 2,000 shellfish.

The total annual entrainment from April through September based on the 2006 entrainment was estimated to be approximately 5,702,590 larvae and eggs. Entrainment during the 2006 survey period was lower than, but comparable to, that reported in 1976, when an estimated 10 million fish and eggs were entrained between early April and late August. Mississippi River flow in the vicinity was extremely low in 1976 compared to historic means. In 2006, river flow was approximately normal in April and May, but below normal in June, July, and August. It is likely that these trends accounted for at least some of the difference in larval flow between 1976 and 2006, as annual ichthyoplankton densities are typically greater in low flow years. The 2005–2006 study concluded that the overall impingement and entrainment rates are notably low and were not likely to result in a significant adverse effect on the resident aquatic communities. In the case of impingement, this is particularly true, due to the presence of both an installed fish return system and a commitment to an operational measure consisting of continuous screen rotations when river temperatures exceed 50 degrees. Additionally, the composition of the overall impingement catch was noted to be dominated by more robust species (bluegill, channel catfish, etc.) which are expected to have high survival rates at MNGP.

The total estimated entrainment for 2017 and 2018 based on actual intake flow was 19,616,797 and 26,377,801, respectively. The total estimated entrainment for plant operations in 2017 and 2018 based on the DIF was 36,885,501 and 31,154,482 individuals, respectively. In comparison to 2017, actual intake flows, entrainment of aquatic organisms was reduced by 88.03 percent in 2017. Entrainment reductions observed in 2017 were primarily attributed to the refueling outage during April-May 2017, because circulating water pumps were out of service for approximately 30 days.

Desktop analysis indicates that channel catfish and smallmouth bass exhibit low susceptibility to entrainment at MNGP. Channel catfish is a speleophil, spawning in holes or crevices that are guarded by the male parent. Smallmouth bass are polyphils, which deposit adhesive eggs, preventing them from dispersing into the area of the CWIS. Common carp, spotfin shiner, sand shiner, bigmouth buffalo, white sucker, shorthead redhorse, and silver redhorse were considered to be most susceptible to entrainment. Walleye and burbot were also considered to be susceptible to entrainment. Walleye and burbot are litho-pelagophils that lay eggs in areas of sandy, rocky, or gravelly habitat, which is a physical characteristic in the vicinity of the MNGP CWIS. The MNGP entrainment characterization study supports this analysis, likely due to consistency with these species' reproductive guild, fecundity, size, and habitat requirements.

The NPDES permit conditions require biennial environmental monitoring studies which include fish surveys conducted using electrofishing and seining. The 2016–2017 and 2018–2019 electrofishing studies concluded that persistence and stability indices for the species assemblages in the two sectors are similar and indicate stable and persistent populations. The seining studies noted that the index of persistence calculated from 20 plus years of seining data at MNGP was similar to values reported by other investigators of other river systems. The seining studies also evaluated trends in individual species abundance for selected common species. While the trends did indicate some species decreasing in some areas, none of the trends were considered statistically significant. The electrofishing and seining surveys conducted over the past 32 years do not indicate any major long-term decreases in overall fish abundance and species diversity. While there may be some changes in spatial distribution due to the thermal discharges from the plant, there is no evidence to suggest that these changes or the MNGP cooling water system impingement and entrainment impacts are having any adverse effects on the local fish communities.

MNGP has a NPDES permit and is a point source for industrial discharge of wastewater. The current NPDES permit (MN0000868) was issued on October 16, 2007, and expired on September 30, 2012. MNGP submitted an application for permit reissuance, allowing MNGP to operate in compliance with the existing permit until the new permit is issued.

MNGP operates a CWIS subject to the Final Rule to Establish Requirements for Cooling Water Intake Structures at Existing Facilities and Amend Requirements at Phase I Facilities. Because MNGP has a DIF greater than two MGD and has an actual intake flow greater than 125 MGD, MNGP is required to prepare permit application requirements § 122.21(r)(2) through (13) for submittal to MPCA. To meet the NPDES permit requirements, MNGP will be required to demonstrate that it is using the BTA to minimize environmental impacts.

The MNGP facility has operated under a NPDES permit and has been withdrawing once-through, non-contact cooling water without any NOVs of the operation of the cooling water system. Current ongoing studies performed at MNGP will ensure that it continues to utilize the BTA to minimize entrainment and impingement to the fullest extent practicable to maintain compliance with the current NPDES permit. As part of the future NPDES permit, the MPCA may establish permit conditions such as continued biological monitoring to ensure impingement and entrainment of aquatic organisms is not resulting in alterations of aquatic species composition or decreasing trends of aquatic species.

Based on previous impingement and entrainment studies, ecological monitoring, and compliance with current and future NPDES permit conditions, MNGP concludes that impacts from impingement and entrainment of aquatic organisms during the proposed operating term would be SMALL. Adherence to the 316(b) rule (79 FR 48300), Minnesota NPDES BTA requirements, and permit requirements for ongoing studies to identify any potential concerns will minimize the already existing SMALL impacts.

Xcel Energy finds that impacts of impingement and entrainment of aquatic organisms for plants with once-through cooling systems or cooling ponds for the proposed SPEO are SMALL.

4.6.2 Thermal Impacts on Aquatic Organisms (Plants with Once-Through Cooling Systems or Cooling Ponds)

4.6.2.1 Generic Analysis for Initial License Renewals [GEIS Section 4.6.1.2]

Because characteristics of both the thermal discharges and the affected aquatic resources are specific to each site, NRC classified heat shock as a Category 2 issue that required a site-specific assessment for license renewal. The NRC found the potential for thermal discharge impacts to be greatest at plants with once-through cooling systems, primarily because of the higher discharge temperatures and larger thermal plume area compared to plants with cooling towers.

The impact level at any plant depends on the characteristics of its cooling system (including location and type of discharge structure, discharge velocity and volume, and three-dimensional characteristics of the thermal plume) and characteristics of the affected aquatic resources (including the species present and their physiology, habitat, population distribution, status, management objectives, and life history).

For initial license renewals, the NRC codified its conclusion that most of the effects associated with thermal discharges are localized and are not expected to affect overall stability of populations or resources. The magnitude of impacts, however, would depend on site-specific thermal plume characteristics and the nature of aquatic resources in the area. The NRC found the impact for this issue to be SMALL, MODERATE, or LARGE.

4.6.2.2 Site-Specific Analysis for MNGP SLR

As part of the Site-Specific Analysis, Xcel Energy considered relevant new information on thermal impacts on aquatic organisms for plants with once-through cooling systems or cooling ponds since initial license renewal. MNGP conducted a thermal effluent discharge analysis to estimate the effect of an EPU on the Mississippi River. The maximum river temperature rise for the effluent temperature increase of 4.5°F (90°F to 94.5°F) ranged from 2.8°F at near the discharge canal to about 1.1°F downstream near the TH 25 Bridge. For the effluent temperature increase of 2°F (90°F to 92°F), the maximum temperature rise varied from 1.2°F near the discharge canal to about 0.5°F downstream near the TH 25 Bridge.

The current NPDES permit (MN0000868) was issued on October 16, 2007, and expired on September 30, 2012. MNGP submitted an application for permit reissuance, allowing MNGP to operate in compliance with the existing permit until the new permit is issued. The thermal limits associated with the MNGP NPDES permit are:

- 95°F during the months April through October
- 85°F during the months of November and March
- 80°F during the months December through February

All existing cooling water towers will operate when water temperatures of reaches of the Mississippi River unaffected by the plant's discharge are consistently at or above 68°F. Additionally, use of the cooling towers is required in cases when the ambient river temperature is below 68°F, but low river flow would otherwise cause the average daily mixed river temperature immediately below the discharge to exceed 86°F.

The MNGP surface water withdrawal permit (Permit No. 661172) also includes limitations on the river flow conditions under which MNGP is allowed to withdraw surface water. The surface water withdrawal permit requires MNGP to operate in helper cycle mode using the two cooling towers onsite in partial recirculation or closed when Mississippi River flows are below 860 cfs. MNGP is not permitted to withdraw more than 75 percent of the river flows below 860 cfs.

From 2017–2022, MNGP has documented fish kills three times. The first fish kill incident was attributed to loss of heat input to the Mississippi River as the result of an outage and was reported to the MDNR. Following the outage, MNGP surveyed for impacted fish in the vicinity of the plant discharge and 1 mile downstream of the site. A total of 49 fish were found dead. Species included smallmouth bass, common shiner, bluegills, and channel catfish. The second incident occurred during the week of May 14, 2022, when 30 fish were discovered in the cooling tower. The third incident occurred in January 2022 due to the loss of heat input to the river because of plant shut down for maintenance. This incident resulted in the loss of 1,398 fish. Based on the limited number of outage events, outage events are not expected to have more than minor effects on aquatic organisms.

There have been no NOVs related to the NPDES permit in the past five years (2017–July 2022). Additionally, as discussed in Section 4.6.1.2, there have been no indications of adverse impacts to aquatic biota within the vicinity of the discharge plume.

Xcel Energy finds that thermal impacts on aquatic organisms for plants with once-through cooling systems or cooling ponds for the proposed SPEO are SMALL.

4.6.3 Water Use Conflicts with Aquatic Resources (Plants with Cooling Ponds or Cooling Towers Using Makeup Water from a River)

4.6.3.1 Generic Analysis for Initial License Renewals [GEIS Section 4.6.1.2]

Increased temperatures and/or decreased rainfall would result in lower river flows, increased cooling pond evaporation, and lowered water levels in the Great Lakes or reservoirs. Regardless of overall climate change, droughts could result in problems with water supplies and allocations. Because future agricultural, municipal, and industrial users would continue to share their demands for surface water with power plants, conflicts might arise if the availability of this resource decreased.

Water use conflicts with aquatic resources could occur when water to support these resources is diminished either because of decreased water availability due to droughts; increased demand for agricultural, municipal, or industrial usage; or due to a combination of such factors. Water use conflicts with biological resources in stream communities are a concern due to the duration of license renewal and potentially increasing demands on surface water.

For initial license renewals, the NRC codified its conclusion that impacts on aquatic resources in stream communities affected by water use conflicts could be of moderate significance in some situations. The NRC found the impact for this issue to be SMALL or MODERATE.

4.6.3.2 Site-Specific Analysis for MNGP SLR

As part of the Site-Specific Analysis, Xcel Energy considered relevant new information on water use conflicts with aquatic resources for plants with cooling ponds or cooling towers using makeup water from a river since initial license renewal. USGS gage station data are available approximately 26 miles upstream from Monticello since 1988 (Station 05270700). Based on available data for the past 10 years, the maximum and minimum daily flows at the upstream USGS gage were 28,200 cfs occurring on June 25, 2012, and 553 cfs on August 19, 2021. (USGS 2021c) The surface water withdrawal from the Mississippi River is regulated by the MDNR surface water appropriations permit. During normal conditions, river flows in the Mississippi River exceed 860 cfs and cooling of circulating water is within the NPDES limits, allowing MNGP to withdraw a maximum of 645 cfs and MNGP operates in a once-through mode. When the Mississippi River flow is below 860 cfs, and not less than 240 cfs, MNGP is allowed to withdraw no more than 75 percent of the river flow and must operate in partial recirculation or closed cycle mode using the two onsite cooling towers. For river flows less than 240 cfs, MNGP will comply with special operating conditions prescribed by MDNR. For all conditions, the surface water allocation permit indicates that the temperature discharge must be within the NPDES permit requirements for the temperature and characteristics of the discharge water.

During the proposed SPEO, MNGP is anticipated to consume water from the Mississippi River at current rates; therefore, there would be no increase in consumptive water use. Based on current and future compliance with the existing surface water allocation permit, relatively low surface water withdrawal demand at the watershed level, and minimal consumptive water loss during periods of cooling tower operation the potential impacts associated with water use conflicts with aquatic resources are considered SMALL.

Xcel Energy finds that impacts of water use conflicts with aquatic resources for plants with cooling ponds or cooling towers using makeup water from a river for the proposed SPEO are SMALL.

4.6.4 Water Use Conflicts with Terrestrial Resources (Plants with Cooling Ponds or Cooling Towers Using Makeup Water from a River)

4.6.4.1 Generic Analysis for Initial License Renewals [GEIS Section 4.6.1.1]

Water use conflicts with terrestrial resources in riparian communities could occur when water that supports these resources is diminished either because of decreased availability due to droughts; increased water demand for agricultural, municipal, or industrial usage; or a combination of such factors. For future license renewals, the potential range of impact levels at plants with cooling ponds or cooling towers using makeup water from a river cannot be determined at this time. For initial license renewals, the NRC codified its conclusion that impacts on terrestrial resources in riparian communities affected by water use conflicts could be of moderate significance. The NRC found the impact for this issue to be SMALL or MODERATE.

4.6.4.2 Site-Specific Analysis for MNGP SLR

As part of the Site-Specific Analysis, Xcel Energy considered relevant new information on water use conflicts with terrestrial resources for plants with cooling ponds or cooling towers using makeup water from a river since initial license renewal. The surface water withdrawal from the Mississippi River is regulated by the MDNR surface water appropriations permit. During normal conditions, river flows in the Mississippi River exceed 860 cfs and cooling of circulating water is within the NPDES permit limits, allowing MNGP to withdraw a maximum of 645 cfs.

During the proposed SPEO, MNGP is anticipated to consume water from the Mississippi River at current rates; therefore, there would be no increase in water withdrawal. Based on current and future compliance with the existing surface water allocation permit, relatively low surface water withdrawal demand at the watershed level, and minimal consumptive water loss during periods of cooling tower operation the potential impacts associated with water use conflicts with terrestrial resources are considered SMALL.

Xcel Energy finds that impacts of water use conflicts with terrestrial resources for plants with cooling ponds or cooling towers using makeup water from a river for the proposed SPEO are SMALL.

4.6.5 Effects on Terrestrial Resources (Non-Cooling System Impacts)

4.6.5.1 Generic Analysis for Initial License Renewals [GEIS Section 4.6.1.1]

Continued operations and refurbishment activities could continue to affect onsite terrestrial resources during the license renewal term at all operating nuclear power plants. Factors that could potentially result in impacts include landscape maintenance activities, stormwater management, and elevated noise levels. These impacts would, for the most part, be similar to past and ongoing impacts.

The characteristics of terrestrial habitats and wildlife communities currently on nuclear power plant sites have generally developed in response to many years of typical operations and maintenance programs. While some may have reached a relatively stable condition, some habitats and populations of some species may have continued to change gradually over time. Operations and maintenance activities during the license renewal term are expected to be similar to current activities. Because the species and habitats present on the sites (i.e., weedy species and habitats they make up) are generally tolerant of disturbance, it is expected that continued operations during the license renewal term would maintain these habitats and wildlife communities in their current state or maintain current trends of change.

Terrestrial habitats and wildlife could be affected by ground disturbance from refurbishment-related construction activities. Land disturbed during the construction of new ISFSIs would range from about 2.5 to 10 acres (1 to 4 hectare). Other activities may include new parking areas for plant employees, access roads, buildings, and facilities. Temporary project support areas for equipment storage, worker parking, and material laydown areas could also result in the disturbance of habitat and wildlife.

Successful application of environmental review procedures, employed by the licensees at many of the operating nuclear plant sites, would result in the identification and avoidance of important terrestrial habitats. In addition, the application of BMPs to minimize the area affected; to control fugitive dust, runoff, and erosion from project sites; to reduce the spread of invasive nonnative plant species; and to reduce disturbance of wildlife in adjacent habitats could greatly reduce the impacts of continued operations and refurbishment activities.

For initial license renewals, the NRC codified its conclusion that impacts resulting from continued operations and refurbishment associated with license renewal may affect terrestrial communities. Application of BMPs would reduce the potential for impacts. The magnitude of impacts would depend on the nature of the activity, the status of the resources that could be affected, and the effectiveness of mitigation.

The NRC found the impact for this issue to be SMALL, MODERATE, or LARGE.

4.6.5.2 Site-Specific Analysis for MNGP SLR

As part of the Site-Specific Analysis, Xcel Energy considered relevant new information on the effects on terrestrial resources (non-cooling systems impacts) since initial license renewal. As discussed in Section 2.3, no SLR-related refurbishment activities have been identified. Therefore, there would be no SLR-related refurbishment impacts to important plant and animal habitats, and no further analysis is required.

Terrestrial resources are described in Section 3.7.2. No SLR-related construction activities or changes in operational practices have been identified that would involve disturbing habitats.

Xcel Energy would continue to conduct ongoing plant operational and maintenance activities during the license renewal period.

Operational and maintenance activities that Xcel Energy might undertake during the proposed SPEO, such as maintenance and repair of plant infrastructure (e.g., roadways, piping installations, fencing, and other security infrastructure), would likely be confined to previously disturbed areas of the site. Staging of spoil material produced as a result of maintenance dredging may also occur during the proposed SPEO. The requirements for the management of dredge material, including spoil storage and disposal, are determined by the NPDES permit, USACE dredge permit, and MDNR dredge permit requirements. These activities are expected to have minimal impacts on terrestrial resources because activities would not occur within previously undisturbed habitats.

As discussed in Sections 3.7.6 and 9.6, Xcel Energy has administrative controls in place at the MNGP site to ensure operational changes or construction activities are reviewed and any impacts minimized through implementation of BMPs, permit modifications, or acquisition of new permits as needed. In addition, regulatory programs that the site is currently subject to, such as stormwater management, spill prevention, dredging, and herbicide usage, further serve to minimize impacts to terrestrial resources.

In summary, adequate management programs and regulatory controls are in place to ensure important plant and animal habitats are protected during the proposed MNGP SPEO.

Xcel Energy finds that impacts of the effects on terrestrial resources (non-cooling system impacts) for the proposed SPEO are SMALL.

4.6.6 Threatened, Endangered, and Protected Species, and Essential Fish Habitat

4.6.6.1 Generic Analysis for Initial License Renewals [GEIS Section 4.6.1.3]

There are several federal acts that provide protection to certain species and habitats that are treated here under a single issue. The issue includes impacts to biological resources such as threatened and endangered species and their critical habitat under the ESA, EFH as protected under the Magnuson-Stevens Fishery Conservation and Management Act, and impacts to mammalian species protected under the Marine Mammal Protection Act.

Factors that could potentially result in impacts on listed terrestrial species include habitat disturbance, cooling tower drift, operation and maintenance of cooling systems, transmission line ROW maintenance, collisions with cooling towers and transmission lines, and exposure to radionuclides. The listed species on or in the vicinity of nuclear power plants also range widely, depending on numerous factors such as the plant location and habitat types present.

Potential impacts of continued operations and refurbishment activities on federally or state-listed threatened and endangered species, protected marine mammals, and EFH could occur during the license renewal term. Factors that could potentially result in impacts to these species and habitats include impacts of refurbishment, other ground-disturbing activities, release of contaminants, effects of cooling water discharge on dissolved oxygen, gas supersaturation, eutrophication, thermal discharges, entrainment, impingement, reduction in water levels due to the cooling system operations, dredging, radionuclides, and transmission line ROW maintenance.

For initial license renewals, the NRC codified its conclusion that the magnitude of impacts on threatened endangered, and protected species, critical habitat, and EFH would depend on the occurrence of listed species and habitats and the effects of power plant systems on them. Consultation with appropriate agencies would be needed to determine whether special status species or habitats are present and whether they would be adversely affected by continued operations and refurbishment associated with license renewal.

4.6.6.2 Site-Specific Analysis for MNGP SLR

As part of the Site-Specific Analysis, Xcel Energy considered relevant new information on threatened, endangered and protected species, and EFH since initial license renewal. As discussed in Section 2.3, no SLR-related refurbishment activities have been identified. Therefore, there would be no SLR-related refurbishment impacts to important plant and animal habitats, and no further analysis is required.

Operational and maintenance activities that Xcel Energy might undertake during the renewal term, such as maintenance and repair of plant infrastructure (e.g., roadways, piping installations, fencing, and other security infrastructure), would likely be confined to previously disturbed areas of the site. Furthermore, as discussed in Sections 3.7.6 and 9.6, Xcel Energy has administrative controls in place at the MNGP site to ensure that operational changes or construction activities are reviewed and the impacts minimized through implementation of BMPs, permit modifications, or acquisition of new permits as needed. In addition, existing regulatory programs that the site is subject to, as presented in Chapter 9, also ensure that habitats and wildlife are protected. These are related to programs such as stormwater management for controlling the runoff of pollution sources such as sediment, metals, or chemicals; spill prevention to ensure that BMPs and structural controls are in place to minimize the potential for a chemical release to the environment; USACE permitting programs to minimize dredging impacts; and management of herbicide applications to ensure that the intended use will not adversely affect the environment.

As discussed in Section 3.7.8, three federally listed species are listed for Sherburne and Wright counties, Minnesota: the northern long-eared bat, the monarch butterfly, and the rusty patched bumble bee. No critical habitat for federally listed species has been designated in Sherburne and Wright counties. Although suitable habitat may be present on the MNGP site for the monarch butterfly and rusty patched bumblebee, according to USFWS information, the monarch butterfly and rusty patched bumblebee are considered unlikely to occur within 6 miles of the MNGP site. (USFWS 2022) Further, MDNR NHI data indicate no documented occurrences of these species within 6 miles on the MNGP site. Thus, the continued operation of the MNGP site for the proposed SPEO will have NO EFFECT on the monarch butterfly and rusty patched bumblebee.

As discussed in Section 3.7.8, suitable roosting and maternity habitat for the northern long-eared bat is present on the MNGP site and the immediate vicinity; however, MDNR NHI data and MNGP records indicate no occurrences of northern long-eared bat documented within 6 miles of the MNGP site. Actions requiring removal of trees may be conducted under the USFWS 4(d) rule which sets guidelines for incidental take, and consultation with federal wildlife agencies to ensure that no impacts to this species occur from any future activities. Where warranted, MNGP would consult with USFWS to ensure compliance with the ESA. Compliance with all regulatory requirements associated with the federally listed species will continue to be an administrative control practiced by MNGP for the life of the facility; thus, the continued operation of the MNGP site for the proposed SPEO MAY AFFECT BUT IS NOT LIKELY TO ADVERSELY AFFECT the northern long-eared bat.

As stated in Section 3.7.8.5, no EFH is located within the vicinity of MNGP, nor were any EFH areas protected from fishing. As HAPCs are derived from EFH, there were also no HAPCs located within the 6-mile vicinity of MNGP (NOAA 2021b). Thus, the continued operation of the MNGP site for the proposed SPEO will have NO EFFECT on EFH.

As stated in Section 3.7.8.4, golden eagles are known to occur throughout the state through the spring, fall, and winter; however, they are not known to nest in Minnesota. MDNR NHI data indicate no occurrences of golden eagles within 6 miles of the MNGP site. Bald eagles are known to nest within the MNGP site and its vicinity. One nest is known to exist on Cedar Island, upstream from the power block; however, recent use of this nest and nesting success has not been confirmed. (NMC 2005; NRC 2006b) MDNR NHI data indicate five known occurrences of bald eagles within 6 miles of the MNGP site. No eagle take permits are currently required for MNGP site operations or in-scope transmission lines. Thus, the continued operation of the MNGP site for the proposed SPEO will have NO EFFECT on bald or golden eagles.

As stated in Section 3.7.8.4, suitable habitat is potentially present on the MNGP site and immediate vicinity for 17 birds of conservation concern protected under the MBTA (USFWS 2022). The short-billed dowitcher, ruddy turnstone, and lesser yellowlegs occur as migrants through Minnesota, and may utilize stop over habitat available onsite and in the immediate vicinity. The black tern, black billed-cuckoo, bobolink, Canada warbler, cerulean warbler, eastern whip-poor-will, golden winged warbler, Heslow's sparrow, Le Conte's sparrow, long-eared owl, marbled godwit, red-headed woodpecker, rusty blackbird, and wood thrush are known to breed in Minnesota. (Cornell 2021) Based on MNGP records, five avian deaths and one injury have been documented on the MNGP site in the past five years, from 2016–2021. Species were not definitively identified for the five deaths; however, one was documented as an unspecified duck and a potential heron. The injured bird was identified as a red-tailed hawk and was transported to a rehabilitation center. Thus, the continued operation of the MNGP site for the proposed SPEO will have NO EFFECT on migratory bird species protected under the MBTA.

The MDNR lists 22 state-listed threatened or endangered species within Sherburne and/or Wright counties, Minnesota (MDNR 2021o). The MDNR will consider an application for a permit for the take of endangered or threatened species incidental to a development project such as construction or creation or repair of infrastructure will be considered only when the proposal provides convincing justification that all alternatives have been considered and rejected, and that take is unavoidable. Permits must include compensatory mitigation that will result in a net benefit to the species and must be approved by the commissioner of the MDNR.

Suitable habitat for the state-listed pugnose shiner, common tern, and seaside three-awn is not present on the MNGP site; however, it may be present in the immediate vicinity. The common tern may fly over the site during migration but is unlikely to use habitat within the MNGP site. MDNR NHI data indicate occurrences of the pugnose shiner and seaside three-awn within 6 miles of the MNGP site. MNGP does not have any records of these species being observed onsite. Due to the lack of habitat onsite as well as adherence to administrative controls and existing programs such as stormwater management for controlling the runoff of pollution sources such as sediment, metals, or chemicals; spill prevention to ensure that BMPs and structural controls are in place to minimize the potential for a chemical release to the environment, operation of the site will not affect offsite habitat. Thus, the continued operation of the MNGP site for the proposed SPEO will have NO EFFECT on these species.

Suitable habitat for the beach heather, annual skeletonweed, and Uncas skipper is not present on the MNGP site or in the immediate vicinity. Additionally, Uncas skipper is considered a rare stray in Minnesota and there is no evidence of establishment within the state (MDNR 2021o). MDNR NHI data indicate no occurrences of these species documented within 6 miles of the MNGP site. Additionally, MNGP does not have any records of these species being observed onsite. Thus, the continued operation of the MNGP site for the proposed SPEO will have NO EFFECT on these species.

Habitat may be present on the MNGP site and the immediate vicinity for the ram's head orchid and rock sandwort; however, based on current population information, these species are unlikely to occur on the MNGP site or the immediate vicinity. MDNR NHI data indicate no occurrences of beach heather documented within 6 miles of the MNGP site. MNGP does not have any records of these species being observed onsite. Recent surveys of potential habitat and historic sites for the ram's head orchid have failed to document any extant populations south of Aitkin County, which is located 60 miles north of the MNGP site. Rock sandwort is found in the southeastern region of the state and on sand and gravel deposits in the northwestern corner of the state. For unknown reasons, the vast majority of habitats that appear to be suitable for the Uncas skipper do not harbor this species. The Uncas skipper has been recorded as a rare stray into southwest Minnesota, but there is no evidence of establishment there. Thus, the continued operation of the MNGP site for the proposed SPEO will have NO EFFECT on these species.

Potential habitat for the following state-listed species may be present in portions of the MNGP site and the immediate vicinity. Potential habitat for blunt-lobed grapefern, butternut, cross-leaved milkwort, Clinton's bullrush, hooded arrowhead, lance-leaf violet, swamp blackberry, tall nutrush, and tubercled rein orchid may occur in undeveloped portions of the site and in the immediate vicinity. The Mississippi River may provide suitable habitat for the elktoe mussel. Additionally, suitable habitat for the loggerhead shrike, horned grebe, eastern spotted skunk, and Blanding's turtle may also be present in undeveloped portions of the site and the immediate vicinity; however, due the mobility of these species, these species may also occur in developed areas while moving between areas of suitable habitat. MDNR NHI data indicate no documented occurrences of these species within 6 miles of the MNGP site. With implementation of administrative controls to ensure compliance with applicable MDNR regulations, Xcel Energy concludes that license renewal MAY AFFECT BUT IS NOT LIKELY TO ADVERSELY AFFECT the blunt-lobed grapefern, butternut, cross-leaved milkwort, Clinton's bullrush, hooded arrowhead, lance-leaf violet, rock sandwort, swamp blackberry, tall nutrush, tubercled rein orchid, loggerhead shrike, horned grebe, eastern spotted skunk, elktoe mussel, and Blanding's turtle.

As discussed under Section 3.7.8.5, no EFH has been identified within the vicinity of the MNGP site. Therefore, continued operation of MNGP for the proposed SPEO will have NO EFFECT on EFH.

Xcel Energy finds that impacts from the continued operation of the site would range from NO EFFECT to MAY AFFECT BUT NOT LIKELY TO ADVERSELY AFFECT threatened, endangered, and protected species and EFH.

4.6.7 Exposure of Terrestrial Organisms to Radionuclides

4.6.7.1 Generic Analysis for Initial License Renewals [GEIS Section 4.5.1.1]

NRC reviewed the potential for radionuclides from normal operations to impact terrestrial organisms and concluded that impacts on terrestrial biota would be SMALL. In its review, the NRC considered the various pathways that radionuclides may be released from nuclear power plants into the environment. Releases into terrestrial environments often result from deposition of small amounts of radioactive particulates released from power plant vents during normal operations. These releases typically include krypton, xenon, and argon (which do not contain radioactive particles), tritium, isotopes of iodine, and cesium, and they may also include strontium, cobalt, and chromium. Radionuclides may also be released into the aquatic environment from the liquid effluent discharge line. Radionuclides that enter shallow groundwater from cooling ponds can be taken up by terrestrial plant species, including both upland species and wetland species, where wetlands receive groundwater discharge. Terrestrial biota may be exposed to ionizing radiation from radionuclides through direct contact with water or other media, inhalation, or ingestion of food, water, or soil.

As part of the 2013 GEIS analysis, the NRC conducted a review of all operating nuclear power plants to evaluate the potential impacts of radionuclides on terrestrial biota from continued operations. The NRC selected 15 representative plants to calculate estimated dose rates for terrestrial biota from nuclear plants. The maximum estimated dose rate calculated for any of the nuclear power plants was 0.0354 rad per day (rad/d) (3.54 x 10-4 gray per day [Gy/d]) (riparian animal at the Browns Ferry plant), which is below the guideline value of 0.1 rad/d (0.001 Gy/d) for a riparian animal receptor. (NRC 2013b) On the basis of these calculations and a review of the available literature, the NRC concluded that the impact of routine radionuclide releases from past and current operations and refurbishment activities on terrestrial biota would be SMALL for all nuclear plants and would not be expected to appreciably change during a license renewal term.

For initial license renewals, the NRC codified its conclusion that doses to terrestrial organisms from continued operations and refurbishment associated with license renewal are expected to be well below exposure guidelines developed to protect these organisms. The NRC found the impact for this issue to be SMALL.

4.6.7.2 Site-Specific Analysis for MNGP SLR

As part of the Site-Specific Analysis, Xcel Energy considered relevant new information on the exposure of terrestrial organisms to radionuclides since initial license renewal. As discussed in Section 3.10.3, MNGP operates in compliance with NRC effluents standards and reports effluents annually to NRC as required. The plant releases small quantities of radioactive materials in gaseous form and does not make routine releases of radioactive liquids. Environmental media samples collected as part of MNGP's REMP in 2020 verify that the levels of radiation and concentrations of radioactive materials are not increasing, and measured exposure rates are consistent with previous years. Continued compliance with NRC radiological effluent limits and implementation of the REMP will ensure that terrestrial organisms' exposure to radionuclides is well within guidelines and adverse trends are detected to implement corrective actions.

Xcel Energy finds that impacts of exposure of terrestrial organisms to radionuclides for the proposed SPEO are SMALL.

4.6.8 Cooling System Impacts on Terrestrial Resources (Plants with Once-Through Cooling Systems or Cooling Ponds)

4.6.8.1 Generic Analysis for Initial License Renewals [GEIS Section 4.6.1.1]

This issue considers potential impacts to terrestrial resources from contaminants and physical alterations of the environment resulting from the operation of the cooling system. Physical alterations include increased water temperatures; humidity and fogging; contaminants in surface water or groundwater; and disturbance of wetlands from maintenance dredging of onsite cooling ponds, disposal of dredged material from such dredging, and erosion of shoreline wetlands. Other potential impacts to terrestrial resources considered in this issue include impingement of waterfowl at the cooling water intakes, potential for groundwater quality degradation by contaminants present in cooling ponds and cooling canals, and reduced water availability due to surface water or groundwater withdrawals.

The 2013 GEIS stated no adverse effects on terrestrial plants or animals have been reported as a result of increased water temperatures, fogging, humidity, or reduced habitat quality. Because of the low concentrations of contaminants within the liquid effluents associated with the cooling systems, the uptake and accumulation of contaminants in the tissues of wildlife exposed to the contaminated water or aquatic food sources are not expected to be a significant issue, and the impacts are expected to be SMALL for all plants. Potential mitigation measures would include regular monitoring of the cooling systems for water quality and measures to exclude wildlife from contaminated ponds. On the basis of these considerations, the NRC concluded that the impact of continued operation of the cooling systems on terrestrial resources would be SMALL for all nuclear plants. For initial license renewals, the NRC codified its conclusion that no adverse effects to terrestrial plants or animals have been reported as a result of increased water temperatures, fogging, humidity, or reduced habitat quality. Due to the low concentrations of contaminants in cooling system effluents, uptake, and accumulation of contaminants in the tissues of wildlife exposed to the contaminated water or aquatic food sources are not expected to be significant issues. The NRC found the impact for this issue to be SMALL.

4.6.8.2 Site-Specific Analysis for MNGP SLR

As part of the Site-Specific Analysis, Xcel Energy considered relevant new information on cooling system impacts on terrestrial resources for plants with once-through cooling systems or cooling ponds since initial license renewal. The NRC identified certain activities or conditions for impacts to terrestrial resources as a consequence of operation of a plant's cooling water system. The cooling water system is described in Section 2.2.3.1. Xcel Energy plans to continue to operate the cooling water as currently configured through the proposed SLR period. These are identified below along with MNGP-specific information.

- Physical alterations include increased water temperatures, humidity, and fogging.
    - MNGP's NPDES permit establishes conditions for operation of the cooling towers based on ambient river water temperature and discharge temperature limits (Attachment A). These permit conditions limit the extent that discharge temperature can be above ambient, minimizing humidity and fogging. There have been no NOVs related to the NPDES permit in the past five years (2017 to 2021).
- Reduced water availability due to surface water use.
    - The cooling water source is the Mississippi River. The MNGP surface water withdrawal permit (No. 661172) establishes limits on withdrawals in low-flow conditions.
- Contaminants in surface water.
    - Discharges are governed by MNGP's NPDES permit. There have been no NOVs related to the NPDES permit in the past five years (2017 to 2021).
- Reduced water availability due to groundwater withdrawals.
    - Not applicable to MNGP because the cooling water source is the Mississippi River, not groundwater.
- Contaminants in groundwater; potential for groundwater quality degradation by contaminants present in cooling ponds and cooling canals.

  - Not applicable to MNGP because the cooling system does not have cooling ponds or cooling canals.
- Disturbance of wetlands from maintenance dredging of onsite cooling ponds, disposal of dredged material from such dredging.
  - Not applicable to MNGP because the cooling system does not have cooling ponds.
- Erosion of shoreline wetlands.
  - Figure 3.7-2 shows the National Wetlands Inventory mapped wetlands within the MNGP site. There are no wetlands along the south bank where the discharge is located. The flow and width of the Mississippi River would minimize the potential for impact to wetlands on the north bank.
- Impingement of waterfowl at the cooling water intakes.
  - None of the six recorded bird deaths/injuries occurring between 2016 to 2021 was a result of impingement at the intake.

In summary, adequate regulatory controls are in place to ensure that terrestrial resources are protected during the proposed MNGP SPEO.

Xcel Energy finds that cooling system impacts on terrestrial resources for plants with once-through cooling systems or cooling ponds for the proposed SPEO are SMALL.

4.6.9 Cooling Tower Impacts on Vegetation (Plants with Cooling Towers)

4.6.9.1 Generic Analysis for Initial License Renewals [GEIS Section 4.6.1.1]

In the 2013 license renewal GEIS, the NRC reviewed the effects of cooling tower operation on surrounding vegetation. Terrestrial habitats in the vicinity of nuclear power plant cooling towers have been exposed to deposition of cooling tower drift particulates (including salt), deposition of water droplets on vegetation from drift, structural damage from freezing vapor plumes, and increased humidity. Generally, deposition rates from these cooling towers have been below those that are known to result in measurable adverse impacts on plants, and no deposition effects on agricultural crops or plant communities have been observed at most of the nuclear power plants. Exceptions have been observed at some nuclear plants; however, the impacts have been addressed by changes to cooling tower operations. Impacts from icing have been rare, minor, and localized near nuclear power plant cooling towers and have been corrected by changes in tower operation at the plants where they occurred. NRC concluded that the impact of continued operation of cooling towers on plant communities would be SMALL for all nuclear plants. For initial license renewals, the NRC codified its conclusion that impacts from salt drift, icing, fogging, or increased humidity associated with cooling tower operation have the potential to affect adjacent vegetation, but these impacts have been small at operating nuclear power plants and are not expected to change over the license renewal term. The NRC found the impact for this issue to be SMALL.

4.6.9.2 Site-Specific Analysis for MNGP SLR

As part of the Site-Specific Analysis, Xcel Energy considered relevant new information on cooling tower impacts on vegetation for plants with cooling towers since initial license renewal. As discussed in Section 4.5, MNGP operates the two MDCTs under certain conditions as established in the NPDES permit. With the implementation of the power uprate, the cooling towers were projected to be operated an average of 150 days per year, up from 130 days per year pre-uprate. No plant operations or modifications that would significantly alter the operation of the cooling towers are proposed during the SPEO. The surrounding areas as discussed in Section 3.1, is primarily deciduous forests and agricultural land including those leased by the University of Minnesota for research purposes. The lessees have continued to lease the property for several years, indicating that operation of the cooling towers does not have adverse impacts on the crop production. Crop production involves young plants which would be more vulnerable to salt deposition than forest; therefore, adverse impacts on the onsite deciduous forest is also not expected. Therefore, cooling tower impacts on vegetation during the license renewal term would be SMALL.

Xcel Energy finds that cooling tower impacts on vegetation for plants with cooling towers for the proposed SPEO are SMALL.

4.6.10 Bird Collisions with Plant Structures and Transmission Lines

4.6.10.1 Generic Analysis for Initial License Renewals [GEIS Section 4.6.1.1]

In the 2013 license renewal GEIS, the NRC reviewed the impact on avian mortality from birds colliding with cooling towers and transmission lines by reviewing the primary literature for avian collision mortality associated with all types of man-made objects, as well as the results of monitoring studies conducted at six nuclear plants. The NRC found that collision mortality associated with nuclear plant structures and transmission lines represents only a fraction of the total annual bird collision mortality from all man-made sources. In addition, there are no reports of relatively high collision mortality occurring at the transmission lines associated with nuclear power plants in the United States.

For initial license renewals, the NRC codified its conclusion that bird collisions with cooling towers and other plant structures and transmission lines occur at rates that are unlikely to affect local or migratory populations and the rates are not expected to change. The NRC found the impact for this issue to be SMALL.

4.6.10.2 Site-Specific Analysis for MNGP SLR

As part of the Site-Specific Analysis, Xcel Energy considered relevant new information on bird collisions with plant structures and transmission lines since initial license renewal. All in-scope transmission lines subject to the evaluation of environmental impacts for license renewal are located completely within the MNGP site boundaries as shown in Figure 2.2.3. The in-scope transmission lines at MNGP are restricted to industrial areas, where vegetation is sparse. Given the lower profile of plant structures and the short distance of the in-scope transmission lines at the MNGP site, these structures would not pose a bird collision hazard beyond that considered in the 2013 GEIS.

Further, as discussed in Section 3.7.2.6, Xcel Energy has installed swan flight diverters on its transmission lines in areas where incidents of bird collisions have occurred to minimize impact. Xcel Energy's avian protection plan describes the company's practices and measures to avoid and minimize risk of avian collision with transmission lines.

Between 2016–2021, there have been five recorded bird deaths and one injury occurring on the MNGP site. This low occurrence of avian deaths/injuries would indicate that none of the MNGP structures have a significant impact on the local or migratory bird populations.

Xcel Energy finds that impacts of bird collisions with plant structures and transmission lines for the proposed SPEO are SMALL.

4.6.11 Transmission Line Right-of-Way Management Impacts on Terrestrial Resources

4.6.11.1 Generic Analysis for Initial License Renewals [GEIS Section 4.5.1.1]

NRC reviewed the impacts of transmission line ROW management on terrestrial resources and found that although the initial habitat destruction associated with ROW clearing can have numerous consequences on wildlife populations, the proper management of transmission line ROW areas does not have significant adverse impacts on current wildlife populations and that ROW management can provide valuable wildlife habitats. The NRC noted that continued ROW management during the license renewal term will not lower habitat quality or cause significant changes in wildlife populations in the surrounding habitat. Therefore, the NRC concluded that the impact of continued transmission line ROW management on terrestrial resources is SMALL for all nuclear plants.

For initial license renewals, the NRC codified its conclusion that continued ROW management during the license renewal term is expected to keep terrestrial communities in their current condition. Application of BMPs would reduce the potential for impacts. The NRC found the impact for this issue to be SMALL.

4.6.11.2 Site-Specific Analysis for MNGP SLR

As part of the Site-Specific Analysis, Xcel Energy considered relevant new information on transmission line ROW management impacts on terrestrial resources since initial license renewal. The in-scope transmission lines are described in Section 2.2.5 and depicted on Figure 2.2-3. All in-scope transmission lines subject to the evaluation of environmental impacts for license renewal are located completely within the MNGP site boundaries. The in-scope transmission line ROW spans a short distance between the generating units and the switchyard, crossing primarily developed, industrial areas with sparse vegetation; they do not cross agricultural fields, pastures, or wildlife habitat.

In-scope transmission line ROWs at MNGP are maintained for vegetation with methods which include, but are not limited to, pruning, removal, herbicide application, and mowing. The application of herbicides used to control vegetation under in-scope transmission lines follows Xcel Energy's chemical control program.

MNGP has administrative policies and implements BMPs for preventing erosion from soil disruption related to maintenance and management. The NPDES permit requires MNGP to implement BMPs to protect surface water and groundwater from runoff of pollutants and loose soil in industrial areas.

The transmission line ROW is highly developed and has very few ecological resources present. Due to the high levels of disturbance and human presence, wildlife use of the ROW is likely to remain minimal. Because of the highly mobile nature of most wildlife species, any potential displacement from corridor management will be temporary.

In summary, the in-scope transmission corridor is developed and industrialized, with limited ecological features. Management of the corridor is not likely to affect terrestrial resources. Implementation of BMPs will ensure continued minimal impact on terrestrial resources from ROW management and maintenance.

Xcel Energy finds that transmission line ROW management impacts on terrestrial resources for the proposed SPEO are SMALL.

4.6.12 Electromagnetic Fields on Flora and Fauna (Plants, Agricultural Crops, Honeybees, Wildlife, and Livestock)

4.6.12.1 Generic Analysis for Initial License Renewals [GEIS Section 4.5.1.1]

In the 2013 license renewal GEIS, the NRC reviewed the impacts of EMFs on flora and fauna and concluded that no significant impacts of EMFs emitted on terrestrial biota have been identified. Although foliage very close to lines can be damaged, the overall productivity and reproduction of native and agricultural plants appear unaffected. Also, no evidence suggests significant impacts on individual animals or wildlife populations that are chronically exposed to EMFs under transmission lines or in the towers. Livestock behavior and production also appear unaffected by line operation. Therefore, the potential impact of EMFs on terrestrial biota is expected to be of SMALL significance for all plants.

For initial license renewals, the NRC codified its conclusion that no significant impacts of EMFs on terrestrial flora and fauna have been identified. Such effects are not expected to be a problem during the license renewal term. The NRC found the impact for this issue to be SMALL.

4.6.12.2 Site-Specific Analysis for MNGP SLR

As part of the Site-Specific Analysis, Xcel Energy considered relevant new information on electromagnetic fields on flora and fauna (plants, agricultural crops, honeybees, wildlife, and livestock) since initial license renewal. The in-scope transmission lines are described in Section 2.2.5 and depicted on Figure 2.2-3. In-scope transmission lines are confined to the

MNGP site, spanning the short distance between the generating units and the switchyard, crossing developed areas. Therefore, the in-scope lines do not cross agricultural fields, pastures, and wildlife habitat, and exposure to flora and fauna from EMFs due to the in-scope transmission lines would be incidental and minimal. The NRC's 2013 literature search on the issue indicated that the EMFs produced by operating transmission lines up to 1,100 kV have not been reported to have any biologically or economically significant impact on plants, wildlife, agricultural crops, or livestock. (NRC 2013b) As described in Section 2.2.5, the in-scope transmission lines are 115 kV and 345 kV. Given that in-scope transmission lines are confined to developed areas and are of a voltage not reported to have any biologically significant impact on plants, wildlife, agricultural crops, or livestock, the EMFs emitted by the MNGP in-scope transmission lines would have no impact on flora and fauna. Therefore, impacts from EMFs on flora and fauna during the proposed SPEO are SMALL.

Xcel Energy finds that impacts of electromagnetic fields on flora and fauna (plants, agricultural crops, honeybees, wildlife, and livestock) for the proposed SPEO are SMALL.

4.6.13 Impingement and Entrainment of Aquatic Organisms (Plants with Cooling Towers)

4.6.13.1 Generic Analysis for Initial License Renewals [GEIS Section 4.5.1.1]

In the 2013 license renewal GEIS, the NRC reviewed the impacts of impingement and entrainment at plants with cooling towers. Removal of any substantial volume of water from a natural body of water by a cooling system will likely also remove or kill some of the aquatic organisms that live there through impingement or entrainment. The potential for impingement and entrainment of aquatic organisms is influenced by a variety of factors with the volume of water withdrawn relative to the size of the water source appears to be the best predictor of the number of organisms that would be impinged or entrained within a given aquatic system. Because the volume of water withdrawn by a power plant is minimized when a closed-cycle cooling system is employed, the impacts to aquatic organisms from impingement and entrainment would be smaller than the impacts from impingement and entrainment that would occur if that plant employed a once-through cooling system instead. In considering the impingement and entrainment effects of closed-cycle cooling systems on aquatic ecology, the NRC evaluated the same issues that were evaluated for plants with once-through cooling systems or cooling ponds. On the basis of these considerations, the NRC concludes that the impingement and entrainment of aquatic organisms at plants with cooling towers operating as a closed-cycle cooling system over the license renewal term would be SMALL.

For initial license renewals, the NRC codified its conclusion that impingement and entrainment rates are lower at plants that use closed-cycle cooling with cooling towers because the rates and volumes of water withdrawal needed for makeup are minimized. The NRC found the impact for this issue to be SMALL.

4.6.13.2 Site-Specific Analysis for MNGP SLR

As part of the Site-Specific Analysis, Xcel Energy considered relevant new information on impingement and entrainment of aquatic organisms for plants with cooling towers since initial license renewal. MNGP operates in the once-through cooling mode the majority of the year and operates its MDCTs under certain conditions as established in the NPDES permit. The impact analysis in Section 4.6.1.2 for once-through cooling would bound the impacts from use of the cooling towers at MNGP.

Xcel Energy finds that impacts from impingement and entrainment of aquatic organisms for plants with cooling towers for the proposed SPEO are SMALL.

4.6.14 Entrainment of Phytoplankton and Zooplankton (All Plants)

4.6.14.1 Generic Analysis for Initial License Renewals [GEIS Section 4.5.1.1]

In the 2013 license renewal GEIS, the NRC reviewed the entrainment of phytoplankton and zooplankton and found that due to no change in operation of the cooling system during the license renewal term, no change in effects on entrainment of phytoplankton and zooplankton was anticipated. Therefore, the NRC determined that entrainment of phytoplankton and zooplankton is expected to have a SMALL impact on populations of these organisms in source waterbodies for all plants.

For initial license renewals, the NRC codified its conclusion that entrainment of phytoplankton and zooplankton has not been found to be a problem at operating nuclear power plants and is not expected to be a problem during the license renewal term. The NRC found the impact for this issue to be SMALL.

4.6.14.2 Site-Specific Analysis for MNGP SLR

As part of the Site-Specific Analysis, Xcel Energy considered relevant new information on entrainment of phytoplankton and zooplankton (all plants) since initial license renewal. As discussed under Section 3.7.1.2, zooplankton are not a prominent component of the Mississippi River ecosystem, because few zooplankton species are well-adapted to flowing water. Zooplankton communities that do exist in flowing streams tend to be dominated by microscopic, single-celled protozoans and rotifers, with few crustaceans. Zooplankton and phytoplankton are a primary source of food for a large number of fish species, including those found in the vicinity of the MNGP site. MNGP conducts fish surveys in the Mississippi River fisheries as required by its NPDES permit. The monitoring conducted over the past 32 years do not indicate any major long-term decreases in overall fish abundance and species diversity. There are no on-going monitoring data available for plankton communities in the vicinity of the MNGP site. However, given the correlation between fish and plankton, it is reasonable to expect that no major changes in the zooplankton and phytoplankton communities have occurred in the same time period (i.e., 32 years). As discussed in Section 2.2, there are no plant operations or modifications planned for the proposed SPEO that would alter the cooling water system, and no plans for SLR-related refurbishment activities have been identified.

Based on impingement and entrainment studies, ecological monitoring (including new information of 2020-2021 biennial environmental monitoring results), and compliance with current and future NPDES permit conditions, impacts from entrainment of phytoplankton and zooplankton during the proposed operating term would be SMALL.

Xcel Energy finds that impacts of entrainment of phytoplankton and zooplankton (all plants) for the proposed SPEO are SMALL.

4.6.15 Thermal Impacts on Aquatic Organisms (Plants with Cooling Towers)

4.6.15.1 Generic Analysis for Initial License Renewals [GEIS Section 4.5.1.1]

In the 2013 license renewal GEIS, the NRC the NRC considered the impacts of thermal discharges on aquatic organisms during the license renewal term. NRC concluded that the direct impact of thermal discharges on aquatic organisms at nuclear plants with cooling towers over the license renewal term would be SMALL. This finding was based, in part, on the presence of smaller thermal plumes at plants with closed-cycle cooling towers than would occur if a once-through cooling system was used at those plants. For initial license renewals, the NRC codified its conclusion that thermal effects associated with plants that use cooling towers are expected to be SMALL because of the reduced amount of heated discharge.

4.6.15.2 Site-Specific Analysis for MNGP SLR

As part of the Site-Specific Analysis, Xcel Energy considered relevant new information on thermal impacts on aquatic organisms for plants with cooling towers since initial license renewal. MNGP operates in the once-through cooling mode the majority of the year and operates its MDCTs under certain conditions as established in the NPDES permit. The impact analysis in Section 4.6.2.2 for once-through cooling would bound the impacts from use of the cooling towers at MNGP.

Xcel Energy finds that impacts of thermal impacts on aquatic organisms for plants with cooling towers for the proposed SPEO are SMALL.

4.6.16 Infrequently Reported Thermal Impacts (All Plants)

4.6.16.1 Generic Analysis for Initial License Renewals [GEIS Section 4.5.1.1]

In the 2013 license renewal GEIS, the NRC reviewed infrequently reported thermal impacts for all nuclear plants. Potential effects common to the operation of nuclear power plant cooling systems considered by NRC in the license renewal GEIS as infrequently reported thermal impacts are listed below, along with a description of the effect. The mitigation measures identified for the thermal effect are also included in the description and/or the standard used by NRC to classify the impacts of the effect as being of SMALL significance. The NRC's review revealed only SMALL levels of impact in the aquatic resources due to the infrequently reported thermal impacts and expects the same at all plants.

Cold shock. Cold shock can occur when organisms acclimated to the elevated temperatures of a thermal plume are abruptly exposed to temperature decreases when thermal effluent stops. Such events are most likely to occur during winter. Cold shock events have only rarely occurred at nuclear plants. Gradual shutdown of plant operations generally precludes cold shock events.

Creation of thermal plume migration barriers. The potential exists for thermal plumes to create a barrier to migrating fish if the mixing zone covers an extensive cross-sectional area of a river and exceeds the fish avoidance temperature. A demonstration of the size of the cross section being small enough to allow passage could indicate a SMALL impact.

Changes in the distribution of aquatic organisms. Impacts of thermal discharges on the geographic distribution of aquatic organisms are considered to be of SMALL significance if populations in the overall region are not reduced.

Accelerated development of aquatic insect maturation. Heated effluents could accelerate the development of immature stages of aquatic insects in freshwater systems, resulting in premature emergence. If adults emerge before the normal seasonal cycle, they may be unable to feed or reproduce. The NRC did not describe any occurrences of this effect at nuclear power plants and acknowledged that the literature search indicated it had not been observed in field investigations. The NRC also included the stimulation of population growth of macroinvertebrates from heated effluents under this effect.

Stimulation of the growth of aquatic nuisance species. An aquatic nuisance species is a non-indigenous species that threatens the diversity or abundance of native species or the ecological stability of infested waters, or commercial, agricultural, aquacultural, or recreational activities dependent on such waters. Thermal discharges can allow nuisance species, such as the Asiatic clam (*Corbicula fluminea*) and zebra mussel (*Dreissena polymorpha*), to become established or proliferate. The effects of stimulating the growth of nuisance organisms are considered to be of SMALL significance to aquatic resources if these organisms are restricted to the condenser cooling system (e.g., Asiatic clam; zebra mussel) or do not proliferate beyond the immediate vicinity of the plant.

For initial license renewals, the NRC codified its conclusion that continued operations during the license renewal term are expected to have SMALL thermal impacts with respect to the following:

Cold shock has been satisfactorily mitigated at operating nuclear plants with once-through cooling systems, has not endangered fish populations or been found to be a problem at operating nuclear power plants with cooling towers or cooling ponds, and is not expected to be a problem.

Thermal plumes have not been found to be a problem at operating nuclear power plants and are not expected to be a problem.

Thermal discharge may have localized effects but is not expected to affect the larger geographical distribution of aquatic organisms.

Premature emergence has been found to be a localized effect at some operating nuclear power plants but has not been a problem and is not expected to be a problem.

Stimulation of nuisance organisms has been satisfactorily mitigated at the single nuclear power plant with a once-through cooling system where previously it was a problem. It has not been found to be a problem at operating nuclear power plants with cooling towers or cooling ponds and is not expected to be a problem.

4.6.16.2 Site-Specific Analysis for MNGP SLR

As part of the Site-Specific Analysis, Xcel Energy considered relevant new information on infrequently reported thermal impacts for all plants since initial license renewal. The activities or conditions NRC identified above in the background discussion for this issue as a consequence of operation of a plant's cooling water system thermal discharge are listed below along with applicable MNGP information.

Cold Shock: From 2017–2022, MNGP has documented fish kills three times. The first fish kill incident was attributed to loss of heat input to the Mississippi River as the result of an outage and was reported to the MDNR. Following the outage, MNGP surveyed for impacted fish in the vicinity of the plant discharge and one mile downstream of the site. A total of 49 fish were found deceased. Species included smallmouth bass, common shiner, bluegills, and channel catfish. The second incident occurred during the week of May 14, 2022, when 30 fish were discovered in the cooling tower. The third incident occurred in January 2022 due to the loss of heat input to the river because of plant shut down for maintenance. This incident resulted in the loss of 1,398 fish. Based on the limited number of outage events, outage events are not expected to have more than minor effects on aquatic organisms.

Creation of thermal plume migration barriers. The thermal discharge is to the Mississippi River and due to its width, aquatic organisms can navigate around MNGP's thermal discharges' mixing zone without being impacted.

Changes in the distribution of aquatic organisms. Xcel Energy's biennial ecological monitoring results have no indications of adverse impacts to aquatic biota within the vicinity of the discharge plume (Sections 4.6.1 and 4.6.2).

Accelerated development of aquatic insect maturation. MNGP's circulating water system's discharge of thermal effluent to the Mississippi River is unlikely to create a thermal environment that would result in the accelerated development of aquatic insect maturation. The MPCA limits waste heat rejected to the river through discharge temperature seasonal limits in the site's NPDES permit. The NPDES temperature limit for the warmest months of the year is 95°F (Attachment A) and the maximum daily temperature released to the discharge canal (which is at a point prior to the discharge to the river itself) from 2016 through July 25, 2021, was 94.8°F. Lower temperatures would occur in the river itself because temperatures would rapidly decrease once canal water mixes with river water.

Stimulation of the growth of aquatic nuisance species. Section 3.7.5 discusses the invasive aquatic species found in the MNGP vicinity. Of the aquatic plants and animals, only the purple loosestrife, zebra mussel, Asiatic clam, and common carp have been observed on the MNGP site. The purple loosestrife, zebra mussel, and common carp have a wide distribution that is not dependent on warmed waters. In Minnesota, the occurrence of the scattered populations of Asiatic clams are near power plant locations, suggesting that other factors like warm water discharge, may create situations that allow for sustained populations. The lack of spread downstream from these isolated pools suggest that current seasonal conditions may not support spread.

Xcel Energy finds that impacts of infrequently reported thermal impacts for all plants for the proposed SPEO are SMALL.

4.6.17 Effects of Cooling Water Discharge on Dissolved Oxygen, Gas Supersaturation, and Eutrophication

4.6.17.1 Generic Analysis for Initial License Renewals [GEIS Section 4.5.1.1]

In the 2013 license renewal GEIS, the NRC reviewed the potential effects on aquatic biota from low dissolved oxygen levels, gas supersaturation (gas bubble disease), and eutrophication for nuclear power plant cooling water discharges. The addition of a heat load to an aquatic ecosystem via the discharge of cooling water has the potential to stress aquatic biota by simultaneously increasing metabolic rates and the need for oxygen and by reducing dissolved oxygen concentrations to sub-optimal levels. The potential for effects on biota from a reduction in the dissolved oxygen concentration is greater in ecosystems where dissolved oxygen levels are already approaching sub-optimal levels as a result of other factors that affect the environment. Thus, organisms in ecosystems where (1) the biological demand for dissolved oxygen is elevated as a result of increased levels of detritus or nutrients (e.g., eutrophication from runoff containing fertilizers or manure or from the release of dead, entrained organisms in the discharge of once-through cooling systems); or (2) low flow levels and high ambient temperatures already exist (e.g., as a result of drought conditions or hot weather) may be more susceptible to negative effects if dissolved oxygen levels are reduced further. For this reason, the EPA and states often regulate dissolved oxygen to ensure that minimum levels will be maintained.

In addition to the effects of cooling systems on dissolved oxygen described above, the NRC reviewed the potential for impacts to aquatic organisms from gas bubble disease. The rapid heating of water in the condenser cooling system also decreases the solubility and saturation point for other dissolved gases. Thus, as the water passing through the cooling system is heated, the water becomes supersaturated with gases. Although the levels of dissolved gases will return to normal values as the water cools and mixes with ambient waters, tissues of aquatic organisms that remain in the supersaturated effluent for extended periods can become equilibrated to the increased partial pressures of gases within the effluent. If these organisms are subsequently exposed to water with lower partial pressures (which occurs when the water cools or when the organisms move to water in other locations or at other depths), dissolved gas (especially nitrogen) within the tissues may come out of solution and form embolisms (bubbles) within the affected tissues, most noticeably the eyes and fins. The resulting condition is known as gas bubble disease.

In the 2013 GEIS, the NRC concluded that there would be no change in effects of low dissolved oxygen concentrations or gas supersaturation on aquatic biota during the license renewal term in the absence of changes to operation of the cooling system or the ambient conditions. Overall, the NRC concluded that impacts of plant operation on low dissolved oxygen concentrations and gas supersaturation attributable to cooling water discharges would be SMALL for all plants.

For initial license renewals, the NRC codified its conclusion that gas supersaturation was a concern at a small number of operating nuclear power plants with once-through cooling systems but has been mitigated. Low dissolved oxygen was a concern at one nuclear power plant with a once-through cooling system but has been mitigated. Eutrophication (nutrient loading) and resulting effects on chemical and biological oxygen demands have not been found to be a problem at operating nuclear power plants. The NRC found the impact for this issue to be SMALL.

4.6.17.2 Site-Specific Analysis for MNGP SLR

As part of the Site-Specific Analysis, Xcel Energy considered relevant new information on the effects of cooling water discharge on dissolved oxygen, gas supersaturation, and eutrophication since initial license renewal. MNGP operates under conditions of an NPDES permit that requires biennial environmental monitoring studies which include water quality assessment and fish surveys. Data collected between 1995–2021 do not indicate significant changes in the water quality of the cooling water discharge or any major long-term decreases in overall fish abundance and species diversity in the Mississippi River in the vicinity of the MNGP site. MNGP has not proposed any refurbishment activities or changes to operation of the cooling system or ambient conditions that could lead to changes in dissolved oxygen, supersaturation, and eutrophication in the Mississippi River in the vicinity of the MNGP site are anticipated.

Xcel Energy finds that impacts of the effects of cooling water discharge on dissolved oxygen, gas supersaturation, and eutrophication for the proposed SPEO are SMALL.

4.6.18 Effects of Nonradiological Contaminants on Aquatic Organisms

4.6.18.1 Generic Analysis for Initial License Renewals [GEIS Section 4.5.1.1]

The potential for nonradiological contaminants to accumulate in sediments or aquatic biota was identified as a Category 1 issue in the 1996 GEIS. This was originally raised as an issue of concern at a few power plants that used copper alloy condenser tubes, but this concern has been successfully mitigated by replacing copper alloy tubes with those made from other metals (e.g., titanium). An operating nuclear power plant can contribute other contaminants by concentrating existing constituents from the water body (e.g., in blowdown at closed-cycle plants) or by the addition of chemicals to cooling water during plant operations (e.g., biocides). Concentrations of heavy metals and other contaminants in the discharges of nuclear power plants are normally quickly diluted or flushed from the area by the large volumes of the receiving water. The discharge of metals and other toxic contaminants may also be subject to controls implemented by state or federal agencies through the NPDES permit process. Impacts of contaminant discharges are considered to be of SMALL significance if water quality criteria (e.g., NPDES permits) are not violated and if aquatic organisms in the vicinity of the plant are not bioaccumulating the contaminants.

For initial license renewals, the NRC codified its conclusion that BMPs and discharge limitations of NPDES permits are expected to minimize the potential for impacts to aquatic resources during continued operations and refurbishment associated with license renewal. Accumulation of metal contaminants has been a concern at a few nuclear power plants but has been satisfactorily mitigated by replacing copper alloy condenser tubes with those of another metal. The NRC found the impact for this issue to be SMALL.

4.6.18.2 Site-Specific Analysis for MNGP SLR

As part of the Site-Specific Analysis, Xcel Energy considered relevant new information on the effects of nonradiological contaminants on aquatic organisms since initial license renewal. Condenser tubes are stainless steel at MNGP and would not contribute leached metals to the cooling water discharge. The plant's NPDES permit governs water treatment chemicals and biocides use and requires any changes to be addressed by a change in the permit (Attachment A). Discharges are monitored and constituents are controlled in compliance with the permit.

Sections 4.5.8 and 4.5.9 address discharge of metals in the cooling system effluent and discharge of biocides in the cooling system effluent, respectively. These assessments conclude that the impacts to surface water from these constituents in the cooling water discharge would be SMALL. Since no alterations are planned for the proposed SPEO and discharges would continue to be in compliance with MNGP's NPDES permit, the impact on the aquatic community during the proposed SPEO from nonradiological contaminants would be SMALL.

Xcel Energy finds that impacts of the effects of nonradiological contaminants on aquatic organisms for the proposed SPEO are SMALL.

4.6.19 Exposure of Aquatic Organisms to Radionuclides

4.6.19.1 Generic Analysis for Initial License Renewals [GEIS Section 4.5.1.1]

Pathways for aquatic biota exposure considered by the NRC in 2013 included that aquatic biota can be exposed externally to ionizing radiation from radionuclides in water, sediment, and other biota, and aquatic biota can be exposed internally via ingested food and water and, in certain situations, absorption through the skin and respiratory organs. No evidence of significant differences in sensitivity to radionuclides between marine and freshwater organisms has been reported. Some radionuclides tend to follow pathways similar to their nutrient analogs and can therefore be transferred rapidly through the food chain. These include (1) radionuclides such as strontium-90, barium-140, radon-226, and calcium-46 that behave like calcium and are therefore accumulated in bony tissues; (2) radionuclides such as iodine-129 and iodine-131 that act like stable iodine and accumulate in thyroid tissue; (3) radionuclides such as potassium-40, cesium-137, and rubidium-86 that follow the general movement of potassium and can be distributed throughout the body; and (4) radionuclides such as tritium, which resembles stable hydrogen, that is distributed throughout the body of an organism.

In the 2013 GEIS, the NRC conducted a review of all operating nuclear power plants to evaluate the potential impacts of radionuclides on aquatic biota from continued operations. The NRC selected 15 representative plants to calculate estimated dose rates for aquatic biota. The total estimated dose rates for aquatic biota for these plants were all less than 0.2 rad/d (0.002 Gy/d), considerably less than the U.S. Department of Energy's (DOE) guideline value of 1 rad/d (0.01 Gy/d). On the basis of the reviewed literature and the dose rates estimated for aquatic biota from site-specific data, the NRC concluded that the impact of radionuclides on aquatic biota from past operations would be SMALL for all plants, and it would not be expected to change appreciably during the renewal period.

For initial license renewals, the NRC codified its conclusion that doses to aquatic organisms are expected to be well below exposure guidelines developed to protect these aquatic organisms. The NRC found the impact for this issue to be SMALL.

4.6.19.2 Site-Specific Analysis for MNGP SLR

As part of the Site-Specific Analysis, Xcel Energy considered relevant new information on the exposure of aquatic organisms to radionuclides since initial license renewal. MNGP operates in accordance with its license. Releases are maintained in compliance with 10 CFR Part 20 limits and reported in ARERRs submitted to the NRC. In addition, MNGP conducts sampling in accordance with its REMP. The MNGP REMP is designed to provide representative measurements of radiation and of radioactive materials through various media exposure pathways. As detailed in Section 3.10.3, the REMP measures the aquatic, terrestrial, and atmospheric environment for ambient radiation and radioactivity. Monitoring is conducted for the following: direct radiation, air, drinking water, river water, groundwater, vegetation, milk, fish, and shoreline sediment. The most current (2021) REMP sampling did not detect radioactive material due to plant operation in offsite samples. This confirms that impact on the environment and the public due to plant effluents remains very low. As discussed in Section 3.10.3, the 2020 REMP report states that river water samples and groundwater samples showed tritium and gamma isotopic results all below detection limits and consistent with the results from previous years. Fish samples for 2020 showed results with no gamma emitting radionuclides attributable to MNGP operations which were consistent with historical results, and shoreline sediment samples for 2020 indicated no MNGP effect as well. (Xcel 2021d)

Continued compliance with NRC radiological effluent limits and implementation of the REMP will ensure that aquatic organisms' exposure to radionuclides is well within guidelines and adverse trends are detected to implement corrective actions.

Xcel Energy finds that impacts of the exposure of aquatic organisms to radionuclides for the proposed SPEO are SMALL.

4.6.20 Effects of Dredging on Aquatic Organisms

4.6.20.1 Generic Analysis for Initial License Renewals [GEIS Section 4.5.1.1]

Dredging is an activity that is performed at some power plants to remove accumulated sediments from intake and discharge areas (or, more rarely, to maintain barge slips) and may have localized impacts on aquatic biota. The impacts of dredging were not evaluated in the 1996 GEIS. NRC reviewed potential impacts to aquatic organisms from dredging operations to support nuclear power plant operations and anticipated that maintenance dredging would occur infrequently, would be of relatively short duration, would affect relatively small areas, and would be primarily undertaken in areas containing soft sediments that would be recolonized fairly rapidly by benthic organisms in surrounding areas. NRC also considered that the levels of chemical and radionuclide contamination of sediments in the areas near power plant intakes and discharges that would need to be dredged are likely to be relatively low. The NRC considered compliance with USACE, and applicable state permits sufficient to mitigate any impacts to a SMALL significance.

For initial license renewals, the NRC codified its conclusion that dredging at nuclear power plants is expected to occur infrequently, would be of relatively short duration, and would affect relatively small areas. Dredging is performed under permit from the USACE and possibly from other state or local agencies. The NRC found the impact for this issue to be SMALL.

4.6.20.2 Site-Specific Analysis for MNGP SLR

As part of the Site-Specific Analysis, Xcel Energy considered relevant new information on the effects of dredging on aquatic organisms since initial license renewal. MNGP conducts maintenance dredging in the Mississippi River permitted in conjunction with the MDNR and USACE. The 2022 dredging activity is authorized under Nationwide Permit No. 3.

Xcel Energy finds that impacts of the effects of dredging on aquatic organisms for the proposed SPEO are SMALL.

4.6.21 Effects on Aquatic Resources (Non-Cooling System Impacts)

4.6.21.1 Generic Analysis for Initial License Renewals [GEIS Section 4.5.1.1]

Impacts on aquatic resources from continued operations and refurbishment activities could occur at all operating nuclear power plants during the license renewal term as a result of (1) direct disturbance (e.g., ground disturbance, draining ponds, blocking or redirecting streams, and placing riprap along shorelines) of aquatic habitats within project areas; (2) sedimentation of nearby aquatic habitats as a consequence of soil erosion; (3) changes in water quantity or water quality (e.g., grading that affects surface runoff patterns or depletions or discharges of water into aquatic habitats); or (4) releases of chemical contaminants into nearby aquatic systems. In the 2013 license renewal GEIS, the NRC reviewed these activities and their effects under this issue as listed above, with the understanding that permits from various federal, state, and local governmental authorities are typically required for ground-disturbing activities and with proper application of environmental reviews, permitting processes, and BMPs, impacts on sensitive aquatic habitats would likely be avoided. With this understanding, the NRC concluded that the impact of continued operations and refurbishment activities on aquatic resources would be SMALL.

For initial license renewals, the NRC codified its conclusion that licensee application of appropriate mitigation measures is expected to result in no more than small changes to aquatic communities from their current condition. The NRC found the impact for this issue to be SMALL.

4.6.21.2 Site-Specific Analysis for MNGP SLR

As part of the Site-Specific Analysis, Xcel Energy considered relevant new information on the effects on aquatic resources (non-cooling system impacts) since initial license renewal. Non-cooling water discharges at MNGP wastewater are discharged to the Mississippi River through four NPDES-permitted external outfalls (SD003, SD004, SD005, and SD006) (Attachment A).

MNGP has procedures and plans in place to address concern for the potential for impacts to onsite and nearby aquatic habitats as a consequence of site disturbance, soil erosion, changes in water quality, or releases of chemical contaminants as detailed below.

MNGP has administrative procedures that establish the policies and general requirements for ongoing operations, maintenance, and construction activities to be conducted in accordance with the MNGP environmental protection plan, and applicable federal, state, and local regulations and permit conditions.

MNGP has not proposed any refurbishment activities related to SLR. Land disturbance for continued operations at MNGP would be related to routine infrastructure maintenance and renovation activities to maintain and upgrade or replace infrastructure and structures as needed to support MNGP operations. Construction and maintenance activities undertaken during the SLR period that would involve ground disturbance of greater than 6 inches would be required to follow the MNGP excavation permit procedure and could also trigger an environmental review to determine any impacts.

MNGP has an SWPPP that addresses storage, secondary containment, and inspections. The plan identifies potential sources of pollution, such as erosion, that would reasonably be expected to affect the quality of stormwater and identifies BMPs that will be used to prevent or reduce the pollutants in stormwater discharges. MNGP has SPCC and hazardous substance spill contingency plans and a chemical control program procedure. Between January 2016 and July 2020, there has been one reported spill: a release of approximately 300 gallons of water containing sodium hypochlorite from the service water system. The spill was primarily contained within the building by a berm, though a half gallon of water was able to reach a floor drain. The release was initially reported to the Minnesota Duty Officer due to the small amount of water that was able to escape, and a release sampling report was submitted to the MPCA as part of the July DMR. Subsequent sampling of the spilled water determined that the solution was heavily diluted, with sodium hypochlorite constituting less than one percent. All repairs were completed within two days of the release and not further action was taken or required by the MPCA. There were no reportable spills associated with MNGP from August 2020–March 2022.

MNGP conducts maintenance dredging in the Mississippi River. The requirements for the management of dredge material, including spoil storage and disposal, are determined by the NPDES permit, USACE dredge permit, and MDNR dredge permit requirements.

Xcel Energy finds that impacts of the effects on aquatic resources (non-cooling system impacts) for the proposed SPEO are SMALL.

4.6.22 Impacts of Transmission Line Right-of-Way Management on Aquatic Resources

4.6.22.1 Generic Analysis for Initial License Renewals [GEIS Section 4.5.1.1]

This is a new issue added by the 2013 GEIS. Continued operations and refurbishment activities will require management and maintenance of in-scope transmission lines and associated in-scope transmission line ROWs. Continued operations and refurbishment activities could result in negative impacts on aquatic resources within the ROW or from runoff associated with in-scope transmission line management and maintenance. In the 2013 license renewal GEIS, the NRC reviewed the impacts of transmission line ROW management on aquatic species and found that changes in aquatic species diversity, abundance, or health from transmission line ROW maintenance are likely to be SMALL. The continued use of proper management practices with respect to soil erosion and application of herbicides is expected. In addition, license renewal for a specific plant would affect only the portion of the transmission line that connects the power plant to the first substation, so the amount of aquatic habitat crossed is likely to be small.

For initial license renewals, the NRC codified its conclusion that licensee application of BMPs to ROW maintenance is expected to result in no more than SMALL impacts to aquatic resources. The NRC found the impact for this issue to be SMALL.

4.6.22.2 Site-Specific Analysis for MNGP SLR

As part of the Site-Specific Analysis, Xcel Energy considered relevant new information on the impacts of transmission line ROW management on aquatic resources since initial license renewal. In-scope transmission lines are confined to the MNGP site, spanning the short distance between the generating units and the switchyard, crossing developed areas and do not cross surface water features (described in Section 2.2.5 and depicted on Figure 2.2-3).

MNGP has administrative policies and implements BMPs for preventing erosion from soil disruption. The NPDES permit requires MNGP to implement BMPs to protect surface water and groundwater from runoff of pollutants and loose soil in industrial areas. In addition, maintenance of vegetation within the in-scope transmission line ROW includes herbicide application that follows Xcel Energy's chemical control program. MNGP has not proposed any refurbishment activities related to in-scope transmission lines as part of SLR.

Continued ROW management will maintain aquatic communities and resources in their current condition. Implementation of BMPs and adherence to vegetation management protocols will ensure minimal impact on aquatic resources from ROW management and maintenance.

Xcel Energy finds that impacts of transmission line ROW management on aquatic resources for the proposed SPEO are SMALL.

4.6.23 Losses from Predation, Parasitism, and Disease Among Organisms Exposed to Sub-Lethal Stresses

4.6.23.1 Generic Analysis for Initial License Renewals [GEIS Section 4.5.1.1]

During the license renewal term, cooling system intake and discharge would continue to affect aquatic resources. Sub-lethal stresses can come from impingement, entrainment, thermal discharge, low dissolved oxygen levels, gas supersaturation in tissues, and exposure to radionuclides and nonradiological contaminants. Impacts such as increased susceptibility to predation, parasitism, and disease can increase for species exposed to sub-lethal stresses. The effects of low dissolved oxygen levels are not expected to be felt by aquatic species beyond the thermal mixing zone. It is anticipated that heavy metal concentrations and radionuclide releases related to normal plant operations would not result in negative effects on aquatic biota. Impacts on the susceptibility of aquatic organisms to predation, parasitism, and disease due to sub-lethal stresses are considered to be of SMALL significance if changes are localized and populations of aquatic organisms in the receiving water body are not reduced. Indirect power plant-induced mortality has not been shown to cause reductions in the overall populations of aquatic organisms near any existing nuclear power plants. The level of impact due to sub-lethal stresses has been SMALL at plants reviewed by the NRC in the 2013 GEIS and is expected to be SMALL for all nuclear plants.

For initial license renewals, the NRC codified its conclusion that these types of losses have not been found to be a problem at operating nuclear power plants and are not expected to be a problem during the license renewal term. The NRC found the impact for this issue to be SMALL.

4.6.23.2 Site-Specific Analysis for MNGP SLR

As part of the Site-Specific Analysis, Xcel Energy considered relevant new information on losses from predation, parasitism, and disease among organisms exposed to sub-lethal stresses since initial license renewal. The stresses of impingement, entrainment, thermal discharge, low dissolved oxygen levels, gas supersaturation in tissues, and exposure to radionuclides and nonradiological contaminants are discussed under previous sections and summarized below:

- Surface water use and quality (non-cooling system impacts), Section 4.5.5: Compliance with current and future NPDES and stormwater regulatory requirements and permit conditions, and implementation of SWPPP BMPs, and the SPCC plan will ensure an insignificant impact on surface water quality from non-cooling systems during the proposed SPEO. Compliance with water use permits and regulations would ensure an insignificant impact on surface water use.

- Altered current patterns at intake and discharge structures, Section 4.5.6: Given the size of the Mississippi River and that there are no modifications planned that would alter the existing current pattern, impacts to surface water use and quality are SMALL.
- Discharge of metals in cooling system effluent, Section 4.5.8: Condenser tubes at MNGP are stainless steel and would not contribute leached metals to the cooling water discharge. As such, impacts from the discharge of metals in cooling system effluent are SMALL.
- Discharge of biocides, sanitary wastes, and minor chemical spills, Section 4.5.9: Compliance with current and future NPDES regulatory requirements and permit conditions will ensure the impact of biocides and minor chemical spills to be SMALL.
- Temperature effects on sediment transport capacity, Section 4.5.12: Discharges are governed by MNGP's NPDES permit which establish temperature discharge limits. There have been no NOVs related to the NPDES permit in the past 6 years and no plant operations or modifications are planned for the proposed SPEO that would alter discharge patterns. As such, temperature effects on sediment transport capacity are SMALL.
- Impingement and entrainment of aquatic organisms (plants with cooling towers), Section 4.6.13: Based on impingement and entrainment studies, ecological monitoring and compliance with current and future NPDES permit conditions, impacts from impingement and entrainment of aquatic organisms will be SMALL.
- Entrainment of phytoplankton and zooplankton, Section 4.6.14: Based on impingement and entrainment studies, ecological monitoring, and compliance with current and future NPDES permit conditions, impacts from entrainment of phytoplankton and zooplankton will be SMALL.
- Thermal impacts on aquatic organisms (plants with cooling towers), Section 4.6.15: MNGP operates in the once-through cooling mode the majority of the year and operates its MDCTs under certain conditions as established in the NPDES permit. There have been no NOVs related to the NPDES permit in the past 6 years (2016–2021). As such, thermal impacts on aquatic organisms are SMALL.
- Effects of cooling water discharge on dissolved oxygen, gas supersaturation, and eutrophication, Section 4.6.17: Biennial environmental monitoring conducted between 1995–2021 do not indicate significant changes in the water quality of the cooling water discharge or any major long-term decreases in overall fish abundance and species diversity in the Mississippi River in the vicinity of the MNGP site. Given that MNGP operates under conditions of an NPDES permit and that no site modifications are planned, the effects of cooling water discharge on dissolved oxygen, gas supersaturation, and eutrophication will be SMALL.
- Effects of nonradiological contaminants on aquatic organisms, Section 4.6.18: MNGP's NPDES permit governs water treatment chemicals and biocides use (Attachment A). Since no alterations are planned for the proposed SPEO and discharges would continue

to be in compliance with the NPDES permit, effects of nonradiological contaminants on aquatic organisms will be SMALL.

- Exposure of aquatic organisms to radionuclides, Section 4.6.19: MNGP operates in compliance with NRC regulations. The most current (2021) REMP sampling at the MNGP site verifies that the levels of radiation and concentrations of radioactive materials in environmental samples are not increasing. Continued compliance with NRC radiological effluent limits and implementation of the REMP will ensure that aquatic organisms' exposure to radionuclides is well within guidelines and adverse trends are detected to implement corrective actions.
- Effects on aquatic resources (non-cooling system impacts), Section 4.6.21: Compliance with USACE/MDNR regulatory requirements and permit conditions, implementation of a SWPPP and implementation of BMPs will ensure minimal impacts to nearby aquatic habitats as a consequence of soil erosion, changes in water quality, or releases of chemical contaminants.

Consideration of the above issues would indicate sub-lethal stresses are not significantly impacting the aquatic resources in the vicinity of MNGP.

Xcel Energy finds that impacts from predation, parasitism, and disease among organisms exposed to sub-lethal stresses for the proposed SPEO are SMALL.

4.7 Historic and Cultural Resources

The following sections address the historic and cultural issues applicable to MNGP, providing background on issues and analyses regarding the proposed SPEO.

4.7.1 Historic and Cultural Resources

4.7.1.1 Generic Analysis for Initial License Renewals [GEIS Section 4.7.1]

The NRC will identify historic and cultural resources within a defined APE. The license renewal APE is the area that may be impacted by land-disturbing or other operational activities associated with continued plant operations and maintenance during the license renewal term and/or refurbishment. The APE typically encompasses the nuclear power plant site, its immediate environs, including viewshed, and the transmission lines within this scope of review. The APE may extend beyond the nuclear plant site and transmission lines when these activities may affect historic and cultural resources.

Continued operations during the license renewal term and refurbishment activities at a nuclear power plant can affect historic and cultural resources through (1) ground-disturbing activities associated with plant operations and ongoing maintenance (e.g., construction of new parking lots or buildings), landscaping, agricultural or other use of plant property; (2) activities associated with transmission line maintenance (e.g., maintenance of access roads or removal of danger trees); and (3) changes to the appearance of nuclear power plants and transmission lines. Licensee renewal environmental reviews have shown that the appearance of nuclear power plants and transmission lines has not changed significantly over time; therefore, additional viewshed impacts to historic and cultural resources are not anticipated.

For initial license renewals, the NRC codified its conclusion that continued operations and refurbishment associated with license renewal are expected to have no more than small impacts on historic and cultural resources. The NHPA requires the federal agency to consult with the SHPO and appropriate Native American tribes to determine the potential effects on historic properties and mitigation, if necessary.

4.7.1.2 Site-Specific Analysis for MNGP SLR

As part of the Site-Specific Analysis, Xcel Energy considered relevant new information on historic and cultural resources since initial license renewal.

Refurbishment Activities

As discussed in Section 2.3, no SLR-related refurbishment activities have been identified. Therefore, there would be no SLR-related refurbishment impacts to historic and cultural resources, and no further analysis is required.

Operational Activities

As discussed in Section 3.8.5, there have been no cultural resource investigations conducted within the approximately 2,000-acre MNGP site. As discussed in Section 3.8, no SLR-related ground-disturbing activities outside of the already disturbed area have been identified. Therefore, no adverse effects are anticipated during the proposed SPEO for any sites within the MNGP site boundary.

The area within a 6-mile radius of the site may be archaeologically sensitive based on the location of 35 archaeological sites in areas that have been surveyed for cultural resources (Table 3.8-2). However, adverse impacts would only occur to such sites as a result of soil-intrusive activities. Because MNGP has no plans to conduct such soil intrusive activities at any location outside the MNGP site boundary under SLR, no adverse effects to these archaeological sites would occur.

As discussed in Section 3.8.4, there are four NRHP-listed aboveground historic properties within the 6-mile APE of MNGP. Due to topography, vegetation, and distance, no potential adverse effects to any NRHP-listed properties are expected as a result of the continued operation of MNGP, including viewshed, aesthetic, and noise impacts.

There are five aboveground properties certified as eligible by the SHPO within the 6-mile APE of MNGP (Table 3.8-1). Due to topography, vegetation, and distance, it is doubtful that any of these five properties are within the viewshed of MNGP. As no refurbishment or construction-related activities are planned at MNGP, there will be no change in viewshed from what currently exists.

As discussed above, no SLR-related refurbishment activities outside of the already disturbed area have been identified. No offsite NRHP-listed historic properties will be adversely impacted as a result of continued operation of MNGP, and there are no plans to alter operations, expand existing facilities, or disturb additional land for the purpose of SLR. The Xcel Energy administrative procedures discussed in Section 3.8 are in place to identify, minimize impacts to, and manage cultural resources in the event of ground-disturbing activities.

Xcel Energy finds that there will be NO ADVERSE EFFECT to historic and cultural resources as a result of continued operation during the proposed SPEO.

4.8 Socioeconomics

The following sections address socioeconomic issues applicable to MNGP, providing an evaluation of potential impacts of the proposed subsequent license renewal action.

4.8.1 Employment and Income, Recreation, and Tourism

4.8.1.1 Generic Analysis for Initial License Renewals [GEIS Section 4.8.1.1]

Employees receive income from the nuclear power plant in the form of wages, salaries, and benefits. Employees and their families, in turn, spend this income on goods and services within the community, thereby creating additional opportunities for employment and income. In addition, people and businesses in the community receive income for the goods and services sold to the power plant. Payments for these goods and services create additional employment and income opportunities in the community. The measure of a community's ability to support the operational demands of a power plant depends on the ability of the community to respond to changing socioeconomic conditions.

Some communities experience seasonal transient population growth due to local tourism and recreational activities. Income from tourism and recreational activities creates employment and income opportunities in the communities around nuclear power plants.

Nevertheless, the effects of nuclear power plant operations on employment, income, recreation, and tourism are ongoing and have become well established during the current license term for all nuclear power plants. The impacts from power plant operations during the license renewal term on employment and income in the region around each nuclear power plant are not expected to change from what is currently being experienced. In addition, tourism, and recreational activities in the vicinity of nuclear plants are not expected to change as a result of license renewal.

For initial license renewals, the NRC codified its conclusion that, although most nuclear plants have large numbers of employees with higher-than-average wages and salaries, employment, income, recreation, and tourism impacts from continued operations and refurbishment associated with license renewal are expected to be small. The NRC found the impact for this issue to be SMALL.

4.8.1.2 Site-Specific Analysis for MNGP SLR

As part of the Site-Specific Analysis, Xcel Energy considered relevant new information on employment and income, recreation and tourism since initial license renewal. Information related to employment and income, and recreation and tourism is presented in Section 3.9.1 and Section 3.9.7. As discussed in Section 2.5, there are no plans to add workers to support MNGP plant operations in the proposed SPEO. Furthermore, there are no refurbishment activities planned that would require additional workers or create a visual impact. As previously discussed in Section 3.2.3, the area surrounding MNGP is primarily farmland, scattered forest and natural areas, and small residential communities. As a result, the site does not visually impact areas in the vicinity that have a high degree of visitor use.

Because there are no anticipated changes to the MNGP operational workforce or the site's visual profile associated with plant structures or transmission lines, and no refurbishment is planned, the people living in the MNGP region are not likely to experience any changes to socioeconomic and aesthetic conditions during the proposed SPEO.

Xcel Energy finds that impacts to employment and income, recreation and tourism for the proposed SPEO are SMALL.

4.8.2 Tax Revenues

4.8.2.1 Generic Analysis for Initial License Renewals [GEIS Section 4.8.1.2]

Nuclear power plants and the workers who operate them are an important source of tax revenue for many local governments and public-school systems. Tax revenues from nuclear power plants mostly come from property tax payments or other forms of payments such as payments in lieu of tax (PILOT), although taxes on energy production have also been collected from several nuclear power plants. County and municipal governments and public-school districts receive tax revenue either directly or indirectly through state tax and revenue-sharing programs.

Counties and municipal governments in the vicinity of a nuclear power plant also receive tax revenue from sales taxes and fees from the power plant and its employees. Changes in the number of workers and the amount of taxes paid to county, municipal governments, and public schools can affect socioeconomic conditions in the counties and communities around the nuclear power plant.

A review of license renewal applications received by the NRC since the 1996 GEIS has shown that SLR-related refurbishment activities, such as steam generator and vessel head replacement, have not had a noticeable effect on the assessed value of nuclear plants, thus changes in tax revenues are not anticipated from future SLR-related refurbishment activities.

The primary impact of license renewal would be the continuation or change in the amount of taxes paid by nuclear power plant owners to local governments and public-school systems. The impact of nuclear plant operations on tax revenues in local communities and the impact that the expenditure of tax revenues has on the region are not expected to change appreciably from the amount of taxes paid during the current license term. Tax payments during the license renewal term would be similar to those currently being paid by each nuclear plant.

For initial license renewals, the NRC codified its conclusion that nuclear plants provide tax revenue to local jurisdictions in the form of property tax payments, PILOT payments, or tax payments on energy production. The amount of tax revenue paid during the license renewal term as a result of continued operations and refurbishment associated with license renewal is not expected to change. The NRC found the impact for this issue to be SMALL.

4.8.2.2 Site-Specific Analysis for MNGP SLR

As part of the Site-Specific Analysis, Xcel Energy considered relevant new information on tax revenues since initial license renewal. Information related to annual property tax payments made on behalf of MNGP and apportionment to local taxing jurisdictions is presented in Section 3.9.5. As discussed in Section 2.3, no subsequent license renewal-related refurbishment activities have been identified for MNGP. Xcel Energy plans to continue to operate MNGP as currently designed and no associated changes to plant employment or MNGP taxable property value is anticipated. Therefore, Xcel Energy annual property tax payments are expected to remain constant through the period of extended operation with no notable future increases or decreases.

Because there are no anticipated changes to the operational workforce, no refurbishment is planned, and tax payments are expected to remain constant, the people living in the MNGP region are not likely to experience any noticeable changes in socioeconomic conditions attributable to the SLR during the proposed SPEO.

Xcel Energy finds that impacts to tax revenues for the proposed SPEO are SMALL.

4.8.3 Community Services and Education

4.8.3.1 Generic Analysis for Initial License Renewals [GEIS Section 4.8.1.3]

Any changes in the number of workers at a nuclear plant will affect the demand for public services from local communities. Environmental reviews conducted by the NRC since the 1996 GEIS have shown, however, that the number of workers at relicensed nuclear plants has not changed significantly because of license renewal, so demand-related impacts on community services, including public utilities, are no longer anticipated from future license renewals.

In addition, refurbishment activities, such as steam generator and vessel head replacement, have not required the large numbers of workers and the months of time that were conservatively analyzed in the 1996 GEIS, so significant impacts on community services are no longer anticipated. Because of the relatively short duration of refurbishment-related activities, workers are not expected to bring families and school-age children with them; therefore, impacts from refurbishment on educational services are also no longer anticipated.

Taxes paid by nuclear power plant owners support a range of community services, including public water, safety, fire protection, health, and judicial, social, and educational services. In some communities, tax revenues from power plants can have a noticeable impact on the quality of services available to local residents. Although many of the community services paid for by tax revenues from power plants are used by plant workers and their families, the impact of nuclear plant operations on the availability and quality of community services and education is SMALL and is not expected to change as a result of license renewal.

For initial license renewals, the NRC codified its conclusion that changes resulting from continued operations and refurbishment associated with license renewal to local community and educational services would be small. With little or no change in employment at the licensee's plant, value of the power plant, payments on energy production, and PILOT payments expected during the license renewal term, community and educational services would not be affected by continued power plant operations. The NRC found the impact for this issue to be SMALL.

4.8.3.2 Site-Specific Analysis for MNGP SLR

As part of the Site-Specific Analysis, Xcel Energy considered relevant new information on community services and education since initial license renewal. See Section 3.9.4 for a discussion of Community Services and Education. As described in Section 2.5, there are no plans to add workers to support MNGP operations during the SPEO. Furthermore, there are no refurbishment activities planned that would require additional workers or change the taxable value of MNGP. The Xcel Energy annual property tax payments made on behalf of MNGP are expected to remain constant throughout the proposed SPEO.

Because no changes to employment are expected from continued operations, tax payments are anticipated to remain consistent throughout the SPEO, and no refurbishment activities are planned, the people living in the MNGP region are not likely to experience any noticeable changes in socioeconomic conditions attributable to the SLR during the proposed SPEO beyond the current conditions.

Xcel Energy finds that impacts to community services and education for the proposed SPEO are SMALL.

4.8.4 Population and Housing

4.8.4.1 Generic Analysis for Initial License Renewals [GEIS Section 4.8.1.4]

Socioeconomic impact analyses of resources (e.g., housing) affected by changes in regional population are based on employment trends at nuclear power plants. Population growth from increased employment and spending at a nuclear power plant is important because it is one of the main drivers of socioeconomic impacts. As previously discussed, however, employment levels at nuclear power plants are expected to remain relatively constant with little or no population growth or increased demand for permanent housing during the license renewal term. The operational effects on population and housing values and availability in the vicinity of nuclear power plants are not expected to change from what is currently being experienced, and no demand-related impacts are expected during the license renewal term.

The increased number of workers at nuclear power plants during regularly scheduled plant refueling and maintenance outages does create a short-term increase in the demand for temporary (rental) housing units in the region around each plant. However, because of the short duration and the repeated nature of these scheduled outages and the general availability of rental housing units (including portable trailers) in the vicinity of nuclear power plants, employment-related housing impacts have had little or no long-term impact on the price and availability of rental housing. Refurbishment impacts would be similar to what is experienced during routine plant refueling and maintenance outages.

For initial license renewals, the NRC codified its conclusion that changes resulting from continued operations and refurbishment associated with license renewal to regional population and housing availability and value would be small. With little or no change in employment at the licensee's plant expected during the license renewal term, population and housing availability and values would not be affected by continued power plant operations. The NRC found the impact for this issue to be SMALL.

4.8.4.2 Site-Specific Analysis for MNGP SLR

As part of the Site-Specific Analysis, Xcel Energy considered relevant new information on population and housing since initial license renewal. Information related to population and housing is presented in Section 3.9.2. As described in Section 2.5, there are no plans to add workers to support MNGP plant operations during the SPEO. Furthermore, no MNGP refurbishment activities have been identified that would lead to a need for a larger workforce at the plant.

Because no changes to employment are expected from the continued operations and no refurbishment activities are identified that would require additional workers, the people living in the MNGP region are not likely to experience any noticeable changes in socioeconomic conditions attributable to the SLR during the proposed SPEO.

Xcel Energy finds that impacts to population and housing for the proposed SPEO are SMALL.

4.8.5 Transportation

4.8.5.1 Generic Analysis for Initial License Renewals [GEIS Section 4.8.1.5]

Transportation impacts depend on the size of the workforce, the capacity of the local road network, traffic patterns, and the availability of alternate commuting routes to and from the plant. Because most sites have only a single access road, there is often congestion on these roads during shift changes.

Transportation impacts are ongoing and have become well established during the current licensing term for all nuclear power plants. As previously discussed, it is unlikely that the number of permanent operations workers would increase at a nuclear power plant during the license renewal term. In addition, refurbishment activities, such as steam generator and vessel head replacement, have not required the numbers of workers and the months of time conservatively estimated in the 1996 GEIS. Consequently, employment at nuclear power plants during the license renewal term is expected to remain unchanged.

For initial license renewals, the NRC codified its conclusion that changes resulting from continued operations and refurbishment associated with license renewal to traffic volumes would be small. The NRC found the impact for this issue to be SMALL.

4.8.5.2 Site-Specific Analysis for MNGP SLR

As part of the Site-Specific Analysis, Xcel Energy considered relevant new information on transportation since initial license renewal. As presented in Section 3.9.6, the road capacity in the immediate vicinity of MNGP has an acceptable LOS and should continue to adequately support plant staffing levels during the period of extended operation. As discussed in Section 2.5, there are no plans to add workers to support plant operations at MNGP during the proposed SPEO. Furthermore, there are no identified refurbishment activities that would require additional MNGP staff (see Section 2.3). Therefore, no changes are anticipated for the commuting workforce of MNGP.

Because no changes to employment are expected from continued operations of MNGP and no potential refurbishment activities have been proposed that would require a larger workforce, the people living in the MNGP region are not likely to experience any changes in traffic and transportation attributable to the SLR during the MNGP SPEO beyond the current conditions.

Xcel Energy finds that impacts to transportation for the proposed SPEO are SMALL.

4.9 Human Health

Site-specific assessments for human health issues are discussed below.

4.9.1 Microbiological Hazards to the Public (Plants with Cooling Ponds or Canals, or Cooling Towers that Discharge to a River)

4.9.1.1 Generic Analysis for Initial License Renewals [GEIS Section 4.9.1.1.3]

N. fowleri, which is the pathogenic strain of the free-living amoebae *Naegleria* spp., appears to be the most likely microorganism that may pose a public health hazard resulting from nuclear power plant operations. Increased populations of *N. fowleri* may have significant adverse impacts.

Since *Naegleria* concentrations in freshwater can be enhanced by thermal effluents, nuclear power plants that use cooling lakes, canals, ponds, or rivers experiencing low-flow conditions may enhance the populations of naturally occurring thermophilic organisms.

Changes in microbial populations and in the public use of water bodies might occur after the operating license is issued and the application for license renewal is filed. Other factors could also change, including the average temperature of the water, which could result from climate change that affected water levels and air temperature. Finally, the long-term presence of a power plant might change the natural dynamics of harmful microorganisms within a body of water.

For initial license renewals, the NRC codified its conclusion that these organisms are not expected to be a problem at most operating plants except possibly at plants using cooling ponds, lakes, or canals, or that discharge into rivers. Impacts would depend on site-specific characteristics. The NRC found the impact for this issue to be SMALL, MODERATE, or LARGE.

4.9.1.2 Site-Specific Analysis for MNGP SLR

As part of the Site-Specific Analysis, Xcel Energy considered relevant new information on microbiological hazards to the public for plants with cooling ponds or canals, or cooling towers that discharge to a river since initial license renewal. Section 3.10.1 describes the thermophilic microorganisms that the 2013 GEIS identified to be of potential concern at nuclear power plants. The section also summarizes data on incidences of waterborne diseases in Minnesota from the MDH and the U.S. Centers for Disease Control and Prevention.

MNGP releases heated condenser cooling water to the discharge canal and the wastewater is then discharged to the Mississippi River. The heated condenser cooling water could first be circulated through the plant's two MDCTs if cooling is needed to meet NPDES discharge limits. The NPDES permit's daily maximum temperature discharge limits are 80°F from December through February, 85°F in March and November, and 95°F from April through October (Attachment A).

The circulating water system's discharge of thermal effluent to the Mississippi River is unlikely to create a thermal environment that would enhance the survival of thermophilic organisms, if already present in the river. The MPCA limits waste heat rejected to the river through discharge temperature seasonal limits in the site's NPDES permit. The NPDES temperature limit for the warmest months of the year is 95°F (Attachment A) and the maximum daily temperature released to the discharge canal (which is at a point prior to the discharge to the river itself) from 2016 through July 25, 2021, was 94.8°F. Figure 3.6-5 presents the monthly average discharge temperatures measured within the discharge canals. The average discharge canal temperatures from May to September peaked at about 92.5°F and are generally 90°F and below. To ensure that releases to the discharge canal do not exceed the NPDES limit, MNGP replaced its old cooling towers in 2021 and 2022 with upgraded ones having slightly greater cooling capacity.

Lower temperatures would occur in the river itself because temperatures would rapidly decrease once canal water mixes with river water. A thermal plume study looked at ambient river temperatures with the maximum projected temperature increase for the power uprate of 4.5°F and predicted that the temperature rise over ambient river temperature would be 2.8°F at the discharge point. Applying the 2.8°F maximum temperature increase to the intake temperatures, representative of ambient river water temperatures, shown in Figure 3.6-4, results in a peak monthly average thermal plume temperature of 82°F at the discharge, which decreases as the water moves downstream. The thermal plume temperatures would be well below the optimum growth temperature for intestinal pathogens such as *Shigella*, *Cryptosporidium*, and *Giardia* (optimum growth at 98.6°F) (CDC 2021a; CDC 2021b; Todar 2020), the free-living amoeba *N.*

fowleri (optimum growth at 115°F) (NRC 2013a), and the free-living bacteria, *Pseudomonas aeruginosa* (optimum growth at 98.6°F) (Todar 2020). Thus, thermal additions to the Mississippi River resulting from MNGP operations are unlikely to enhance the growth or survival of thermophilic organisms.

Mississippi River conditions near MNGP are not favorable for swimming and diving. The strong river flow and rocks in the river make swimming and diving hazardous. The area is used for fishing and boating. However, the discharge structure and the immediate area are ringed by buoys indicating it is restricted from public access. Restricted access minimizes the potential for human exposure to the microorganisms of concern if present in the river. Thus, exposure of recreational users to elevated concentrations of the microorganisms of concern is unlikely, given the lack of favorable conditions for thermophilic microorganisms in the water and the restricted access of the public to these areas.

Public exposure to aerosolized *Legionella* from nuclear plant operations is not a concern because such exposure would be confined to a small area of the site near the cooling towers, the discharge canal, and the discharge structure. The cooling towers and discharge canal are within the plant's fenced area. Also, the cooling towers are equipped with drift eliminators. The riverbank area surrounding the discharge structure is posted as restricted and monitored by MNGP security; buoys indicate the area near the discharge structure is restricted.

Xcel Energy concludes that the microbiological hazard to the public attributable to MNGP's thermal discharge to the Mississippi River would be SMALL from continued operation of MNGP because (1) MNGP's thermal discharges mixing with the ambient river water would result in temperatures less than the optimum growth temperatures for the thermophilic microorganisms of concern, (2) the area immediately surrounding the thermal discharge's outlet to the Mississippi River is restricted, (3) the recreational activity in the Mississippi River along the MNGP plant is boating which presents low risk of infection from the microorganisms of concern, and (4) the influence of MNGP's thermal discharge on river water temperature would continue to decrease downstream and the nearest public access to the Mississippi River downstream is more than one mile distance from the thermal discharge's outlet to the river. Xcel Energy also concludes that the microbiological hazard to the public attributable to continued operation of MNGP's cooling water system's two cooling towers would be SMALL because (1) the cooling towers are located within the plant's protected area and not accessible to the public, (2) the circulating water is treated with biocides, (3) the higher risk of *Legionella* exposure is presented by indoor or confined spaces.

Xcel Energy finds that impacts of microbiological hazards to the public for plants with cooling ponds or canals, or cooling towers that discharge to a river for the proposed SPEO are SMALL.

Regulatory Guide 4.2 for license renewal applicants (NRC 2013b) directs the applicant to consult with the state public health department—in this case, the MDH—regarding concerns about the potential for waterborne disease outbreaks associated with license renewal. Correspondence is included in Attachment D. As shown in MDH's November 15, 2022, letter, MDH concurred with Xcel Energy's assessment of SMALL for this issue: "MDH concurs with

Xcel Energy that the potential for environmental effects from the renewal of Xcel Energy's Monticello operating license renewal is small."

4.9.2 Electric Shock Hazards

4.9.2.1 Generic Analysis for Initial License Renewals [GEIS Section 4.9.1.1.5]

Design criteria for nuclear power plants that limit hazards from steady-state currents are based on the NESC, adherence to which requires that utility companies design transmission lines so that the short-circuit current to ground produced from the largest anticipated vehicle or object is limited to less than 5 milliampere. With respect to shock safety issues and license renewal, three points must be made. First, in the licensing process for the earlier licensed nuclear plants, the issue of electrical shock safety was not addressed. Second, some plants that received operating licenses with a stated transmission line voltage may have chosen to upgrade the line voltage for reasons of efficiency, possibly without reanalysis of induction effects. Third, since the initial NEPA review for those utilities that evaluated potential shock situations under the provision of the NESC, land use may have changed, resulting in the need for a reevaluation of this issue. The electrical shock issue, which is generic to all types of electrical generating stations, including nuclear plants, is of SMALL significance for transmission lines that are operated in adherence with the NESC. Without a review of the conformance of each nuclear plant's transmission lines, within this scope of review with NESC criteria, it is not possible to determine the significance of the electrical shock potential generically.

For initial license renewals, the NRC codified its conclusion that electrical shock potential is of small significance for transmission lines that are operated in adherence with the NESC. Without a review of conformance with NESC criteria of each nuclear power plant's in-scope transmission lines, it is not possible to determine the significance of the electrical shock potential. The NRC found the impact for this issue to be SMALL, MODERATE, or LARGE.

4.9.2.2 Site-Specific Analysis for MNGP SLR

As part of the Site-Specific Analysis, Xcel Energy considered relevant new information on electric shock hazards since initial license renewal. As discussed in Section 3.10.2, the in-scope transmission lines are within the owner-controlled area of MNGP, which minimizes the risk of electric shock hazards to the public.

As discussed in Section 3.10.2, the in-scope transmission lines are in compliance with the NESC.

As discussed in Section 3.10.2, work on and near the transmission lines is governed by plant procedures and MNGP's comprehensive health and safety program.

Xcel Energy finds that impacts to electric shock hazards for the proposed SPEO are SMALL.

4.9.3 Radiation Exposures to the Public

4.9.3.1 Generic Analysis for Initial License Renewal [GEIS Section 4.9.1.1]

Radiological exposures from nuclear power plants include offsite doses to members of the public. This impact is common to all commercial U.S. reactors. NRC regulations in 10 CFR Part 20 identify maximum allowable concentrations of radionuclides that can be released from a licensed facility to control radiation exposures of the public. In addition, pursuant to 10 CFR 50.36a, nuclear power reactors have special license conditions requiring minimization of radiological impacts associated with plant operations to ALARA levels. Nuclear power plant releases to the environment must also comply with EPA standards in 40 CFR Part 190. These standards specify limits on the annual dose equivalent from normal operations of uranium fuel-cycle facilities.

In the 2013 license renewal GEIS, the NRC-reviewed radiation exposures to the public and states that experience with the design, construction, and operation of nuclear power reactors indicate that compliance with the design objectives of Appendix I to 10 CFR Part 50 will keep average annual releases of radioactive material in effluents at small percentages of the limits specified in 10 CFR Part 20 and 40 CFR Part 190. No aspect of future operation has been identified that would substantially alter this situation.

For initial license renewals, the NRC codified its conclusion that radiation doses to the public from continued operations and refurbishment associated with license renewal are expected to continue at current levels and would be well below regulatory limits. The NRC found the impact for this issue to be SMALL.

4.9.3.2 Site-Specific Analysis for MNGP SLR

As part of the Site-Specific Analysis, Xcel Energy considered relevant new information on radiation exposures to the public since initial license renewal. As discussed in Section 3.10.3, MNGP operates in compliance with NRC effluents standards and reports effluents annually to NRC as required. The plant releases small quantities of radioactive materials in gaseous form and does not make routine releases of radioactive liquids. There were no radioactive liquid releases in 2016, 2018, 2019, or 2020. As presented in Section 3.10.3, abnormal radioactive liquid releases occurred in 2017 and 2021, resulting in doses a fraction of the limit. Radioactive effluent release data from 2016–2021 showed that radiation doses to members of the public were a very small fraction of the limits of NRC's and EPA's radiation protection standards contained in Appendix I to 10 CFR Part 50, 10 CFR Part 20, and 40 CFR Part 190.

As discussed in Section 3.10.3, environmental media samples collected in 2020 as part of MNGP's REMP verify that the levels of radiation and concentrations of radioactive materials are not increasing, and measured exposure rates are consistent with exposure rates that were observed during previous years.

Continued compliance with NRC radiological effluent limits and implementation of the REMP will ensure that public exposure to radionuclides attributable to MNGP is well within guidelines and adverse trends are detected to implement corrective actions.

Xcel Energy finds that impacts of radiation exposures to the public for the proposed SPEO are SMALL.

4.9.4 Radiation Exposures to Plant Workers

4.9.4.1 Generic Analysis for Initial License Renewals [GEIS Section 4.9.1.1]

Radiological exposures from nuclear power plants include onsite doses to the workforce. This impact is common to all commercial U.S. reactors. Nuclear power reactors are required to comply with 10 CFR Part 20, Subpart C, "Occupational Dose Limits for Adults."

In the 2013 license renewal GEIS, the NRC reviewed radiation exposures to plant workers. Occupational dose information collected and reviewed by the NRC in the 2013 license renewal GEIS provides evidence that doses to nearly all radiation workers are far below the worker dose limit established by 10 CFR Part 20 and that the continuing efforts to maintain doses at ALARA levels have been successful. As plants age, there may be slight increases in radioactive inventories, which would result in slight increases in occupational radiation doses. However, it is expected that occupational doses from refurbishment activities associated with license renewal and occupational doses for continued operations during the license renewal term would be similar to the doses during the current operations.

For initial license renewals, the NRC codified its conclusion that occupational doses from continued operations and refurbishment associated with license renewal are expected to be within the range of doses experienced during the current license term and would continue to be well below regulatory limits. The NRC found the impact for this issue to be SMALL.

4.9.4.2 Site-Specific Analysis for MNGP SLR

As part of the Site-Specific Analysis, Xcel Energy considered relevant new information on radiation exposures to plant workers since initial license renewal. Occupational exposure at nuclear power plants is monitored by the NRC. As presented in Section 3.10.3, MNGP's average annual individual occupational dose was well under the NRC exposure limit and the collective worker dose was also below average. The three-year (2017–2019) average TEDE was 0.128 rem for MNGP. The annual TEDE limit is 5 rem [10 CFR 20.1201(a)(1)]. The NRC also trended MNGP's collective dose for workers. In 2017–2019, the collective dose at MNGP was similar to the average collective dose for BWRs. (NRC 2022a)

Occupational doses from continued operations are expected to be within the range of doses experienced during the current licensing term and would continue to be well below regulatory limits.

Xcel Energy finds that impacts of radiation exposures to plant workers for the proposed SPEO are SMALL.

4.9.5 Human Health Impact from Chemicals

4.9.5.1 Generic Analysis for Initial License Renewals [GEIS Section 4.9.1.1]

Human health impacts from chemicals and physical occupational hazards other than noise are new issues added by the 2013 GEIS. Chemical effects could result from discharge of chlorine or other biocides, small-volume discharges of sanitary and other liquid wastes, heavy metals leached from cooling system piping and condenser tubing in plant wastewater effluents, the use and disposal of chemicals and chemical spills, and use and disposal of hazardous chemicals. These chemical effects could pose human health hazards to the public and workers. In the 2013 license renewal GEIS, the NRC reviewed the potential for human health impacts from the chemical effects and these activities. Federal and state environmental agencies regulate the use, storage, and discharge of chemicals, biocides, and sanitary wastes. These environmental agencies also regulate how facilities like a nuclear power plant manage minor chemical spills. The NRC requires nuclear power plants to operate in compliance with all permits, thereby minimizing adverse impacts to the environment and on workers and the public. It is anticipated that all plants will continue to operate in compliance with all applicable permits, and no additional mitigation measures would be warranted for the license renewal term. Based on these considerations, the NRC considered the health impact from chemicals to workers and the public to be SMALL for all nuclear plants.

For initial license renewals, the NRC codified its conclusion that chemical hazards to plant workers resulting from continued operations and refurbishment associated with license renewal are expected to be minimized by the licensee implementing good industrial hygiene practices as required by permits and federal and state regulations. Chemical releases to the environment and the potential for impacts to the public are expected to be minimized by adherence to discharge limitations of NPDES and other permits. The NRC found the impact for this issue to be SMALL.

4.9.5.2 Site-Specific Analysis for MNGP SLR

As part of the Site-Specific Analysis, Xcel Energy considered relevant new information on human health impact from chemicals since initial license renewal. Plant workers may encounter hazardous chemicals when the chemistries of the primary and secondary coolant systems are being adjusted, biocides are being applied to address the fouling of cooling system components, equipment containing hazardous oils or other chemicals is being repaired or replaced, solvents are being used for cleaning, or other equipment is being repaired. As discussed in Chapter 9, MNGP operates in compliance with its various wastewater permits and in compliance with waste and chemical management regulations. MNGP has a chemical control program to review chemicals prior to being approved for onsite use and identify proper use and storage of chemicals onsite.

Work on the MNGP site is governed by a comprehensive industrial safety program. The effectiveness of the occupational safety program is indicated by the number of injuries and illnesses experienced by the plant's workers. The MNGP OSHA Form 300A submittals, which report the number of recordable injuries and illnesses experienced by MNGP workers in a given year, were reviewed for 2016–2020. The number of recordable injuries per year ranged from 0–2 and MNGP's average recordable injury and illness incident rate per 100 equivalent full-time workers was 0.33 for 2016–2020 comparable to the nuclear electric power generation industry's rate of 0.2 for 2019 (BLS 2020). Chemical hazards to plant workers resulting from continued operations associated with license renewal are expected to be minimized by good industrial hygiene practices as required by permits and compliance with federal and state regulations. Chemical releases to the environment and the potential for impacts to the public are expected to be minimized by adherence to discharge limitations of NPDES and other permits and regulatory requirements.

The risk of human health impacts from chemicals could increase over time with the accumulation of chemical substances that do not easily biodegrade such as heavy metals and PCBs. With the Mississippi River capturing the plant's wastewater and stormwater, the fishery would be the environmental setting to see if accumulation of long-lived chemical substances is indicated. As discussed in Section 3.7, various annual biological studies demonstrate that the operation of MNGP has not resulted in significant harm to the biological community. As presented in Section 3.6.4.1, the Mississippi River in the vicinity is identified as having an impairment due to PCBs; however, MNGP does not contribute to this or other impairments. Further, MNGP is in compliance with its NPDES permit. With regard to MNGP operations, there are no indications of an increasing risk to human health from chemicals and operations are unlikely to increase risk to human health from chemicals.

Xcel Energy finds that impacts to human health impact from chemicals for the proposed SPEO are SMALL.

4.9.6 Microbiological Hazards to Plant Workers

4.9.6.1 Generic Analysis for Initial License Renewals [GEIS Section 4.9.1.1]

Some microorganisms associated with nuclear power plant cooling towers and thermal discharges can have deleterious impacts on the health of plant workers and the public. Certain microorganisms can benefit from thermal effluents. The potential for adverse health effects from microorganisms on nuclear power plant workers is an issue for plants that use cooling towers. In the 2013 license renewal GEIS, the NRC reviewed microbiological hazards to plant workers. The GEIS discussion of microbiological hazards focuses on the thermophilic microorganisms *Legionella spp*. (which can be a hazard during such activities as cleaning condenser tubes and cooling towers) and the pathogenic amoeba, *Naegieria fowleri* (which can be a hazard in cooling water discharges and also can pose a public health hazard, as addressed under a separate Category 2 issue). No change in existing microbiological hazards is expected over the license renewal term. It is considered unlikely that any plants that have not already experienced occupational microbiological hazards would do so during the license renewal term or that hazards would increase over that period. It is anticipated that all plants will continue to employ proven industrial hygiene principles so that adverse occupational health effects associated with microorganisms will be of SMALL significance at all sites.

For initial license renewals, the NRC codified its conclusion that occupational health impacts are expected to be controlled by continued application of accepted industrial hygiene practices to minimize worker exposures as required by permits and federal and state regulations. The NRC found the impact for this issue to be SMALL.

4.9.6.2 Site-Specific Analysis for MNGP SLR

As part of the Site-Specific Analysis, Xcel Energy considered relevant new information on microbiological hazards to plant workers since initial license renewal. MNGP workers and contractors perform work at or near the cooling towers and discharge canal. *Legionella* is a respiratory hazard and given the discharge canal does not have mechanical sprayers or other equipment to create aerosols or droplets and the cooling towers are equipped with drift eliminators, the potential for exposure to *Legionella* is minimized. Further, *Legionella* exposure hazards are of greater concern for indoor or confined spaces. Any work at/near the cooling towers and discharge canal would be conducted under the plant's occupational safety program which includes a respirator program.

MNGP's condenser tubing is cleaned during outages. AmterTap cleaning and additional mechanical cleaning includes work in the water boxes performed by an outage contractor. Entry into the cooling water system's water boxes where exposure to *Legionella* is possible is governed by procedure which requires all personnel entering the water box to wear a disposable respirator when water temperatures are greater than 68°F.

Occupational health impacts are expected to be controlled by continued application of accepted industrial hygiene practices and MNGP has a comprehensive occupational safety program to minimize worker exposures as required by permits and federal and state regulations. The human health impact from the microbiological organisms mentioned above is from acute exposure rather than chronic exposure.

Xcel Energy finds that impacts of microbiological hazards to plant workers for the proposed SPEO are SMALL.

4.9.7 Physical Occupational Hazards

4.9.7.1 Generic Analysis for Initial License Renewals [GEIS Section 4.9.1.1]

This issue addresses the potential for workers at a nuclear plant to have human health impacts from physical occupational hazards (e.g., slips and trips, falls from height, and those related to transportation, temperature, humidity, electricity, noise, and vibration). The NRC evaluated the issue of occupational hazards by comparing the rate of fatal injuries and nonfatal occupational injuries and illnesses in the utility sector with the rate in all industries combined. The utility sector rates were lower than those of many other sectors. It is expected that over the license renewal term, workers would continue to adhere to safety standards and use protective equipment, so adverse occupational impacts would be of SMALL significance at all sites.

For initial license renewals, the NRC codified its conclusion that occupational safety and health hazards are generic to all types of electrical generating stations, including nuclear power plants, and are of SMALL significance if the workers adhere to safety standards and use protective equipment as required by federal and state regulations. The NRC found the impact for this issue to be SMALL.

4.9.7.2 Site-Specific Analysis for MNGP SLR

As part of the Site-Specific Analysis, Xcel Energy considered relevant new information on physical occupational hazards since initial license renewal. Work on the MNGP site is governed by a comprehensive industrial safety program. The program addresses electrical safety, use of ladders and portable equipment, etc.

As discussed above in Section 4.9.5, MNGP has a comprehensive industrial safety program and MNGP's OSHA recordable injury and illness rate is comparable to the nuclear electric power generation industry's rate. Implementation of MNGP's comprehensive industrial safety program, including worker training and communication of hazards called for by the program, will ensure continued effectiveness of the program to minimize worker health impacts. The human health impact from most physical hazards would be due to singular events (e.g., falls) which do not accumulate to result in a material difference in human health risk from one renewal term to a subsequent one. The exception would be physical hazards that have a chronic exposure component such as sound level exposure. OSHA regulations address precautions to reduce chronic exposure. Continued compliance with OSHA regulations for exposure and use of personal protective equipment would reduce the risk from chronic exposure.

Xcel Energy finds that impacts of physical occupational hazards for the proposed SPEO are SMALL.

4.10 Environmental Justice

The NRC identified only one issue for environmental justice. This is discussed below, providing background and the analysis identified as pertaining to the proposed SPEO.

4.10.1 Minority and Low-Income Populations

4.10.1.1 Generic Analysis for Initial License Renewals [GEIS Section 4.10.1]

Disproportionately high and adverse human health effects occur when the risk or rate of exposure to an environmental hazard for a minority or low-income population is significant and exceeds the risk or exposure rate for the general population or for another appropriate comparison group. Disproportionately high environmental effects refer to impacts or risk of impact on the natural or physical environment in a minority or low-income community that are significant and appreciably exceed the environmental impact on the larger community. Such effects may include biological, cultural, economic, or social impacts. Minority and low-income populations are subsets of the general public residing around the site and all are exposed to the same risks and hazards generated from operating a nuclear power plant.

Continued reactor operations and other activities associated with license renewal could have an impact on air, land, water, and ecological resources in the region around each nuclear power plant site, which might create human health and environmental effects on the general population. Depending on the proximity of minority and low-income populations in relation to each nuclear plant, the environmental impacts of license renewal could have a disproportionate effect on these populations.

The location and significance of environmental impacts may affect population groups that are particularly sensitive because of their resource dependencies or practices (e.g., subsistence agriculture, hunting, or fishing) that reflect the traditional or cultural practices of minority and low-income populations. The analysis of special pathway receptors can be an important part of the identification of resource dependencies or practices. Special pathways take into account the levels of contaminants in native vegetation, crops, soils and sediments, surface water, fish, and game animals on or near the power plant sites in order to assess the risk of radiological exposure through subsistence consumption of fish, native vegetation, surface water, sediment, and local produce; the absorption of contaminants in sediments through the skin; and the inhalation of airborne particulates.

For initial license renewals, the NRC codified its conclusion that impacts to minority and low-income populations and subsistence consumption resulting from continued operations and refurbishment associated with license renewal will be addressed in plant-specific reviews. See NRC Policy Statement on the Treatment of Environmental Justice Matters in NRC Regulatory and Licensing Actions (69 FR 52040).

4.10.1.2 Site-Specific Analysis for MNGP SLR

As part of the Site-Specific Analysis, Xcel Energy considered relevant new information on minority and low-income populations since initial license renewal.

4.10.1.2.1 Refurbishment Activities

As presented in Section 2.3, no license renewal-related refurbishment activities have been identified. Therefore, there would be no license-renewal-related refurbishment impacts to minority and low-income populations, and no further analysis is applicable.

4.10.1.2.2 Operational Activities

The consideration of environmental justice is required to assure that federal programs and activities will not have disproportionately high and adverse human health or environmental effects on minority populations and low-income populations. Xcel Energy's analyses of the Category 2 issues defined in 10 CFR 51.53(c)(3)(ii) determined that environmental impacts from the continued operation of MNGP during the proposed SPEO would either be SMALL or non-adverse. Therefore, high, or adverse impacts to the general human population would not occur. Further, Xcel Energy will approach Environmental Justice in a reasonable, proactive, transparent and consistent manner in keeping with the company's mission (Xcel 2022c).

As described in Section 3.10, MNGP maintains a REMP. With this program, Xcel Energy monitors important radiological pathways and considers potential radiation exposure to plant and animal life in the environment surrounding MNGP. The results of the program indicate MNGP has created no adverse environmental effects or health hazards. Therefore, no environmental pathways have been adversely impacted and are not anticipated to be impacted during the MNGP SPEO.

Section 3.11.2 identifies the locations of minority and low-income populations as defined by NRR Office Instruction LIC-203 (NRC 2020b). Section 3.11.3 describes the search for subsistence populations near MNGP, of which none were found. The figures accompanying Section 3.11.2 show the locations of minority and low-income populations within a 50-mile radius of MNGP. None of those locations, when considered in the context of impact pathways described in this chapter, are expected to be disproportionately impacted.

Therefore, there are no disproportionately high and adverse impacts or effects on members of the public.

4.11 Waste Management

Site-specific assessments for waste management issues are discussed below.

4.11.1 Low-Level Waste Storage and Disposal

4.11.1.1 Generic Analysis for Initial License Renewals [GEIS Section 4.11.1.1]

The NRC believes that the comprehensive regulatory controls that are in place and the low public doses being achieved at reactors ensure that the radiological impacts on the environment will remain SMALL during the term of a renewed license. The maximum additional onsite land that may be required for LLW storage during the term of a renewed license and associated impacts would be SMALL. Nonradiological impacts on air and water would be negligible. The radiological and nonradiological environmental impacts of long-term disposal of LLW from any individual plant at licensed sites are SMALL. In addition, the NRC concludes that there is reasonable assurance that sufficient LLW disposal capacity will be made available when needed for facilities to be decommissioned consistent with NRC decommissioning requirements.

For initial license renewals, the NRC codified its conclusion that the comprehensive regulatory controls that are in place and the low public doses being achieved at reactors ensure that the radiological impacts to the environment would remain SMALL during the license renewal term. The NRC found the impact for this issue to be SMALL.

4.11.1.2 Site-Specific Analysis for MNGP SLR

As part of the Site-Specific Analysis, Xcel Energy considered relevant new information on LLW storage and disposal since initial license renewal. MNGP will continue to manage and store LLRW onsite in accordance with NRC regulations and dispose of LLRW in NRC-licensed treatment and disposal facilities during the proposed SPEO. As presented in Section 2.2.6, MNGP does not anticipate an increase in LLW from normal operations. MNGP reports on its LLRW shipping to disposal and treatment facilities in the ARERR (Xcel 2021d). Xcel Energy anticipates that it would continue to have access to licensed LLRW processing and disposal facilities during the proposed SPEO. This is consistent with NRC's conclusion mentioned in Section 4.11.1.1 specific to the greater disposal capacity needed for decommissioning that sufficient LLRW disposal capacity would be available. Discussed above in Section 4.9.3, MNGP estimated public dose is controlled within radiation protection standards. REMP results indicate that radioactivity is not accumulating in environmental media.

The radiological impacts from disposal of waste generated during a SPEO have the potential to increase as long-lived radionuclides accumulate at disposal facilities. However, the disposal facilities would be licensed, which means the facility would have a design including design capacity and conditions of operation to minimize environmental impacts.

Xcel Energy finds that impacts to LLW storage and disposal for the proposed SPEO are SMALL.

4.11.2 Onsite Storage of Spent Nuclear Fuel

4.11.2.1 Generic Analysis for Initial License Renewals [GEIS Section 4.11.1.2]

As discussed in Section 3.11.1.2 of the GEIS, SNF is currently stored at reactor sites either in spent fuel pools or in ISFSIs. The storage of spent fuel in spent fuel pools was considered for each plant in the safety and environmental reviews at the construction permit and OL stage. This onsite storage of spent fuel and high-level waste is expected to continue into the foreseeable future.

Interim storage needs vary among plants, with older units likely to lose pool storage capacity sooner than newer ones. Given the uncertainties regarding the final disposition of spent fuel and high-level waste, it is expected that expanded spent fuel storage capacity will be needed at all nuclear power plants.

NUREG-2157, *Generic EIS for Continued Storage of Spent Nuclear Fuel* (NRC 2014a), concluded on a generic basis for all nuclear power plants that spent fuel can be stored onsite for 60 years following the license term with SMALL environmental effects.

For initial license renewals, the NRC codified its conclusion that, during the license renewal term, the expected increase in the volume of SNF from an additional 20 years of operation can be safely accommodated onsite during the license renewal term with SMALL environmental impacts through dry or pool storage at all plants.

For the period after the licensed life for reactor operations, the impacts of onsite storage of spent nuclear fuel during the continued storage period are discussed in NUREG-2157 and, as stated in § 51.23(b), shall be deemed incorporated into this issue. The NRC found the impact for this issue to be SMALL.

4.11.2.2 Site-Specific Analysis for MNGP SLR

As part of the Site-Specific Analysis, Xcel Energy considered relevant new information on onsite storage of SNF since initial license renewal. MNGP currently stores spent nuclear fuel in its spent fuel pool and in dry storage at the onsite ISFSI. The current existing ISFSI footprint, which consists of a lighted area, approximately 200 feet by 460 feet in size, roughly 3-1/2 acres in size, is located adjacent to the reactor and turbine building. Two fences surround the facility with a clear zone in between. Within the storage area, spent fuel is currently stored in 30 canisters in modular concrete vaults. Currently, the storage modules in use at MNGP are the NUHOMS-61BT model. At the end of the current license in 2030, 40 containers would be required to store all of the fuel assemblies in the reactor and pool, assuming a 61-fuel assembly capacity cask. The existing ISFSI can accommodate another 36 vaults of the existing design on a second support pad without having to change the security perimeter. (Xcel 2021b)

In addition to the existing ISFSI being licensed by NRC, the facility required a state of Minnesota CN. The placement of the 30 canisters was allowed by a CN issued in 2006 that expires in 2030. A subsequent CN is required to place more than the 30 canisters in the ISFSI. Xcel Energy filed a CN application with MPUC in 2021 for a subsequent CN which under Minnesota statues is limited to a term of 10 years. Xcel Energy's CN application requests approval for placement of NRC-licensed dual-purpose (storage and transport) dry storage casks (approximately 13 additional storage casks) on a new storage pad constructed within the existing ISFSI footprint. The exact number of casks needed will be determined by the specific amount of nuclear fuel required to operate an additional 10 years, from 2030 to 2040, how much fuel is loaded each cycle, and the capacity of the NRC-licensed cask eventually selected. For storage at the ISFSI beyond the expiration date of the CN, if granted, Xcel Energy would seek additional MPUC approval. (Xcel 2021b)

The additional 20 years of spent nuclear fuel generated during the proposed SPEO would be stored in the spent fuel pool until adequately cooled and then transferred to dry storage at the onsite ISFSI with MPUC approval. The NRC-licensed design and operation of each of these storage options ensures that the increased volume in onsite storage can be safely accommodated with SMALL environmental effects. As mentioned above, MNGP would have to obtain a state of Minnesota CN. In addition to the CN, Minnesota Statutes §116.836(b) requires an EIS be prepared by the Department of Commerce – Energy Environment Review and Analysis (Xcel 2021b), further ensuring that MNGP storage of spent nuclear fuel would have insignificant environmental effects.

For on-site storage of spent fuel during the license renewal term, Table B-1 was amended after the 2013 GEIS by the Continued Storage Rule to codify the Commission's determination that the impacts would be SMALL (79 FR 56238). This rulemaking postdates the license renewal GEIS rulemaking in 2013, and the Commission's codified impact determination was not overturned by the NRC's CLI-22-02 Order. The Continued Storage Rulemaking explicitly considered subsequent license renewals, stating in Footnote 3 at 79 FR 56245, "The Commission's regulations provide that renewed operating licenses may be subsequently renewed…The GEIS [Continued Storage of Spent Nuclear Fuel GEIS] assumes two renewals in evaluating potential environmental impacts."

Xcel Energy finds that impacts to onsite storage of SNF for the proposed SPEO are SMALL.

4.11.3 Offsite Radiological Impacts of Spent Nuclear Fuel and High-Level Waste Disposal

4.11.3.1 Generic Analysis for Initial License Renewals [GEIS Section 4.11.1.3]

As a result of the *New York v. NRC* decision and pending the issuance of a GEIS and revised Waste Confidence Decision and Rule, the NRC has revised the Category 1 issue, "Offsite radiological impacts of spent nuclear fuel and high-level waste disposal." This issue pertained to the long-term disposal of spent nuclear fuel and high-level waste, including possible disposal in a deep geologic repository. Although the Waste Confidence Decision and Rule did not assess the impacts associated with disposal of spent nuclear fuel and high-level waste in a repository, it did reflect the NRC's confidence, at the time, in the technical feasibility of a repository and when that repository could have been expected to become available. Without the analysis in the Waste Confidence Decision, the NRC cannot assess how long the spent fuel will need to be stored onsite. Therefore, the NRC reclassifies this GEIS issue from a Category 1 issue with no assigned impact level to an uncategorized issue with an impact level of uncertain. Moreover, the ultimate disposal of spent nuclear fuel in a potential future geologic repository is a separate and independent licensing action that is outside the regulatory scope of license renewal.

For initial license renewals, the NRC codified its conclusion that, for the high-level waste and spent fuel disposal component of the fuel cycle, the EPA established a dose limit of 0.15 millisieverts (mSv) (15 mrem) per year for the first 10,000 years and 1.0 mSv (100 mrem) per year between 10,000 years and one million years for offsite releases of radionuclides at the proposed repository at Yucca Mountain, Nevada.

The NRC concludes that the impacts would not be sufficiently large to require the NEPA conclusion, for any plant, that the option of extended operation under 10 CFR Part 54 should be eliminated. Accordingly, while the NRC has not assigned a single level of significance for the impacts of spent fuel and high-level waste disposal, the NRC found the impact for this issue to be SMALL.

4.11.3.2 Site-Specific Analysis for MNGP SLR

As part of the Site-Specific Analysis, Xcel Energy considered relevant new information on offsite radiological impacts of SNF and high-level waste disposal since initial license renewal. The NRC considered the environmental impacts of away-from-reactor storage and the technical feasibility of disposal in a geologic repository in its *Generic EIS for Continued Storage of Spent Nuclear Fuel* (NRC 2014a). Based on the 2014 EIS's findings, the NRC codified for license renewal in the Continued Storage Rulemaking that the offsite radiological impacts of spent nuclear fuel and high-level waste disposal would not be sufficiently large to require the National Environmental Policy Act conclusion for any plant and that the option of extended operation under 10 CFR Part 54 should be eliminated (10 CFR Part 51, Subpart A, Appendix B, Table B-1). Further, the Continued Storage Rulemaking explicitly considered subsequent license renewals, stating in Footnote 3 at 79 FR 56245, "The Commission's regulations provide that renewed operating licenses may be subsequently renewed…The GEIS [Continued Storage of Spent Nuclear Fuel GEIS] assumes two renewals in evaluating potential environmental impacts." Pursuant to the Commission's generic analysis and codified conclusion, the impacts of onsite storage of spent fuel during the SPEO at MNGP are SMALL. NRC has not revisited the 2014 GEIS conclusions nor presented any new and significant information findings in license renewal EISs as evidenced by the most recently issued SEIS, the draft SEIS for Point Beach (NRC 2021a).

MNGP spent nuclear fuel is packaged in NRC-licensed NUHOMS-61BT modules, designed by Orano (Xcel 2021b). MNGP would continue to use NRC-licensed packaging for its spent nuclear fuel. Should spent nuclear fuel be shipped offsite, it would only be shipped to a licensed facility. Further, MNGP would comply with the applicable NRC, DOT, DOE, and state regulatory controls for packaging and transportation of spent nuclear fuel.

As to this issue, the Continued Storage Rulemaking postdates the license renewal GEIS rulemaking in 2013, and the Commission's codified impact determination was not overturned by the NRC's CLI-22-02 Order and the Continued Storage Rulemaking explicitly considered subsequent license renewals. Thus, pursuant to the Commission's codified conclusion, with regard to this issue's consideration for MNGP's SLR, the offsite radiological impacts of spent nuclear fuel remain a generically determined issue with no impact level assigned.

4.11.4 Mixed-Waste Storage and Disposal

4.11.4.1 Generic Analysis for Initial License Renewals [GEIS Section 4.11.1.4]

Mixed waste is regulated both by the EPA or the authorized state agency under RCRA and by the NRC or the agreement state agency under the Atomic Energy Act [Public Law 83-703]. The waste is either treated onsite or sent offsite for treatment followed by disposal at a permitted landfill. The comprehensive regulatory controls and the facilities and procedures that are in place at nuclear power plants ensure that the mixed waste is properly handled and stored and that doses to and exposure to toxic materials by the public and the environment are negligible at all plants. License renewal will not increase the small but continuing risk to human health and the environment posed by mixed waste at all plants. The radiological and nonradiological environmental impacts from the long-term disposal of mixed waste at any individual plant at licensed sites are considered SMALL for all sites.

For initial license renewals, the NRC codified its conclusion that the comprehensive regulatory controls and the facilities and procedures that are in place ensure proper handling and storage, as well as negligible doses and exposure to toxic materials for the public and the environment at all plants. License renewal would not increase the small, continuing risk to human health and the environment posed by mixed waste at all plants. The radiological and nonradiological environmental impacts of long-term disposal of mixed waste from any individual plant at licensed sites are SMALL. The NRC found the impact for this issue to be SMALL.

4.11.4.2 Site-Specific Analysis for MNGP SLR

As part of the Site-Specific Analysis, Xcel Energy considered relevant new information on mixed waste storage and disposal since initial license renewal. MNGP's systems for managing radioactive and hazardous waste is presented in Sections 2.2.6 and 2.2.7. MNGP is a VSQG for hazardous waste. MNGP generates a small amount of mixed waste and manages it onsite in accordance with waste management procedures. MNGP has procedures for shipping mixed waste to be in accordance with federal and state regulations. The most recent mixed waste shipment was in 2018, this and future shipments would be sent to licensed and permitted processing and disposal facilities.

As discussed in Section 3.10.3, environmental media samples collected in 2020 as part of MNGP's REMP verifies that the levels of radiation and concentrations of radioactive materials are not increasing, and measured exposure rates are consistent with exposure rates that were observed during previous years.

Based on review of its compliance history for the previous 5 years (2016–March 2022), MNGP has not received any NOVs for hazardous waste management. MNGP's compliance with comprehensive regulatory controls and use of NRC-licensed and EPA-permitted treatment and disposal facilities will ensure the continued SMALL impact from the handling, storage, and disposal of mixed waste during the proposed SPEO. This is further supported by the negligible doses and exposure to toxic materials for the public and the environment. License renewal would not increase the small continuing risk to human health and the environment posed by mixed waste at MNGP. The radiological and nonradiological environmental impacts of long-term disposal of mixed waste from any individual plant at licensed sites are considered SMALL.

The impacts from disposal of mixed waste generated during a SPEO has the potential to increase as long-lived radionuclides, chemicals, and metals accumulate at disposal facilities. However, the disposal facilities would be licensed and permitted, which means the facility would be designed (inclusive of a design capacity and conditions of operation) to minimize environmental impacts.

Xcel Energy finds that impacts to mixed-waste storage and disposal for the proposed SPEO are SMALL.

4.11.5 Nonradioactive Waste Storage and Disposal

4.11.5.1 Generic Analysis for Initial License Renewals [GEIS Section 4.5.1.1]

The management of hazardous wastes generated at all of these facilities, both onsite and offsite, is strictly regulated by the EPA or the responsible state agencies per the requirements of RCRA. As does any industrial facility, nuclear power plants and the rest of the uranium fuel cycle facilities also generate nonradioactive nonhazardous waste. These wastes are managed by following good housekeeping practices and are generally disposed of in local landfills permitted under RCRA Subtitle D regulations.

In the 1996 GEIS, the impacts associated with managing nonradioactive wastes at uranium fuel cycle facilities, including nuclear power plants, were found to be SMALL. It was indicated that no changes to nonradioactive waste generation would be anticipated for license renewal, and that systems and procedures are in place to ensure continued proper handling and disposal of the wastes at all plants.

For initial license renewals, the NRC codified its conclusion that no changes to systems that generate nonradioactive waste are anticipated during the license renewal term. Facilities and procedures are in place to ensure continued proper handling, storage, and disposal, as well as negligible exposure to toxic materials for the public and the environment at all plants. The NRC found the impact for this issue to be SMALL.

4.11.5.2 Site-Specific Analysis for MNGP SLR

As part of the Site-Specific Analysis, Xcel Energy considered relevant new information on non-radioactive waste storage and disposal since initial license renewal. MNGP's systems for managing radioactive and hazardous waste is presented in Sections 2.2.6 and 2.2.7. MNGP is a VSQG for hazardous waste. MNGP manages its nonradioactive waste streams including hazardous, universal, and solid wastes according to MNGP procedures. MNGP would continue to store and dispose of or recycle hazardous and nonhazardous wastes in accordance with EPA and state regulations and dispose of the wastes in appropriately permitted treatment and disposal facilities during the proposed SPEO.

As mentioned in previous sections, MNGP has SPCC and hazardous substance spill contingency plans and a chemical control program procedure.

Based on review of its compliance history for 2016 to March 2022, MNGP has not received any NOVs for hazardous waste management.

MNGP's compliance with comprehensive regulatory controls and use of NRC-licensed and EPA-permitted treatment and disposal facilities will ensure the continued SMALL impact from the handling, storage, and disposal of non-radioactive waste during the proposed SPEO.

The impacts from disposal of hazardous waste generated during a SPEO have the potential to increase as long-lived toxic metals accumulate at disposal facilities. However, the disposal facilities would be permitted, which means the facility would be designed (inclusive of design capacity and conditions of operation) to minimize environmental impacts. Furthermore, MNGP operations generate small quantities of hazardous waste.

Xcel Energy finds that impacts to non-radioactive waste storage and disposal for the proposed SPEO are SMALL.

4.12 Cumulative Impacts

Cumulative impacts of continued operations and refurbishment associated with subsequent license renewal would depend on regional resource characteristics, the resource-specific impacts of license renewal, and the cumulative significance of other factors affecting the resource. The potential for cumulative impacts during MNGP's SPEO are discussed in Section 4.12.2 by resource area.

4.12.1 Generic Analysis for Initial License Renewals [GEIS Section 4.13]

Applicants shall provide information about other past, present, and reasonably foreseeable future actions occurring in the vicinity of the nuclear plant that may result in a cumulative effect. Actions to be considered in cumulative impact analyses include new and continuing activities, such as license renewal, that are conducted, regulated, or approved by a federal agency. The cumulative impacts analysis takes into account all actions, however minor, since impacts from individually minor actions may be significant when considered collectively over time. The goal of the analysis is to identify potentially significant impacts to improve decisions and move toward more sustainable development.

For some resource areas (e.g., water and aquatic resources), the contributions of ongoing actions within a region to cumulative impacts are regulated and monitored through a permitting process (e.g., NPDES) under state or federal authority. In these cases, it may be assumed that cumulative impacts are managed as long as these actions (facilities) are in compliance with their respective permits.

For initial license renewals, the NRC codified its conclusion that cumulative impacts could be SMALL, MODERATE, or LARGE during the license renewal term depending on the individual nuclear power plant site. The NRC found the impact for this issue required a site-specific assessment.

4.12.2 Site-Specific Analysis for MNGP SLR

As part of the Site-Specific Analysis, Xcel Energy considered relevant new information on cumulative impacts since initial license renewal. Cumulative impacts analysis involves determining if there is an overlapping or compounding of the anticipated impacts of the continued operation of MNGP during the proposed SPEO with past, present, and reasonably foreseeable future actions, regardless of what agency (federal or non-federal) or person undertakes such actions.

Xcel Energy considered potential cumulative impacts during the SPEO in its environmental analysis associated with the resources discussed in the following sections. For the purposes of this analysis, past actions are those related to the resources at the time of plant licensing and construction, present actions are those related to the resources at the time of current operation of the power plant, and future actions are considered to be those that are reasonably foreseeable through the end of plant operation, which would include the 20-year SPEO. These criteria are in line with Regulatory Guide 4.2, Supplement 1, Revision 1 (NRC 2013b). The geographic area over which past, present, and future actions would occur is dependent on the resource area and is described below for each impact area.

The impacts of the proposed action are combined with other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. These combined impacts are defined as "cumulative" in 40 CFR 1508.7 and include individually minor, but collectively significant, actions taking place over a period of time. It is possible that an impact that may be SMALL by itself could result in a MODERATE or LARGE impact when considered in combination with the impacts of other actions on the affected resource. Likewise, if a resource is regionally declining or imperiled, even a SMALL individual impact could be important if it contributes to or accelerates the overall resource decline.

As discussed in Section 2.3, no SLR-related refurbishment activities have been identified. As indicated in Section 3.1.4, no major changes to MNGP Unit 1 operations or plans for future expansion of plant infrastructure during the proposed SPEO, are anticipated. The effects of past actions are already reflected in the description of the affected environment in Chapter 3. MNGP has determined that the current onsite ISFSI pad has enough space for canister storage to operate to 2030, but insufficient space to operate through the proposed SPEO. Xcel Energy proposes to increase the storage capacity of the existing MNGP ISFSI with the construction of a second concrete storage pad to be located within the existing ISFSI fenced area. This would cause no significant environmental impact.

Additional offsite potential projects in the MNGP vicinity include Xcel Energy's 2021 proposal to construct the Sherco solar project, a solar energy conversion facility with an up to 460-MW capacity, located outside the city of Becker in Sherburne County, Minnesota. The project includes the construction of 4.9 miles of transmission line. As a replacement for the Sherco coal-fired plant, Xcel Energy intends to add four smaller natural gas facilities to the region. Section 3.1.4 describes other (non-MNGP) projects in the vicinity of MNGP. The city of Becker in Sherburne County is also pursuing the addition of a new Google data center at the Becker business park.

For each of the resource areas presented below, Xcel Energy finds that cumulative impacts for the proposed SPEO are SMALL.

4.12.2.1 Land Use and Visual Resources

As described in Section 4.1.1 and Section 4.1.2, MNGP's continued operation would have a SMALL impact on onsite and offsite land use. As described in Section 3.1.4, the planned projects for the MNGP site either fall within the existing footprint or fall within areas already allocated for expansion, therefore no onsite project is expected to require a change in land use. As described in Section 3.1.1 and illustrated in Figure 3.1-3, the MNGP vicinity falls within rural portions of both Sherburne and Wright counties. As discussed in Section 3.2.1, the MNGP industrial area is located within the city limits of Monticello, Minnesota. The city has zoned the area as a heavy industrial district.

As described in Section 3.1.4, land use changes are anticipated for the Sherco solar project covering 3,479.4 acres, the construction of 4.9 miles of transmission line, four smaller natural gas facilities and the Google data center. Other power projects in the region are expected to follow Minnesota law where land use conflicts will be considered (MLORS 2021c). Land use impacts due to MNGP's SLR are not expected to contribute significantly to cumulative land use impacts.

Therefore, the contribution of land use impacts of MNGP on other reasonably foreseeable projects in the region would be SMALL.

As stated in Section 3.2.3, the continued use of existing structures associated with MNGP would not alter their visual impact. MNGP would continue to have minimal visual impact on the neighboring properties or from the viewpoint of the surrounding areas, communities, and the Mississippi River. Other power projects in the region are expected to follow Minnesota law where aesthetics will be considered (MLORS 2021c). The Google data center is expected to be limited to the Becker Industrial Park (SCT 2021).

As concluded in Section 4.1.3, the visual impacts due to MNGP are SMALL and not expected to change. The visual impacts from the other power projects are expected to be mitigated, and the visual impacts from the Google data center are expected to be limited to the industrial park, the cumulative visual impacts are expected to be SMALL.

4.12.2.2 Air Quality and Noise

Air Quality

Section 3.3.3 discusses regional air quality and MNGP air emission sources. The section lists counties in a 62-mile area designated as nonattainment areas and maintenance areas. Wright County has been designated a maintenance area for CO (1971 standard). All other counties within 50 miles of MNGP are in attainment. As presented in Section 3.3.3, there are no mandatory Class I federal areas within 100 miles of MNGP.

MNGP air pollutant emissions are minimal and stem from intermittent use, maintenance, and testing of diesel generators, pumps, and a heating boiler (see Table 3.3-9). Compliance with the existing air permit and any future permit would minimize impacts to air quality. Section 4.2 concluded that the impact to air quality from the continued operation of MNGP during the proposed SPEO is anticipated to be SMALL. The planned projects listed above could result in localized temporary air emissions from construction and demolition equipment and fugitive dust. BMPs and maintaining portable equipment in proper working order will minimize air emissions. The pending present actions and anticipated future actions, along with continued operation of MNGP, are expected to have a SMALL cumulative impact on air quality.

Climate Change

Climate change can impact air quality as a result of changes in meteorological conditions. Air pollutant concentrations are sensitive to winds, temperature, humidity, and precipitation. Ozone levels have been found to be particularly sensitive to climate change influences. Sunshine, high temperatures, and air stagnation are favorable meteorological conditions leading to higher levels of ozone. Although surface temperatures are expected to increase, ozone levels will not necessarily increase because ozone formation is also dependent on the relative amount of precursors available. The combination of higher temperatures, stagnant air masses, sunlight, and emissions of precursors may make it difficult to meet ozone NAAQS. States, however, must continue to comply with the CAA and ensure air quality standards are met (NRC 2015).

Because the fuel source for MNGP does not produce carbon dioxide emissions or other GHG emissions, the continued operation MNGP would avoid millions of tons of greenhouse gases from a fossil fuel-fired alternative such as the NGCC alternative presented in Chapter 7. Given that climate change trends in air temperature and precipitation are increasing but continued operation would contribute only small emissions of GHG from minor air emission sources, the cumulative impact on climate change from present and future actions would be SMALL. Moreover, continued operation of MNGP avoids millions of tons of carbon dioxide from alternative fossil-fuel generation, positively impacting the climate change factor of carbon dioxide concentrations.

Noise

The surrounding land use, as discussed in Section 4.12.2.1, is zoned a heavy industrial zone, and falls within rural portions of both Sherburne and Wright counties. Impacts due to noise from continued plant operations are expected to be limited to the heavy industrial zone and rural areas. Thus, cumulative noise impacts over the proposed SPEO would be SMALL.

4.12.2.3 Geology and Soils

Impacts to geology and soils could result from ground-disturbing activities. As noted in Section 2.3, Xcel Energy has no plans to conduct SLR-related refurbishment or replacement activities. Section 3.1.4 discusses onsite and offsite projects which may include ground-disturbing activities during their construction stage. Recent ground-disturbing activities include the replacement of the old cooling towers in 2021 and 2022 with upgraded ones. Anticipated future onsite ground disturbing activities would be confined to an area within the existing MNGP ISFSI fenced area. Given ground disturbances at the MNGP site would be limited to the current site area, Xcel Energy concluded that impacts to geology and soils during the proposed SPEO would be SMALL (Section 4.4). Thus, the site's contribution to the cumulative impact on geology and soils would be SMALL.

4.12.2.4 Water Resources

Surface Water

As described in Section 2.2.3.1, MNGP utilizes a once-through cooling system and two MDCTs, as needed, to meet surface water appropriation limits and thermal discharge limits. Surface water use impacts are detailed in Section 4.5. Any modifications to surface water withdrawals would be governed by appropriation limits set by the MDNR. Any modifications to surface water discharges are regulated under an NPDES permit issued by the MPCA.

Water use appropriation impacts for all users including MNGP would be considered by MDNR prior to issuance of a permit. Cumulative impacts due to water appropriation are mitigated by this process. There are no plant operations or modifications planned for the proposed SPEO that would alter current water use patterns at the intake and discharge structures. As for surface water quality cumulative impacts, MNGP complies (see Chapter 9) with its NPDES thermal discharge limits, and the discharge rapidly mixes with the Mississippi River. As discussed in Section 3.6.4.1, the water quality at several streams near MNGP are impaired; however, MNGP operations do not contribute to these impairments.

Given MNGP's compliance with its surface water withdrawal limits, NPDES permit, compliance with stormwater permits and regulations, MNGP would have only a SMALL contribution to the surface water consumption and the surface water quality cumulative impact. Any offsite projects would similarly have to comply with MPCA regulations, resulting in a SMALL cumulative impact.

Groundwater

As presented in Section 4.5.3.2, the average withdrawal rate for two permitted water supply wells averaged less than 11.5 million gallons per year from 2016–2021. These two wells are used to supply raw water to the reverse osmosis/makeup demineralizer system used to produce purified water for the plant primary systems and seal water to pumps located at the plant intake structure. The wells also provide water for potable use such as drinking water, lavatories, and showers. Annual usage for five additional water supply wells is less than one million gallons per year per well, or less than 1.9 gpm; therefore, water appropriation permits are not required by MDNR. These five wells provide domestic water as needed. It is not anticipated that groundwater withdrawal increases above the reported quantities will be required during the SPEO. The offsite water supply wells mentioned in Section 3.6.3.2 within 2 miles of the MNGP center point, are primarily used for domestic purposes. As such, future groundwater well development in the area should be primarily domestic and are not expected to conflict with groundwater use with MNGP. Therefore, the cumulative impact to groundwater availability would be SMALL.

MNGP will continue to maintain and implement its site-specific spill prevention plans to prevent spills that would contaminate soils, groundwater, and surface water during the proposed SPEO. Therefore, the cumulative impact to groundwater quality would be SMALL.

Climate Change

In Minnesota, temperatures and precipitation have been increasing over the past century. Spring rainfall and annual precipitation are likely to continue to increase, and severe rainstorms are likely to intensify, increasing the risk of flooding (EPA 2016).

As discussed in Section 3.6.1.2.6, water discharge temperatures are limited by the NPDES permit. MDNR regulates surface water use for surface water users in the state. MNGP uses a once-through cooling system and two MDCTs, as needed, to meet surface water appropriation limits and thermal discharge limits. As discussed in Section 3.6.3.1, 26 water appropriation permits have been issued for the reach of the river near MNGP. As such, all projects would fall within the appropriation limits set by MDNR. As presented above, MNGP operations do not require significant surface water consumption or groundwater withdrawals, and MNGP operates in compliance with its permits for water withdrawals and discharges. There are no anticipated or reasonably foreseeable changes in MNGP's surface water or groundwater withdrawal rates. Xcel Energy concluded in Section 4.5 that surface water and groundwater impacts from continued operation of MNGP during the proposed SPEO would be SMALL. Based on these findings, MNGP would have a SMALL contribution to cumulative impacts on water resources during the proposed SPEO.

4.12.2.5 Ecological Resources

The impacts of the plant on ecological resources are presented in Section 4.6.

4.12.2.6 Terrestrial

The impacts on terrestrial species during the proposed SPEO are described as SMALL in Section 4.6. The continued operation of MNGP is governed by regulations, MNGP procedures, and plans. As discussed in Section 9.6, MNGP has administrative controls in place to ensure that operational changes or construction activities are reviewed and any impacts are minimized through implementation of BMPs, permit modifications, or acquisition of new permits as needed. Successful application of the regulations, procedures, plans, and administrative controls would result in the identification and avoidance of important terrestrial habitats. Regulatory programs that the site is currently subject to, such as stormwater management, spill prevention, dredging, and herbicide usage, further serve to minimize impacts to terrestrial resources. With continued application of these programs and procedures, the land-based impacts would largely be confined to MNGP property and would have minimal opportunity to contribute to cumulative impacts.

As discussed in Sections 3.7.8.1 and 4.6.6, habitat for federally and state listed terrestrial species does occur on the MNGP site. However, adherence to regulatory and permit requirements to avoid take of protected species and Xcel Energy administrative controls such as those regarding response to avian collisions with transmission lines will minimize or avoid impact to these species. Xcel Energy is not aware of any adverse impacts regarding threatened, endangered, and protected species attributable to the site. Maintenance activities necessary to support license renewal likely would be limited to previously disturbed areas onsite, and construction of an ISFSI pad, if undertaken, during the proposed SPEO would be among operational areas of the MNGP site rather than within any other habitat on the MNGP site. Therefore, MNGP's contribution to cumulative impacts on protected species would be SMALL.

4.12.2.7 Aquatic

Aquatic resource impacts during the proposed SPEO were concluded to be SMALL in Section 4.6. The aquatic ecological communities could be impacted through surface water discharges that are governed by MNGP's NPDES permit. In addition, aquatic ecological communities could be impacted by impingement and entrainment of species in MNGP surface water intake. Impingement and entrainment impacts are addressed through CWA 316(b) compliance implemented through the NPDES. Ongoing studies performed at MNGP will ensure that MNGP continues to utilize the BTA to minimize entrainment and impingement to the fullest extent practicable to maintain compliance with the NPDES permit. Continued compliance with NPDES permit conditions during the proposed SPEO (the permit is subject to renewal every five years) would ensure that MNGP's direct and indirect impacts to aquatic ecological communities are minimized. Xcel Energy meets its NPDES permit conditions, minimizing the potential for ongoing activities to combine with impacts from other actions that would lead to cumulative impacts.

Therefore, MNGP's contribution to cumulative impacts on aquatic species would be SMALL.

4.12.2.8 Climate Change

Temperatures in Minnesota have been increasing over the past several decades. Annual precipitation has also increased. Flooding is becoming more frequent and severe. Ranges of plants and animals are expected to change as species adapt to the changes in climate (EPA 2016). Xcel Energy's adherence to regulatory and permit requirements to avoid take of protected species and Xcel Energy's administrative controls, such as those regarding response to avian collisions with transmission lines, will minimize or avoid impact to species impacted by changing aquatic or terrestrial habitat. No changes in the temperature of MNGP's existing thermal discharge are expected with no planned operational changes during the proposed SPEO. Therefore, MNGP's contribution to cumulative impacts to ecological communities from climate change and developments in the vicinity are anticipated to be SMALL during the proposed SPEO.

4.12.2.9 Historic and Cultural Resources

As presented in Section 2.3, there are no refurbishment activities or other construction activities currently planned to support SLR operations. Therefore, the SLR consists of an administrative action relative to historic and cultural resources. Although construction of the existing MNGP facility itself would have impacted any archaeological resources that may have been located within its footprint, much of the surrounding area remains largely undisturbed. As stated in Section 3.8.6, MNGP has three procedures which aim to identify, protect, and minimize potential impacts to cultural resources within the MNGP facility. These are excavation permits, excavation and trenching controls, and archaeological, cultural, and historic resources procedures. Section 4.7.1.2 states there will be no adverse effects on historic and cultural resources as a result of continued operation of MNGP during the proposed SPEO. Therefore, no cumulative adverse effects are anticipated to historic and cultural resources on the site during the proposed SPEO or due to reasonably foreseeable future projects.

4.12.2.10 Socioeconomics

As discussed in Section 2.5, the proposed SLR does not include plans to add permanent workers, so the SMALL adverse impacts that are the result of workers' impact on community services, education, and infrastructure, including transportation, would not change. Tax payments from the operating plant (Section 3.9.5) are anticipated to continue without significant change through the proposed SPEO and the economic contributions of the plant's workers and the beneficial socioeconomic impacts would also continue. Thus, significant beneficial socioeconomic impacts would also continue during the proposed SPEO.

4.12.2.11 Human Health

Radiological dose limits for protection of the public and workers have been developed by the EPA and the NRC to address the cumulative impacts of acute and long-term exposure to radiation and radioactive material. These dose limits are codified in 10 CFR Part 20 and 40 CFR Part 190. For this analysis, the region of influence is the surrounding 50-mile region. There are no other operating nuclear power plants, fuel cycle facilities, or radiological waste treatment and disposal facilities within the 50-mile region of MNGP (NRC 2021b).

As presented in Section 3.10.3, Xcel Energy prepares annual radiological environmental operating reports and ARERRs. The reports for 2016–2021 indicate that doses to members of the public were a very small fraction of the limits of NRC's and EPA's radiation protection standards. The direct radioactivity measured by thermoluminescent dosimetry at various sampling locations has remained relatively constant with previous years. The three-year (2017–2019) average TEDE was 0.128 rem for MNGP. (NRC 2022a) The annual TEDE limit is 5 rem [10 CFR 20.1201(a)(1)].

Operating MNGP for an additional 20-year period is not expected to result in an increase in annual radioactive effluent releases. The impact of MNGP's operation would be expected to be SMALL, because all routine releases and occupational exposure would be subject to federal regulations. Given there are no other operating nuclear power plants, fuel cycle facilities, or radiological waste treatment and disposal facilities within the 50-mile region of MNGP, the cumulative radiological impacts would be SMALL.

As for nonradiological human health impacts, discussed in Sections 3.10.1 and 4.9.1, MNGP's thermal discharge complies with the NPDES permit limit and river temperatures at the discharge are below those optimal for the growth of thermophilic microorganisms, and the immediate area around the discharge is restricted. Therefore, the thermophilic microorganisms are unlikely to pose a risk to human health. Occupational health impacts from microbiological hazards are also SMALL as discussed in Section 4.9.6. Compliance with the NESC and MNGP procedures minimize occupational risk from electrical shock hazards (Section 4.9.2). Human health impacts from chemicals and physical hazards are also SMALL as discussed in Sections 4.9.5 and 4.9.7. As described in Section 2.2.5.5, MNGP maintains a comprehensive occupational safety program. Therefore, cumulative impacts to human health from nonradiological hazards are not expected. The cumulative impacts on human health are expected to be SMALL.

4.12.2.12 Waste Management

As concluded in Section 4.11, the comprehensive regulatory controls in place for management of radiological waste and Xcel Energy's compliance with these regulations and use of only licensed treatment and disposal facilities would allow the impacts to remain SMALL during the proposed SPEO. The NRC oversees the licensing of radiological waste treatment and disposal facilities. Four facilities provide LLRW disposal services in the United States (NRC 2020c).

As presented in Section 3.10.3, Xcel Energy's annual reports indicate that radiological doses to members of the public were negligible and in accordance with NRC and EPA radiation protection standards. There are no other operating nuclear power plants, fuel cycle facilities, or radiological waste treatment and disposal facilities within the 50-mile region of MNGP (NRC 2021b).

As presented in Sections 2.2.6 and 2.2.7, Xcel Energy has programs in place to manage its hazardous and nonhazardous waste streams. Continuation of existing systems and procedures to ensure proper storage and disposal during the proposed SPEO would allow the impacts to be SMALL. All other projects, such as the Sherco solar project, the new natural gas facilities, and the Google data center within the 50-mile region of MNGP are also required to comply with appropriate EPA and state requirements for the management of wastes. Thus, the cumulative waste management impact would be SMALL.

4.13 Uranium Fuel Cycle

Site-specific assessments for uranium fuel cycle issues are discussed below.

4.13.1 Offsite Radiological Impacts (Individual Impacts from Other than the Disposal of Spent Fuel and High-Level Waste)

4.13.1.1 Generic Analysis for Initial License Renewals [GEIS Section 4.12.1.1]

The primary indicators of impact are the concentrations of radionuclides in the effluents from the fuel cycle facilities and the radiological doses received by a maximum exposed individual (MEI) on the site boundary or at some location away from the site boundary. The basis for establishing the significance of individual effects is the comparison of the releases in the effluents and the MEI doses with the permissible levels in applicable regulations. The analyses performed by the NRC in the preparation of Table S-3 and found in the 1996 GEIS indicate that as long as the facilities operate under a valid license issued by either the NRC or an agreement state, the individual effects will meet the applicable regulations. Based on these considerations, the NRC has concluded that the impacts on individuals from radioactive gaseous and liquid releases during the license renewal term would remain at or below the NRC's regulatory limits. Accordingly, the NRC concludes that offsite radiological impacts of the uranium fuel cycle (individual effects from sources other than the disposal of spent fuel and high-level waste) are SMALL.

For initial license renewals, the NRC codified its conclusion that the impacts to the public from radiological exposures have been considered by the NRC in Table S-3 of this part. Based on information in the GEIS, impacts to individuals from radioactive gaseous and liquid releases, including radon-222 and technetium-99, would remain at or below the NRC's regulatory limits. The NRC found the impact for this issue to be SMALL.

4.13.1.2 Site-Specific Analysis for MNGP SLR

As part of the Site-Specific Analysis, Xcel Energy considered relevant new information on offsite radiological impacts (individual impacts from other than the disposal of spent fuel and high-level waste) since initial license renewal. The uranium fuel cycle impact issues concern the direct impacts from facilities involved in the uranium fuel cycle other than the reactors themselves (NRC 2013b). These would be facilities that supply fuel to MNGP and receive radioactive waste from MNGP. MNGP's contribution to any radiological impacts at radioactive waste management facilities would be limited to impacts stemming from MNGP's handling of the waste prior to the facility taking ownership. MNGP's radioactive and mixed waste management programs are described in Section 2.2.6. Xcel Energy has a comprehensive program of managing its radioactive and mixed wastes at MNGP that implements the regulatory requirements for management, storage, inspections, packaging, and shipping. MNGP would comply with the applicable NRC, DOT, DOE, and state regulatory controls for packaging and transportation of radioactive wastes.

The impacts to the public from radiological exposures have been considered by the NRC in Table S-3 of 10 CFR 51.51. Impacts to individuals from radioactive gaseous and liquid releases, including radon-222 and technetium-99 would remain at or below regulatory limits as long as facilities operate under a valid license issued by either the NRC or an agreement state.

During a second license renewal term, MNGP would continue to utilize facilities with the appropriate licenses and permits.

Xcel Energy finds that offsite radiological impacts (individual impacts from other than the disposal of spent fuel and high-level waste) for the proposed SPEO are SMALL.

4.13.2 Offsite Radiological Impacts (Collective Impacts from Other than the Disposal of Spent Fuel and High-Level Waste)

4.13.2.1 Generic Analysis for Initial License Renewals [GEIS Section 4.12.1.1]

There are no regulatory limits applicable to collective doses to the general public from fuel cycle facilities. All regulatory limits are based on individual doses. All fuel cycle facilities are designed and operated to meet the applicable regulatory limits.

As discussed in the 1996 GEIS, despite the lack of definitive data, some judgment as to the regulatory NEPA implications of these matters should be made and it makes no sense to repeat the same judgment in every case. The NRC concludes that these impacts are acceptable in that these impacts would not be sufficiently large to require the NEPA conclusion, for any plant, that the option of extended operation under 10 CFR Part 54 should be eliminated. Accordingly, while the NRC has not assigned a single level of significance for the collective effects of the fuel cycle, this issue was considered to be generic.

4.13.2.2 Site-Specific Analysis for MNGP SLR

As part of the Site-Specific Analysis, Xcel Energy considered relevant new information on offsite radiological impacts (collective impacts from other than the disposal of spent fuel and high-level waste) since initial license renewal. The uranium fuel cycle impact issues concern the direct impacts from facilities involved in the uranium fuel cycle other than the reactors themselves (NRC 2013b). These would be facilities that supply fuel to MNGP and received radioactive waste from MNGP. Therefore, the generic issues related to the uranium fuel cycle would not be affected by continued operations associated with license renewal. This would apply to a second license renewal term as well provided MNGP continues to utilize facilities with the appropriate licenses and permits.

As presented in Section 4.13.1, MNGP would comply with the applicable NRC, DOT, DOE, and state regulatory controls for packaging and transportation of radioactive wastes.

Xcel Energy finds that offsite radiological impacts (collective impacts from other than the disposal of spent fuel and high-level waste) for the proposed SPEO are SMALL.

4.13.3 Nonradiological Impacts of the Uranium Fuel Cycle

4.13.3.1 Generic Analysis for Initial License Renewals [GEIS Section 4.12.1.1]

Data on the nonradiological impacts of the fuel cycle are provided in Table S-3. These data cover land use, water use, fossil fuel use, and chemical effluents. The significance of the environmental impacts associated with these data was evaluated in the 1996 GEIS on the basis of several relative comparisons. It was noted that the impacts associated with uses of all of the above resources would be SMALL. Any impacts associated with nonradiological liquid releases from the fuel cycle facilities would also be SMALL. As a result, the aggregate nonradiological impact of the uranium fuel cycle resulting from the renewal of an OL for a plant would be SMALL, and it was considered a Category 1 issue in the 1996 GEIS.

For initial license renewals, the NRC codified its conclusion that the nonradiological impacts of the uranium fuel cycle resulting from the renewal of an OL for any plant would be SMALL.

4.13.3.2 Site-Specific Analysis for MNGP SLR

As part of the Site-Specific Analysis, Xcel Energy considered relevant new information on non-radiological impacts of the uranium fuel cycle since initial license renewal. This issue concerns the nonradiological environmental impacts associated with the uranium fuel cycle. Impacts are the result of the steps employed to extract, transform, transport, and utilize uranium as a fuel. Emissions generally occur at each stage of the fuel cycle (NRC 2013b). The extraction through fuel production of fuel steps do not occur at MNGP. Xcel Energy has no planned changes for its fuel regarding uranium enrichment for the SPEO. MNGP's continued fuel demand would not alter nonradiological impacts upstream in the fuel cycle presented in 10 CFR 51.51 Table S-3.

Xcel Energy finds that non-radiological impacts of the uranium fuel cycle for the proposed SPEO are SMALL.

4.13.4 Transportation

4.13.4.1 Generic Analysis for Initial License Renewals [GEIS Section 4.12.1.1]

The impacts associated with transporting fresh fuel to one 1,000-MWe model light-water reactor and with transporting spent fuel and radioactive waste (LLW and mixed waste) from that light water reactor are provided in Table S-4 in 10 CFR 51.52. Similar to Table S-3, and as indicated in 10 CFR 51.52, every ER prepared for the construction permit stage of a commercial nuclear power plant must contain a statement concerning the transport of fuel and radioactive waste to and from the reactor. A similar statement is also required in license renewal applications. Table S-4 forms the basis of such a statement.

In 1999, the NRC issued an addendum to the 1996 GEIS in which the agency evaluated the applicability of Table S-4 to future license renewal proceedings, given that the spent fuel is likely to be shipped to a single repository (as opposed to several destinations, as originally assumed in the preparation of Table S-4) and given that shipments of spent fuel are likely to involve more highly enriched fresh fuel (more than 4 percent as assumed in Table S-4) and higher-burnup spent fuel (higher than 33,000 MWd/MTU as assumed in Table S-4). In the addendum, the NRC evaluated the impacts of transporting the spent fuel from reactor sites to the candidate repository at Yucca Mountain and the impacts of shipping more highly enriched fresh fuel and higher burnup spent fuel. On the basis of the evaluations, the NRC concluded that the values given in Table S-4 would still be bounding, as long as the (1) enrichment of the fresh fuel was 5 percent or less; (2) burnup of the spent fuel was 62,000 MWd/MTU or less; and (3) higher-burnup spent fuel (higher than 33,000 MWd/MTU) was cooled for at least five years before being shipped offsite.

For initial license renewals, the NRC codified its conclusion that the impacts of transporting materials to and from uranium-fuel-cycle facilities on workers, the public, and the environment are expected to be SMALL.

4.13.4.2 Site-Specific Analysis for MNGP SLR

As part of the Site-Specific Analysis, Xcel Energy considered relevant new information on transportation since initial license renewal. In the 2013 GEIS, NRC considered the impacts of this issue to be SMALL, provided the three Table S-4 conditions were met (NRC 2013b). The NRC did not revisit the radiological impact analysis of transporting spent nuclear fuel away from reactor storage locations in the 2014 GEIS for Continued Storage of Spent Nuclear Fuel and again stated that the radiological impact analysis can be found in Table S-4 (NRC 2014a). Xcel Energy has no current plan to deviate from the current industry standard of 4.95 percent by weight for maximum enrichment of fuel or exceed the average burnup level of 62,000 MWd/MTU of the peak rod. Spent fuel is stored onsite in the spent fuel pool for adequate cooling prior to transfer to onsite dry storage. Therefore, the three Table S-4 conditions are met.

As presented in Sections 4.11.1.2 and 4.11.4.2, Xcel Energy has a comprehensive program of managing its radioactive and mixed wastes at MNGP that implements the regulatory requirements for management, storage, inspections, packaging, and shipping. Also as presented in ER Section 4.11.3, MNGP stores its spent nuclear fuel in NRC-licensed cask systems.

MNGP would comply with the applicable NRC, DOT, DOE, and state regulatory controls for packaging and transportation of radioactive wastes and spent nuclear fuel.

The impacts (e.g., direct radiation) of a transportation event would be discrete from other transportation events and accumulation of dose by the public other than persons in the cab of a truck transporting the material on subsequent trips would be unlikely. The packaging of radioactive materials in accordance with NRC and DOT regulations would minimize exposure. Further, the transportation events are unlikely to be staffed by the same person throughout a license term and into a second.

Xcel Energy finds that impacts to transportation for the proposed SPEO are SMALL.

4.14 Termination of Nuclear Power Plant Operations and Decommissioning

4.14.1 Termination of Nuclear Power Plant Operations and Decommissioning

4.14.1.1 Generic Analysis for Initial License Renewals [GEIS Section 4.12.2 and 4.12.2.1]

The impacts of decommissioning nuclear plants were evaluated by the NRC in NUREG-0586, Generic Environmental Impact Statement for Decommissioning Nuclear Facilities: Supplement 1, Regarding the Decommissioning of Nuclear Power Reactors.

This section describes and discusses the environmental consequences of terminating nuclear power plant operations and decommissioning, but the only impacts attributable to the proposed action (license renewal) are the effects of an additional 20 years of operations on the impacts of decommissioning. The majority of the impacts associated with plant operations would cease with reactor shutdown; however, some impacts would remain unchanged, while others would continue at reduced or altered levels. Some new impacts might also result directly from terminating nuclear power plant operations.

Terminating nuclear power plant operations would result in the cessation of actions necessary to maintain the reactor, as well as a significant reduction in the workforce. NRC presumes that terminating nuclear power plant operations would not immediately lead to the dismantlement of the reactor or other infrastructure, much of which would still be in use to support other units onsite that continued to operate. Even for sites with just one unit, some facilities would remain in operation to ensure that the site was maintained in safe shutdown condition.

For initial license renewals, the NRC codified its conclusion that license renewal is expected to have a negligible effect on the impacts of terminating operations and decommissioning on all resources. The NRC found the impact for this issue to be SMALL.

4.14.1.2 Site-Specific Analysis for MNGP SLR

As part of the Site-Specific Analysis, Xcel Energy considered relevant new information on the termination of nuclear power plant operations and decommissioning since initial license renewal. The site-specific review focused on the environmental concerns dominating termination of plant operation and decommissioning, including waste volumes, changes in worker numbers, and changes in tax revenues. Only the incremental increase in the impacts of termination of plant operations and decommissioning attributable to continued operation during the proposed SPEO is within the scope of this issue. The potential for the additional operating years to alter the impacts attributable to termination of plant operations or decommissioning is presented by resource area in Table 4.14-1.

The proposal to continue operation during an SPEO does not include construction of additional plant facilities that would require decommissioning, and additional workers that would incrementally increase socioeconomic impacts of termination of plant operations are not anticipated for the proposed SPEO. Radiation exposures from continued operations and stored spent fuel to both workers and the public are expected to remain at current levels, which are well below regulatory limits. Therefore, the impacts are expected to remain SMALL.

Xcel Energy would plan and conduct decommissioning activities in accordance with NRC-reviewed methods and evaluate anticipated environmental impacts to ensure that they are bounded by previously issued environmental assessments.

Decommissioning will occur whether MNGP is permanently shut down at the end of its current renewed operating license term, or at the end of the proposed SPEO 20 years later. After permanent shutdown, plant operators will initiate decommissioning in accordance with 10 CFR 50.82, "Termination of License."

Xcel Energy finds that impacts of termination of nuclear power plant operations and decommissioning for the proposed SPEO are SMALL.

Table 4.14-1: Site-Specific Impacts of License Renewal on Termination of Operations and Decommissioning (Sheet 1 of 2)

Issue	Impact
Land Use	The proposed action does not include a change in onsite land use. No additional workers whose housing could affect offsite land use are proposed. Therefore, the land needed for and impacted by decommissioning activities would not be changed by the additional 20 operating years.
Visual Resources	No additional facilities were proposed to continue operation for another 20 years; therefore, the visual impact of the plant at the end of the current license term as well as the end of the proposed SPEO would be the same. There would be no visual impact during decommissioning as a result of the additional 20 years of operation.
Air Quality	During the proposed SPEO, appropriate permit conditions would regulate and mitigate any potential MNGP activities that could increase air pollutants. Furthermore, no temporary impacts associated with refurbishment activities are expected. Therefore, there would be no additional impacts to air quality during decommissioning as a result of the additional 20 years of operation.
Noise	Noise levels at the end of the current license renewal term and at the end of the proposed SPEO would be the same with the exception of an improvement gained by no further monthly testing of EDGs after decommissioning. No additional impacts related to noise would occur as a result of extending the operation of the plant by an additional 20 years.
Geology and Soils	With no construction planned during the proposed SPEO, there would be no additional impacts to geology and soils from decommissioning as a result of the 20-year SPEO.
Surface Water	No significant surface water impacts are anticipated during the SPEO that would be different from those occurring during the current license term. Therefore, there would be no change in the impacts to surface water during decommissioning as a result of the additional 20 years of operation.
Groundwater	No significant groundwater impacts are anticipated during the SPEO that would be different from those occurring during the current license term. Therefore, there would be no change in the impacts to groundwater during decommissioning as a result of the additional 20 years of operation.
Terrestrial	Terrestrial resources can be impacted by landscape maintenance, stormwater management, elevated noises levels, and other ongoing operations and maintenance activities. However, these impacts are not different from current site activities and would remain the same throughout the proposed SPEO. Therefore, there should be no additional impacts on terrestrial resources during decommissioning as a result of the additional 20 years of operation.
Aquatic	Aquatic resources can be impacted by landscape maintenance, stormwater management, effluent discharge, and other ongoing operations and maintenance activities. However, these impacts are not different from current site activities and would remain the same throughout the proposed SPEO. Therefore, there should be no additional impacts on terrestrial resources during decommissioning as a result of the additional 20 years of operation.
Special Status Species	No SLR-related refurbishment activities have been identified. Therefore, there would be no SLR-related refurbishment impacts to important plant and animal habitats. Therefore, there should be no additional impacts on special status species during decommissioning as a result of the additional 20 years of operation.

Table 4.14-1: Site-Specific Impacts of License Renewal on Termination of Operations and Decommissioning (Sheet 2 of 2)

Issue	Impact
Historic and Cultural Resources	MNGP has a low archeological potential and current site infrastructure will be utilized during the proposed SPEO. For these reasons, the potential impact of decommissioning activities on cultural resources would not change as a result of the additional 20 years of operation.
Socioeconomics	MNGP has no plans to add non-outage workers during the proposed SPEO, does not anticipate changes in tax payments, and has no plans for refurbishment. Xcel Energy expects its beneficial impact on the local taxing entities to continue during the SPEO. The tax revenue socioeconomic impact of termination of operations would not be appreciably affected by the additional years of operation under a SLR. Therefore, impacts under the SPEO from the additional 20 years of operation will not impact decommissioning activities.
Human Health	Continued operation of MNGP through the proposed SPEO would not change the current exposure to physical, chemical, and microbiological hazards, or risks of accidents than those currently in existence and controlled by accepted industrial hygiene practices as required by permits and federal and state regulations. Chemical releases to the environment and the potential for impacts to the public are expected to continue to be minimized by adherence to discharge limitations of the NPDES and other permits. Radiation doses are expected to continue at current levels during the proposed SPEO and would be well below regulatory limits. Due to adherence to ongoing practices, the additional 20 years of operation will not impact decommissioning efforts.
Environmental Justice	Xcel Energy has determined that minority and low-income populations within a 50-mile radius of MNGP will not be at risk of impact from continued operations associated with the proposed SPEO. Radiation doses from continued operations would continue at current levels and would remain within regulatory limits. Terrestrial and aquatic monitoring programs conducted by MNGP are designed to ensure contaminants are not entering natural systems that would impose a risk to the environment or the public. As operations during the proposed SPEO will continue with current monitoring activities and compliance with existing regulations, the additional 20 years of operation would have no impact on decommissioning.
Waste Management	Continued operation during the proposed SPEO would generate additional waste which would need to be handled under the comprehensive regulatory controls that are in place. Therefore, the low public doses achieved at reactors to date ensure that the impacts to the environment would remain SMALL during the proposed SPEO. Application of ALARA principles during the operating years of the proposed SPEO would minimize increases in radioactivity in the structures and equipment to be decommissioned. The expected increase in volume of spent fuel can be safely stored onsite in either pool or dry storage. Additional pad(s) will be added to the existing ISFSI to accommodate the increased spent fuel volume. The expanded ISFSI would require decommissioning, but use of NRC-licensed dry storage modules would minimize radioactivity levels in the pads. Spent fuel will be stored in the ISFSI until transfer to a licensed facility. If spent nuclear fuel remains in storage after MNGP's license termination, the ISFSI would remain under a new separate license and decommissioning of the ISFSI would be conducted under that separate ISFSI license following transfer to all the spent nuclear fuel to a licensed facility.

4.15 Postulated Accidents

4.15.1 Design-Basis Accidents

The following generic issue related to postulated accidents was reviewed for new and significant information that could make the generic finding as described in the GEIS (NRC 2013a) inapplicable to MNGP: Issue 65—Design-basis accidents.

4.15.1.1 Generic Analysis for Initial License Renewals [GEIS Section 4.9.1.2]

Design-basis accidents (DBAs) are those that both the licensee and the NRC staff evaluate to ensure the plant meets acceptable design and performance criteria, and that the plant can withstand normal and abnormal transients and a broad spectrum of postulated accidents without undue hazard to the health and safety of the public.

Section 5.3 of the 1996 GEIS discusses the impacts of potential accidents, their consequences, and addresses the general characteristics of DBAs, including characteristics of fission products, meteorological considerations, possible exposure pathways, potential adverse health effects, avoiding adverse health effects, accident experience and observed impacts, and emergency preparedness. In the 2013 license renewal GEIS, the NRC reexamined the information from the 1996 GEIS regarding DBAs and concluded that this information is still valid. The NRC found that the environmental impacts of DBAs are of SMALL significance for all nuclear plants. This conclusion was reached because the plants were designed to successfully withstand these accidents, and a licensee is required to maintain the plant within acceptable design and performance criteria, including during any license renewal term. It is also stated that the environmental impacts during a license renewal term should not differ significantly from those calculated for the DBA assessments conducted as part of the initial plant licensing process. Impacts from DBAs would not be affected by changes in plant environment because such impacts (1) are based on calculated radioactive releases that are not expected to change; (2) are not affected by plant environment because they are evaluated for the hypothetical maximally exposed individual; and (3) have been previously determined acceptable (NRC 1996b, NRC 2013a).

4.15.1.2 Site-Specific Analysis for MNGP SLR

As part of the Site-Specific Analysis, Xcel Energy considered relevant new information on DBAs since initial license renewal. In 2005, Nuclear Management Company submitted an application for license renewal, which was approved in 2006. The original 40-year license for MNGP was thereby renewed for an additional 20 years. As part of the initial license renewal process, to receive NRC approval to operate a nuclear power facility, an applicant must submit a safety analysis report as part of its application. The safety analysis report presents the design criteria and design information for the proposed reactor and comprehensive data on the proposed site. The safety analysis report also discusses various hypothetical accident situations and the safety features provided to prevent and mitigate accidents.

The NRC staff reviewed the application to determine whether the plant design met the NRC's regulations and requirements and includes, in part, the nuclear plant design and its anticipated response to an accident.

These postulated accidents are not expected to occur during the life of MNGP but are evaluated to establish the design basis for the preventive and mitigative safety systems of the facility. The acceptance criteria for DBAs were described in 10 CFR Part 50 and 10 CFR Part 100. The environmental impacts of DBAs are evaluated during the initial license process, and the ability of the plant to withstand these accidents was demonstrated to be acceptable before issuance of the operating license. The results of these evaluations are found in license documentation such as the staff's safety evaluation report, the final environmental impact statement, and the MNGP final safety analysis report. MNGP is required to maintain the acceptable design and performance criteria throughout the life of the plant including any extended-life operation. The consequences for these events are evaluated for the hypothetical MEI; as such, changes in the plant environment will not affect these evaluations. Because of the requirements that continuous acceptability of the consequences and aging management programs be in effect for license renewal, the environmental impacts as calculated for DBAs should not differ significantly from initial licensing assessments over the life of MNGP, including the license renewal period. Accordingly, the design of MNGP relative to DBAs during the extended period is considered to remain acceptable and the environmental impacts of those accidents were not examined further in the GEIS (NRC 2006b).

When the 2013 GEIS was issued, the NRC's review of updated external hazards information for all operating power reactors (as ordered by the Commission following the Fukushima Dai-Ichi accident) remained ongoing. On November 25, 2020, the NRC completed its review of such information as to MNGP and concluded that no further regulatory actions were needed to ensure adequate protection or compliance with regulatory requirements, re-confirming the acceptability of MNGP's design basis. (NRC 2020d).

The environmental impacts of DBAs are of SMALL significance for all plants because the plants were designed to successfully withstand these accidents. Due to the requirements for MNGP to maintain its licensing basis (the adequacy of which the NRC recently re-confirmed) and implement aging management programs during the license renewal term, the environmental impacts during a license renewal term are not expected to differ significantly from those calculated for the DBA assessments conducted as part of the initial plant licensing process. Collectively, the Generic Analysis for Initial License Renewals and the Site-Specific Analysis for MNGP SLR demonstrates that impacts due to DBAs are SMALL, consistent with the GEIS findings, and confirms that the NRC's generic assessment for this issue is valid for MNGP.

Xcel Energy finds that impacts of DBAs for the proposed SPEO are SMALL.

4.15.2 Evaluation of New Information Concerning Severe Accident Consequences

4.15.2.1 Generic Analysis for Initial License Renewals [GEIS Section 4.9.1.2]

Severe accidents are postulated accidents that are more severe than DBAs because severe accidents can result in substantial damage to the reactor core, with or without serious offsite consequences. Severe accidents can entail multiple failures of equipment or functions. The evaluation of severe accident consequences follows the model approach in NEI 17-04 Revision 1 for determination of whether or not there is new and significant information regarding the severe accident mitigation alternatives (SAMA) analyses (NEI 2019b). The NRC staff has reviewed the NEI 17-04 Rev. 1 document and endorsed its interim use (NRC 2019a). For the MNGP SLR, the consideration of new and significant changes since the time of the initial license renewal is consistent with the GEIS (NRC 2013a), Supplement 49 (NRC 2014b). Section 5.3.9 of GEIS Supplement 49 states the following:

> *New information is significant if it provides a seriously different picture of the impacts of the Federal action under consideration. Thus, for mitigation alternatives such as SAMAs, new information is significant if it indicates that a mitigation alternative would substantially reduce an impact of the Federal action on the environment. Consequently, with respect to SAMAs, new information may be significant if it indicated a given cost-beneficial SAMA would substantially reduce the impacts of a severe accident or the probability or consequences (risk) of a severe accident occurring.*

The implication of this statement is that "significance" is not solely related to whether or not a SAMA is cost beneficial but depends also on a SAMA's potential to significantly reduce risk to the public (NEI 2019b).

The following issue (requirement) related to severe accidents has been defined by the NRC in 10 CFR 51.53(c)(3)(ii)(L):

> *If the staff has not previously considered severe accident mitigation alternatives for the applicant's plant in an environmental impact statement or related supplement or in an environmental assessment, a consideration of alternatives to mitigate severe accidents must be provided.*

The NRC finding regarding severe accidents is stated in 10 CFR Part 51, Subpart A, Appendix B, Table B-1, as follows:

> *The probability-weighted consequences of atmospheric releases, fallout onto open bodies of water, releases to groundwater, and societal and economic impacts from severe accidents are small for all plants. However, alternatives to mitigate severe accidents must be considered for all plants that have not considered such alternatives.*

In accordance with 10 CFR 51.53(c)(3)(ii)(L) and Table B-1 of Appendix B to Subpart A of 10 CFR Part 51, Xcel Energy is not required to perform another SAMA analysis for MNGP for the SLR application. However, Xcel Energy is required to provide for MNGP in the SLR application any new and significant information regarding the environmental impacts of license renewal of which it is aware, including new and significant information that could affect the environmental impacts related to postulated severe accidents or that could affect the results of a previous SAMA analysis. Accordingly, Xcel Energy reviewed this issue for new and significant information that would cause the following generic conclusions in the GEIS concerning this issue to be inapplicable to MNGP (NRC 2013a).

1. The probability-weighted consequences of atmospheric releases, fallout onto open bodies of water, releases to groundwater, and societal and economic impacts from severe accidents are small for all plants.
2. License renewal ERs for plants for which SAMAs have been previously considered need not consider SAMAs again.

The assessment process for new and significant information related to the first conclusion included (1) interviews with subject matter experts on the validity of the conclusions of the 2013 GEIS as they relate to MNGP; and (2) review of documents related to predicted impacts of severe accidents at MNGP. Consideration was given to developments in plant operation and accident analysis that could have changed the assumptions made concerning severe accident consequences after SAMAs were previously evaluated by the NRC for MNGP during initial license renewal (NRC 2006b). Developments in the following areas included:

- New internal events information
- External events
- New source term information
- Power uprates
- Higher fuel burnup
- Low power and shutdown events
- Spent fuel pool accidents
- BEIR VII Coefficient
- Uncertainties
- Other considerations including population increase and risk-beneficial plant changes implemented in response to recommendations from the Fukushima Dai-ichi Near Term Task Force (NTTF).

4.15.2.2 Site-Specific Analysis for MNGP SLR

As part of the Site-Specific Analysis, Xcel Energy considered relevant new information concerning severe accident consequences since initial license renewal. The review for new and significant information was informed by the current MNGP probabilistic risk assessment (PRA). Over the course of plant operation, changes are made to the plant design, operation, and maintenance practices. Periodic updates to the MNGP PRA have ensured that the PRA includes the relevant changes and continues to reflect the current plant design and operation. PRA updates also include updates to the initiating event and equipment performance data using the most current industry and plant specific sources. The PRA models have been updated to reflect improvements in state-of-the-art analysis of severe accidents. Therefore, the PRA provides valuable insights into the risk significance of the plant changes over time.

Each of the above areas of severe accident consequence are evaluated in more detail in the following discussion.

New Internal Events Information

In the 2013 GEIS, the NRC reviewed accident core damage frequencies (CDF) for internal events forming the basis for the environmental impacts shown in the 1996 GEIS, finding them in most cases to be comparable to or higher than updated accident frequencies. Considering the decreasing trend observed in the likelihood of severe accidents caused by internal events since 1996 and the conservative dose values used in the 1996 GEIS, the 2013 GEIS concludes that the 1996 GEIS estimates of offsite consequences from severe accidents initiated by internal events remain valid.

Since the first MNGP license renewal and SAMA evaluation, there have been many improvements to the plant's risk profile. The MNGP model used to evaluate the SAMA in the original license renewal had an internal events CDF of approximately 4.5E-5/year (NRC 2006b, Table G-1). The MNGP internal events PRA model used to determine the significance of new information in the license renewal analysis has a CDF of approximately 1.3E-5/year. This change represents approximately 71 percent reduction or about a factor of 3.5 reduction in CDF. The improvement in CDF makes any proposed new SAMA or previously evaluated SAMA less likely to be cost-beneficial.

According to the 2013 GEIS, new information shows that CDFs are generally comparable to or less than those forming the basis of the 1996 GEIS. This includes consideration of MNGP's plant-specific PRA analysis. This MNGP PRA model reflects the most up-to-date understanding of plant risk at the time of the analysis. Therefore, Xcel Energy concludes that although this information is new, no significant information exists for MNGP concerning offsite consequences from severe accidents initiated by internal events. Accordingly, the conclusions of the 2013 GEIS on this topic are considered appropriate for the MNGP SLR (NRC 1996b, NRC 2013a).

Also, changes have been implemented at the site in response to Fukushima Dai-ichi NTTF recommendations and other plant-specific programs that are "risk-beneficial" but not all are credited in MNGP PRA models. If these were fully credited in the PRAs, the internal events CDF would be somewhat lower.

External Events

In the 1996 GEIS, it was concluded that an applicant for license renewal only needed to analyze the environmental impacts from either internal or external events, since it was found that the risk from external events (such as earthquakes) were adequately addressed through consideration of severe accidents initiated by internal events (such as loss of cooling water) (NRC 1996b).

In the 2013 GEIS, the scope expanded the prior evaluation using more recent technical information that included both internally and externally initiated event CDFs (NRC 2013a). The NRC found external event CDFs to be generally one or more orders of magnitude lower than the CDFs that formed the basis of the 1996 GEIS. The primary focus of the assessment was on seismic and fire events, which the NRC had determined would contribute most to plant risk from external events. The 2013 GEIS concluded that it would be reasonable to assume contributions to plant risk from fire events and seismic events are each comparable to the contribution from internal events, but lower than the estimates used in the 1996 GEIS.

The MNGP fire PRA model has been developed since the time of the first license renewal and is considered new information. The MNGP fire CDF (2.3E-5/year) is about two times that of the internal events CDF, which is considered comparable. Therefore, the MNGP fire results are in keeping with the findings of the 2013 GEIS. The fire PRA is used in the quantitative evaluations for SAMAS for potential significance.

A seismic PRA has not been developed for MNGP. For seismic risk, an alternative approach is taken to conservatively estimate seismic core damage frequency (SCDF). This approach uses the plant-level high confidence of low probability of failure seismic capacity of 0.19g (g is standard acceleration due to earth's gravity) for MNGP. The total MNGP SCDF is 6.4E-6 per year based on the MNGP seismic hazard curve (Xcel 2020c).

The fire and seismic CDFs (2.3E-5 and 6.4E-6 respectively) as well as the sum are less than 5.4E-5 per reactor year, the internal events mean value CDF for BWRs that the 2013 GEIS used to estimate the probability weighted, offsite consequences for airborne, surface water and groundwater pathways, as well as the resulting economic impacts for such pathways. Also, changes have been implemented at the site in response to Fukushima Dai-ichi NTTF recommendations and other plant-specific programs that are "risk-beneficial" but not all are credited in MNGP PRA models. If these were fully credited in the PRAs, the fire CDF would be somewhat lower.

For all other external hazards, it has been determined that the contribution for external flooding, transportation, pipeline, and nearby facility accidents are negligible and cannot contribute any insights to new and significant information (Xcel 2020c).

In conclusion, there was a greater-than-a-factor-of-four decrease in the MNGP internal events CDF from those calculated in the previous license renewal application, and seismic and fire risk was determined to be within the values calculated in the GEIS. Therefore, the offsite consequences of severe accidents initiated by external events during the subsequent license renewal term would not exceed the impacts predicted in the GEIS. Xcel Energy concludes that no new and significant information exists for MNGP concerning offsite consequences of severe accidents initiated by external events. As such, this confirms that the conclusions of the 2013 GEIS on this topic are appropriate for the MNGP SLR.

New Source Term Information

Based on a comparison of NRC studies from NUREG-0773 (NRC 1982) and NUREG/CR-6295 (NRC 1997a), the 2013 GEIS (NRC 2013a) concluded that the 1997 source term information indicated that the timing from dominant severe accident sequences is comparable to the analysis forming the basis of the 1996 GEIS. In most cases, the release frequencies and release fractions estimated in the 1997 study were significantly lower than previously estimated. Thus, the environmental impacts used as the basis for the 1996 GEIS (i.e., the frequency-weighted consequences) were higher than impacts that would be estimated using the 1997 source term information. Therefore, the updated estimates of offsite consequences remained within the bounds of the 1996 GEIS evaluation (NRC 1996b). Additionally, Peach Bottom Atomic Power Station was evaluated in NUREG/CR-7110 (NRC 2013f) in the state-of-art-reactor consequence analysis (SOARCA), published in 2013. This analysis updated the NRC's severe accident studies of the Peach Bottom Atomic Power Station (e.g., NUREG-1150), incorporating state-of-the-art analyses to evaluate offsite risk. The SOARCA was not a complete analysis of all scenarios in the PRA, but it supports the conclusion that the offsite effects from a severe accident would be small. While MNGP is not a design identical to Peach Bottom Atomic Power Station, both are BWRs with MARK I containments, and the general conclusions of lower offsite consequences from the SOARCA apply to MNGP as well. Previously evaluated source terms used to assess offsite radiological consequences of severe accidents are bounded by the conclusions of the 2013 GEIS and considered appropriate for MNGP.

Power Uprates

The NRC approved a 13 percent power uprate for MNGP in 2010. The MNGP PRA was updated to include impacts related to EPU changes. The increase in internal events CDF (approximately 7.8 percent) and large early release frequency (LERF) (approximately 8.2 percent) met the Regulatory Guide 1.174 acceptance guidelines for being "very small" and therefore do not raise concerns of adequate protection. The Level 2 PRA analysis calculates the containment response under postulated sever accident conditions and proves an assessment of the containment adequacy. The NRC concurred that the EPU change in power represent a relatively small change to the overall challenge to containment under severe accident conditions (NRC 2013d). In addition, since the EPU, the PRA was updated to include impacts related to the EPU changes that are included as new information in the quantitative SLR SAMA evaluations.

Higher Fuel Burnup

The 2013 GEIS (NRC 2013a) evaluated updated information from NUREG/CR-6703 (NRC 2001a) to account for the effect of future increased fuel burnup on consequences of postulated accidents as predicted in the 1996 GEIS. The future peak burnup considered in the 2013 GEIS was 70 GWd/MTU for BWRs. According to the 2013 GEIS, increased peak fuel burnup from 60 to 75 GWd/MTU for BWRs results in small increases (up to 8 percent) in population dose in the event of a severe accident. As discussed in Section 2.2.1 of this report, average peak rod fuel burnup limit for MNGP during the terms of the extended licenses is not expected to exceed 62 GWd/MTU. Because MNGP peak fuel burnup will be within the range considered by the NRC in the 2013 GEIS for BWRs, the conclusions are considered appropriate for MNGP.

Low Power and Shutdown Events

The 2013 GEIS (NRC 2013a) concluded that the environmental impacts from accidents at low power and shutdown conditions were generally comparable to those from accidents at full power, based on a comparison of NUREG/CR-1150 (NRC 1990), which assesses five nuclear plants, and NUREG/CR-6143 (NRC 1995), which specifically analyzes Grand Gulf. MNGP and Grand Gulf are not identically designed plants, but they are both BWRs. Peach Bottom was one of the five plants analyzed in NUREG/CR-1150 (NRC 1990). While MNGP is not a design identical to Peach Bottom Atomic Power Station, both are BWRs with MARK I containments. Based on the similarities between MNGP and Peach Bottom and Grand Gulf, the general conclusions of plant configurations in low-power and shutdown conditions evaluated in the GEIS apply to MNGP as well. Additionally, as discussed in SECY 97-168, existing regulatory controls for shutdown operations have evolved through a series of industry actions which have been successful in achieving an acceptable level of safety of low power and shutdown operation (NRC 1997b). Therefore, the offsite consequences of severe accidents, considering low power and shutdown events, would not exceed the impacts predicted in either the 1996 or 2013 GEIS. At MNGP, low power and shutdown events are in line with the conclusions in the GEIS. Xcel Energy concludes that no new and significant information exists for MNGP concerning lower power and shutdown events.

Spent Fuel Pool Accidents

Consistent with NUREG-1738 (NRC 2001b), the impacts of accidents in spent fuel pools (SFPs) at MNGP is comparable to or lower than those from reactor accidents and are bounded by the 1996 GEIS (NRC 1996b). There are no spent fuel configurations that would distinguish MNGP from the evaluated plants such that the assumptions in the 1996 and 2013 GEIS would not apply. The 2013 GEIS (NRC 2013a) indicates that analyses performed and mitigative measures employed since 2001 have further lowered the risk of accidents involving SFPs. As a result of post-Fukushima NTTF 2.1 recommendations, implementation of diverse and flexible coping strategies (FLEX), provides additional resources to maintain SFP water inventory and risk reduction (NRC 2017). Therefore, Xcel Energy concludes that there is no new and significant information related to SFP accidents at MNGP.

BEIR VII Coefficients

The risk coefficients from the biological effects of ionizing radiation (BEIR VII) are applicable to the health effects from radiation exposures and cancers associated with them. As stated in SECY-05-0202, "the major conclusion is that current scientific evidence in consistent with the hypothesis that there is a linear, no-threshold dose response relationship between exposure to ionizing radiation and the development of cancer in humans. This conclusion is consistent with the system of radiological protection that the NRC uses to develop its regulations. Therefore, the NRC's regulations continue to be adequately protective of public health and safety and the environment" (NRC 2005). The NRC has concluded the impacts from BEIR VII would be small and that conclusions of the 1996 GEIS remain valid. Because the MNGP SAMA analysis does not find any SAMAs that reduced the risk metrics by at least 50 percent, no offsite doses are computed as part of a full Level 3 evaluation. Therefore, BEIR VII risk coefficients have no impact on the MNGP SAMA Stage 1 analysis, and there is no new and significant information. Further, the plant internal events risk has reduced by approximately 75 percent since the first license renewal, therefore the impact from consideration of the BIER VII report would be insignificant.

Uncertainties

The 1996 GEIS used 95th percentile upper confidence bound estimates whenever available for its estimates of the environmental impacts of severe accidents, which applies conservatism to cover uncertainties (NRC 1996b). The 2013 GEIS states that "a comparison of population dose from newer assessments illustrates a reduction in impact by a factor of 5 to 100 when compared to older assessments, and an additional factor of 2 to 4 due to the conservatism built into the 1996 GEIS values." (NRC 2013a) The 1996 GEIS used a MNGP specific predicted upper confidence bound total dose value of 730 person-rem/reactor-year (NRC 1996b, Table 5-9). This can be compared to the MNGP initial license renewal specific dose calculation of 38 person-rem/reactor year (NRC 2006b, Table 5-4). For MNGP, this factor of population dose reduction from newer information is on the order of a factor of 19, which confirms the 2013 GEIS conclusion. Considering additional plant improvements since the initial license renewal, this dose reduction factor remains valid for the subsequent licensing term.

The exposure index (EI) method uses the projected population distribution around each nuclear power plant site at the middle of its first license renewal period and meteorology data for each site to provide a measure of the degree to which the population would be exposed to the release of radioactive material resulting from a severe accident (i.e., the EI method weights the population in each of 16 sectors around a nuclear power plant by the fraction of time the wind blows in that direction on an annual basis). The 1996 GEIS (NRC 1996b) concluded that meteorological patterns, (i.e., wind directions and frequencies) tend to remain constant over time. Therefore, changes in the EI would result from changes in the population estimates or distributions. The 2013 GEIS adjusted the EIs and found an increase in impacts ranging from 5 to 30 percent from year 2000 to each plant's mid-year license renewal period (NRC 2013b). Given the range of uncertainties in this type of analysis, this was considered as not significant.

Another consideration for uncertainty is population growth. According to NEI 17-04, Rev. 1, Section 2.1 (NEI 2019b), population growth is considered new information, but not necessarily significant for the Stage 1 analysis. For MNGP, detailed population information including population projection information is presented in Section 3.11.1 of this report. For the 50-mile radius from the plant, the 2020 permanent population was 3,285,866, and the projected 2050 permanent and transient population is 4,387,091. Using an exponential scale, that is a 0.97 percent growth per year or a 21.3 percent growth from the beginning to the end of the 60 to 80 years renewal period of interest. This is well within the 30 percent population increase that the

2013 GEIS has determined not to be significant. Therefore, the effect of population growth is expected to be bounded by the assessment in the 1996 GEIS (NRC 1996b).

Conclusions for Severe Accident Consequences:

As stated in the 2013 GEIS, "given the difficulty in conducting a rigorous aggregation of these results (due to the differences in the information sources utilized), a fairly simple approach is taken." The 2013 GEIS estimated the net increase by a factor of 4.7 for consideration of the five areas leading to an increase in best-estimate impacts, external events, spent fuel pool accidents, higher fuel burnup, power uprates, and low-power and reactor shutdown events (NRC 2013a).

For MNGP, the newer internal event information accounts for a decrease in CDF by a factor of 3.5. When uncertainties are considered, the regional population dose reduction based on MNGP specific newer information is on the order of a factor of 19 when compared to the upper bound estimates utilized in the 1996 GEIS. When these factors are applied, the net change in risk for MNGP is a reduction by a factor of 17.8 (3.5 +19 – 4.7 = 17.8). Further, the significant decrease in environmental impacts is supported by the SOARCA that found latent cancer fatality risk is reduced by a factor of 3 to 100. (NRC 2013f) Therefore, Xcel Energy concludes there is no new and significant information identified for impacts of severe accidents.

This reduction demonstrates that the 1996 GEIS 95th percentile upper confidence bound risk metrics are not challenged, and the conclusions of the 1996 GEIS remain valid regarding severe accidents for the proposed SPEO:

"The probability-weighted consequences of atmospheric releases, fallout onto open bodies of water, releases to groundwater, and societal and economic impacts from severe accidents are SMALL for all plants."

Xcel Energy finds that impacts of severe accidents for the proposed SPEO are SMALL.

4.15.3 Evaluation of New Information Concerning Severe Accident Mitigation Alternatives

4.15.3.1 Generic Analysis for Initial License Renewals [GEIS Section 4.9.1.2]

Overview of NEI 17-04 Methodology

The NEI 17-04 Revision 1 methodology, which describes a three-stage process for determining whether there is any "new and significant" information relevant to a previous SAMA analysis (NEI 2019b). In Stage 1, the SLR applicant uses PRA risk insights and risk model quantifications to estimate the percent reduction in the maximum benefit (MB) associated with (1) all unimplemented final plant-specific SAMAs for the analyzed plant and (2) those SAMAs identified as potentially cost beneficial for other U.S. nuclear power plants and that are applicable to the analyzed plant. Consistent with the NRC's rulings that new and significant information is that which "presents 'a seriously different picture' of the environmental impacts . . . compared to the previously issued final environmental impact statement," the first stage examines whether these potentially cost-beneficial SAMA might reduce severe accident risk substantially (NRC 2014b). If it can be demonstrated that none of these SAMAs being evaluated can reduce the MB by 50 percent or more, then the applicant may document the conclusion that there is no "new and significant" information relevant to the previous SAMA analysis. If one or more of those SAMAs are shown to reduce the MB by 50 percent or more, then the applicant must complete Stage 2 by developing updated averted cost-risk estimates for implementing those SAMAs. If the Stage 2 assessment confirms that one or more SAMAs reduce the MB by 50 percent or more, then the applicant must complete Stage 3 by performing a cost-benefit analysis for the "potentially significant" SAMAs identified in Stage 2. Applicants able to demonstrate through the Stage 1 screening process that there is no potentially significant new information are not required to perform the Stage 2 or Stage 3 evaluations. The application of the NEI 17-04 methodology is described as follows.

Definitions of New and Significant Information

"New" information pertains to data used in a SAMA analysis that have changed or become available since the time the preceding SAMA analysis was performed.

There are some inputs to the SAMA analysis that are expected to change, or to potentially change, for all plants. These inputs include the following:

- Updated Level 3 model consequence results, which may be impacted by multiple inputs, including, but not limited to, the following:
    - Population, as projected within a 50-mile radius of the plant
    - Value of farm and non-farm wealth
    - Core inventory (e.g., due to power uprate)
    - Evacuation timing and speed
    - Level 3 methodology updates
- NUREG/BR-0058 (NRC 2004) cost-benefit methodology updates.

In addition, other changes that could be considered "new information" are dependent on plant activities or site-specific changes. These types of changes include the following:

- The identification of a new hazard.
- Updated plant risk model (e.g., a fire PRA that replaces the individual plant examination of external events [IPEEE] analysis).
    - Impacts of plant changes that are included in the plant risk models will be reflected in the model results and do not need to be assessed separately.
- Non-modeled modifications/changes to the plant.

- Modifications determined to have no risk impact need not be included (e.g., replacement of the condenser vacuum pumps), unless they impact a specific input to SAMA (e.g., a new low-pressure turbine in the power conversion system that results in a greater net electrical output).

For risk model updates performed to reflect the latest PRA model state of the practice, it is noted that the actual physical plant risk may not have changed; however, because the best-estimate assessment or understanding of the risk has changed, it is considered new information.

4.15.3.2 Site-Specific Analysis for MNGP SLR

As part of the Site-Specific Analysis, Xcel Energy considered relevant new information on severe accident mitigation alternatives since initial license renewal.

Background

The evaluations of the MNGP SLR SAMAs are consistent with the NEI 17-04 Revision 1 methodology, which describes a three-stage process for determining whether there is any "new and significant" information relevant to a previous SAMA analysis (NEI 2019b).

As part of the MNGP first license renewal process, a detailed evaluation of potential SAMAs was performed. Of the potential SAMAs identified in the first license renewal, a detailed cost-benefit analysis was performed on the 16 SAMAs that could not be otherwise screened (NRC 2006b). The cost-benefit analysis included development of a Level 3 approach PRA for MNGP, which was used to calculate conditional offsite doses and property damage for each of the PRA source term categories (STCs). By calculating the reduction in CDF and STC frequencies for each potential SAMA, the present value dollar benefit of each was determined, using the guidance of NUREG/BR-0184 (NRC 1997c). The benefit was then compared to a cost estimate for each to complete the cost-benefit comparison. The conclusion of the analysis was that 6 of the proposed SAMAs were cost beneficial and implemented at MNGP, and 10 SAMAs were not cost beneficial at that time but remain for further evaluation in this subsequent license renewal.

The current MNGP PRA models (internal events plus flooding and fire PRA models) were used to determine the level of significance of new information. Consistent with the NEI methodology, these PRA models reflected the most up-to-date understanding of plant risk at the time of analysis (NEI 2019b). For seismic risk, an alternative approach is taken to conservatively estimate SCDF. This approach uses the plant-level high confidence of low probability of failure seismic capacity of 0.19g for MNGP. The total MNGP SCDF is 6.4E-6 per year based on the MNGP seismic hazard curve (Xcel 2020c). Because this is a plant level assessment, there is no quantifiable MB from SAMAs that can be measured. Inclusion of this hazard in the aggregate assessment would further lower the MB for the evaluated SAMAs. The evaluated SAMAs MBs are therefore calculated in a conservative manner by excluding the seismic contribution.

Consistent with the NEI 17-04 methodology, the MNGP PRA model is used to determine the level of significance of new information (NEI 2019b). As noted above, the criterion established for a SAMA being "potentially significant" is if the MB calculated for MNGP would be reduced by a factor of two or more if the SAMA were implemented. If it can be shown that a particular SAMA would not reduce the CDF or any of the significant Level 2 release category group frequencies in the models of record by more than a factor of two, then that particular SAMA could not reduce the MB by more than a factor of two. Therefore, that SAMA would not be considered potentially significant and would not be evaluated further in assessing the significance of new information. This criterion was applied to the SAMA screening evaluation presented in Section 4.15.3.1

As seen in the subsequent sections, for MNGP, all SAMAs were screened using the Stage 1 qualitative or quantitative screening criteria from NEI 17-04. Therefore, the "Stage 2" NEI 1704 (update of the Level 3 PRA for detailed benefit calculations) is not required, and all SAMAs were found to not meet the criteria for "new and significant information" in Stage 1. The existence of a SAMA that would reduce MB by 50 percent or more and also be potentially cost-beneficial, would indicate the existence of "new and significant" information relevant to the previous SAMA analysis.

Analysis of SAMAs for New and Significant Information

Stage 1 Assessment – Overview

The list of candidate SAMAs for the MNGP SLR was developed from plant-specific and industry sources. For the plant-specific portion, the initial MNGP license renewal SAMA evaluation was examined to identify all SAMAs that could not be qualitatively screened, and that were found not to be cost effective. Evaluating these items is appropriate for determining if there is any new and significant information for MNGP and the PRA since the time of the initial license renewal in regard to the potential plant improvements.

For evaluation of the industry sources, the GEIS (NRC 2013a) supplements were examined for SAMAs found to be potentially cost effective at plants similar to MNGP. SAMAs found to be cost effective at similar plants (BWRs) were considered for their significance at MNGP (NRC 2014b).

The list of SAMAs collected was evaluated qualitatively to screen any that are not applicable to MNGP or are already implemented at MNGP (including plant modifications since the first license renewal). The final plant specific MNGP SAMAs from the initial license renewal are those that were potentially cost beneficial and did not exceed the modified maximum averted cost risk.

The remaining SAMAs were then grouped based on similarities in mitigation equipment or risk-reduction benefits, and all were evaluated for the impact they would have on the MNGP CDF and significant STC group frequencies (i.e., LERF; large, late release frequency [LLRF]; medium early release frequency [MERF]; medium intermediate release frequency [MIRF]; and medium late release frequency [MLRF]) if implemented. If any of the SAMAs reduced the total CDF, LERF, LLRF, MERF, MIRF, or MLRF by at least 50 percent, then the SAMA would be retained for a full Level 3 PRA evaluation of the reduction in MB. As described in the following sections, all SAMAs were screened without the need to perform a Level 3 update.

The quantitative evaluations performed for this analysis use the MNGP internal events plus flooding and fire PRA models. Each of these models is used to calculate CDF and the significant STC groups (i.e., LERF, LLRF, MERF, MIRF, and MLRF). This approach is sufficient to evaluate the SAMAs for new and significant information, given the bounding approach to the quantitative analyses and to the conservatism in the NEI approach.

Stage 1 Assessment – Identification and Qualitative Screening

A total of 129 industry SAMAs were collected from the 1996 GEIS supplements for each BWR site, of which all but 49 were qualitatively screened using the criteria discussed in Section 4.15.3.1. In addition, 10 MNGP-specific SAMAs were collected for evaluation in the SLR, of which 1 was screened.

Table 4.15-1 presents the 58 SAMAs that were not qualitatively screened. The first column presents the number assigned to each SAMA for tracking purposes. The second column identifies the plant from which the SAMA originated (i.e., MNGP or an industry SAMA); the third column identifies the SAMA number from the source plant; the fourth column provides a description of the SAMA. The fifth column discusses the grouping of the SAMAs, and the sixth column identifies the name assigned to the SAMA group.

A total of 21 SAMA groups were identified for quantitative screening evaluation.

Stage 1 Assessment – Quantitative Screening

This section presents the quantitative screening of the MNGP SAMAs. The current MNGP PRA models (internal events plus flooding and fire PRA models) were used in the quantitative evaluation of MB to determine the level of significance of new information. The NEI 17-04 methodology considers a SAMA to be potentially significant if it reduces the MB by at least 50 percent. The Stage 1 quantitative screening process evaluates this using the criteria of total CDF and no STC frequency being reduced by at least 50 percent. Because the MB is the sum total of the contribution of each STC, if no STC decreases by at least 50 percent, then the total MB reduction cannot exceed 50 percent.

Therefore, the STC groups are examined for percentage reduction. If neither the total CDF, nor any STC (LERF, LLRF, MERF, MIRF or MLRF) frequency is reduced by >50 percent, then the MB is also not reduced by >50 percent. SAMAs screened in this manner are not considered "potentially significant" and are conclusively screened as part of the Stage 1 assessment.

Table 4.15-2 presents the quantitative screening results from the bounding SAMA evaluations. As seen in Table 4.15-2, none of the bounding quantitative screening evaluations result in a reduction of total CDF, total LERF, or total LLRF greater than 50 percent. The evaluations were selected conservatively to provide assurance that they are bounding. In some cases, some measures (e.g., internal flooding LERF) yield an individual reduction greater than 50 percent, but when combined with the other hazards, no SAMA results in a collective CDF or significant STC group frequency (LERF) reduction of greater than 50 percent.

Appropriate qualitative screening criteria were applied to the industry SAMAs identified for consideration. For the remaining industry SAMAs and for the MNGP-specific SAMAs to be evaluated, a series of bounding quantitative analyses were performed. These analyses demonstrate that none of the SAMAs considered for quantitative evaluation would reduce the MNGP MB by 50 percent or greater.

Xcel Energy finds that there is no new and significant information that would alter the conclusions of the original SAMA analysis for MNGP for the proposed SPEO.

Table 4.15-1 Grouping of Related Industry and MNGP-Specific SAMAs for Bounding Evaluation (Sheet 1 of 15)

MNGP SAMA #	Plant	Plant SAMA #	SAMA Description	Assessment	Case Name
51	Fermi 2	Unnumbered-3	Revise existing alarm response procedures to direct operators to the direct current switchgear room and the Division 2 alternating current switchgear room following indication of leakage in the reactor building closed cooling water/emergency equipment cooling water system piping.	Quantitatively evaluate extended battery capacity, providing capability to cope up to 16 hours.	16Hr_BATTERY
53	FitzPatrick	30	Modify plant equipment to provide 16-hour SBO injection to improve capability to cope with longer SBO scenarios.		
62	Hope Creek 1 & 2	1	Remove automatic depressurization system (ADS) inhibit from non-ATWS emergency operating procedures.	Quantitatively Evaluate removing ADS inhibit.	ADS

Table 4.15-1 Grouping of Related Industry and MNGP-Specific SAMAs for Bounding Evaluation (Sheet 2 of 15)

MNGP SAMA #	Plant	Plant SAMA #	SAMA Description	Assessment	Case Name
2	Brunswick 1 & 2	6	Proceduralize all potential 4-kV Alternating Current (AC) bus crosstie actions. The benefit of this SAMA is limited because the loss of Decay Heat Removal (DHR) sequences are long evolutions and even without these procedures the onsite staff would likely perform the 4-kV crossties given that the hardware is in place to support it.	Quantitatively evaluate SAMAs that eliminate impact of loss of 4.16 kV. Expand the evaluation to flood and fire induced initiators.	ALT_4kV
7	Brunswick 1 & 2	18	Provide alternate feeds to essential loads directly from an alternate emergency bus: Loss of emergency 4-kV bus initiating events were eliminated.		
106	Peach Bottom	13	Develop procedures to repair or replace failed 4-kV breakers.		
125	Susquehanna 1 & 2	2a	Install minimal hardware changes and modify procedures to provide a crosstie capability between the 4 kilovolt (kV) alternating current (AC) emergency buses.		

Table 4.15-1 Grouping of Related Industry and MNGP-Specific SAMAs for Bounding Evaluation (Sheet 3 of 15)

MNGP SAMA #	Plant	Plant SAMA #	SAMA Description	Assessment	Case Name
127	Susquehanna 1 & 2	2b	Improve the crosstie capability between 4 kV AC emergency buses, i.e., between A or D emergency buses and B or C emergency buses (a more flexible crosstie option than SAMA 2a).		
11	Brunswick 1 & 2	30	Improve alternate shutdown panel: Improves operator reliability over the use of the current panel by a factor of five for all control room fire scenarios.	Quantitatively evaluate SAMAs that eliminate alternate shutdown system (ASDS) panel failures.	ASD_PNL
12	Brunswick 1 & 2	31	Improved alternate shutdown training and equipment: Improves operator reliability over the use of the current panel by 10 percent for all control room fire scenarios.		
68	Hope Creek 1 & 2	30	Provide procedural guidance for partial transfer function of control functions from the control room to the remote shutdown panel.		

Table 4.15-1 Grouping of Related Industry and MNGP-Specific SAMAs for Bounding Evaluation (Sheet 4 of 15)

MNGP SAMA #	Plant	Plant SAMA #	SAMA Description	Assessment	Case Name
121	River Bend 1	185	Upgrade the alternate shutdown system (ASDS) panel to include additional system controls for opposite division.		
136	MNGP	39	Enhance the ASDS panel to include additional system controls for opposite division.		
47	Fermi 2	115	Revise procedures to control vessel injection to prevent boron loss or dilution following standby liquid control injection.	Quantitatively Evaluate improving ATWS mitigation.	ATWS
78	La Salle 1 & 2	5	Automate SBLC initiation.		
87	La Salle 1 & 2	21	Install automatic ATWS level control system.		
107	Peach Bottom	18	Increase the safety relief valve reseat reliability		
134	MNGP	13	Enhance, test and train on alternate boron Injection with the control rod drive system.		

Table 4.15-1 Grouping of Related Industry and MNGP-Specific SAMAs for Bounding Evaluation (Sheet 5 of 15)

MNGP SAMA #	Plant	Plant SAMA #	SAMA Description	Assessment	Case Name
137	MNGP	40	Add an emergency level control system to the hotwell.	Quantitatively evaluate addition of a condenser hotwell emergency level control to address scenarios where CND/FW injection is available, but the main condenser is unavailable and hotwell makeup is failed.	CHW_ELVLC
9	Brunswick 1 & 2	25	Proceduralize battery charger high-voltage shutdown circuit inhibit: This SAMA involves disabling the charger high-voltage trip circuit when the batteries are disconnected from the DC circuit, preventing the trip, and allowing the chargers to remain online.	Quantitatively evaluate SAMAs that improve DC system performance. Like Brunswick, MNGP battery chargers cannot carry the current load if there is an open circuit on a battery. (Ref. 3.10)	DC

Table 4.15-1 Grouping of Related Industry and MNGP-Specific SAMAs for Bounding Evaluation (Sheet 6 of 15)

MNGP SAMA #	Plant	Plant SAMA #	SAMA Description	Assessment	Case Name
93	Nine Mile Point 1 & 2	U2-23a	U2-23a – Provide redundant ventilation for residual heat removal (RHR) pump rooms. This SAMA involves a revision of the operating procedure to provide additional space cooling via the use of portable equipment or blocking doors open.	Quantitatively evaluate improvements to heating, ventilation, and air conditioning (HVAC) to the CS and RHR pump rooms.	ECCS_HVAC
94	Nine Mile Point 1 & 2	U2-23b	U2-23b – Provide redundant ventilation for high-pressure core spray pump room: This SAMA is similar to SAMA U2-23a		
96	Nine Mile Point 1 & 2	U2-213	U2-213—Enhance loss of service water procedure: This SAMA involves a procedure enhancement of the Unit 2 loss of service water procedure (SOP-11) to provide more specific guidance for events involving loss of service water.		

Table 4.15-1 Grouping of Related Industry and MNGP-Specific SAMAs for Bounding Evaluation (Sheet 7 of 15)

MNGP SAMA #	Plant	Plant SAMA #	SAMA Description	Assessment	Case Name
115	River Bend 1	94a	Enhance procedures for actions on loss of heating, ventilation, and air conditioning (HVAC) to the high-pressure core spray (HPCS) pump room		
116	River Bend 1	94b	Enhance procedures for actions on loss of HVAC to the residual heat removal (RHR) B and C (B/C) pump rooms.		
117	River Bend 1	94c	Enhance procedures for actions on loss of HVAC to the low-pressure core spray (LPCS) and RHR A pump rooms.		
118	River Bend 1	97	Perform study and analysis to add steps to trip unneeded emergency core cooling system (ECCS) pumps on loss of HVAC.		
132	MNGP	8	Improve EDG-emergency service water (ESW) pumping capability by utilizing the fire service water (FSW) system as a backup for EDG cooling.	Quantitively evaluate alternatives for EDG-ESW.	EDG_ESW

Table 4.15-1 Grouping of Related Industry and MNGP-Specific SAMAs for Bounding Evaluation (Sheet 8 of 15)

MNGP SAMA #	Plant	Plant SAMA #	SAMA Description	Assessment	Case Name
4	Brunswick 1 & 2	15	Diverse emergency diesel generator (EDG) heating, ventilation, and air conditioning logic: This SAMA involves the installation of a diverse set of fan actuation logic that would reduce the reliance on operators to perform a fan start on loss of the automatic actuation logic.	Quantitatively evaluate SAMAs improving EDG HVAC reliability. MNGP FLR Plant SAMA #6 identified CCF of ventilation fans/louvers as significant to risk. (Ref 3.2).	EDG_HVAC
36	Cooper 1	40	Revise procedures to provide additional space cooling to the emergency diesel generator (EDG) room via the use of portable equipment, increasing availability of the EDG.		
56	FitzPatrick	62	Modify plant procedures to open the doors of the emergency diesel generator (EDG) buildings upon receipt of a high temperature alarm, which improves the reliability of the EDGs following high temperatures in the EDG buildings.		

Table 4.15-1 Grouping of Related Industry and MNGP-Specific SAMAs for Bounding Evaluation (Sheet 9 of 15)

MNGP SAMA #	Plant	Plant SAMA #	SAMA Description	Assessment	Case Name
61	Grand Gulf 1	Unnumbered (RAI 8a)	Revise procedures to direct the operator monitoring a running diesel generator to ensure that the ventilation system is running or take action to open doors or use portable fans.		
66	Hope Creek 1 & 2	17	Replace a supply fan with a different design in service water pump room.		
67	Hope Creek 1 & 2	18	Replace a return fan with a different design in service water pump room.		
100	Nine Mile Point 1 & 2	U2-221a	U2-221a—Reduce unit cooler contribution to emergency diesel generator (EDG) unavailability increase testing frequency: This SAMA would provide a more reliable means of cooling the EDG control panel rooms by testing the unit coolers during every cycle.		

Table 4.15-1 Grouping of Related Industry and MNGP-Specific SAMAs for Bounding Evaluation (Sheet 10 of 15)

MNGP SAMA #	Plant	Plant SAMA #	SAMA Description	Assessment	Case Name
101	Nine Mile Point 1 & 2	U2-221b	U2-221b—Reduce unit cooler contribution to EDG unavailability provide redundant means of cooling: This SAMA would also provide a more reliable means of cooling the EDG control panel rooms by providing guidance for operators to open the EDG control panel room doors.		
119	River Bend 1	102	Operator procedure revisions to provide additional space cooling to the emergency diesel generator (EDG) room via the use of portable equipment.		
131	MNGP	6	Install additional fan and louver pair for emergency diesel generator (EDG) heating, ventilation, and air conditioning.		

Table 4.15-1 Grouping of Related Industry and MNGP-Specific SAMAs for Bounding Evaluation (Sheet 11 of 15)

MNGP SAMA #	Plant	Plant SAMA #	SAMA Description	Assessment	Case Name
65	Hope Creek 1 & 2	10	Provide procedural guidance to use B.5.b low-pressure pump for non-security events.	Quantitatively evaluate credit for FLEX pumps as an alternate to RCIC during non-ELAP sequences.	FLEX
123	River Bend 1	205	Revise flexible coping strategies (FLEX) procedures to allow use of FLEX equipment in non-extended loss of alternating current power (ELAP) conditions.		
10	Brunswick 1 & 2	29	Portable EDG fuel oil transfer pump: This SAMA provides additional means of supplying the EDG day tank in the event that a common cause failure prevents operation of the existing pumps.	Quantitatively evaluate SAMAs that mitigate common cause failures of diesel fuel oil transfer pumps for EDGs 11 and 12.	FO_XFER
133	MNGP	10	Install drywell Igniters or passive hydrogen ignition system.	Quantitatively evaluate crediting venting or a new system to control hydrogen using the drywell vent.	H2_DRYWELL
130	MNGP	4	Install a direct drive diesel Injection pump as additional high-pressure injection system.	Quantitatively evaluate improving high-pressure injection reliability and availability.	HPI

Table 4.15-1 Grouping of Related Industry and MNGP-Specific SAMAs for Bounding Evaluation (Sheet 12 of 15)

MNGP SAMA #	Plant	Plant SAMA #	SAMA Description	Assessment	Case Name
48	Fermi 2	206	Improve the ability of operators to manually close a damper to isolate the third floor of the reactor building from the hardened vent path.	Quantitatively Evaluate measures for controlling HPV.	HPV
76	La Salle 1 & 2	3	Install passive vent path.		
112	Quad Cities 1 & 2	14	Develop procedures to control containment venting within a narrow band of pressure.		
138	MNGP	16	Provide passive overpressure relief by changing the containment vent valves to fail open and improving the strength of the rupture disk.		
8	Brunswick 1 & 2	19	Provide an alternate means of supplying the instrument air header: This SAMA involves procurement of an additional portable compressor to be aligned to the supply header to reduce the risk associated with loss of instrument air.	Quantitatively evaluate SAMAs that eliminate impact of loss of instrument air. Expand evaluation to flood and fire induced initiators.	IA
37	Cooper 1	45	Provide an alternate means of supplying the instrument air header, increasing availability of instrument air.		
63	Hope Creek 1 & 2	3	Install backup air compressor to supply air-operated valves.		

Table 4.15-1 Grouping of Related Industry and MNGP-Specific SAMAs for Bounding Evaluation (Sheet 13 of 15)

MNGP SAMA #	Plant	Plant SAMA #	SAMA Description	Assessment	Case Name
102	Nine Mile Point 1 & 2	U2-222	U2-222—Improve procedure for loss of instrument air: This SAMA involves an enhancement to loss of instrument air procedure N2-SOP-19 to provide a better means of responding to loss of instrument air.		
45	Fermi 2	112	Revise emergency operating procedures to improve identification of interfacing system loss-of-coolant accidents (ISLOCA).	Quantitatively evaluate SAMAs to mitigate ISLOCAs.	ISLOCA
46	Fermi 2	113	Improve operator training on coping with ISLOCA.		
83	La Salle 1 & 2	15	Tie RHRSW to the low-pressure core spray (LPCS) system for ISLOCA mitigation.		
44	Dresden 2 & 3	11	Procedural changes to align low-pressure coolant injection or core spray to the condensate storage tank on loss of suppression pool cooling.	Quantitatively Evaluate measures for operating LPCI post venting loss of NPSH.	LPCI_PV

Table 4.15-1 Grouping of Related Industry and MNGP-Specific SAMAs for Bounding Evaluation (Sheet 14 of 15)

MNGP SAMA #	Plant	Plant SAMA #	SAMA Description	Assessment	Case Name
60	Grand Gulf 1	59	Increase operator training for alternating operation of the low-pressure emergency core cooling system pumps (low-pressure coolant injection and low-pressure core spray) for loss of standby service water scenarios.		
122	River Bend 1	198	Develop a procedure for alternating operation of low-pressure ECCS pumps for loss of standby service water (SSW).		
139	MNGP	9	Additional dedicated Alternate Low-Pressure Injection/Drywell Spray System.	Quantitatively evaluate alternate low-pressure system to prevent drywell liner melt. This SAMA was screened on exceeding the modified maximum averted cost risk but added back to the list of SAMAs through sensitivity analysis in the first license renewal. This provides containment flooding to help prevent drywell liner melt-through after RPV failure.	LPI_DRYWELL

Table 4.15-1 Grouping of Related Industry and MNGP-Specific SAMAs for Bounding Evaluation (Sheet 15 of 15)

MNGP SAMA #	Plant	Plant SAMA #	SAMA Description	Assessment	Case Name
86	La Salle 1 & 2	19	Provide remote alignment capability of RHRSW to the LPCS system for LOCA mitigation.	Quantitatively evaluate changing manual valves to MOVs with remote control on the control room or ASDS panel.	RHR_MOVS
75	La Salle 1 & 2	2	Automate suppression pool cooling.	Quantitatively evaluate Automatic Suppression Pool cooling.	SUPP_POOL

Table 4.15-2 Summary of Aggregate SAMA Maximum Benefits (Sheet 1 of 6)

#	Case	Release Category	Figure of Merit	Base	SAMA	MB %
1	16Hr_BATTERY	Core Damage	CDF	3.65E-5	3.36E-5	7.8%
		Large Early	STC-LERF	3.47E-6	3.31E-6	4.5%
		Large Late	STC-LLRF	8.37E-7	7.57E-7	9.5%
		Med. Early	STC-MERF	8.91E-6	8.16E-6	8.4%
		Med. Interm.	STC-MIRF	6.97E-6	6.09E-6	12.6%
		Med. Late	STC-MLRF	1.22E-6	1.10E-6	9.8%
2	ADS	Core Damage	CDF	3.65E-5	2.76E-5	24.2%
		Large Early	STC-LERF	3.47E-6	3.44E-6	0.8%
		Large Late	STC-LLRF	8.37E-7	7.76E-7	7.2%
		Med. Early	STC-MERF	8.91E-6	8.56E-6	3.9%
		Med. Interm.	STC-MIRF	6.97E-6	5.23E-6	24.9%
		Med. Late	STC-MLRF	1.22E-6	1.13E-6	7.4%
3	ALT_4KV	Core Damage	CDF	3.65E-5	3.24E-5	11.2%
		Large Early	STC-LERF	3.47E-6	3.32E-6	4.2%
		Large Late	STC-LLRF	8.37E-7	7.73E-7	7.7%
		Med. Early	STC-MERF	8.91E-6	7.99E-6	10.3%
		Med. Interm.	STC-MIRF	6.97E-6	5.53E-6	20.6%
		Med. Late	STC-MLRF	1.22E-6	1.13E-6	8.0%
4	ASD_PNL	Core Damage	CDF	3.65E-5	3.40E-5	6.8%
		Large Early	STC-LERF	3.47E-6	2.51E-6	27.6%
		Large Late	STC-LLRF	8.37E-7	7.74E-7	7.5%
		Med. Early	STC-MERF	8.91E-6	7.17E-6	19.5%
		Med. Interm.	STC-MIRF	6.97E-6	5.88E-6	15.6%
		Med. Late	STC-MLRF	1.22E-6	1.13E-6	7.8%

Table 4.15-2 Summary of Aggregate SAMA Maximum Benefits (Sheet 2 of 6)

#	Case	Release Category	Figure of Merit	Base	SAMA	MB %
5	ATWS	Core Damage	CDF	3.65E-5	3.45E-5	5.4%
		Large Early	STC-LERF	3.47E-6	2.24E-6	35.5%
		Large Late	STC-LLRF	8.37E-7	8.37E-7	0.0%
		Med. Early	STC-MERF	8.91E-6	6.91E-6	22.5%
		Med. Interm.	STC-MIRF	6.97E-6	6.97E-6	0.0%
		Med. Late	STC-MLRF	1.22E-6	1.22E-6	0.0%
6	CHW_ELVLC	Core Damage	CDF	3.65E-5	3.57E-5	2.0%
		Large Early	STC-LERF	3.47E-6	3.40E-6	1.9%
		Large Late	STC-LLRF	8.37E-7	8.30E-7	0.9%
		Med. Early	STC-MERF	8.91E-6	8.60E-6	3.5%
		Med. Interm.	STC-MIRF	6.97E-6	6.85E-6	1.6%
		Med. Late	STC-MLRF	1.22E-6	1.21E-6	0.9%
7	DC	Core Damage	CDF	3.65E-5	3.56E-5	2.5%
		Large Early	STC-LERF	3.47E-6	3.45E-6	0.5%
		Large Late	STC-LLRF	8.37E-7	8.17E-7	2.4%
		Med. Early	STC-MERF	8.91E-6	8.83E-6	0.9%
		Med. Interm.	STC-MIRF	6.97E-6	6.48E-6	6.9%
		Med. Late	STC-MLRF	1.22E-6	1.19E-6	2.5%
8	ECCS_HVAC	Core Damage	CDF	3.65E-5	2.34E-5	35.8%
		Large Early	STC-LERF	3.47E-6	3.11E-6	10.3%
		Large Late	STC-LLRF	8.37E-7	4.55E-7	45.6%
		Med. Early	STC-MERF	8.91E-6	6.78E-6	23.9%
		Med. Interm.	STC-MIRF	6.97E-6	4.14E-6	40.6%
		Med. Late	STC-MLRF	1.22E-6	6.65E-7	45.6%

Table 4.15-2 Summary of Aggregate SAMA Maximum Benefits (Sheet 3 of 6)

#	Case	Release Category	Figure of Merit	Base	SAMA	MB %
9	EDG_ESW	Core Damage	CDF	3.65E-5	3.64E-5	0.1%
		Large Early	STC-LERF	3.47E-6	3.46E-6	0.1%
		Large Late	STC-LLRF	8.37E-7	8.34E-7	0.4%
		Med. Early	STC-MERF	8.91E-6	8.90E-6	0.1%
		Med. Interm.	STC-MIRF	6.97E-6	6.98E-6	-0.2%
		Med. Late	STC-MLRF	1.22E-6	1.22E-6	0.3%
10	EDG_HVAC	Core Damage	CDF	3.65E-5	3.64E-5	0.2%
		Large Early	STC-LERF	3.47E-6	3.46E-6	0.2%
		Large Late	STC-LLRF	8.37E-7	8.34E-7	0.3%
		Med. Early	STC-MERF	8.91E-6	8.89E-6	0.3%
		Med. Interm.	STC-MIRF	6.97E-6	6.89E-6	1.1%
		Med. Late	STC-MLRF	1.22E-6	1.22E-6	0.4%
11	FLEX	Core Damage	CDF	3.65E-5	3.51E-5	3.6%
		Large Early	STC-LERF	3.47E-6	3.46E-6	0.1%
		Large Late	STC-LLRF	8.37E-7	4.68E-7	44.1%
		Med. Early	STC-MERF	8.91E-6	8.86E-6	0.6%
		Med. Interm.	STC-MIRF	6.97E-6	6.46E-6	7.2%
		Med. Late	STC-MLRF	1.22E-6	6.85E-7	44.0%
12	FO_XFER	Core Damage	CDF	3.65E-5	3.64E-5	0.0%
		Large Early	STC-LERF	3.47E-6	3.47E-6	0.0%
		Large Late	STC-LLRF	8.37E-7	8.37E-7	0.0%
		Med. Early	STC-MERF	8.91E-6	8.91E-6	0.0%
		Med. Interm.	STC-MIRF	6.97E-6	6.96E-6	0.0%
		Med. Late	STC-MLRF	1.22E-6	1.22E-6	0.0%

Table 4.15-2 Summary of Aggregate SAMA Maximum Benefits (Sheet 4 of 6)

#	Case	Release Category	Figure of Merit	Base	SAMA	MB %
13	H2_DRYWELL	Core Damage	CDF	3.65E-5	3.65E-5	0.0%
		Large Early	STC-LERF	3.47E-6	3.46E-6	0.1%
		Large Late	STC-LLRF	8.37E-7	8.37E-7	0.0%
		Med. Early	STC-MERF	8.91E-6	8.91E-6	0.0%
		Med. Interm.	STC-MIRF	6.97E-6	6.97E-6	0.0%
		Med. Late	STC-MLRF	1.22E-6	1.22E-6	0.0%
14	HPI	Core Damage	CDF	3.65E-5	2.48E-5	31.9%
		Large Early	STC-LERF	3.47E-6	3.43E-6	1.1%
		Large Late	STC-LLRF	8.37E-7	7.06E-7	15.7%
		Med. Early	STC-MERF	8.91E-6	8.83E-6	0.9%
		Med. Interm.	STC-MIRF	6.97E-6	4.59E-6	34.1%
		Med. Late	STC-MLRF	1.22E-6	1.03E-6	16.0%
15	HPV	Core Damage	CDF	3.65E-5	3.46E-5	5.0%
		Large Early	STC-LERF	3.47E-6	2.83E-6	18.5%
		Large Late	STC-LLRF	8.37E-7	8.33E-7	0.5%
		Med. Early	STC-MERF	8.91E-6	7.11E-6	20.2%
		Med. Interm.	STC-MIRF	6.97E-6	6.95E-6	0.3%
		Med. Late	STC-MLRF	1.22E-6	1.22E-6	0.5%
16	IA	Core Damage	CDF	3.65E-5	3.16E-5	13.3%
		Large Early	STC-LERF	3.47E-6	3.50E-6	-1.0%
		Large Late	STC-LLRF	8.37E-7	8.01E-7	4.3%
		Med. Early	STC-MERF	8.91E-6	8.49E-6	4.7%
		Med. Interm.	STC-MIRF	6.97E-6	6.11E-6	12.3%
		Med. Late	STC-MLRF	1.22E-6	1.17E-6	4.5%

Table 4.15-2 Summary of Aggregate SAMA Maximum Benefits (Sheet 5 of 6)

#	Case	Release Category	Figure of Merit	Base	SAMA	MB %
17	ISLOCA	Core Damage	CDF	3.65E-5	3.61E-5	0.9%
		Large Early	STC-LERF	3.47E-6	3.14E-6	9.5%
		Large Late	STC-LLRF	8.37E-7	8.37E-7	0.0%
		Med. Early	STC-MERF	8.91E-6	8.91E-6	0.0%
		Med. Interm.	STC-MIRF	6.97E-6	6.97E-6	0.0%
		Med. Late	STC-MLRF	1.22E-6	1.22E-6	0.0%
18	LPCI_PV	Core Damage	CDF	3.65E-5	3.51E-5	3.7%
		Large Early	STC-LERF	3.47E-6	3.46E-6	0.2%
		Large Late	STC-LLRF	8.37E-7	4.65E-7	44.5%
		Med. Early	STC-MERF	8.91E-6	8.83E-6	0.9%
		Med. Interm.	STC-MIRF	6.97E-6	6.45E-6	7.4%
		Med. Late	STC-MLRF	1.22E-6	6.80E-7	44.4%
19	LPI_DRYWELL	Core Damage	CDF	3.65E-5	3.65E-5	0.0%
		Large Early	STC-LERF	3.47E-6	3.46E-6	0.1%
		Large Late	STC-LLRF	8.37E-7	8.37E-7	0.0%
		Med. Early	STC-MERF	8.91E-6	8.91E-6	0.0%
		Med. Interm.	STC-MIRF	6.97E-6	6.97E-6	0.0%
		Med. Late	STC-MLRF	1.22E-6	1.22E-6	0.0%
20	RHR_MOVS	Core Damage	CDF	3.65E-5	3.21E-5	11.9%
		Large Early	STC-LERF	3.47E-6	3.39E-6	2.2%
		Large Late	STC-LLRF	8.37E-7	7.10E-7	15.1%
		Med. Early	STC-MERF	8.91E-6	8.34E-6	6.4%
		Med. Interm.	STC-MIRF	6.97E-6	5.32E-6	23.6%
		Med. Late	STC-MLRF	1.22E-6	1.03E-6	15.4%

Table 4.15-2 Summary of Aggregate SAMA Maximum Benefits (Sheet 6 of 6)

#	Case	Release Category	Figure of Merit	Base	SAMA	MB %
21	SUPP_POOL	Core Damage	CDF	3.65E-5	3.55E-5	2.5%
		Large Early	STC-LERF	3.47E-6	3.34E-6	3.8%
		Large Late	STC-LLRF	8.37E-7	8.36E-7	0.1%
		Med. Early	STC-MERF	8.91E-6	8.29E-6	6.9%
		Med. Interm.	STC-MIRF	6.97E-6	6.80E-6	2.3%
		Med. Late	STC-MLRF	1.22E-6	1.22E-6	0.1%

5.0 NEW AND SIGNIFICANT INFORMATION

All applicable Category 2 and former Category 1 environmental issues are presented in Chapter 4 and include a site-specific analysis considering environmental impacts during the SPEO. The site-specific analyses for these issues considers any applicable new and significant information that may affect the determination of environmental impact for each issue. Based on the discussion presented in Chapter 4, no new and significant information was identified that would affect the determinations made regarding environmental impacts for the issues with respect to an SPEO for MNGP.

6.0 SUMMARY OF LICENSE RENEWAL IMPACTS AND MITIGATING ACTIONS

6.1 License Renewal Impacts

Chapter 4 presents site-specific analysis for each of the 71 environmental issues that apply to MNGP, all of which have SMALL environmental impacts. Table 6.1-1 identifies the environmental impacts that subsequent renewal of the MNGP OLs would have on resources associated with the environmental issues.

In summary, Xcel Energy has reviewed the environmental impacts of renewing the MNGP OLs and concluded that further mitigation measures beyond those presented in Section 6.2 and listed in Table 6.1-1 to avoid, reduce the severity of, or eliminate adverse impacts are not warranted. This ER documents the basis for Xcel Energy's conclusion.

Table 6.1-1 Environmental Impacts Related to Subsequent License Renewal at MNGP (Sheet 1 of 12)

Resource Issue	ER Section	Environmental Impact
Land Use		
Offsite Land Use in Transmission Line Right-of-Way (ROWs)	NA	No impact. Issue is not applicable at MNGP.
Onsite Land Uses	4.1.1	SMALL impact. Operation of MNGP is not expected to change and no refurbishment activities are anticipated. Therefore, no changes to onsite land use are projected. Therefore, the impact from onsite land uses would remain SMALL during the SPEO.
Offsite Land Uses	4.1.2	SMALL impact. MNGP has no plans to add workers, no significant changes to tax payments, and no refurbishment activities have been identified. Therefore, no changes in offsite land use are anticipated. Therefore, the impact from offsite land uses would remain SMALL during the SPEO.
Visual Resources		
Aesthetic Impacts	4.1.3	SMALL impact. MNGP has not identified refurbishment activities that would change the aesthetics of the MNGP facility. Therefore, aesthetic impacts would remain SMALL during the SPEO.
Air Quality		
Air Quality Impacts (All Plants)	4.2.1	SMALL impact. MNGP has not identified refurbishment activities, future upgrades, or replacement activities that would increase or decrease air emissions. Appropriate permit conditions would regulate and mitigate any potential MNGP activities that could increase air pollutants. Therefore, air quality impacts for the proposed SPEO are SMALL
Air Quality Effects of Transmission Lines	4.2.2	SMALL impact. MNGP's in-scope transmission lines range from 13.8 kV to 345 kV and there no anticipated changes to the system. The amount of ozone generated from the in-scope transmission lines is anticipated to be minimal. Therefore, air quality effects of transmission lines for the proposed SPEO are SMALL
Noise		
Noise Impacts	4.3.1	SMALL impact. People living in the vicinity of MNGP will not experience any changes in noise levels beyond what is currently experienced. Therefore, the impact of continued reactor operations on noise will be SMALL.

Table 6.1-1 Environmental Impacts Related to Subsequent License Renewal at MNGP (Sheet 2 of 12)

Resource Issue	ER Section	Environmental Impact
Geologic Environment		
Geology and Soils	4.4.1	SMALL impact. MNGP's compliance with current and future NPDES regulatory requirements and permit conditions, implementation of a SWPPP, implementations of BMPs, and adhering to internal procedures will ensure that geology and soil impacts will remain SMALL.
Surface Water Resources		
Surface Water Use Conflicts (Plants with Cooling Ponds or Cooling Towers Using Makeup Water from a River)	4.5.1	SMALL impact. MNGP utilizes a once-through cooling system and two MDCTs as needed to meet surface water appropriation limits and thermal discharge limits. MNGP is in compliance with both the Surface Water Appropriations Permit and the NPDES permit and future compliance with these water use permits and regulations will ensure a SMALL impact on surface water use.
Surface Water Use and Quality (Non-Cooling System Impacts)	4.5.5	SMALL impact. MNGP has permits in place to govern discharges and programs and procedures in place to minimize the potential for spills. The impacts on surface water use and quality from non-cooling systems are SMALL.
Altered Current Patterns at Intake and Discharge Structures	4.5.6	SMALL impact. MNGP has no modifications that would alter the existing current pattern. Therefore, impacts to surface water use and quality are SMALL.
Scouring Caused by Discharged Cooling Water	4.5.7	SMALL impact. MNGP has no plant operations or modifications planned that would alter discharge patterns and flow rates. Therefore, MNGP's impact due to scouring caused by cooling water discharge is SMALL.
Discharge of Metals in Cooling System Effluent	4.5.8	SMALL impact. Condenser tubes are stainless steel at MNGP and would not contribute leached metals to the cooling water discharge. Discharges at MNGP are monitored and controlled as part of the NPDES permit process and the impact is SMALL.
Discharge of Biocides, Sanitary Wastes, and Minor Chemical Spills	4.5.9	SMALL impact. The comprehensive regulatory controls and permits in place and MNGP's compliance with them, guided by internal procedures, would mitigate impacts to surface waters from continued operation. Impacts of biocides and minor chemical spills will continue to be limited to a SMALL impact.
Surface Water Use Conflicts (Plants with Once-Through Cooling Systems)	4.5.10	SMALL impact. MNGP utilizes a once-through cooling system and two MDCTs. MNGP is in compliance with both the Surface Water Appropriations Permit and the NPDES permit. Future compliance with these water use permits and regulations will ensure a SMALL impact on surface water use.

Table 6.1-1 Environmental Impacts Related to Subsequent License Renewal at MNGP (Sheet 3 of 12)

Resource Issue	ER Section	Environmental Impact
Effects of Dredging on Surface Water Quality	4.5.11	SMALL impact. MNGP's dredging operations are conducted in compliance with regulatory and permitting requirements. Continued compliance ensures that the impacts from dredging on surface water quality would remain SMALL.
Temperature Effects on Sediment Transport Capacity	4.5.12	SMALL impact. Discharges are governed by MNGP's NPDES permit. There are no plant operations or modifications planned that would alter discharge patterns. Impacts from increased water temperature on sediment transport capacity would remain SMALL.
Altered Salinity Gradients	NA	No impact. Issue is not applicable at MNGP.
Altered Thermal Stratification of Lakes	NA	No impact. Issue is not applicable at MNGP.
Groundwater Resources		
Groundwater Use Conflicts (Plants that Withdraw More than 100 gpm)	NA	No impact. Issue is not applicable because MNGP does not withdraw more than 100 gpm.
Groundwater Use Conflicts (Plants with Closed-Cycle Cooling Systems that Withdraw Makeup Water from a River)	4.5.2	SMALL impact. MNGP utilizes a once-through cooling system and two MDCTs which are placed in a closed-cycle cooling system for condenser cooling purposes, as needed. MNGP estimated consumption from the Mississippi River would not be expected to have a significant impact on groundwater availability potentially leading to groundwater use conflicts. Therefore, the impact on groundwater use conflicts from continued operations would be SMALL.
Groundwater Quality Degradation (Plants with Cooling Ponds at Inland Sites)	NA	No impact. Issue is not applicable because MNGP uses a once-through cooling system and two MDCTs, but does not utilize cooling ponds.
Groundwater Use Conflicts (Plants that Withdraw Less than 100 gpm)	4.5.3	SMALL impact. MNGP does not anticipate groundwater withdrawals greater than 100 gpm. Therefore, the impact on groundwater use conflicts from continued operations would be SMALL.
Radionuclides Released to Groundwater	4.5.4	SMALL impact. Water from plant uses continues to be processed and monitored in compliance with licensing and permitting resulting in SMALL impacts and do not warrant additional mitigation measures.
Groundwater Contamination and Use (Non-Cooling System Impacts)	4.5.13	SMALL impact. MNGP has programs and procedures in place to minimize the potential for groundwater contamination. Compliance with current and future water withdrawal permits, NPDES permits, stormwater regulatory requirements, and implementation of the SWPPP, BMPs, and the SPCC plan with ensure impacts on groundwater use and quality from non-cooling systems would remain SMALL.

Table 6.1-1 Environmental Impacts Related to Subsequent License Renewal at MNGP (Sheet 4 of 12)

Resource Issue	ER Section	Environmental Impact
Groundwater Quality Degradation Resulting from Water Withdrawals	4.5.14	SMALL impact. MNGP does not anticipate an increase in groundwater withdrawals beyond what is currently reported. Therefore, the impacts from groundwater quality degradation resulting from water withdrawals would be SMALL.
Groundwater Quality Degradation (Plants with Cooling Ponds in Salt Marshes)	NA	No impact. Issue is not applicable at MNGP.
Terrestrial Resources		
Water Use Conflicts with Terrestrial Resources (Plants with Cooling Ponds or Cooling Towers Using Makeup Water from a River)	4.6.4	SMALL impact. Based on current and future compliance with the existing surface water allocation permit, relatively low surface water withdrawal demand at the watershed level, and minimal consumptive water loss during periods of cooling tower operation the potential impacts associated with water use conflicts with terrestrial resources are considered SMALL.
Effects on Terrestrial Resources (Non-Cooling System Impacts)	4.6.5	SMALL impact. No refurbishment or other license renewal-related construction activities have been identified; adequate management programs and regulatory controls are in place to ensure that important plant and animal habitats are protected during the MNGP license renewal period resulting in SMALL impacts on terrestrial resources.
Exposure of Terrestrial Organisms to Radionuclides	4.6.7	SMALL impact. MNGP operates in compliance with NRC effluents standards and reports effluents annually as required. Continued compliance with NRC radiological effluent limits and implementation of the REMP will ensure that terrestrial organisms' exposure to radionuclides remains SMALL.
Cooling System Impacts on Terrestrial Resources (Plants with Once-Through Cooling Systems or Cooling Ponds)	4.6.8	SMALL impact. MNGP utilizes regulatory controls to ensure that terrestrial resources are protected. Therefore, the cooling system at MNGP would continue to have a SMALL impact on terrestrial resources.

Table 6.1-1 Environmental Impacts Related to Subsequent License Renewal at MNGP (Sheet 5 of 12)

Resource Issue	ER Section	Environmental Impact
Cooling Tower Impacts on Vegetation (Plants with Cooling Towers)	4.6.9	SMALL impact. MNGP operates two MDCTs under conditions established in their NPDES permit. There are no plant operations or modifications anticipated that would significantly alter the operation of the cooling towers. Therefore, cooling tower impacts on vegetation would remain SMALL.
Bird Collisions with Plant Structures and Transmission Lines	4.6.10	SMALL impact. MNGP's avian protection plan establishes measures to avoid and minimize risk of avian collision with transmission lines. Given the lower profile of plant structures and the short distance of the in-scope transmission lines, the impacts due to bird collisions with plant structures and transmission lines would remain SMALL.
Transmission Line Right-of-Way Management Impacts on Terrestrial Resources	4.6.11	SMALL impact. MNGP's in-scope transmission corridor is developed and industrialized, with limited ecological features. Implementation of BMPs will ensure the impact on terrestrial resources from ROW management and maintenance would continue to be SMALL.
Electromagnetic Fields on Flora and Fauna (Plants, Agricultural Crops, Honeybees, Wildlife, Livestock)	4.6.12	SMALL impact. MNGP in-scope transmission lines are confined to developed areas and are of a voltage not reported to have any biologically significant impact and the EMFs emitted by the in-scope transmission lines would have no impact of flora and fauna. Therefore, impacts from electromagnetic fields on flora and fauna during the proposed operating term would be SMALL.
Aquatic Resources		
Impingement and Entrainment of Aquatic Organisms (Plants with Once-Through Cooling System or Cooling Ponds)	4.6.1	SMALL impact. Based on previous impingement and entrainment studies, ecological monitoring, and compliance with current and future NPDES permit conditions, impacts from impingement and entrainment of aquatic organisms during the proposed operating term would be SMALL.
Thermal Impacts on Aquatic Organisms (Plants with Once-Through Cooling Systems or Cooling Ponds)	4.6.2	SMALL impact. There have been no indications of adverse impacts to aquatic biota within the vicinity of the discharge plume. Therefore, with continued compliance with the NPDES permit condition the thermal impact on aquatic organisms is SMALL.
Water Use Conflicts with Aquatic Resources (Plants with Cooling Ponds or Cooling Towers Using Makeup Water from a River)	4.6.3	SMALL impact. MNGP's current and future compliance with the existing surface water allocation permit, relatively low surface water withdrawal demand at the watershed level, and minimal consumptive water loss during periods of cooling tower operation, the potential impacts associated with water use conflicts with aquatic resources are considered SMALL.

Table 6.1-1 Environmental Impacts Related to Subsequent License Renewal at MNGP (Sheet 6 of 12)

Resource Issue	ER Section	Environmental Impact
Impingement and Entrainment of Aquatic Organisms (Plants with Cooling Towers)	4.6.13	SMALL impact. MNGP operates a once-through cooling system with MDCTs. Impingement and entrainment studies have shown no aquatic organism life stages exhibited in discharge and cooling tower entrainment samples. Therefore, the impacts from impingement and entrainment of aquatic organisms would be SMALL.
Entrainment of Phytoplankton and Zooplankton (All Plants)	4.6.14	SMALL impact. MNGP conducts monitoring in the Mississippi River fisheries as required by its NPDES permit. Based on impingement and entrainment studies, ecological monitoring, and compliance with current and future NPDES permit conditions, impacts from entrainment of phytoplankton and zooplankton would be SMALL.
Thermal Impacts on Aquatic Organisms (Plants with Cooling Towers)	4.6.15	SMALL impact. MNGP operates a once-through cooling system with MDCTs. There have been no indications of adverse impacts to aquatic biota within the vicinity of the discharge plume. Therefore, the thermal impacts on aquatic organisms would remain SMALL.
Infrequently Reported Thermal Impacts (All Plants)	4.6.16	SMALL impact. MNGP has had a limited number of outage events that are not expected to have more than minor effects on aquatic organisms. Aquatic organisms can navigate around MNGP's thermal discharges' mixing zone without being adversely impacted. MNGP's biennial ecological monitoring results have no indications of adverse impacts to aquatic biota within the vicinity of the discharge plume. MNGP's circulating water system's discharge of thermal effluent is unlikely to create a thermal environment that would result in the accelerated development of aquatic insect maturation. The lack of spread downstream from isolated pools of aquatic nuisance species suggests that current seasonal conditions in Minnesota may not support spread. Therefore, collective analysis demonstrates that infrequently reported thermal impacts would remain SMALL.
Effects of Cooling Water Discharge on Dissolved Oxygen, Gas Supersaturation, and Eutrophication	4.6.17	SMALL impact. MNGP operates under conditions of its NPDES permit that requires biennial environmental monitoring studies which include water quality assessments and fish surveys. Data collected does not indicate significant change in water quality or decrease in fish abundance in the Mississippi River at MNGP. Therefore, the effects of dissolved oxygen, supersaturation, and eutrophication would remain SMALL.

Table 6.1-1 Environmental Impacts Related to Subsequent License Renewal at MNGP (Sheet 7 of 12)

Resource Issue	ER Section	Environmental Impact
Effects of Nonradiological Contaminants on Aquatic Organisms	4.6.18	SMALL impact. MNGP's NPDES permit governs water treatment chemicals and biocide use. Since no alterations are planned and discharges will continue to be in compliance with the NPDES permit, the impact on the aquatic community from nonradiological contaminants will remain SMALL.
Exposure of Aquatic Organisms to Radionuclides	4.6.19	SMALL impact. MNGP's continued compliance with NRC radiological effluent limits and implementation of the REMP ensures that aquatic organisms' exposure to radionuclides are well within guidelines and the impact will remain SMALL.
Effects of Dredging on Aquatic Organisms	4.6.20	SMALL impact. MNGP conducts maintenance dredging in the Mississippi River permitted in conjunction with the MDNR and USACE. Continued compliance ensures that MNGP's potential impacts would be mitigated to SMALL.
Effects on Aquatic Resources (Non-Cooling System Impacts)	4.6.21	SMALL impact. Non-cooling water discharges at MNGP wastewater are discharged to the Mississippi River through four NPDES-permitted external outfalls. The requirements for the management of dredge material, including spoil storage and disposal, are determined by the NPDES permit, USACE dredge permit, and MDNR dredge permit. Continued compliance with the permits ensures that MNGP potential for impacts to nearby aquatic habitats as a consequence of soil erosion, changes in water quality, or releases of chemical contaminants will remain SMALL.
Impacts of Transmission Line Right-of-Way Management on Aquatic Resources	4.6.22	SMALL impact. MNGP has administrative policies and implements BMPs for preventing erosion from soil disruption. Implementation of BMPs and adherence to vegetation management protocols will ensure minimal impact on aquatic resources from ROW management and maintenance. Therefore, impacts on terrestrial resources from transmission line ROW management during the proposed SPEO would be SMALL.
Losses From Predation, Parasitism, and Disease Among Organisms Exposed to Sub-Lethal Stresses	4.6.23	SMALL impact. Sub-lethal stresses are not significantly impacting the aquatic resources in the vicinity of MNGP. Therefore, losses from predation, parasitism, and disease among organisms exposed to sub-lethal stresses during the SPEO would be SMALL.
Special Status Species and Habitats		
Threatened, Endangered, and Protected Species and Essential Fish Habitat	4.6.6	NO EFFECT and MAY AFFECT BUT IS NOT LIKELY TO ADVERSELY AFFECT. No refurbishment or other license renewal related construction activities have been identified. The continued operation of the site would range from NO EFFECT to MAY AFFECT BUT IS NOT LIKELY TO ADVERSELY AFFECT threatened, endangered, and protected species and EFH.

Table 6.1-1 Environmental Impacts Related to Subsequent License Renewal at MNGP (Sheet 8 of 12)

Resource Issue	ER Section	Environmental Impact
Historic and Cultural Resources		
Historic and Cultural Resources	4.7.1	No adverse effects on historic and cultural resources. No refurbishment or other SLR-related construction activities have been identified; administrative procedure ensures protection of these type resources in the event of excavation activities.
Socioeconomics		
Employment and Income, Recreation, and Tourism	4.8.1	SMALL impact. MNGP has no plans to add workers to support plant operations in the proposed SPEO. There are no refurbishment activities planned that would require additional workers or create a visual impact. Therefore, impacts associated with employment and income, and recreation and tourism during the proposed SPEO are SMALL.
Tax Revenues	4.8.2	SMALL impact. MNGP plans to continue to operate as currently designed and no associated changes to plant employment or MNGP taxable property value is anticipated. Therefore, potential impacts related to tax revenue during the proposed SPEO are SMALL.
Community Services and Education	4.8.3	SMALL impact. MNGP plans to continue to operate as currently designed and no associated changes to plant employment or MNGP taxable property value is anticipated. Therefore, potential impacts related to community services and education during the proposed SPEO are SMALL.
Population and Housing	4.8.4	SMALL impact. No changes to employment are expected from the continued operations and refurbishment activities are identified that would require additional workers. The people living near MNGP are not likely to experience any noticeable changes. Therefore, potential impacts related to population and housing during the proposed SPEO are SMALL.
Transportation	4.8.5	SMALL impact. No changes to employment are expected from continued operations of MNGP and no potential refurbishment activities have been proposed that would require a larger workforce. Therefore, transportation impacts during the proposed SPEO are SMALL.
Human Health		
Microbiological Hazards to the Public (Plants with Cooling Ponds or Canals or Cooling Towers that Discharge to a River)	4.9.1	SMALL impact. Conditions necessary for optimal growth of pathogens are limited by water temperatures in the discharge area. Therefore, the public human health risk posed by MNGP's thermal discharge's capacity to enhance thermophilic microorganisms is SMALL.

Table 6.1-1 Environmental Impacts Related to Subsequent License Renewal at MNGP (Sheet 9 of 12)

Resource Issue	ER Section	Environmental Impact
Electric Shock Hazards	4.9.2	SMALL impact. Work on and near the transmission lines is governed by plant procedures and MNGP's comprehensive health and safety program. Given these conditions, the human health impact from electric shock hazards during the proposed SPEO would be SMALL.
Radiation Exposures to the Public	4.9.3	SMALL impact. Continued compliance with NRC radiological effluent limits and implementation of the REMP ensures that public exposure to radionuclides attributable to MNGP is well within guidelines. Therefore, impacts from radiation exposures to the public attributable to MNGP operations would be SMALL during the proposed SPEO.
Radiation Exposures to Plant Workers	4.9.4	SMALL impact. Occupational doses from continued operations are expected to be within the range of doses during the current licensing term and would continue to be well below regulatory limits. Therefore, impacts from radiation exposure to plant workers during the proposed SPEO are SMALL.
Human Health Impact from Chemicals	4.9.5	SMALL impact. Work on the MNGP site is governed by a comprehensive industrial safety program. Therefore, human health impacts from chemicals during the proposed SPEO are SMALL.
Microbiological Hazards to Plant Workers	4.9.6	SMALL impact. Occupation health impacts are controlled by continued application of accepted industrial hygiene practices and MNGP has a comprehensive occupational safety program to minimize worker exposures as required by permits and federal and state regulations. Therefore, microbiological hazards to plant workers during the proposed SPEO are SMALL.
Physical Occupational Hazards	4.9.7	SMALL impact. Continued compliance with OSHA regulations for exposure and use of personal protective equipment reduces the risk from chronic exposure. Therefore, physical occupational hazards during the proposed SPEO would be SMALL.
Chronic Effects of Electromagnetic Fields	NA	This issue is not categorized and is considered not applicable.
Postulated Accidents		
Design-Basis Accidents	4.15.1	SMALL impact. MNGP maintains its licensing basis and implements aging management programs during the license renewal term, the environmental impacts during a SPEO are not expected to differ significantly from those calculated for DBA assessments conducted as part of the initial plant licensing process. Therefore, the impacts due to DBAs are SMALL.

Table 6.1-1 Environmental Impacts Related to Subsequent License Renewal at MNGP (Sheet 10 of 12)

Resource Issue	ER Section	Environmental Impact
Evaluation of New Information Concerning Severe Accident Consequences	4.15.2	SMALL impact. The probability-weighted consequences of atmospheric releases, fallout onto open bodies of water, releases to groundwater, and societal and economic impacts from severe accidents is SMALL. Therefore, the impact of severe accidents remains SMALL for the SPEO.
Evaluation of New Information Concerning Severe Accident Mitigation Alternatives	4.15.3	The quantitative analyses performed demonstrate that none of the SAMAs considered for quantitative evaluation would reduce the MNGP MB by 50 percent or greater. Therefore, there is no new and significant information that would alter the conclusions of the original SAMA analysis for MNGP.
Environmental Justice		
Minority and Low-Income Populations	4.10.1	No disproportionately high and adverse impacts or effects on members of the public, including minority, low-income, or subsistence populations, are anticipated.
Waste Management		
Low-Level Waste Storage and Disposal	4.11.1	SMALL impact. MNGP manages and stores LLRW onsite in accordance with NRC regulations and disposes of LLRW in NRC-licensed treatment and disposal facilities. Therefore, impacts from the storage and disposal of LLRW during the proposed SPEO would remain SMALL.
Onsite Storage of Spent Nuclear Fuel	4.11.2	SMALL impact. MNGP currently stores spent nuclear fuel in its spent fuel pool and dry storage in a NRC-licensed ISFSI. MNGP is required to maintain a State of Minnesota CN as well as an EIS. Therefore, the impacts of onsite storage of spent fuel during the SPEO at MNGP are SMALL.
Offsite Radiological Impacts of Spent Nuclear Fuel and High-Level Waste Disposal	4.11.3	SMALL impact. MNGP will continue to use NRC-licensed packaging for its spent fuel. Should spent nuclear fuel be shipped offsite, it would only be shipped to a licensed facility. MNGP will comply with the applicable NRC, DOT, DOE, and state regulatory controls for packaging and transportation of spent nuclear fuel. Therefore, the offsite radiological impacts of onsite storage of spent nuclear fuel remains SMALL.
Mixed-Waste Storage and Disposal	4.11.4	SMALL impact. MNGP has procedures for shipping mixed waste to be in accordance with federal and state regulations. MNGP's compliance with comprehensive regulatory controls and use of NRC-licensed and EPA-permitted treatment and disposal facilities will ensure the continued SMALL impact the handling, storage, and disposal of mixed waste during the proposed SPEO.

Table 6.1-1 Environmental Impacts Related to Subsequent License Renewal at MNGP (Sheet 11 of 12)

Resource Issue	ER Section	Environmental Impact
Nonradioactive Waste Storage and Disposal	4.11.5	SMALL impact. MNGP stores and disposes of recyclable, hazardous, and nonhazardous wastes in accordance with EPA and state regulations and disposes of the wastes in appropriately permitted treatment and disposal facilities. MNGP's compliance with comprehensive regulatory controls and use of NRC-licensed and EPA-permitted treatment and disposal facilities will ensure the continued SMALL impact from the handling, storage, and disposal of nonradioactive waste during the proposed SPEO.
Cumulative Impacts		
Cumulative Impacts	4.12	SMALL adverse to SMALL beneficials impacts. SMALL for land use and visual resources, air quality and noise, geology and soils, surface water, groundwater, terrestrial and aquatics ecological resources, waste management and human health. SMALL adverse to SMALL beneficial for climate change. SMALL beneficial for socioeconomics. No impact for historic and cultural resources.
Uranium Fuel Cycle		
Offsite Radiological Impacts (Individual Impacts from other than the Disposal of Spent Fuel and High-Level Waste)	4.13.1	SMALL impact. MNGP has a comprehensive program of managing its radioactive wastes that implements regulatory requirements for management, storage, inspections, packaging, and shipping. MNGP complies with applicable NRC, DOT, DOE, and state regulatory controls for packaging and transportation of radioactive wastes. Therefore, offsite radiological impacts from radioactive waste management during the proposed SPEO are SMALL.
Offsite Radiological Impacts (Collective Impacts from other than the Disposal of Spent Fuel and High-Level Waste)	4.13.2	SMALL impact. MNGP complies with the applicable NRC, DOT, DOE, and state regulatory controls for packaging and transportation of radioactive wastes. Therefore, offsite radiological impacts from radioactive waste management during the proposed SPEO are SMALL.
Nonradiological Impacts of the Uranium Fuel Cycle	4.13.3	SMALL impact. MNGP has no planned changes for its fuel regarding uranium enrichment for the SPEO. MNGP's continued fuel demand would not alter nonradiological impacts upstream in the fuel cycle. Therefore, the nonradiological impacts of the uranium fuel cycle resulting from the proposed SPEO are SMALL.

Table 6.1-1 Environmental Impacts Related to Subsequent License Renewal at MNGP (Sheet 12 of 12)

Resource Issue	ER Section	Environmental Impact
Transportation	4.13.4	SMALL impact. MNGP has a comprehensive program of managing its radioactive and mixed wastes that implements the regulatory requirements for management, storage, inspections, packaging, and shipping. MNGP complies with the applicable NRC, DOT, DOE, and state regulatory controls for packaging and transportation of radioactive wastes and spent nuclear fuel. Therefore, radiological impacts from transportation of radioactive materials and waste during the proposed SPEO are SMALL.
Termination of Nuclear Power Plant Operations and Decommissioning		
Termination of Plant Operations and Decommissioning	4.14.1	SMALL impact. Radiation exposures from continued operations and stored spent fuel to both workers and the public are expected to remain at current levels, which are well below regulatory limits. Therefore, continued operation during the SPEO would be a SMALL impact on terminating operations and decommissioning on all resources.

6.2 Mitigation

6.2.1 Requirements [10 CFR 51.45(c)]

The environmental report must include an analysis that considers and balances … alternatives available for reducing or avoiding adverse environmental effects. [10 CFR 51.45(c)]

6.2.2 Xcel Energy Response

NRC Regulatory Guide 4.2, Supplement 1, Revision 1, specifies that the applicant should identify any ongoing mitigation and address the potential need for additional mitigation. Applicants are only required to consider mitigation alternatives in proportion to the significance of the impact. (NRC 2013b)

As discussed in Section 6.1, impacts associated with the proposed MNGP SLR do not require the implementation of additional mitigation measures. The permits and programs presented in Chapter 9 (i.e., NPDES permit; stormwater program; air permit; SPCC program; hazardous waste management program; cultural resource protection plan; and environmental review programs) that currently mitigate the operational environmental impacts of MNGP are adequate. Therefore, additional mitigation measures are not sufficiently beneficial as to be warranted.

6.3 Unavoidable Adverse Impacts

6.3.1 Requirement [10 CFR 51.45(b)(2)]

The environmental report shall … discuss … any adverse environmental effects which cannot be avoided should the proposal be implemented … [10 CFR 51.45(b)(2)]

6.3.2 Xcel Energy Response

An environmental review conducted at the license renewal stage differs from the review conducted in support of a construction permit because the facility is in existence at the license renewal stage and has already operated for years. As a result, adverse impacts associated with the initial construction have been avoided, mitigated, or already occurred.

As discussed in Chapter 4, Xcel Energy does not anticipate the continued operations of MNGP to adversely affect the environment. Xcel Energy also does not anticipate any SLR-related refurbishment as a result of the technical and aging management program information that will be submitted in accordance with the NRC license renewal process. Therefore, the environmental impacts to be evaluated for SLR are those associated with continued operation during the renewal term.

Xcel Energy identified the following site-specific unavoidable adverse impacts associated with license renewal:

- The majority of the land use at MNGP would continue to be designated as industrial until the plant is shut down and decommissioned (decommissioning can take up to 60 years after permanent shutdown of MNGP).
- Aquatic organisms would continue to be impinged and entrained at the low-level intake structure, but as discussed in Section 4.6.1, these impacts were determined to be SMALL.
- As discussed in Section 3.6.1, normal plant operations result in industrial wastewater discharges containing small amounts of water treatment chemical additives to the Mississippi River at or below MPCA-approved concentrations. Compliance with the NPDES permit (Attachment A) would ensure that impacts remain SMALL.
- Operation of MNGP results in consumptive use of groundwater. However, annual average groundwater withdrawals are less than 100 gpm.
- As discussed in Section 3.6.3.1, plant operation of MNGP results in consumptive water use of the Mississippi River. MNGP utilizes a once-through circulating water system where water is drawn and discharged to the Mississippi River. MNGP is also equipped with two MDCTs enabling complete or partial recirculation of the cooling water when conditions require.
- Operation of MNGP results in the generation of spent nuclear fuel and waste material, including LLRW, hazardous waste, and nonhazardous waste. Specific plant design features, in conjunction with a waste minimalization program, employee safety training programs and work procedures, and strict adherence to applicable regulations for storage, treatment, transportation, and ultimate disposal of this waste ensure that the impact is SMALL.
- Operation of MNGP results in a very small increase in radioactivity in the air and water emissions. The incremental radiation dose to the local population resulting from MNGP operations is typically less than the magnitude of the fluctuations that occur in natural background radiation. Doses to members of the public from MNGP's gaseous releases would be well within the allowable limits of 10 CFR Part 20; 10 CFR Part 50, Appendix I; and 40 CFR Part 190. Operation of MNGP also creates a very low probability of accidental radiation exposure to inhabitants of the area.

6.4 Irreversible or Irretrievable Resource Commitments

6.4.1 Requirement [10 CFR 51.45(b)(5)]

The environmental report shall … discuss … any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented. [10 CFR 51.45(b)(5)]

6.4.2 Xcel Energy Response

The term "irreversible" applies to the commitment of environmental resources (e.g., permanent use of land) that cannot by practical means be reversed to restore the environmental resources to their former state. In contrast, the term "irretrievable" applies to the commitment of material resources (e.g., irradiated steel, petroleum) that, once used, cannot by practical means be recycled or restored for other uses.

The continued operation of MNGP for the proposed SPEO will result in irreversible and irretrievable resource commitments, including the following:

- Uranium in the nuclear fuel consumed in the reactor that becomes high-level radioactive waste if the used fuel is not recycled through reprocessing.
- Land required for permanent storage or disposal of spent nuclear fuel, LLRWs generated as a result of plant operations, and sanitary waste generated from normal industrial operations.
- Elemental materials that will become radioactive.
- Materials used for the normal industrial operations of MNGP that cannot be recovered or recycled, or that are consumed or reduced to unrecoverable forms.

Other than the above, no SLR-related refurbishment activities have been identified that would irreversibly or irretrievably commit significant environmental components of land, water, and air.

6.5 Short-Term Use Versus Long-Term Productivity of the Environment

6.5.1 Requirement [10 CFR 51.45(b)(4)]

The environmental report shall … discuss … the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity… [10 CFR 51.45(b)(4)]

6.5.2 Xcel Energy Response

The current balance between short-term use and long-term productivity of the environment at the site has remained relatively constant since MNGP began operations. The SEIS for MNGP evaluated the relationship between the short-term uses of the environment and the maintenance and enhancement of the long-term productivity associated with the construction and operation of MNGP (NRC 2006b). The proposed SPEO will not alter the short-term uses of the environment from the uses previously evaluated in the MNGP final environmental statements. The proposed SPEO will postpone the availability of site resources (land, air, water) for other uses. Denial of the application to renew the MNGP OLs would lead to the shutdown of the plant and would alter the balance in a manner that depends on the subsequent uses of the site. For example, the environmental consequences of turning the site area occupied by MNGP into a park or an industrial facility after decommissioning are quite different. Extending MNGP operations would not alter, but only postpone, the potential long-term uses of the site that are currently possible.

In summary, no SLR-related refurbishment activities have been identified that would alter the evaluation of the MNGP final environmental statement for the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity of these resources.

7.0 ALTERNATIVES TO THE PROPOSED ACTION

The environmental report shall . . . discuss . . . alternatives to the proposed action . . . . [10 CFR 51.45(b)(3)]

The applicant shall discuss in this report the environmental impacts of alternatives and any other matters . . . . The report is not required to include discussion of need for power or economic costs and benefits of . . . alternatives to the proposed action except insofar as such costs and benefits are either essential for a determination regarding the inclusion of an alternative in the range of alternatives considered or relevant to mitigation . . . . [10 CFR 51.53(c)(2)]

A reasonable alternative must be commercially viable on a utility scale and operational prior to the expiration of the reactor's operating license, or expected to become commercially viable on a utility scale and operational prior to the expiration of the reactor's operating license . . . . The amount of replacement power generated must equal the base-load capacity previously supplied by the nuclear plant and reliably operate at or near the nuclear plant's demonstrated capacity factor. (NRC 2013a)

7.1 No Action Alternative

As described in Section 2.1, the proposed action is to renew the OL for MNGP for an additional 20-year period. The only other alternative under consideration is the no-action alternative, which would be the decision not to renew the MNGP OL. If the MNGP OL is not renewed, the 640 MWe (net) of baseload power would not be available to meet Xcel Energy’s power generation needs during the proposed SPEO from 2030–2050. Because Xcel Energy is a regulated utility that must meet its customers’ long-term power needs, the no-action alternative will identify replacement power sources for the loss of MNGP generation.

In accordance with 10 CFR 51.53(b)(3), this ER will discuss a no-action alternative to the proposed license renewal and a range of alternatives for replacement baseload power sources. A reasonable alternative as described by the NRC must be technically feasible and commercially viable on a utility scale and operational prior to the expiration of the reactor’s renewed OL or expected to become commercially viable on a utility scale and operational prior to the expiration of the reactor’s renewed OL (NRC 2013a). The replacement power alternative generation must also provide equivalent adequate baseload power capacity as previously supplied by the nuclear plant.

The replacement power sources being considered under the no-action alternative are presented in Section 7.2.1. Section 7.2.2 will identify the no-action alternative power sources evaluated that were not considered reasonable power sources for the replacement of the MNGP generation.

7.1.1 Decommissioning Impacts

The NRC's definition of decommissioning as stated in 10 CFR 20.1003 is the safe removal of a nuclear facility from service and the reduction of residual radioactivity to a level that permits the following:

- Release of the property for unrestricted use and termination of the license; or
- Release of the property under restricted conditions and termination of the license.

The NRC-evaluated decommissioning options include the following:

- Immediate dismantling soon after the facility closes.
- Safe storage and monitoring of the facility for a period of time that allows the radioactivity to decay, followed by dismantling and additional decontamination.
- Permanent entombment on the site in structurally sound material such as concrete that is maintained and monitored.

All the decommissioning options must be completed within a 60-year period following permanent cessation of operations and permanent removal of fuel.

Under the no-action alternative, Xcel Energy would continue operating MNGP until the existing OL expires. Upon expiration of the OL, Xcel Energy would initiate decommissioning procedures in accordance with NRC requirements. The NRC Decommissioning GEIS (NUREG 0586) evaluated decommissioning environmental impacts for land use, visual resources, air quality, noise, geology and soils, hydrology, ecology, historic and cultural resources, socioeconomics, human health, environmental justice, and waste management. Xcel Energy considers the GEIS description of decommissioning impacts as representing the actions it would perform for the MNGP decommissioning. Therefore, Xcel Energy relies on the NRC's conclusions regarding the environmental impacts of decommissioning MNGP.

Decommissioning and its associated impacts are not considered evaluation criteria used to proceed with the proposed action or select the no-action alternative. MNGP will be decommissioned eventually, regardless of the NRC decision on license renewal, and license renewal will only postpone decommissioning for another 20 years. Regarding decommissioning after the initial license renewal period, the license renewal GEIS states the timing of the decommissioning does not change the environmental impacts associated with decommissioning activities and concluded for initial license renewals that delaying decommissioning until after the renewal term would result in SMALL environmental impacts (NRC 2013a).

The primary criteria used to evaluate the proposed action and the no-action alternative are the power options available for replacement of MNGP generation. Xcel Energy concludes that the decommissioning impacts under the no-action alternative (i.e., decommissioning following the initial license renewal of MNGP) would not be substantially different from those identified in the license renewal GEIS. Decommissioning impacts would be SMALL and could overlap with operation of a MNGP replacement.

7.2 Energy Alternatives that Meet System Generating Needs

In accordance with 10 CFR 51.53(c)(2), Xcel Energy considered a range of alternatives to replace generation if the renewed MNGP OL are not renewed. Xcel Energy considered each of the replacement alternatives identified in the NRC GEIS for license renewal (NRC 2013a). These alternatives were evaluated based on their ability to provide reliable baseload power and to be operational prior to the expiration of the current OL.

7.2.1 Energy Alternatives Considered as Reasonable

A reasonable alternative as described by the NRC must be technically feasible and commercially viable on a utility scale and operational prior to the expiration of the reactor's OL or expected to become commercially viable on a utility scale and operational prior to the expiration of the reactor's OL. The replacement power alternative generation must also provide equivalent baseload capacity as previously supplied by the nuclear plant.

Xcel Energy has conducted a screening and analysis of replacement alternatives as a component of its CN for expansion of the onsite ISFSI. As required under Minnesota regulations, in addition to analyzing alternatives to the ISFSI expansion in the CN, Xcel Energy also examined alternatives that could replace the capacity and energy provided by MNGP (Xcel 2021b). The MNGP replacement analysis examined the commercially available generating and non-generating alternatives that could replace the energy provided by MNGP in the event that the OL was not renewed. The CN application is prompted by the need for additional SNF dry storage. MNGP will exhaust its current SNF dry storage capacity in 2030 and must receive a CN from the State of Minnesota prior to expanding the onsite ISFSI. Absent the additional storage that would be provided by an expanded ISFSI, MNGP would need to close in 2030 without regard to its OL expiration, and Xcel Energy would need to replace the substantial capacity and energy MNGP provides to the system.

In accordance with 10 CFR 51.53(c)(2), Xcel Energy considered a range of alternatives to replace generation if the MNGP OL is not renewed. In addition to the alternative being technically feasible and commercially viable on a utility scale and operational prior to the expiration of the reactor's OL, Xcel Energy also considered the following as established in Minnesota Regulation 7855.0120(B):

1) The appropriateness of the size, the type, and the timing of the proposed facility compared to those of reasonable alternatives;
2) The cost of the proposed facility and the cost of energy to be supplied by the proposed facility compared to the costs of reasonable alternatives and the cost of energy that would be supplied by reasonable alternatives;
3) The effects of the proposed facility upon the natural and socioeconomic environments compared to the effects of reasonable alternatives; and
4) The expected reliability of the proposed facility compared to the expected reliability of reasonable alternatives.

To fulfill the consideration of generation alternatives in the CN application, Xcel Energy utilized its integrated resource planning process. Regarding CN and resource planning, Minnesota Statute § 216B.2422, Subdivision. 3(a) – states: "The commission shall, to the extent practicable, quantify and establish a range of environmental costs associated with each method of electricity generation. A utility shall use the values established by the commission in conjunction with other external factors, including socioeconomic costs, when evaluating and selecting resource options in all proceedings before the commission, including resource plan and certificate of need proceedings."

The 2020–2034 Upper Midwest Energy Plan (integrated resource plan or IRP) found that extending the life of MNGP is cost effective (presenting the lowest cost scenario from a present value of societal cost (PVSC) perspective, supports achievement of carbon reduction goals, and ensures that a robust share of firm and/or dispatchable generation relative to peak load across seasons is maintained. As alternatives to MNGP life extension, the IRP modeling selected two combinations of incremental resources to replace MNGP's capacity and energy. (Xcel 2021b)

Criteria parameters for energy resource planning are set by the MPUC and focus on current and near-term commercially available sources providing the most economical options for the regulated utility's customer base. Embedded within the model is consideration for carbon reduction, thus influencing which generation resources are graded as more economical, as well as influencing the economics of usage of carbon-emitting sources (e.g., peaking generation versus constant generation). The natural gas and renewables alternative presented below was selected on the basis of PVSC for reliably meeting forecasted demand. PVSC includes traditional cost factors (e.g., capital cost, debt, tax considerations, fuel price forecasts, and transmission costs) and environmental cost values for carbon dioxide and criteria pollutants in accordance with MPUC's Order Updating Environmental Cost Values in Docket No. E999/CI-14-643 issued January 3, 2018. The renewables and storage alternative presented below resulted from an additional restriction on the modeling in which no incremental natural gas-fired resources could be used to replace MNGP. (Xcel 2021e)

Alternative 3, a new nuclear plant, is the third alternative and is not included in the IRP submitted to the MPUC. New nuclear power plants within Minnesota are prohibited by Minnesota Statute 216B.243, Subdivision 3b; therefore, the IRP for the MPUC did not include new nuclear within its range of generating resources. For purposes of considering a nuclear replacement, Alternative 3 is a new nuclear plant located within Xcel Energy service area.

The alternatives analysis identified the following power sources as meeting NRC criteria for reasonableness in the replacement of MNGP generation during the proposed SPEO. These energy alternatives considered reasonable are further discussed in Section 7.2.3.

1) Natural Gas and Renewables Alternative
    a. New 750 MW natural gas-fired CT generation located offsite
    b. New 750 MW wind turbines located offsite
    c. New 200 MW of solar panels located onsite and offsite

    d. Additional generation from existing natural gas-fired plants
    e. Purchased power as needed

2) Renewables and Storage Alternative
    a. New 950 MW of wind turbines located offsite
    b. New 700 MW of solar panels located onsite and offsite
    c. New 300 MW of lithium battery storage located at solar offsite locations
    d. Purchased power as needed
    e. Occasional very small additional generation from existing natural gas-fired plants

3) Nuclear Alternative
    a. New SMR plant sized to replace 640 MWe at a minimum with MDCTs located within Xcel Energy's service area

7.2.2 Energy Alternatives Not Considered Reasonable

The full range of energy alternatives as described in the GEIS include power sources that will require development of new generation and power alternatives that will not require new generation, such as purchased power (NRC 2013a). Xcel Energy considered all the alternatives described in the GEIS for replacement of the MNGP generation. This section will address energy alternatives not considered reasonable for additional evaluation.

7.2.2.1 Purchased Power

Purchased power is a component of natural gas and renewables and renewables and storage alternatives. Replacing all of the energy generation and capacity provided by MNGP with purchased power would introduce greater uncertainties in energy reliability that are not within Xcel Energy's control. Further, purchased power would be subject to competing power demand to secure firm power contracts, adding to energy reliability concerns.

Potential environmental impacts associated with purchased power could be substantial and exceed the impacts associated with the continued operation of MNGP. Potential environmental impacts associated with purchased power would include those associated with the source of the generation and the transmission of the power into the regional grid. Fossil generation results in air emissions, water use and quality issues, and land use impacts associated with the plant footprint. Renewable energy generation can have a large development footprint that can convert natural habitats to an industrial site. The conversion of forest and even agricultural lands to an industrial site can result in impacts to habitat that may adversely impact wildlife and plant species. Additional transmission capacity may be required to distribute electricity from renewable or fossil generation and this may result in impacts to communities and lands within and adjacent to the corridor. These impacts could include loss of sensitive habitat, visual and view shed impairment, and degradation of wetlands and stream crossings.

Given the uncertainties associated with purchasing baseload power at the scale of MNGP's generation capacity on a long-term basis and the environmental impacts for developing new generation and transmission capacity, as well the operational impacts of fossil-fuel generation, purchased power was not considered a reasonable discrete alternative.

7.2.2.2 Plant Reactivation or Extended Service Life

Xcel Energy has proposed to close all its coal-fired plants by 2030 to support a carbon reduction goal of 80 percent by 2030 (Xcel 2021e).

Reactivating or continuing to operate fossil fuel-fired plants would result much higher criteria air pollutant emissions than the operation of a nuclear power plant. Also, continuing to operate fossil fuel-fired generation sources is counter to Xcel Energy's carbon emission reduction goals. Therefore, plant reactivation and extended service life is not considered a reasonable alternative because of the environmental impacts with continued use of fossil fuel-fired generation sources.

7.2.2.3 Conservation and Energy Efficiency Measures

Demand-side management (DSM) includes demand response that shifts electricity from a peak-use period to times of lower demand, and energy efficiency or conservation programs that reduce the amount of electricity required for existing activities and processes. A DSM alternative would be required to reduce the baseload demand within Xcel Energy's service area by 640 MWe to be considered a reasonable alternative. Xcel Energy has a variety of DSM programs and includes these in its resource planning. Recent resource planning proposed increased levels of energy efficiency with a projected total of demand response saving of 1,500 MW by 2034 (Xcel 2020d). However, this resource planning also proposed continued operation of MNGP; therefore, any realized demand savings would be offsetting other energy generation and capacity changes within the Xcel Energy system such as coal plant closures. To replace MNGP's generation with DSM alone would require even greater energy savings to be realized and introduce additional energy reliability concerns. Reliance on DSM as a reasonable alternative to MNGP is uncertain because any realized energy savings would rely on voluntary participation rather than mandatory energy efficiency from compliance with codes and standards (e.g., building codes and appliance energy use ratings). As such, DSM is not a reasonable replacement alternative for MNGP as a stand-alone option.

7.2.2.4 Wind

Wind generation is a component of both the natural gas and renewables alternative and the renewables and storage alternative. However, fully replacing MNGP's generating capacity with a discrete wind alternative would require more than one utility-scale wind farm, effectively multiplying the potential environmental impacts, particularly the land use and terrestrial ecology impacts.

The land needs for wind generation include land parcel(s) that can host a wind farm where turbines are spaced for operation and linked with other turbines and with power converters and connections with transmission infrastructure. Within the wind farm acreage, land would be permanently disturbed for wind turbine bases and power infrastructure as well as temporary construction areas such as laydown and worker support areas. The DOE developed three land use metrics for these acreage considerations: 85 acres per MW for wind farm boundaries, 2.47 acres per MW for construction footprint, and 0.74 acres per MW for permanent structures (DOE 2015). To replace 640 MWe from MNGP with wind power would require approximately 1546 MWe based on the average wind generation capacity of 41.4 percent (DOE 2021). Based on the DOE metrics, the acreage requirements are about 132,000 acres for wind farms, 3,820 acres for construction footprint, and 1,140 acres for permanent structures. To achieve the required MW capacity, the wind farm acreage would require many installations to bring together enough available land parcels, each with the potential to significantly impact land use even with the spaced wind turbines allowing for compatible uses such as crop cultivation.

Wind typically cycles significantly over a 24-hour period, is not dispatchable and low-capacity factors can be experienced for several days at a time due to variable wind patterns. Therefore, wind generation by itself is not capable of providing baseload power. For a wind farm to replace a baseload energy source, capacity significantly in excess of MNGP generation coupled with large amounts of energy storage would have to be included for the facility. Installation of batteries to provide firm power, compensating for wind's intermittent nature, could further increase acreage requirements.

Impacts from wind generation include terrestrial ecology from land disturbance, land use conversion, and avian mortality from operations. Depending on the location of the wind facilities, the land use disturbances could result in MODERATE to LARGE impacts on wildlife habitats, vegetation, land use, and aesthetics. Therefore, discrete wind would not be a superior alternative to continued operation of MNGP.

Portions of Xcel Energy's service area in Wisconsin abut Lake Superior. Wisconsin has potential for offshore wind of more than 14,000 MW (AWEA 2020). However, there are currently no offshore wind installations on the Great Lakes. The first is anticipated to be the Icebreaker wind demonstration project of 20.7 MW in Lake Erie offshore from Cleveland, OH, projected for operation in 2022. One of the project's challenges has been designing the installation to withstand the force of ice floes. (EE News 2019)

Installation and siting of offshore wind farms in Lake Superior would, like the Icebreaker project, have the challenge of ice floes. Siting would require careful consideration of bathymetry, shipping lanes, fishing rights, wildlife migration patterns, and other environmental concerns. Wind installations also pose aesthetic impact concerns, and the larger turbines require greater offshore distances to minimize aesthetic impacts.

7.2.2.5 Solar

Both the natural gas and renewables alternative and renewables and storage alternative include a solar component. However, replacing MNGP's generating capacity with a discrete solar alternative would require several utility-scale solar installations, effectively multiplying the potential environmental impacts, particularly the land use and terrestrial ecology impacts. A solar alternative using distributed solar involving solar panels installed on residential and commercial buildings would avoid the land use impacts. Such a distributed system would rely on the participation of the property owners and would have the same uncertainties as discussed in Section 7.2.2.3 for DSM. Reliance on distributed rooftop solar as a reasonable alternative to MNGP is uncertain because it relies on voluntary participation and would have to comply compliance with codes and standards (e.g., building codes and property covenants) and realized reduced consumption at those properties as well as extra energy being fed back to the regional grid. The National Renewable Energy Laboratory (NREL) developed estimates for the potential generating capacity of solar photovoltaic (PV) panels that could be installed on residential and commercial properties in each state. NREL's estimate for Minnesota is 26,591,491.9 megawatt hours (MWh) (NREL 2021). To fully replace MNGP generation with distributed solar on rooftops require approximately 21 percent of the available rooftop space for the entire state of Minnesota. Moreover, NREL (2021) cautions that its estimation could be overestimating the available rooftop space -- "The technical generation potential of residential and commercial rooftop PV provides an upper bound of feasible development potential for planning purposes. Technical generation potential does not consider economic or market feasibility. The technical generation potential of residential and commercial rooftop PV is estimated by combining modeled suitable rooftop area with solar resource availability and quality and system performance data . . . Technical potential does not account for existing systems." Thus, if the available space was overestimated, distributed solar could require well over 21 percent of all the Minnesota rooftop space available. Given the uncertainties in implementation of distributed solar, distributed solar is not a reasonable replacement alternative for MNGP. Solar generation is intermittent by nature. Generation can fluctuate from hour to hour, and daylight hours are reduced during the winter months. This type of generation volatility on a large scale can create distribution and/or transmission instability. For solar power to be viable as a discrete source of large amounts of energy that are reliably available for the regional grid at all hours of the day, additional generation capacity would be needed to produce energy for storage.

Due to the amount of solar generating capacity needed to replace the entire MNGP baseload generation and the lower efficiencies in producing electricity from solar power versus nuclear power, the land conversion acreage required for a discrete solar alternative is larger than other alternatives being considered in this ER. Using a capacity factor of 25 percent (EIA 2021), replacing the 640 MW from MNGP would require approximately 2,560 MW. Using 7.6 acres per MW based on Xcel Energy's Sherco solar project, about 19,500 acres would be required to replace MNGP with solar. Furthermore, to install batteries to provide firm power, compensating for solar's intermittent nature, further additional acreage could be needed. To acquire this much acreage through purchase or lease would require many installations, each with the potential to significantly impact land use. Therefore, depending on the location of the solar facilities, the land use disturbances could result in MODERATE to LARGE impacts on wildlife habitats, vegetation, land use, and aesthetics. Therefore, discrete solar would not be a superior alternative to continued operation of MNGP.

7.2.2.6 Hydropower

The DOE's Oak Ridge National Laboratory assessed the ability of existing non-powered dams across the country to generate electricity. The non-powered dams in Minnesota do not provide the scale of power generation capacity needed to replace MNGP's generation capacity, as they provide an accumulative total of less than 300 MW (ORNL 2012). The study assessed the dam with the greatest generation potential in Minnesota to be approximately 46 MWe.

Construction of a new dam and hydropower facility would require significant siting considerations, such as the area that would be inundated to provide water storage for generation, as well as the overall environmental impacts associated with the development of the facility. The environmental impacts could be significant for land use, water resources, socioeconomics, ecology, and cultural resources for single location and replacement of the MNGP generation would require several locations to be developed.

The lack of potential for large hydroelectric power facilities at existing dams in Minnesota and the environmental constraints associated with the development of a new hydropower facility make hydropower an unreasonable alternative to replace the MNGP generation.

7.2.2.7 Geothermal

The National Renewable Energy Laboratory graded the geothermal resources of the United States. Much of Minnesota is graded as having the least potential for geothermal energy, with the remainder having deep subterrain temperatures that did not meet the minimal criteria for assessment as geothermal resources (NREL 2018). Therefore, geothermal energy is not considered a reasonable power source for the replacement for MNGP.

7.2.2.8 Biomass

Biomass includes wood waste, municipal waste, manure, certain crops, and other types of waste residues used to create electricity. Using biomass-fired generation for baseload power depends on the geographic distribution, available quantities, constancy of supply, and energy content of biomass resources.

Biomass plants tend to be much smaller than nuclear or fossil fuel plants. To replace the MNGP baseload generation, it would take the construction of many biomass plants located near reliable fuel sources that continuously produce enough biomass to fuel the plants. Average-sized biomass plants are generally 50 MWe, with the largest ones slightly more than 100 MWe Also, biomass generation emits carbon dioxide and hazardous air pollutants, making it less desirable for utilities looking to reduce air pollutants and comply with regulations. (NRC 2019b). Replacing the generating capacity of MNGP using only biomass would require the construction of more than six large facilities.

Biomass plants require storage facilities for the fuel products and for waste ash/residue for the wood, crop, and agriculture waste types. Wood waste plants require a large land area for storage and processing, and, like coal generation, they produce ash that must be disposed of in a manner that does not pollute waterways and air. Therefore, environmental impacts associated with construction of a wood waste plant could be significant, with the impact intensity level being dependent on the siting and proximity to a source of wood waste.

Utilizing municipal solid waste for electricity is also dependent on being close to large population centers that generate large amounts of waste. Air emissions are also an issue with biomass plants, and construction of a plant would require installation of maximum achievable control technology to comply with the CAA. The combustion of the fuel also results in air emissions that must be controlled to meet air quality regulations.

Overall, the construction and operation of biomass plants of the size necessary to act as an alternative to MNGP would result in MODERATE environmental impacts to land use, water quality, ecological resources, and air quality.

Generating baseload generation from biomass sources is limited because of the need to site facilities near substantial fuel sources and impacts to land from constructing and operating the facility. In addition, without the construction of multiple smaller facilities, biomass plants are unable to produce the large baseloads of electricity that nuclear and fossil fuel plants generate. Therefore, biomass is not considered a reasonable alternative to MNGP's baseload generation.

7.2.2.9 Fuel Cells

Current fuel cell installations for large-scale stationary power are significantly smaller scale than what is needed as a reasonable replacement of MNGP's generating capacity, with much of the systems installed for individual customers. Larger applications generally provide from hundreds of kilowatts to tens of megawatts of power (DOE 2017; Duke 2019). Fuel cells as a utility-scale generation alternative are not presently competitive with other alternatives. Therefore, fuel cells are not considered a reasonable alternative to MNGP's baseload generation.

7.2.2.10 Ocean Wave and Current Energy

The FERC has licensing authority over hydrokinetic energy projects deployed in the United States. Currently, there is only one licensed inland project, a project of 70kW (FERC 2021).

Given hydrokinetic technology is in the early stages of commercial application and projects have low generation capacities, ocean wave and current energy is not considered a reasonable alternative in the necessary time frame for power supply.

7.2.2.11 Petroleum-Fired

Oil-fired generation emits large amounts of carbon dioxide and hazardous air pollutants, making it undesirable for utilities looking to reduce air pollutants and comply with regulations. Also, as presented in Section 7.2.2.2, Xcel Energy is closing fossil fuel-fired units. Based on the greater environmental impacts and cleaner energy source policies and regulations, oil-fired generation is not a reasonable alternative.

7.2.2.12 Coal-Fired

Coal-fired plants are being retired throughout the United States, and as presented in Section 7.2.2.2, Xcel Energy is closing coal-fired plans to reduce carbon emissions. The NRC recently considered a supercritical pulverized coal facility as an alternative to renewing the River Bend Station Unit 1 OL but found license renewal as the preferred alternative. The supercritical pulverized coal facility alternative had operating impacts greater than license renewal, in addition to the environmental impacts inherent with new construction projects. (NRC 2018) Based on the greater potential environmental impacts, coal-fired generation is not a reasonable alternative.

7.2.3 Environmental Impacts of Alternatives

7.2.3.1 Natural Gas and Renewables Alternative

The natural gas and renewables alternative is a mix of new construction and reliance on existing generation and power purchases. This mix was selected as a replacement for MNGP by Xcel Energy's IRP modeling, which follows the guidance issued by the MPUC (Xcel 2021b). The mix is balanced for energy reliability, including sources focused on energy generation (intermittent renewables) and others focused on energy capacity (natural gas CTs). The CTs would provide firm capacity for system reliability, but to lower carbon emissions, it would be operated as a peaking plant to provide energy during occasional extended periods of low renewable output. This mix would not fully replace the baseload generation from MNGP and would be supported with power purchases from the market and additional generation by other existing natural gas-fired plants within Xcel Energy's system as needed to meet energy demand. This alternative would consist of the following:

- New generation:
    - New 750 MW natural gas-fired generation supplied by two new CT units with MDCTs located offsite at two sites in Minnesota
    - New 750 MW wind turbines located offsite in Minnesota
    - New 200 MW of solar panels (73 MW located onsite) and at two offsite locations in Minnesota
- Existing Xcel Energy generation:
    - Additional generation from existing natural gas-fired plants on Xcel Energy's system
- Market:
    - Purchased power as needed

The following sections present the impact assessment for the new construction portions of this alternative. The incremental additional generation from existing Xcel Energy natural gas-fired units would result in additional air emissions and water use for cooling. Generation of power that

Xcel Energy would purchase from the market would also have environmental impacts as described in Section 7.2.2.1.

7.2.3.1.1 Land Use

The two CT units could be co-located at an existing generation site or sited on a greenfield site. If one or both of the CT units would be located on an existing plant site, no additional land conversion for the unit and its transmission lines would be needed. For one or more greenfield sites, land would be needed for the units, supporting infrastructure, and transmission. The average plant footprint for a natural gas plant is 20–40 acres (Leidos 2016); for 2 greenfield sites, up to 80 acres would need to be converted to industrial use. The selected sites would be compatible with county-level or regional land use plans for heavy industrial development. Also, Xcel Energy assumes 25 miles of new 345-kV transmission lines in a new 150-foot-wide ROW transmission corridor would need to be developed to support each CT, an acreage requirement of 455 acres each or 910 acres total. Depending on the selected site, new natural gas pipelines might be required as well, further increasing the acreage needed to support two new CTs.

Operation of the MDCTs to support the CTs would result in air emissions and plumes. Given that the CTs would be operated as peaking plants to provide energy during occasional extended periods of low renewable output, the potential for plumes and drift impacting surrounding land use is minimal. The environmental impacts from MDCT operation are further discussed in the SMR nuclear alternative.

The MNGP site has land north and south of the Mississippi River that could be used for solar panels. The treed areas along the river would be left intact, minimizing ecological impacts. As depicted in Figure 7.2-1, approximately 550 acres were identified for the onsite solar panel installation. A factor of approximately 7.6 acres per MW based on Xcel Energy's nearby Sherco solar project[1] was used to estimate that the onsite solar installation would accommodate an approximately 73 MW nameplate capacity installation. The onsite transmission infrastructure would be used to support the solar installation. The onsite solar installation would not require land use conversion.

Additional solar installations and wind turbines would be located offsite within Minnesota. A screening process would be used for site selection. Xcel Energy follows a robust screening and due diligence process when reviewing prospective projects for development and/or acquisition. This includes applying the USFWS's land-based wind energy guidelines, as well as periodic and ongoing engagement with federal, state, tribal, and jurisdictional regulatory and wildlife agencies to identify and mitigate any potential environmental and cultural impacts or risks associated with renewable energy development. The due diligence and siting process includes, but is not limited to, wind capacity optimization, environmental and natural resource protection, and cultural and archeological mitigation. Contractors are aligned with Xcel Energy processes and protocols while developing renewable energy sites. This allows Xcel Energy to have a fully engaged

[1] Xcel Energy is proposing the Sherco solar project to be located in Clear Lake Township and Becker Township in Sherburne County, Minnesota. The project area covers 3,479.4 acres. The total nameplate capacity for the proposed project is up to 460 MW. (Xcel 2021f, Section 2.1.2)

process which is consistent with industry guidelines, engages stakeholders, and is protective of the environment. (Xcel 2021e)

Two solar installations of approximately 64 MW nameplate capacity each would be sited offsite. Each solar site would be approximately 480 acres and is assumed to require the land use to be converted to energy generation but compatible with county-level or regional land use plans. Also, Xcel Energy assumes 25 miles of new 345-kV transmission lines in a new 150-foot-wide ROW transmission corridor would need to be developed to support each solar installation, an acreage requirement of 455 acres each.

Xcel Energy's resource planning assessment of wind resources in Minnesota that provide economical wind capacity indicates that wind turbines would be sited many miles from MNGP. However, the energy generation may need to be transferred back to the MNGP area for distribution based on constraints and obligations under existing transmission operator agreements. The wind turbines would be linked to a new 345-kV transmission line and the energy transferred back to the transmission network that MNGP serves for distribution. Xcel Energy assumes 150 miles of new 345-kV transmission lines in a new 150-foot-wide ROW transmission corridor would be needed, an acreage requirement of 2,727 acres. The DOE developed land use metrics for wind generation of 2.47 acres per MW for disturbed area. A further breakdown of this disturbed area is 0.74 acres per MW hosting permanent structures and supporting facilities such as transformers and access roads and 1.73 acres per MW for temporary land use to support construction. (DOE 2015). Based on these metrics, development of 750 MWe of wind power would have a construction footprint of 1,853 acres and a permanent footprint of 555 acres. Depending on the selected location, a wind installation may impact existing land use; however, wind turbines are compatible with many land use categories and can be co-located and not require a conversion of land use other than the turbine's footprint. Wind turbines are spaced for operation, so the wind installation encompasses many acres between the linked turbines. The acreage between the linked turbines typically continues to be used for farmland and other compatible purposes and therefore, would not necessarily result in land use conversion to power generation. However, the number of land parcels and landowners that are often required to site a wind installation provides uncertainty with impacts to land use.

Given that Xcel Energy would screen sites to be compatible with existing county-level planning or regional land use plans, the impact of individual sites would not be expected to have a significant impact. However, the total acreage needed to support offsite installations and the acreage required for transmission and a new pipeline could impact many landowners including adjacent residences; overall, the project would have a MODERATE to LARGE land use impact.

7.2.3.1.2 Visual Resources

The onsite solar installation would be screened from the Mississippi River by leaving the tree buffers, but portions of the solar installation would likely be visible offsite from local roadways.

For CTs constructed on an existing plant site, construction activities and the completed structures would be within the character of the existing industrial site. For CTs constructed at greenfield sites, the extent of visual impact would depend on the character of the surrounding area. The selected sites would be compatible with county-level or regional land use plans for heavy industrial development, so adjacent property would likely be industrial, minimizing visual impacts. However, a CT plant would have structures high enough to be seen from a distance with the capacity to have greater visual impacts than other industrial neighbors.

The offsite solar installations would require large land areas. The solar panels could be visible to the public from offsite locations, depending on buffer areas or screening. The solar installations would be sited to comply with land zoning and any required buffers or screening. The wind turbines would be visible from all directions. In addition, the rotating blades of wind turbines cast moving shadows on the ground or on structures, causing the phenomenon of shadow flicker. Shadow flicker is considered a nuisance rather than a human health hazard, and the potential impact of shadow flicker can be mitigated by setback distances from structures, vegetative buffers, or the curtailment of the turbine during times of highest impact (DOE 2015).

Site selection would seek to minimize cultural impacts and would avoid impacting scenic areas such as U.S. Congress-designated areas for protection of unique natural, cultural, and recreational values (e.g., national scenic and historic trails, national historic landmarks, scenic areas, recreation areas, preserves, and monuments). Avoiding impacting the most scenic viewsheds would reduce the most significant visual impacts, allowing the impact to be noticeable, but not destabilizing.

The turbines would be marked and lighted according to Federal Aviation Administration (FAA) guidelines, which call for painting the turbines and towers white or light gray while making them highly visible to pilots from the air. Aviation red flashing, strobe, or pulsed obstruction lights would be mounted atop selected turbines and at the end of each turbine string, or within and around the perimeter such that the gap between lights is no greater than 0.5 miles, allowing the entire facility to be perceived as a single unit by pilots flying at night. The specific location of aviation lighting and the operation of the lighting system would be determined in consultation with FAA. (FAA 2018)

The visible impact of the transmission lines and new pipelines would not appear any different than existing ones. Site selection would avoid scenic views and impacts to cultural resources. Mitigation measures to reduce impacts of shadow flicker would be implemented as appropriate. Overall, the visual impacts from the construction and operation of this alternative would range from SMALL to MODERATE.

7.2.3.1.3 Air Quality

Construction activities of the new installations would result in temporary and minor effects on local ambient air quality. Fugitive dust and fine particulate matter would be generated during earthmoving activities, material-handling activities, by wind erosion, and other activities, and would be managed in accordance with regulatory requirements. BMPs (e.g., paving or stabilizing disturbed areas, water suppression, reduced material handling) would minimize such emissions. Construction equipment and vehicles would also emit exhaust emissions. These emissions would be temporary and mitigation such as curtailing idling of vehicles would be implemented to minimize short-term air quality impacts. Construction emissions would be SMALL.

The CTs would be required to obtain a Title V operating permit, or the Title V permit of its host site be modified to address the CT's emissions of carbon dioxide and hazardous air pollutants. Compliance with the permit and CAA regulations would minimize air quality impacts. The CT would be operated as a peaking plant; thus, its run time would be a fraction of an "always on" plant. The projected generation for the CTs for the 2030–2040 timeframe provided in the CN alternative analysis is an annual average of 368,000 MWh (Xcel 2021b). In contrast, MNGP annual average gross generation 2017–2020 was 5,550,000 MWh. The solar and wind components of the combination alternative would not release any air emissions during operation. The operations-related impacts on air quality for this alternative would be SMALL.

7.2.3.1.4 Noise

Sources of noise during construction of the CTs, solar installations, and wind installations would include clearing, earthmoving, foundation preparation, pile driving (if needed), concrete mixing and pouring, steel erection, and various stages of facility equipment fabrication, assembly, and installation. Additionally, a substantial number of diesel- and gasoline-powered vehicles and other equipment would be used. Projected noise levels from most construction activities at the site boundary would have levels below the 60 to 65 dBA range of acceptable day-night, 24-hour average (Ldn) noise levels set by the U.S. Department of Housing and Urban Development.

The onsite solar would be constructed on an existing industrial site. The offsite installations could have adjacent properties with sensitive receptors (e.g., residences, schools, etc.), Given the acreage of the solar installations and the potential need for land clearing and the number of turbines that would need to be installed, as well as the longer duration of construction of a CT plant on a greenfield site, noise impacts would range from SMALL to MODERATE and be temporary for the duration of construction of each facility.

During operations, the wind turbines would emit sound. Turbine sound is typically one of the greatest nuisance impacts associated with wind power. The DOE addressed this concern with a review of the available data and research on impacts to human health, concluding that as of 2013, global peer-reviewed scientific data and independent studies consistently concluded that sound from wind installations has no direct impact on physical human health. (DOE 2015)

Overall, construction-related noise impacts associated with this alternative are dependent on the site selected and proximity to residents and other sensitive receptors and would range from SMALL to MODERATE. Operations-related noise impacts associated with this alternative would be SMALL.

7.2.3.1.5 Geology and Soils

Construction impacts to geology and soils resulting from the construction of the new generation and supporting transmission lines and pipelines would primarily be impacts to soils from clearing and grubbing. In addition, construction of a new CT on an existing power plant site could also require land clearing. These temporary soil impacts would be minimized by implementation of

BMPs. Geological impacts would be minor, as any gravel or stone used in the construction of roads and infrastructure would be sourced from local businesses that sell materials sourced from local quarries. During operations, the solar and wind installations would be required to have a NPDES construction stormwater permit.

Overall, the geology and soil impacts from the construction and operation of this alternative would be SMALL.

7.2.3.1.6 Hydrology (Surface Water and Groundwater)

Construction of the solar and wind installations and CTs and their supporting transmission lines/pipelines would require water for dust suppression, equipment washing, and sanitary systems. The solar and wind installations would not have process water needs for operation, but water would be needed for periodically washing the solar panels. The water demand could be met by municipal supply available at the site, trucked in potable water, or onsite or nearby surface or groundwater resources. Xcel Energy would utilize the most practical supply and comply with any required water withdrawal permits and applicable regulations. Water quality impacts could result from erosion and runoff associated with the construction but controlled by implementation of BMPs and compliance with stormwater permits and applicable regulations.

The use of water resources for cooling tower makeup and blowdown for the CTs would comply with their NPDES permits. CTs being operated as peaking plants is anticipated to require a smaller volume of cooling water. Xcel Energy would operate each installation in compliance with stormwater regulations and spill response BMPs.

Overall, the impacts to surface water and groundwater resources from the construction and operations of this alternative would be SMALL.

7.2.3.1.7 Ecological Resources (Terrestrial and Aquatic)

Terrestrial

The terrestrial ecology setting for the MNGP site is discussed in Section 3.7.1. Development at the MNGP site for the onsite solar installation would impact onsite acreage in close proximity to the existing plant structures. Development would avoid the riparian areas and is largely open area with some previous clearing/development. Likewise, a CT constructed on an industrial site would have less potential for a significant impact to terrestrial habitat. Prior to tree removal, wildlife surveys would be conducted as appropriate to identify protected species and habitat and design appropriate avoidance and minimization measures. Given that the onsite solar would be located on an industrial site and Xcel Energy would take appropriate mitigation measures prior to tree removal, there would be SMALL impact on terrestrial ecology.

Terrestrial ecology impacts resulting from the construction of the solar installations would result from the about 500 acres of land development required for each. Disturbed acreage for the wind development would be about 1,900 acres. Disturbed acreage for each CT site would be 40 acres for plant development and more could be needed for a construction footprint as well as transmission and pipeline corridors. This development could occur at separate sites and by applying siting criteria. As discussed in Section 7.2.3.1, Xcel Energy follows a robust screening and due diligence process when reviewing prospective projects for development and/or acquisition. This includes applying the USFWS guidance on wind development and engagement with jurisdictional regulatory and wildlife agencies to identify and mitigate any potential environmental impacts or risks associated with renewable energy development. The site selection process would seek to avoid wetlands and other high-quality terrestrial habitats such as critical habitat for threatened and endangered species and habitats identified as a priority for preservation.

The impacts to terrestrial ecology would be nearly all attributable to land clearing and habitat removal during construction, However, the operation of the wind turbines could affect avian and bat species. Following USFWS guidance for siting would minimize impacts and compliance with any incidental take permits would minimize impacts to special status species. As discussed in the DOE's 2015 wind vision report, mortality rates for birds at land-based wind plants average between three and five birds per MW per year, and no plant has reported an average greater than 14 birds per MW per year with common songbirds accounting for approximately 60 percent of all bird collision mortality. Those mortality levels for the 61 gigawatt of wind capacity installed in 2013 at the time of DOE's study constitute a very small percentage, typically <0.02 percent, of the total populations of those songbird species. (DOE 2015) Using the annual average of five bird deaths per MW, operation of the wind component of this alternative would result in an estimated 3,750 bird deaths per year of operation.

Overall, the ecological impacts to terrestrial species from construction and operation of this alternative would be SMALL to MODERATE primarily due to the acreage disturbed and permanent terrestrial habitat removal of the offsite solar installations.

Aquatic

The implementation of BMPs to control erosion and run-off would minimize impacts to aquatic resources that would result from the construction. No operations-related impacts are associated with the solar and wind components. The use of water resources for cooling tower makeup and blowdown for the CTs would comply with their NPDES permits. Use of closed-cycle cooling would minimize impingement and entrainment impacts. Further, with the CTs being operated as peaking plants, a smaller volume of cooling water is anticipated.

Therefore, the ecological impacts to aquatic species from the construction and operation of this alternative would be SMALL.

Special Status Species

As mentioned above, Xcel Energy follows a robust screening and due diligence process when reviewing prospective projects for development and/or acquisition. This includes applying the USFWS guidance on wind development and engagement with jurisdictional regulatory and wildlife agencies to identify and mitigate any potential environmental impacts or risks associated with renewable energy development.

The ecological setting and the presence of protected species at the MNGP is discussed in Sections 3.7 and 4.6.8. The MNGP has suitable habitat for federally protected species, but there are no documented occurrences of these species within 6 miles on the MNGP site. The MNGP also offers suitable habitat for a state protected species, but the species have not been observed onsite. Xcel Energy would follow USFWS guidance for tree removal to minimize impacts to avian and bat species.

Given avoidance, minimization and mitigation measures, and compliance with applicable permits, it is anticipated that construction and operation of facilities in the various sites under this alternative, MAY AFFECT, but is NOT LIKELY TO ADVERSELY AFFECT special status species.

7.2.3.1.8 Historic and Cultural Resources

As presented in Section 3.8.3, no cultural resources have been recorded within the MNGP site, so development of an onsite solar installation would not impact cultural resources. The site selection process that would be used for offsite installations and supporting transmission lines/pipelines would have criteria to avoid locations whose development would impact cultural resources. With application of the site selection process and use of existing industrial sites for the onsite solar, impacts to any historic and cultural resources present with the installation's APE is anticipated to have NO ADVERSE EFFECT.

7.2.3.1.9 Socioeconomics

Socioeconomic Issues Other than Transportation

The construction of the CTs and solar and wind components and supporting transmission lines/pipelines would create construction jobs that would give a boost to the local economies. Each CT construction workforce would likely be several hundred and require more than a year while the construction workforce for the solar and wind installations would be upwards of a few hundred for less than a year.

Operation of a CT would require a significantly smaller workforce than a conventional nuclear power plant. Other natural gas fired plants require approximately 150 workers (NRC 2019b). The workers would contribute to the local economies via housing, living expenses, taxes, and other revenue contributions. The number of workers required to maintain each solar and wind installation would be small, and it would not result in a quantifiable impact on the local economy.

The socioeconomic impacts of the CTs and solar and wind components would be similar to other large industrial construction projects and have short- and long-term economic stimulus to the host county and region due to worker wages and tax payments. Beneficial socioeconomic impacts would range from SMALL to LARGE and be location dependent. Adverse socioeconomic impacts from increased use and demand for community services and infrastructure would be mitigated through tax revenues.

As discussed in Section 3.9.5, Xcel Energy pays property taxes to Wright County, the City of Monticello, and other taxing authorities and would continue to pay property taxes for the MNGP site occupied by a solar installation. Likewise, Xcel Energy would pay property taxes for the CT sites. If Xcel Energy leases the property for the solar and wind installations, lease payments would be made to the property owners. The solar installations and the property occupied by the wind turbines could be taxed at a higher industrial rate than agricultural land, providing a tax benefit. The beneficial impact would be dependent on the tax base of the county, but the impact would likely be small.

Overall, the socioeconomic impacts from the construction and operation of this alternative would be beneficial and SMALL to MODERATE for host counties.

Transportation

The construction workforce and equipment transported to the individual sites could have traffic congestion impacts; however, the impacts would be temporary, and any significant impacts could be mitigated. Traffic impacts associated with the operation workforces for the new installations would be less than those of the construction workforce. For the CTs, staggered work shifts could be used to mitigate traffic impacts as needed. The operation workforces for each solar and wind installation would be a small number and would not have a noticeable impact on traffic. Therefore, transportation impacts for construction and operation of this alternative would be SMALL.

7.2.3.1.10 Human Health

During construction and operation, worker safety would be addressed by following the OSHA worker protection standards. CTs operated as peaking plants and in compliance with their air permits would minimize human health impacts due to air emission from the plant. As mentioned in Section 7.2.3.1.4, DOE concluded regarding wind turbine noise that sound from wind plants has no direct impact on physical human health (DOE 2015). Overall, the human health impacts associated with the construction and operation of this alternative would be SMALL.

7.2.3.1.11 Environmental Justice

Potential impacts on minority and low-income populations from the new construction components would primarily result from socioeconomic effects. Some minor environmental impacts would result from the construction from fugitive dust, but this impact would be temporary and short in duration. Socioeconomic impacts on minority and low-income population under this alternative would consist of the short-term increase in worker expenditures at local businesses and potential rental housing shortages during the construction phase of the projects. The temporary increase in traffic on roads would likely result in some small adverse impacts to traffic that could affect local minority and low-income populations, if present. During operations, the solar and wind installations would not have air emissions, but the CTs would. However, a CT operated as a peaking plant and in compliance with its air permit would minimize human health impacts from the plant.

Overall, the construction and operations of this alternative would not be expected to have disproportionately high and adverse human health and environmental effects on minority and low-income populations.

7.2.3.1.12 Waste Management

The construction of the new installations would create sanitary, construction, and industrial waste. This waste would be recycled, disposed of onsite, or shipped to an offsite waste disposal facility.

Operation of the CTs would result in waste from spent catalytic reduction catalysts used to control nitrous oxide emissions. This waste stream is considered hazardous and would be disposed of at a facility that handles hazardous materials. The operation of each solar and wind installation is expected to generate very minimal waste from daily operations. The nonhazardous and hazardous waste would be managed in compliance with state regulations and disposed of in permitted facilities.

Solar developers are currently assuming lifespans for solar panels to be 30 years or more (LBNL 2020). Wind turbine manufacturers are generally indicating that current designs have a 30-year lifespan (LBNL 2019). Each solar and wind installation as well as the CTs would be expected to have a lifespan beyond the 20-year SPEO. There would be significant waste generation upon decommissioning. All waste generated at the installations will be recycled or disposed of at an offsite waste disposal facility. Overall, the waste management impacts from the construction and operation of this alternative would be SMALL.

7.2.3.2 Renewables and Storage Alternative

The renewables and storage alternative is a mix of new construction and relying on existing generation and power purchases. This mix was selected as a replacement for MNGP by Xcel Energy's IRP modeling that follows the guidance issued by the MPUC with the additional restriction of no new carbon-emitting source. The mix is balanced for energy reliability, including sources focused on energy generation (intermittent renewables) and others focused on energy capacity energy storage. This mix would not fully replace baseload generation from MNGP and would be supported with power purchases from the market and occasionally additional very small amounts of generation by other existing natural gas-fired plants within Xcel Energy's system as needed to meet energy demand. This alternative would consist of the following:

- New Generation:
    - New 950 MW of wind turbines located offsite in Minnesota
    - New 700 MW of solar panels located onsite and offsite in Minnesota
- Storage:
    - New 300 MW of lithium battery storage located at offsite solar locations
- Market:
    - Purchased power as needed

- Existing Xcel Energy Generation:
    - Occasional additional generation from existing natural gas-fired plants on Xcel Energy's system

The following sections present the impact assessment for the new construction portions of this alternative. The incremental additional generation from existing Xcel Energy natural gas-fired units would result in additional air emissions and water use for cooling. The occasional generation from natural gas-fired plants within the Xcel Energy system provided in the CN alternative analysis is projected for four years during the 2030–2040 timeframe with an annual peak of 204,000 MWh (Xcel 2021b). Generation of power that Xcel Energy would purchase from the market would also have environmental impacts as described in Section 7.2.2.1.

7.2.3.2.1 Land Use

The onsite solar installation would be same as for the natural gas and renewables alternative. The land needed for the onsite solar installation is described in Section 7.2.3.1.1.

The offsite site solar installations would be supported by lithium battery storage. As described in Section 7.2.3.1.1, each offsite solar installation would be approximately 64-MW nameplate capacity and approximately 480 acres plus additional acreage for the battery storage infrastructure, totaling approximately 500 acres for each site. Ten offsite solar installations would be required for the 700-MW solar component of this alternative. Xcel Energy assumes 25 miles of new 345-kV transmission lines in a new 150-foot-wide ROW transmission corridor would need to be developed to support each solar installation, an acreage requirement of 455 acres each or 4,550 acres total.

As described in Section 7.2.3.1.1, the wind turbines would be installed in distant portions of Minnesota for more economically favorable wind resources. This alternative would increase the wind nameplate capacity from 750 MW to 950 MW, impacting more acreage. Development of 950 MWe of wind power would have a construction footprint of 2,223 acres and a permanent footprint of 666 acres. Again, the wind generation would be supported by 150 miles of new 345-kV transmission lines for an acreage requirement of 2,727 acres.

Given that Xcel Energy would screen the sites and selected sites would be compatible with existing county-level planning or regional land use plans, individual sites would not be expected to have a significant impact. However, the total acreage needed to support offsite installations and the acreage required for transmission would impact many landowners, including adjacent residences; overall, the project would have a MODERATE to LARGE impact.

7.2.3.2.2 Visual Resources

The visual resources impact of the renewables and storage alternative would be similar to those of the renewables component of the natural gas and renewables alternative in Section 7.2.3.1.2. Xcel Energy would utilize site selection to minimize cultural impacts, which would avoid impacting designated scenic areas, include buffer areas as required by local zoning, and comply with FAA regulations for lighting. The visual impacts from the construction and operation of this alternative would range from SMALL to MODERATE.

7.2.3.2.3 Air Quality

Construction activities of the new installations would result in temporary and minor effects on local ambient air quality. Fugitive dust and fine particulate matter would be generated during earthmoving activities, material-handling activities, by wind erosion, and other activities, and would be managed in accordance with regulatory requirements. BMPs (e.g., paving or stabilizing disturbed areas, water suppression, reduced material handling) would minimize such emissions. Construction equipment and vehicles would also emit exhaust emissions. These emissions would be temporary and mitigation such as curtailing idling of vehicles would be implemented to minimize short-term air quality impacts. Construction emissions would be SMALL.

The solar, storage, and wind installations would not release any air emissions during operation. The incremental additional generation from existing Xcel Energy natural gas-fired units would result in additional air emissions proportional to the additional run time. The CN alternative analysis projected an annual peak of 204,000 MWh for additional natural gas-fired generation (Xcel 2021b). This runtime would increase air emissions negligibly, resulting in very small fractions of a ton for the criteria air pollutants. The operations-related impacts on air quality for this alternative would be SMALL.

7.2.3.2.4 Noise

Sources of noise during construction include clearing, earthmoving, foundation preparation, pile driving (if needed), concrete mixing and pouring, and various stages of facility equipment fabrication, assembly, and installation. Additionally, a substantial number of diesel- and gasoline-powered vehicles and other equipment would be used. Projected noise levels from most construction activities at the site boundary would have levels below the 60 to 65 dBA range of acceptable Ldn noise levels set by the U.S. Department of Housing and Urban Development. Construction activities resulting in offsite sound levels above this range would be temporary. Construction-related noise impacts associated with this alternative are dependent on the site selected and proximity to residents and other sensitive receptors and would range from SMALL to MODERATE.

As presented in Section 7.2.3.1.4, the wind turbines in operation would emit sound considered a nuisance rather than a human health hazard (DOE 2015). The solar and storage installations would not emit noise. Operations-related noise impacts associated with this alternative would be SMALL.

7.2.3.2.5 Geology and Soils

Impacts to geology and soils resulting from the construction of solar and wind installations and supporting transmission lines would primarily be impacts to soils from clearing and grubbing. These temporary soil impacts would be minimized by implementation of BMPs; construction stormwater permits would be obtained as required. Extensive and depth excavations would not be required for solar and wind installations and transmission line construction. Gravel or stone used in the construction would be sourced from local businesses that sell materials sourced from local quarries.

Overall, the geology and soil impacts from the construction and operation of this alternative would be SMALL.

7.2.3.2.6 Hydrology (Surface Water and Groundwater)

Construction of the solar and wind installations and their supporting transmission lines would require water for dust suppression, equipment washing, and sanitary systems. The solar and wind installation would not require process water for operation, but water would be needed for periodically washing the solar panels. The water demand could be met by municipal supply available at the site, trucked in potable water, or onsite or nearby surface or groundwater resources. Xcel Energy would utilize the most practical supply and comply with any required water withdrawal permits and applicable regulations. Water quality impacts could result from erosion and runoff associated with the construction of the solar and wind installations. Impacts would be minimized by implementation of BMPs and compliance with stormwater permits and applicable regulations. Groundwater would be protected through the implementation of a SWPPP and spill prevention measures. Once in operation, Xcel Energy would operate the installations in compliance with stormwater regulations. The use and water quality impacts for both surface water and groundwater resources associated with the construction and operation of the solar and wind installations would be SMALL.

The incremental additional generation for existing Xcel Energy natural gas-fired units would result in additional water usage proportional to the additional run time. The CN alternative analysis projected an annual peak of 204,000 MWh for additional natural gas-fired generation (Xcel 2021b). This runtime would negligibly increase water consumption at the individual facilities based on National Energy Technology Laboratory (NETL) estimates for water needs thermoelectric generation (NETL 2010).

Overall, the impacts to surface water and groundwater resources from the construction and operations of this alternative would be SMALL.

7.2.3.2.7 Ecological Resources (Terrestrial and Aquatic)

Terrestrial

The ecological impacts of the onsite solar would be the same as presented in Section 7.2.3.1.7. The impacts of construction of the offsite solar and wind installations would be similar to the natural gas and renewables alternative, with impacts from land clearing. Sites would be selected to minimize impacts on protected terrestrial species and to avoid wetlands and other high-quality terrestrial habitats. Tree removal guidance from the USFWS would be followed. The overall acreage needed for offsite solar development under this alternative would be significantly more because 10 sites would be needed versus two sites for a total acreage of about 5,000 acres. Acreage for transmission connections for the additional eight sites would also increase the acreage of terrestrial habitat impacted, for a total of 4,500 acres. The total disturbed acreage needed for wind would increase to about 2,200 acres. The impacts to terrestrial ecology would be nearly all attributable to land clearing and habitat removal during construction; however, the operation of the wind turbines would result in avian and bat deaths. Overall, the ecological impacts to terrestrial species from construction and operation of this alternative would be MODERATE to LARGE primarily due to the acreage disturbed and permanent terrestrial habitat removal of the offsite solar installations.

Aquatic

The implementation of BMPs to control erosion and run-off would minimize the impacts to aquatic resources resulting from construction. No operations-related impacts are associated with the solar and wind components. Therefore, the ecological impacts to aquatic species from the construction and operation of this alternative would be SMALL.

Special Status Species

As mentioned in Section 7.2.3.1.7, Xcel Energy follows a robust screening and due diligence process when reviewing prospective projects for development and/or acquisition. This includes applying the USFWS guidance on wind development and engaging with jurisdictional regulatory and wildlife agencies to identify and mitigate any potential environmental impacts or risks associated with renewable energy development.

The ecological setting and the presence of protected species at MNGP is discussed in Sections 3.7 and 4.6.8. The MNGP site has suitable habitat for federally protected species, but the MDNR NHI database which lists observations reported to the agency had no documented occurrences of these species within 6 miles on the MNGP site. MDNR continually updates the NHI database 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 (MDNR 2022b). The MNGP site also offers suitable habitat for state-protected species, but the species have not been observed onsite. Xcel Energy would follow USFWS guidance for tree removal to minimize impacts to avian and bat species.

Given avoidance, minimization and mitigation measures, and compliance with applicable permits, it is anticipated that construction and operation of facilities in the various sites under this alternative, MAY AFFECT, but is NOT LIKELY TO ADVERSELY AFFECT, special status species.

7.2.3.2.8 Historic and Cultural Resources

As presented in Section 3.8.3, no cultural resources have been recorded within the MNGP site, so development of an onsite solar installation would not impact cultural resources. The site selection process that would be used for the offsite solar and wind installations and supporting transmission lines would have criteria to avoid locations whose development would impact cultural resources. With application of the site selection process and use of existing industrial sites for the onsite solar, impacts to any historic and cultural resources present with the installation's APE is anticipated to have NO ADVERSE EFFECT.

7.2.3.2.9 Socioeconomics

Socioeconomic Issues Other than Transportation

The construction and operation of the solar and wind components and supporting transmission lines would create construction jobs that would give a temporary boost to the local economies. The construction workforce for the solar and wind installations would be more than a few hundred for a duration of less than a year. The number of workers required to maintain each solar and wind installation would be small, and it would not result in a quantifiable impact on the local economy. Xcel Energy would continue to pay property taxes for the MNGP site occupied by a solar installation. If Xcel Energy leases the property for the offsite solar and wind installations, lease payments would be made the to property owners. The solar installations and the property occupied by the wind turbines could be taxed at the industrial land rate rather than the agricultural land rate, increasing tax revenues. The beneficial impact would be dependent on the tax base of the county, but the impact would likely be small.

Overall, the socioeconomic impacts from the construction and operation of this alternative would be beneficial and SMALL to MODERATE for host counties.

Transportation

The construction workforce and equipment transported to the individual sites could have traffic congestion impacts; however, the impacts would be temporary, and any significant impacts could be mitigated. The operation workforces for each solar and wind installation would not be quantifiable. Therefore, transportation impacts for construction and operation of this alternative would be SMALL.

The socioeconomic impacts of the solar and wind components would be similar to other large industrial construction projects and have short- and long-term economic stimulus to the host county and region due to worker wages and tax payments. Beneficial socioeconomic impacts would range from SMALL to LARGE and be location dependent. Adverse socioeconomic impacts from increased use and demand for community services and infrastructure would be mitigated through tax revenues.

7.2.3.2.10 Human Health

During construction and operation, worker safety would be addressed by following the OSHA worker protection standards. As mentioned in Section 7.2.3.1.4, the DOE concluded regarding wind turbine noise that sound from wind plants has no direct impact on physical human health (DOE 2015). Overall, the human health impacts associated with the construction and operation of this alternative would be SMALL.

7.2.3.2.11 Environmental Justice

Some minor environmental impacts would result from the construction from fugitive dust, but this impact would be temporary and short in duration. Socioeconomic impacts on minority and low-income population under this alternative would consist of the short-term increase in worker expenditures at local businesses and potential rental housing shortages during the construction phase of the projects. The temporary increase in traffic on roads would likely result in some small impacts to traffic that could affect local minority and low-income populations, but this would be dependent on the sites selected and proximity to residents and other sensitive receptors. The solar and wind installations would not have air emissions.

Overall, the construction and operations of this alternative would not be expected to have disproportionately high and adverse human health and environmental effects on minority and low-income populations.

7.2.3.2.12 Waste Management

The construction of the new installations would create sanitary, construction, and industrial waste. This waste would be recycled, disposed of onsite, or shipped to an offsite waste disposal facility. The operation of each solar and wind installation is expected to generate very minimal waste from daily operations. The nonhazardous and hazardous waste would be managed in compliance with state regulations and disposed of in permitted facilities. The waste management impacts from the construction and operation of this alternative would be SMALL.

Solar developers are currently assuming lifespans for solar panels to be 30 years or more (LBNL 2020). The battery storage system at each solar installation would have to be replaced after several years of operation; however, much of the components are recyclable, minimizing the waste generation. Wind turbine manufacturers are generally indicating that current designs have a 30-year lifespan (LBNL 2019). There would be significant waste generation upon decommissioning. All waste generated at the installations will be recycled or disposed of at an offsite waste disposal facility.

7.2.3.3 Small Modular Reactors Nuclear Alternative

This alternative is a SMR plant based on the NuScale design. The 12-unit plant of the NuScale design would yield 884 MWe net (NuScale 2021a). The NuScale design is scalable, so the plant could be constructed with nine power modules to yield approximately 662 MWe net to replace MNGP's generation. The SMR plant would be sited on a suitable site within its service territory. The plant would not be sited in Minnesota because new nuclear power plants are prohibited by Minnesota Statute 216B.243, Subdivision 3b. The SMR plant would have a closed-cycle cooling system using MDCTs. The source water for the cooling system is assumed to be surface water with adequate inflow to accommodate the plant's cooling system and water consumption. Also, Xcel Energy assumes adequate grid connectivity would be available within 25 miles.

7.2.3.3.1 Land Use

Facility site acreage requirements include land for the reactor core and all balance of plant infrastructure (e.g., cooling towers and switchyard), setbacks, buffer/site safety areas, and access. The land requirement for the 12-unit SMR plant of the NuScale design is 30 acres (NuScale 2021a). A State of Washington siting study for SMRs of various technologies used a model 600-MWe plant and conservatively set 130 acres as its initial threshold for assessing sites within the state, acknowledging that construction needs could also require additional temporary acreage (Golder 2016). Given that the 130 acres is four times the acreage needed for a NuScale plant, a site of 130 acres is assumed to be sufficient to support construction of a MNGP replacement plant on a greenfield site. Also, Xcel Energy assumes 25 miles of new 345-kV transmission lines in a new 150-foot ROW transmission corridor would need to be developed to support the SMR plant, an acreage requirement of 455 acres.

Operation of the MDCTs would result in air emissions and plumes. The air emissions would entrain dissolved solids in the water vapor. When evaporation occurs, the solids that were once dissolved would be deposited on surrounding land onsite and offsite. As discussed below in Section 7.2.3.2.3. use of freshwater for cooling would have low levels of dissolved solids and minerals. No significant impact of solids deposition on surrounding land would be expected. Atmospheric effects of plumes could include fogging and shadowing with the potential for impacting surrounding cultivated land, if present, or visibility on local roads.

Conversion of 130 acres for energy generation given siting criteria that is compatible with existing county-level or planning region land use plans would not be expected to have a significant impact. Site selection would also seek to limit conversion of prime farmland. However, given the atmospheric effects of the MDCTs would extend offsite and the 455 acres required for transmission could impact multiple landowners including adjacent residences, overall, the project would have a SMALL to MODERATE impact.

7.2.3.3.2 Visual Resources

Containment structures for SMR units are not as tall as conventional nuclear containment structures. The NuScale design's containment structure is 76 feet in height (NuScale 2019). The MDCTs would have a low profile compared to natural draft parabolic cooling towers and would not be expected to extend the distance at which the plant would be visible. The visual resources impact for the plant would be similar to other industry appearances during its construction and operation. With selection of a site that is compatible with existing county-level planning or regional land use plans, the appearance would be expected to be compatible with the existing or planned nearby developments rather than being intrusive on the viewscape. Also, compliance with applicable local zoning requirements for setbacks and buffers would mitigate the plant's visual impact.

Operation of the MDCTs would discharge saturated water vapor which when it encounters cooler air, a visible plume would form. The plumes can be transported away from the plant depending upon atmospheric conditions. Plumes can affect the surrounding area with lowered visibility due to fogging and light scatter at night. Local atmospheric conditions would influence the frequency and extent of plume formation and the prevailing wind direction, surrounding topography, and land use would influence the severity of visibility impacts (e.g., fogging on local roads) and intrusion on the viewscape. These generally localized conditions of fogging and lowered visibility during portions of the day and primarily during the colder months of the year would be experienced mostly on local roadways and waterways and nearby properties.

The transmission lines installed to support the plant would have a commonplace appearance. It is assumed that the selected corridor would avoid scenic areas such as U.S. Congress designated areas for protection of unique natural, cultural, and recreational values (e.g., national scenic and historic trails, national historic landmarks, scenic areas, recreation areas, preserves, and monuments). Avoiding impacting the most scenic viewsheds would reduce the most significant visual impacts.

The visual impact of this alternative sited on land compatible with local or regional land use plans and with layout and orientation of the cooling tower being optimized to mitigate plume impacts to surrounding properties is anticipated to be SMALL.

7.2.3.3.3 Air Quality

Temporary and minor effects on local ambient air quality could occur as a result of construction activities. Fugitive dust and fine particulate matter would be generated during earthmoving activities, material-handling activities, by wind erosion, and other activities and would be managed in accordance with regulatory requirements. BMPs (e.g., paving or stabilizing disturbed areas, water suppression, reduced material handling) would minimize such emissions. Vehicles used to haul debris, equipment, and supplies as well as equipment used for excavation and earthmoving would create pollutants. All equipment would be serviced regularly, and all industrial activities would be conducted in accordance with federal, state, and local emission requirements. Emissions from construction activities would be temporary and intermittent for the duration of construction activities. With implementation of mitigation measures and properly serviced equipment impacts would be SMALL.

Air quality impacts from operation would include intermittent releases from the periodic testing and occasional use of stand-by equipment and use of other minor sources of air emissions. GHG emissions associated with nuclear power are within the same order of magnitude as renewable energy sources (NRC 2013a). The SMR alternative would have greatly reduced GHG emissions compared to emissions from a fossil fuel-fired plant.

The MDCTs would have air emission and atmospheric effects from drift and plumes. Cooling tower drift is the liquid droplets that become entrained in the exhaust air stream. Drift that leaves the top of the tower will reflect the same water chemistry as that of the circulating water. The water chemistry would be controlled by Xcel Energy and would be in accordance with any applicable limits and restrictions for use of water treatment chemicals and discharge limits.

When the small droplets within the drift or plumes are released into the air, evaporation occurs, leaving behind the solids that were once dissolved. This has the effect of introducing fine particulate matter into the atmosphere. Particulate matter emissions (e.g., PM_{10} and $PM_{2.5}$) are regulated air emissions.

The magnitude of drift related PM_{10} and $PM_{2.5}$ emissions from wet towers (e.g., MDCTs) depends on several conditions and parameters, such as the makeup water composition, concentrations of total dissolved solids (organic matter, biocides, corrosion inhibitors, sodium chloride), steam condenser flow rate, design and number of cooling towers/cells, and annual hours of operation. NRC's comparison of the impacts of using seawater versus freshwater included consideration that drift emissions from cooling tower systems using seawater are over seven times greater than those from systems supplied with freshwater makeup feeds if everything else is held constant. NRC determined that operation of wet towers at nuclear power plants for salt or freshwater sources would result in small impacts on air quality provided the plant operated within their state-issued air permit. (NRC 2013a)

With a freshwater cooling water source, the plant's cooling water would not be expected to have a high salt content or mineral content and therefore, operation of the MDCTs would not adversely affect the local air quality. The dissolved solids from both drift and plumes could also be deposited on the surrounding land onsite and offsite.

As presented in Section 7.2.3.2.2, air exhaust from the MDCTs would have atmospheric effects such as visible plumes and ground level fogging. Overall, the air quality impacts of this alternative operated in compliance with its air permit is anticipated to be SMALL.

7.2.3.3.4 Noise

Sources of noise during construction would include clearing, earthmoving, foundation preparation, pile driving (if needed), concrete mixing and pouring, steel erection, and various stages of facility equipment fabrication, assembly, and installation. Additionally, a substantial number of diesel- and gasoline-powered vehicles and other equipment would be used. Projected noise levels from most construction activities at the site boundary would have levels below the 60 to 65 dBA range of acceptable Ldn noise levels set by the U.S. Department of Housing and Urban Development. The sound would be attenuated by the surrounding topography, buildings and structures, and distance to the site border. Construction activities resulting in offsite sound levels above this range would be temporary. Further, compliance with applicable local zoning requirements for setbacks and buffers and any local noise ordinances would mitigate construction noise as well as operation noise impacts on surrounding properties and nearby sensitive receptors.

Noise sources associated with the operation and infrastructure would include pumps, cooling towers, transformers, switchyard equipment, and loudspeakers. Many of these noise sources are within structures or would be infrequent. Noise from a cooling tower is generally from motors, fans, and cascading water. If cooling tower sound levels are estimated to have offsite impacts or be greater than noise ordinance or guidelines, mitigation measures, such as modifications to fans and motors or the installation of barriers could be implemented.

Given sound attenuation and implementation of mitigation measures if indicated, noise impacts to sensitive receptors are not expected. Therefore, construction and operations-related noise impacts would be SMALL.

7.2.3.3.5 Geology and Soils

Site selection would require investigation of the subsurface for compatibility with site parameters for the SMR design. Given geologic compatibility, excavation associated with plant installation should not damage geologic formations at the site. Site preparation and construction would require the removal and redistribution of several hundred cubic yards of rock and overburden soil material. Construction-related impacts to geology would be minimal as the excavation associated with plant installation should not damage geologic formations at the site. Through compliance with permit conditions, adherence to stormwater regulations, and applying erosion control and stormwater management SWPPP mitigation and BMPs, construction-related impacts on geology and soils would be SMALL.

Operations-related impacts on geology and soils from the SMR units would be minimized by adherence to the industrial site SWPPP. Operations-related impacts would be SMALL.

7.2.3.3.6 Hydrology (Surface Water and Groundwater)

Water needs for construction of an SMR plant would be similar to typical uses of water for large industrial projects. These uses include dust abatement, concrete mixing, and potable water needs. In addition, construction could require dewatering of excavations, but the smaller footprint for reactors in the SMR design would require minimal dewatering as compared to a conventional nuclear power plant. Dewatering would be conducted in compliance with applicable regulations and permits. Potable water needs for human consumption, sanitary needs, fire protection, and concrete batch plant operations would be met by municipal supply or water supply well in compliance with applicable construction and permitted withdrawal requirements. The plant would be sited for access to a suitable water source with sufficient flow to avoid water use conflicts. Groundwater and surface water use impacts from construction and operation would be SMALL.

Construction of the SMR nuclear plant, cooling towers, and transmission lines could result in erosion and sediment. A construction stormwater permit would be obtained for the construction activities and adherence to the permit conditions and required BMPs would mitigate impacts to surface water resources. Through compliance with permit conditions, adherence to stormwater regulations, and applying SWPPP mitigation and BMPs, construction-related impacts on surface water quality would be SMALL.

The SMR plant would have MDCTs for cooling using a surface water source for makeup water. When operated with wet cooling, the NuScale design is estimated to consume 740 gallons per MWh, which falls within the water consumption of conventional nuclear power plants and other large-scale thermoelectric plants (NuScale 2021b). A 12-module plant's annual water consumption for operations would be approximately 5.7 billion gallons.

The SMR plant would operate in compliance with a state issued NPDES permit, any applicable industrial stormwater permit, state, and local surface and groundwater withdrawal requirements, and have spill prevention and response procedures in place, minimizing impacts to groundwater and surface water quality. The impact to surface water and groundwater would be expected to be SMALL.

7.2.3.3.7 Ecological Resources (Terrestrial and Aquatic)

Terrestrial

For site selection, Xcel Energy would conduct any necessary ecological surveys with a focus on threatened and endangered species and avoiding high-quality habitats. Construction on a greenfield site would require land clearing up to 130 acres, which was discussed as a site size threshold criterion in Section 7.2.3.2.1. A new transmission corridor would require approximately 455 acres and would be maintained as a ROW. The impact of the SMR alternative to terrestrial ecology would be SMALL to MODERATE for construction. With the impacts to terrestrial ecology being nearly all attributable to land clearing and habitat removal during construction, the impacts of the SMR alternative attributable to operations would be SMALL.

Aquatic

A CWA Section 404 permit would be obtained as applicable and BMPs would be used to minimize water quality impacts. Discharges during operations would be in compliance with the plant's NPDES permit and any applicable industrial stormwater permit. Given site selection to avoid high-quality habitat and compliance with applicable permits, the aquatic resource impacts would be expected to be SMALL for construction and operations.

Special Status Species

For site selection, Xcel Energy would conduct any necessary ecological surveys for determine the presence/absence of protected species. Construction of the SMR alternative could require permanent removal of terrestrial habitat, and cooling water withdrawal and discharge could impact protected species if present. Given that site selection would take into account the presence of protected species, sites with the greatest potential for impacting protected species would be avoided and operations would be conducted in compliance with applicable environmental permits, the SMR alternative MAY AFFECT, but is NOT LIKELY to ADVERSELY AFFECT federally listed species.

7.2.3.3.8 Historic and Cultural Resources

Site selection and transmission corridor selection criteria would seek to avoid adversely affecting historic and cultural sites and traditional cultural properties. For those that could not be avoided, a mitigation plan could be implemented in concert with the SHPO and applicable Native American tribes. In the event of an inadvertent find during construction work stoppage protocols and notification of the SHPO would apply. Given these precautions, the SMR alternative there would be NO ADVERSE EFFECT to historic and cultural resources.

7.2.3.3.9 Socioeconomics

Socioeconomic Issues other than Transportation

The socioeconomic impacts of the SMR plant would be similar to other large industrial construction projects and have short- and long-term economic stimulus to the host county and region due to worker wages and tax payments. Beneficial socioeconomic impacts would range from SMALL to LARGE and be location dependent. Adverse socioeconomic impacts from increased use and demand for community services and infrastructure would be mitigated through tax revenues. Because the construction workforce for the SMR plant would be smaller and for a shorter duration than a conventional nuclear plant, the adverse impacts would be expected to be SMALL. An operations workforce size similar to that of a conventional nuclear plant would be expected (NRC 2019c).

Transportation

The impacts of transportation would be location dependent and significant impacts could be mitigated with roadways improvements and staggering work shifts. The construction workforce for a SMR plant would be smaller than a conventional nuclear power plant and the operations workforce would be similar or smaller. The transportation impacts would be mitigated as necessary to reduce impacts and would be expected to SMALL to MODERATE for construction and SMALL for operations.

7.2.3.3.10 Human Health

Impacts on human health from construction of a SMR plant would be similar to those associated with a large industrial facility construction project. Compliance with OSHA worker protection rules would prevent safety-related accidents. Operation of a SMR plant would also have similar impacts to that of other nuclear power plants and would operate within NRC effluent and dose regulations. Therefore, the human health impacts of the SMR alternative would be SMALL for construction and operations.

7.2.3.3.11 Environmental Justice

The potential for disproportionately high and adverse human health or environmental effects on minority or low-income populations through the pathways of soil, water, and air would be site dependent. However, compliance with applicable local, state, and federal permits and implementation of mitigation measures as appropriate would reduce the potential for environmental impacts to all populations, including environmental justice populations. Thus, no disproportionately high and adverse effect on minority or low-income populations would be expected from the construction and operation of a SMR plant.

7.2.3.3.12 Waste Management

Solid, liquid, and gaseous wastes generated during the construction of the SMR plant would be handled according to county, state, and federal regulations. and disposed at permitted offsite treatment or disposal facilities. Therefore, construction-related waste impacts would be SMALL.

The operation of the SMR plant would result in nonhazardous, hazardous, SNF, and radioactive waste. The nonhazardous and hazardous waste would be managed in compliance with state regulations and disposed of in permitted facilities. The non-radiological waste impacts from operations would be SMALL given Xcel Energy's compliance with regulations, use of permitted facilities, implementation of effective practices for waste minimization. Radioactive waste would be managed onsite, transported, and disposed of in permitted facilities in accordance with NRC, DOT, and state regulations. SNF would be managed onsite in accordance with NRC regulations. Therefore, environmental impacts for the SMR alternative associated with radioactive waste would be SMALL.

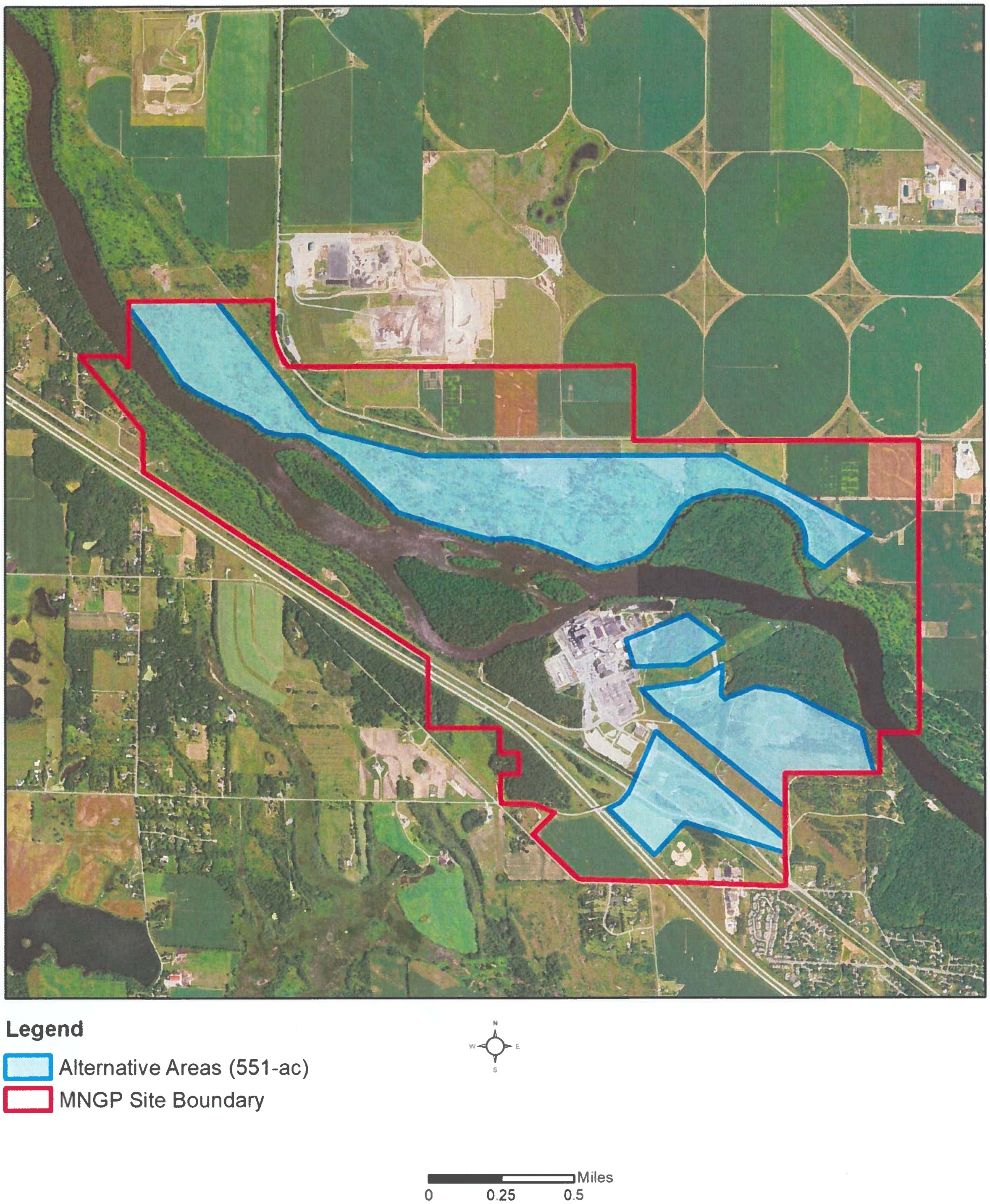


Figure 7.2-1 Potential Areas on the MNGP Site for Alternatives Solar Installation

7.3 Alternatives for Reducing Adverse Impacts

7.3.1 Alternatives Considered

The environmental impacts assessments presented in Chapter 4 identified no significant adverse effects that would require consideration of additional alternatives. Therefore, Xcel Energy concludes that the impacts associated with renewal of the MNGP OL would not require consideration of alternatives for reducing adverse impacts as specified in NRC Regulatory Guide 4.2, Revision 1 (NRC 2013b). This determination assumes the existing mitigation measures discussed in Section 6.2 adequately minimize and avoid environmental impacts associated with operating MNGP.

7.3.2 Environmental Impacts of Alternatives for Reducing Adverse Impacts

No additional alternatives were considered by Xcel Energy to reduce impacts because as determined in Chapter 4, the continued operation of MNGP does not result in significant adverse effects to the environment.

8.0 COMPARISON OF THE ENVIRONMENTAL IMPACT OF SUBSEQUENT LICENSE RENEWAL WITH THE ALTERNATIVES

To the extent practicable, the environmental impacts of the proposal and the alternatives should be presented in comparative form . . . . [10 CFR 51.45(b)(3)]

The proposed action is renewal of the MNGP OL, which would preserve the option to continue to operate MNGP to provide reliable baseload power throughout the proposed 20-year SPEO. Chapter 4 provides analyses of the environmental impacts for the proposed action. The proposed action is compared to the no-action alternative, which includes both the termination of operations and decommissioning of MNGP and reasonably foreseeable replacement of its baseload generating capacity. Decommissioning impacts are analyzed in the GEIS on decommissioning, NUREG-0586, Supplement 1 (NRC 2002). The termination of operations and decommissioning impacts of the proposed action are presented in Section 4.14.1.2. The energy alternatives component of the no-action alternative is described, and its impacts analyzed, in Chapter 7.

Table 8.0-1 summarizes the environmental impacts of the proposed action and the alternatives deemed reasonable for comparison purposes. Tables 8.0-2 and 8.0-3 provide a more detailed comparison.

In conclusion, there is no reasonable alternative that is environmentally preferable to the continued operation of MNGP. All alternatives capable of meeting the needs currently served by MNGP entail impacts greater than or equal to the proposed action of MNGP SLR. The continued operation of MNGP would create significantly less environmental impact than the construction and operation of new alternative generating capacity. In addition, the continued operation of MNGP will have a significant positive economic impact on Wright County through tax revenues paid by Xcel Energy for MNGP. Continued employment of plant workers will continue to provide economic benefits to the surrounding communities.

Table 8.0-1 Environmental Impacts Comparison Summary (Sheet 1 of 2)

Impact Area[a]	Proposed Action	No Action			
		Termination of Operations and Decommissioning[b]	Natural Gas and Renewables	Renewables and Storage	SMR
Land Use	SMALL	SMALL	MODERATE to LARGE	MODERATE to LARGE	SMALL to MODERATE
Visual Resources	SMALL	SMALL	SMALL to MODERATE	SMALL to MODERATE	SMALL
Air Quality	SMALL	SMALL	SMALL	SMALL	SMALL
Noise	SMALL	SMALL	SMALL to MODERATE (construction) SMALL (operations)	SMALL to MODERATE (construction) SMALL (operations)	SMALL
Geology and Soils	SMALL	SMALL	SMALL	SMALL	SMALL
Surface Water	SMALL	SMALL	SMALL	SMALL	SMALL
Groundwater	SMALL	SMALL	SMALL	SMALL	SMALL
Terrestrial	SMALL	SMALL	SMALL to MODERATE	MODERATE to LARGE	SMALL to MODERATE (construction) SMALL (operations)
Aquatic	SMALL	SMALL	SMALL	SMALL	SMALL
Special Status Species	NO EFFECT	(b)	MAY AFFECT, NOT LIKELY to ADVERSELY AFFECT	MAY AFFECT, NOT LIKELY to ADVERSELY AFFECT	MAY AFFECT, NOT LIKELY to ADVERSELY AFFECT
Historic and Cultural	NO ADVERSE EFFECT	NO ADVERSE EFFECT	NO ADVERSE EFFECT	NO ADVERSE EFFECT	NO ADVERSE EFFECT

Table 8.0-1 Environmental Impacts Comparison Summary (Sheet 2 of 2)

Impact Area[(a)]	Proposed Action	No Action			
		Termination of Operations and Decommissioning[(b)]	Natural Gas and Renewables	Renewables and Storage	SMR
Socioeconomics	SMALL	MODERATE to LARGE (termination) SMALL (decommissioning)	SMALL to MODERATE beneficial	SMALL to MODERATE beneficial	SMALL adverse (construction) SMALL to LARGE beneficial (construction and operations)
Transportation	SMALL	SMALL	SMALL	SMALL	SMALL to MODERATE (construction) SMALL (operations)
Human Health	SMALL	SMALL	SMALL	SMALL	SMALL
Environmental Justice	No disproportionately high and adverse effects	(b)	No disproportionately high and adverse effects	No disproportionately high and adverse effects	No disproportionately high and adverse effects
Waste Management	SMALL	SMALL	SMALL	SMALL	SMALL

a. As defined in 10 CFR Part 51, Subpart A, Appendix B, Table B-1, Footnote 3:

SMALL: Environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource.

MODERATE: Environmental effects are sufficient to alter noticeably, but not to destabilize, important attributes of the resource.

LARGE: Environmental effects are clearly noticeable and are sufficient to destabilize important attributes of the resource.

b. NUREG-0586 Supplement 1 (NRC 2002), the decommissioning GEIS, identifies this resource area as requiring a site-specific analysis based on site conditions at the time of decommissioning, as well as the proposed decommissioning method and activities. Decommissioning would at a minimum occur after the expiration of the current license term. The magnitude of impacts could vary widely based on site-specific conditions at the time and analysis of special status species and/or their habitat(s), a consideration of their presence or their habitats' presence, and environmental justice analysis, the potential for disproportionately high and adverse impacts from the impacts of decommissioning being experienced by minority or low-income populations as determined by the most recent USCB decennial census data when the alternative is implemented. Thus, the applicant cannot forecast a level of impact for this resource area.

Table 8.0-2 Alternatives Features Comparison Summary

	Natural Gas and Renewables	Renewables and Storage	SMR
Summary of Alternative	Two CTs combined capacity of 750 MWe; three solar installations combined capacity of 200 MWe; 750 MWe supplied by wind turbines; purchased power, additional generation from existing natural gas plants (Section 7.2.3.1).	11 solar installations combined capacity of 700 MWe; 300 MW lithium-ion battery storage, 950 MWe supplied by wind turbines; purchased power, occasional additional generation from existing natural gas plants (Section 7.2.3.2).	9-12 unit plant with generation capacity comparable to MNGP generation (Section 7.2.3.3).
Location	CTs: existing power plant sites or greenfield sites in Minnesota. Solar: one onsite and two offsite in Minnesota. Wind: offsite in Minnesota (Section 7.2.3.1).	Solar: one onsite and 10 offsite with battery storage in Minnesota. Wind: offsite in Minnesota (Section 7.2.3.2).	Greenfield site in Xcel Energy service area (Section 7.2.3.3.1).
Cooling System	CTs: Closed-cycle cooling with MDCTs) (Section 7.2.3.1). Solar and Wind: No cooling system required.	Solar and Wind: No cooling system required.	Closed-cycle cooling with MDCTs (Section 7.2.3.3).
Land Requirements	CTs: 40 acres plus 455 acres for transmission for each CT Solar: 588 acres onsite and two sites of 477 acres each and each with 455 acres for transmission Wind: permanent footprint of 555 acres, construction footprint of 1,853 acres and 2,727 acres for transmission (Section 7.2.3.1).	Solar: 588 acres onsite and 10 sites of 500 acres each and each with 455 acres for transmission. Wind: permanent footprint of 666 acres, construction footprint of 2,223 acres and 2,727 acres for transmission (Section 7.2.3.2).	130 acres for plant, 455 acres for transmission (Section 7.2.3.3.1).
Workforce	CTs: several hundred for more than a year for construction and 150 operational workers for each site. Solar and Wind: construction workforce few hundred for less than one year; operational workforce would small not a quantifiable impact on the local economy. (Section 7.2.3.1.9)	Solar and Wind: construction workforce few hundred for less than one year; operational workforce would small not a quantifiable impact on the local economy. (Section 7.2.3.2.9)	Less than conventional nuclear plant for construction, similar for operations (Section 7.2.3.3.9).

Table 8.0-3 Environmental Impacts Comparison Detail (Sheet 1 of 16)

Land Use	
Proposed Action	**SMALL** for onsite and offsite land use issues. See Chapter 4 for analyses. Offsite land use in transmission line rights-of-way is not applicable.
Termination of Operations and Decommissioning	Only the incremental increases in the impacts of termination of plant operations and decommissioning attributable to continued operation during the proposed SPEO is within the scope of this issue. No onsite land use or significant offsite land use attributable to MNGP operations are expected. See Section 4.14 for assessment. **SMALL** from NRC generic decommissioning analysis**:** Temporary onsite land use changes during decommissioning are anticipated to be comparable to changes that occur during construction and operations and would not require additional land. Temporary changes in onsite land use would not change the fundamental use of the reactor site. (NRC 2013a)
Natural Gas and Renewables	**MODERATE to LARGE**: Two CTs, two offsite solar installations, 750 MW of wind at greenfield sites and their associated new transmission and pipeline corridors would require more than 6,000 acres to be converted to energy infrastructure. This acreage would impact many landowners and adjacent properties including residences.
Renewables and Storage	**MODERATE to LARGE**: Ten offsite solar installations, 950 MW of wind at greenfield sites and their associated new transmission corridors would require about 13,000 acres to be converted to energy infrastructure. This acreage would impact many landowners and adjacent properties including residences.
SMR	**SMALL to MODERATE**: SMR plant at a greenfield site and its associated new transmission corridor would require about 600 acres to be converted to energy infrastructure. This acreage would impact many landowners and adjacent properties including residences.

Table 8.0-3 Environmental Impacts Comparison Detail (Sheet 2 of 16)

Visual Resources	
Proposed Action	**SMALL:** See Chapter 4 for analysis.
Termination of Operations and Decommissioning	Only the incremental increases in the impacts of termination of plant operations and decommissioning attributable to continued operation during the proposed SPEO is within the scope of this issue. No onsite land use or significant offsite land use attributable to MNGP operations are expected. See Section 4.14 for assessment. No additional structures were proposed to continue operation for another 20 years. See Section 4.14 for assessment. **SMALL** from NRC generic decommissioning analysis**:** Terminating nuclear power plant operations would not change the visual appearance of the nuclear power plant until demolition of structures. Decommissioning activities would be localized and reduced with implementation of BMPs. (NRC 2013a)
Natural Gas and Renewables	**SMALL to MODERATE:** Site selection would avoid scenic views and impacts to cultural resources for the multiple greenfield sites. Wind turbines would comply with FAA lighting requirements.
Renewables and Storage	**SMALL to MODERATE:** Site selection would avoid scenic views and impacts to cultural resources for the multiple greenfield sites. Wind turbines would comply with FAA lighting requirements.
SMR	**SMALL:** With selection of a site that is compatible with existing county-level or planning region land use plans, the appearance would be expected to be compatible with the existing or planned nearby developments and compliance with applicable local zoning requirements for setbacks and buffers would mitigate the plant's visual impact. Plumes from the MDCTs can affect the surrounding area with lowered visibility due to fogging and light scatter at night.

Table 8.0-3 Environmental Impacts Comparison Detail (Sheet 3 of 16)

Air Quality	
Proposed Action	**SMALL:** for air quality impact and air quality effects of transmission lines issues. See Chapter 4 for analyses.
Termination of Operations and Decommissioning	Only the incremental increases in the impacts of termination of plant operations and decommissioning attributable to continued operation during the proposed SPEO is within the scope of this issue. There are no additional emission sources expected to be added to the MNGP. See Section 4.14 for assessment. **SMALL** from NRC generic decommissioning analysis**:** After termination of operations, air emissions from the nuclear power plant would continue, but at greatly reduced levels. The most likely impact of decommissioning on air quality is degradation by fugitive dust. Use of BMPs, such as seeding and wetting, can be used to minimize fugitive dust. (NRC 2013a)
Natural Gas and Renewables	**SMALL:** Construction impacts would be temporary. Emissions being maintained within state regulatory limits and fugitive dust would be minimized with BMPs. The CTs would be operated as peaking plants, minimizing the overall emissions and emissions would be within permit limits. The solar and wind installations would not release any air emissions during operation.
Renewables and Storage	**SMALL:** Construction impacts would be temporary. Emissions being maintained within state regulatory limits. The solar, storage, and wind installations would not release any air emissions during operation.
SMR	**SMALL:** Construction impacts would be temporary; operational impacts would be minor, and emissions being maintained within regulatory limits. The MDCTs would have air emissions and atmospheric effects from drift and plumes. The plant would be operated in compliance with its air permit.

Table 8.0-3 Environmental Impacts Comparison Detail (Sheet 4 of 16)

Noise	
Proposed Action	**SMALL:** for noise issue. See Chapter 4 for analysis.
Termination of Operations and Decommissioning	Only the incremental increases in the impacts of termination of plant operations and decommissioning attributable to continued operation during the proposed SPEO is within the scope of this issue. No additional impacts related to noise are expected. See Section 4.14 for assessment. **SMALL** from NRC generic decommissioning analysis**:** During decommissioning noise would generally be far enough away from sensitive receptors outside the plant boundaries that the noise would be attenuated to nearly ambient levels and would be scarcely noticeable offsite. Noise abatement procedures could also be used during decommissioning in order to reduce noise. (NRC 2013a)
Natural Gas and Renewables	**SMALL to MODERATE (construction):** Noise impacts from land clearing and construction would range from SMALL to MODERATE dependent on proximity to sensitive receptors. **SMALL (operations):** The CTs would be sited in locations compatible with local/region land use plans and comply with buffer requirements. During operations, the wind turbines would emit sound. Turbine sound is typically one of the greatest nuisance impacts associated with wind power. No noise impacts would occur from operation of the solar installations.
Renewables and Storage	**SMALL to MODERATE (construction):** Noise impacts from land clearing and construction would range from SMALL to MODERATE dependent on proximity to sensitive receptors. **SMALL (operations):** During operations, the wind turbines would emit sound. Turbine sound is typically one of the greatest nuisance impacts associated with wind power. No noise impacts would occur from operation of the solar installations.
SMR	**SMALL:** Noise impacts from construction activities would be intermittent and last only through the duration of construction. Construction activities resulting in offsite sound levels above guidelines would be temporary. Compliance with applicable local zoning requirements for setbacks and buffers and any local noise ordinances would mitigate construction noise as well as operation noise impacts on surrounding properties and nearby sensitive receptors. If cooling tower sound levels are estimated to have offsite impacts or be greater than noise ordinance or guidelines, mitigation measures, such as modifications to fans and motors or the installation of barriers could be implemented.

Table 8.0-3 Environmental Impacts Comparison Detail (Sheet 5 of 16)

Geology and Soils	
Proposed Action	**SMALL:** geology and soil issue. See Chapter 4 for analysis.
Termination of Operations and Decommissioning	Only the incremental increases in the impacts of termination of plant operations and decommissioning attributable to continued operation during the proposed SPEO is within the scope of this issue. With no construction planned during the proposed SPEO, there would be no additional impacts to geology and soils are expected. See Section 4.14 for assessment. **SMALL** from NRC generic decommissioning analysis**:** Termination of nuclear plant operations is not expected to impact geology and soils. Erosion problems could be mitigated by using BMPs during decommissioning. Site geologic resources would not be affected by decommissioning. (NRC 2013a)
Natural Gas and Renewables	**SMALL:** Construction activities would be localized and minimized with implementation of BMPs; land disturbance activities during operations would be conducted in compliance with a stormwater permit and associated BMPs.
Renewables and Storage	**SMALL:** Construction activities would be localized and minimized with implementation of BMPs; land disturbance activities during operations would be conducted in compliance with a stormwater permit and associated BMPs.
SMR	**SMALL:** Construction activities would be localized and minimized with implementation of BMPs; land disturbance activities during operations would be conducted in compliance with a stormwater permit and associated BMPs.

Table 8.0-3 Environmental Impacts Comparison Detail (Sheet 6 of 16)

Surface Water	
Proposed Action	**SMALL:** for all surface water issues other than altered salinity gradients and altered thermal stratification of lakes which are not applicable. See Chapter 4 for analyses.
Termination of Operations and Decommissioning	Only the incremental increases in the impacts of termination of plant operations and decommissioning attributable to continued operation during the proposed SPEO is within the scope of this issue. No significant surface water impacts are anticipated during the SPEO. See Section 4.14 for assessment. **SMALL** from NRC generic decommissioning analysis**:** The NRC concluded that the impacts on water use and water quality from decommissioning would be SMALL for all plants. (NRC 2013a)
Natural Gas and Renewables	**SMALL:** Water needs would be met in compliance with any required water withdrawal permits and applicable regulations. Water quality impacts could result from erosion and runoff associated with construction. These temporary impacts would be minimized by implementation of BMPs and compliance with stormwater permits and applicable regulations. Once in operation, the installations would be operated in compliance with stormwater regulations and the CTs would be operated in compliance with their NPDES permits.
Renewables and Storage	**SMALL:** Water needs would be met in compliance with any required water withdrawal permits and applicable regulations. Water quality impacts would be minimized by implementation of BMPs and compliance with stormwater permits and applicable regulations.
SMR	**SMALL:** Potable water needs for human consumption, sanitary needs, fire protection, and concrete batch plant operations would be met by municipal supply or water supply well in compliance with applicable construction and permitted withdrawal requirements. The plant would be sited for access to a suitable water source with sufficient flow to avoid water use conflicts. Water quality impacts would be minimized through adherence to permit requirements and implementation of BMPs.

Table 8.0-3 Environmental Impacts Comparison Detail (Sheet 7 of 16)

Groundwater	
Proposed Action	**SMALL:** for all groundwater issues with the exception of groundwater quality degradation for plants with cooling ponds in salt marches which is not applicable to MNGP. See Chapter 4 for analyses.
Termination of Operations and Decommissioning	Only the incremental increases in the impacts of termination of plant operations and decommissioning attributable to continued operation during the proposed SPEO is within the scope of this issue. No significant groundwater impacts are anticipated. See Section 4.14 for assessment. **SMALL** from NRC generic decommissioning analysis**:** Decommissioning activities include some that may affect groundwater quality through the infiltration of water used for various purposes (e.g., cooling of cutting equipment, decontamination spray, and dust suppression). BMPs are expected to be employed as appropriate to collect and manage these waters. Groundwater chemistry may change as rainwater infiltrates through rubble. The increased pH could promote the subsurface transport of radionuclides and metals. However, this effect is expected to occur only over a short distance as a function of the buffering capacity of soil. Offsite transport of groundwater contaminants is not expected. (NRC 2013a)
Natural Gas and Renewables	**SMALL:** Water needs for construction and operation would be met in compliance with any required water withdrawal permits and applicable regulations. Compliance with stormwater permits and BMPs would address the potential for infiltration of pollutants in run-off and spill response.
Renewables and Storage	**SMALL:** Water needs for construction and operation would be met in compliance with any required water withdrawal permits and applicable regulations. Compliance with stormwater permits and BMPs would address the potential for infiltration of pollutants in run-off and spill response.
SMR	**SMALL:** Minimal dewatering expected. Compliance with permit conditions, adherence to stormwater regulations, and applying SWPPP mitigation and BMPs would minimize impacts during construction and operation.

Table 8.0-3 Environmental Impacts Comparison Detail (Sheet 8 of 16)

Terrestrial	
Proposed Action	**SMALL:** for all terrestrial ecology issues. See Chapter 4 for analyses.
Termination of Operations and Decommissioning	Only the incremental increases in the impacts of termination of plant operations and decommissioning attributable to continued operation during the proposed SPEO is within the scope of this issue. No significant impacts to terrestrial resources are expected. See Section 4.14 for assessment. **SMALL** from NRC generic decommissioning analysis**:** The termination of nuclear power plant operations would reduce some impacts and eliminate others. Impacts from systems that continue operating to support other units (i.e., where the license term for each unit does not end at the same time) on the plant site may continue to affect terrestrial biota, but at a reduced level of impact. Areas disturbed or used to support decommissioning are within the operational areas of the site and are also within the protected area. Decommissioning activities conducted within the operational areas are not expected to have a detectable impact on important terrestrial resources. (NRC 2013a)
Natural Gas and Renewables	**SMALL to MODERATE:** The more than 6,000 acres needed for the permanent footprints of the new installations and transmission lines/pipelines would impact terrestrial habitats. Site selection would avoid wetlands and other high-quality terrestrial habitats such as critical habitat for threatened and endangered species and habitats identified as a priority for preservation. The operation of the wind turbines could affect avian and bat species.
Renewables and Storage	**MODERATE to LARGE** About 13,000 acres would be needed for the permanent footprints of the new installations and transmission which would impact terrestrial habitats. Site selection would avoid wetlands and other high-quality terrestrial habitats such as critical habitat for threatened and endangered species and habitats identified as a priority for preservation. The operation of the wind turbines could affect avian and bat species.
SMR	**SMALL to MODERATE:** For site selection, ecological surveys would be conducted with a focus on threatened and endangered species and avoiding high-quality habitats. Construction on a greenfield site would require land clearing with the extent being up to 130 acres. A new transmission corridor would require approximately 455 acres.

Table 8.0-3 Environmental Impacts Comparison Detail (Sheet 9 of 16)

Aquatic	
Proposed Action	**SMALL:** for all aquatic ecology issues. See Chapter 4 for analyses
Termination of Operations and Decommissioning	Only the incremental increases in the impacts of termination of plant operations and decommissioning attributable to continued operation during the proposed SPEO is within the scope of this issue. No significant impacts to aquatic resources are expected. See Section 4.14 for assessment. **SMALL** from NRC generic decommissioning analysis**:** The termination of nuclear power plant operations would reduce some impacts and eliminate others. Impacts from systems that continue operating to support other units (i.e., where the license term for each unit does not end at the same time) on the plant site may continue to affect aquatic biota, but at a reduced level of impact. Some aquatic organisms may have become established in the mixing zone because of the warmer environment, and these organisms likely would be adversely affected as the water temperature cooled and the original conditions were restored within the body of water. The NRC concluded that for facilities at which the decommissioning activities would be limited to existing operational areas, the potential impacts on aquatic resources would be SMALL. (NRC 2013a)
Natural Gas and Renewables	**SMALL:** Adherence to permits and implementation of BMPs would minimize impacts on aquatic ecosystems during construction and operation.
Renewables and Storage	**SMALL:** Adherence to permits and implementation of BMPs would minimize impacts on aquatic ecosystems during construction and operation. Use of closed-cycle cooling system would minimize impingement and entrainment of aquatic organisms and the CTs would be operated as peaking plants, requiring smaller volumes of withdrawals and discharges than plants operated more hours. The use or water resources for cooling tower makeup and blowdown for the CTs would comply with their NPDES permits.
SMR	**SMALL:** Adherence to permits and implementation of BMPs would minimize impacts on aquatic ecosystems during construction. Use of closed-cycle cooling system would minimize impingement and entrainment of aquatic organisms.

Table 8.0-3 Environmental Impacts Comparison Detail (Sheet 10 of 16)

Special Status Species	
Proposed Action	**MAY AFFECT, NOT LIKELY to ADVERSELY AFFECT:** Suitable habitat for federal and state-protected species is present on the MNGP site or in the vicinity. No SLR-related refurbishment or other SLR-related construction activities have been identified. Administrative controls are in place at MNGP to ensure that operational changes or construction activities are reviewed, and the impacts minimized through implementation of BMPs.
Termination of Operations and Decommissioning	Only the incremental increases in the impacts of termination of plant operations and decommissioning attributable to continued operation during the proposed SPEO is within the scope of this issue. Decommissioning would at a minimum occur after the expiration of the current license term. The magnitude of impacts could vary widely based on site-specific conditions at the time of decommissioning regarding the presence of special status species or their habitats' presence. Thus, MNGP cannot forecast a level of impact for this resource area.
Natural Gas and Renewables	**MAY AFFECT, NOT LIKELY to ADVERSELY AFFECT:** The more than 6,000 acres needed for the permanent footprints of the new installations and transmission/pipelines would impact terrestrial habitats. Site selection would avoid wetlands and other high-quality terrestrial habitats such as critical habitat for threatened and endangered species and habitats identified as a priority for preservation. The operation of the wind turbines could affect avian and bat species. Following USFWS and guidance for siting would minimize impacts and compliance with any incidental take permits would minimize impacts to special status species.
Renewables and Storage	**MAY AFFECT, NOT LIKELY to ADVERSELY AFFECT:** The about 13,000 acres needed for the permanent footprints of the new installations and transmission would impact terrestrial habitats. Site selection would avoid wetlands and other high-quality terrestrial habitats such as critical habitat for threatened and endangered species and habitats identified as a priority for preservation. The operation of the wind turbines could affect avian and bat species. Following USFWS and guidance for siting would minimize impacts and compliance with any incidental take permits would minimize impacts to special status species.
SMR	**MAY AFFECT, NOT LIKELY to ADVERSELY AFFECT:** For site selection, ecological surveys would be conducted with a focus on threatened and endangered species and avoiding high-quality habitats. Construction on a greenfield site would require land clearing with the extent being up to 130 acres. A new transmission corridor would require approximately 455 acres.

Table 8.0-3 Environmental Impacts Comparison Detail (Sheet 11 of 16)

Historic and Cultural Resources	
Proposed Action	**NO ADVERSE EFFECT:** No license renewal-related refurbishment or construction activities identified. MNGP has no plans to conduct such soil intrusive activities at any location outside of the MNGP site boundary during the SPEO. Due to topography, vegetation, and distance, no potential adverse effects to any NRHP-listed properties are expected as a result of the continued operation of MNGP, including viewshed, aesthetic, and noise impacts.
Termination of Operations and Decommissioning	Only the incremental increases in the impacts of termination of plant operations and decommissioning attributable to continued operation during the proposed SPEO is within the scope of this issue. No significant impacts to historic and cultural resources are expected. See Section 4.14 for assessment. **SMALL** from NRC generic decommissioning analysis**:** The termination of nuclear plant operations would not affect historic or cultural resources. The NRC conducted an analysis of the potential effects of decommissioning on historic and archaeological (cultural) resources and found that the potential onsite impacts at sites where the disturbance of lands would not go beyond the operational areas would be SMALL. (NRC 2013a)
Natural Gas and Renewables	**NO ADVERSE EFFECT:** No cultural resources have been recorded within the MNGP site, so development of an onsite solar installation would not impact cultural resources. The site selection process that would be used for offsite installations and supporting transmission lines/pipelines would have criteria to avoid locations whose development would impact cultural resources.
Renewables and Storage	**NO ADVERSE EFFECT:** No cultural resources have been recorded within the MNGP site, so development of an onsite solar installation would not impact cultural resources. The site selection process that would be used for offsite installations and supporting transmission lines/pipelines would have criteria to avoid locations whose development would impact cultural resources.
SMR	**NO ADVERSE EFFECT:** The site selection process would have criteria to avoid locations whose development would adversely impact cultural resources.

Table 8.0-3 Environmental Impacts Comparison Detail (Sheet 12 of 16)

Socioeconomics	
Proposed Action	**SMALL:** for all socioeconomic issues. See Chapter 4 for analyses.
Termination of Operations and Decommissioning	When a nuclear power plant is closed and decommissioned, most of the important socioeconomic impacts will be associated with the plant closure rather than with the decommissioning process (NRC 2002). Only the incremental increases in the impacts of termination of plant operations and decommissioning attributable to continued operation during the proposed SPEO is within the scope of this issue. The proposed action does not include additional workers. See Section 4.14 for assessment. **MODERATE to LARGE** from NRC generic decommissioning analysis**:** Terminating nuclear plant operations would have a noticeable adverse impact on socioeconomic conditions in the region around the nuclear power plant. There would be immediate socioeconomic impacts from the loss of jobs. The impacts from the loss or reduction of tax revenue due to the termination of plant operations on community and public education services could range from SMALL to LARGE. (NRC 2013a) The tax payments attributable to MNGP provide a significant beneficial economic impact to Wright County and its taxing jurisdictions. Therefore, the loss of jobs would affect a small percentage of the population, but the tax revenue loss would have a noticeable and potentially destabilizing impact on Wright County. **SMALL** from NRC generic decommissioning analysis: Decommissioning itself has no impact on the tax base and no detectable impact on the demand for public services. The impacts of decommissioning on socioeconomics are neither detectable nor destabilizing; therefore, the impacts on socioeconomics are SMALL. (NRC 2002)
Natural Gas and Renewables	**SMALL to MODERATE (beneficial):** The construction and operation of the CTs and solar and wind components and supporting transmission lines/pipelines would create construction jobs that would give a temporary boost to the local economies. Construction could increase traffic but could be mitigated with staggering shifts as needed. Each CT would have an operations workforce (<150 workers) and the solar and wind installations would be operated with few staff. Local communities would benefit from property tax or lease payments.
Renewables and Storage	**SMALL to MODERATE (beneficial):** The construction and operation of the solar and wind installations and supporting transmission lines would create construction jobs that would give a temporary boost to the local economies. Construction could increase traffic but could be mitigated with staggering shifts as needed. The solar and wind installations would be operated with few staff. Local communities would benefit from property tax or lease payments.

Table 8.0-3 Environmental Impacts Comparison Detail (Sheet 13 of 16)

Socioeconomics	
SMR	**SMALL to LARGE (beneficial) and SMALL (adverse)**: The construction and operations employment would provide a stimulus to the local economy (beneficial impact). The demand on community services from the construction workforce residing in the local community could have an adverse impact. The size of the construction workforce and duration of construction would be less than that of a conventional nuclear power plant. The impact of the short- and long-term economic stimulus to the host county and region due to worker wages and tax payments would be location dependent. **SMALL to MODERATE (construction traffic); SMALL (operations traffic):** Construction commuting would increase traffic and congestion on the local roadways. Transportation impacts would decrease after construction.

Table 8.0-3 Environmental Impacts Comparison Detail (Sheet 14 of 16)

Human Health	
Proposed Action	**SMALL**: for all human health issues. See Chapter 4 for analyses
Termination of Operations and Decommissioning	Only the incremental increases in the impacts of termination of plant operations and decommissioning attributable to continued operation during the proposed SPEO is within the scope of this issue. No significant human health impacts are expected, and human health impacts are not expected to be significantly increase with an SPEO. See Sections 4.9 and 4.14. **SMALL** from NRC generic decommissioning analysis**:** The human health impacts from physical, chemical, and microbiological hazards during the termination of plant operations and decommissioning would be SMALL for all plants. (NRC 2013a)
Natural Gas and Renewables	**SMALL:** Compliance with OSHA worker protection rules would control impacts on workers from construction activities and operations. The CTs would emit criteria air pollutants within permit limits and would be operated as peaking plants.
Renewables and Storage	**SMALL:** Compliance with OSHA worker protection rules would control impacts on workers from construction activities and operations.
SMR	**SMALL:** Compliance with OSHA worker protection rules would control impacts on workers at acceptable levels during construction and operation. The radiological human health impact would be SMALL due to compliance with NRC regulations and adherence to ALARA principles.

Table 8.0-3 Environmental Impacts Comparison Detail (Sheet 15 of 16)

Environmental Justice	
Proposed Action	**No disproportionately high and adverse impacts to minority and low-income populations:** Based on known pathways, there are no expected disproportionately high and adverse impacts on minority or low-income populations from the proposed action (Section 4.10.1.2.2).
Termination of Operations and Decommissioning	Termination of power plant operations and the resulting loss of jobs, income, and tax revenue could have a disproportionate effect on minority and low-income populations (NRC 2013a). Only the incremental increases in the impacts of termination of plant operations and decommissioning attributable to continued operation during the proposed SPEO is within the scope of this issue. Decommissioning would at a minimum occur after the expiration of the current license term. The magnitude of impacts could vary widely based on site-specific conditions at the time. Thus, MNGP cannot determine the potential for disproportionately high and adverse impacts from the impacts of decommissioning being experienced by minority or low-income populations.
Natural Gas and Renewables	**No disproportionately high and adverse impacts to minority and low-income populations:** Impacts during construction of new installations would be temporary and likely would result in no disproportionately high and adverse impacts to minority and low-income populations. Some minor environmental impacts would result from the construction from fugitive dust, but this impact would be temporary and short in duration. Socioeconomic impacts on minority and low-income population would consist of the short-term increase in worker expenditures at local businesses and potential rental housing shortages during the construction phase of the installations.
Renewables and Storage	**No disproportionately high and adverse impacts to minority and low-income populations:** Impacts during construction of new installations would be temporary and likely would result in no disproportionately high and adverse impacts to minority and low-income populations. Some minor environmental impacts would result from the construction from fugitive dust, but this impact would be temporary and short in duration. Socioeconomic impacts on minority and low-income population would consist of the short-term increase in worker expenditures at local businesses and potential rental housing shortages during the construction phase of the installations.
SMR	**No disproportionately high and adverse impacts to minority and low-income populations:** Disproportionately high and adverse human health or environmental effects on minority or low-income populations through the pathways of soil, water, and air would be site dependent. However, compliance with applicable local, state, and federal permits and implementation of mitigation measures as appropriate would reduce the potential for environmental justice impacts.

Table 8.0-3 Environmental Impacts Comparison Detail (Sheet 16 of 16)

Waste Management	
Proposed Action	**SMALL:** for all waste management issues. See Chapter 4 for analyses.
Termination of Operations and Decommissioning	Only the incremental increases in the impacts of termination of plant operations and decommissioning attributable to continued operation during the proposed SPEO is within the scope of this issue. No significant waste management issues are expected. See Section 4.14 for the assessment. **SMALL** from NRC generic decommissioning analysis**:** After termination of nuclear plant operations, there would be a period before the beginning of decommissioning when the reactor would be placed in a cold shutdown condition and maintained. The quantities of waste generated would be smaller than the quantities generated during either operations or decommissioning. The impacts associated with the management of LLRW, hazardous waste, mixed waste, and nonradioactive and nonhazardous waste during operations and decommissioning would be SMALL. (NRC 2013a)
Natural Gas and Renewables	**SMALL:** Construction-related waste would be properly characterized and disposed of at permitted offsite facilities; during operations, nonhazardous and hazardous would be managed in compliance with federal and state regulations and disposed of in permitted facilities.
Renewables and Storage	**SMALL:** Construction-related waste would be properly characterized and disposed of at permitted offsite facilities; during operations, nonhazardous and hazardous would be managed in compliance with federal and state regulations and disposed of in permitted facilities.
SMR	**SMALL:** Construction-related waste would be properly characterized and disposed of at permitted offsite facilities; during operations, nonhazardous, hazardous, and radioactive wastes would be managed in compliance with federal and state regulations and disposed of in permitted facilities.

9.0 STATUS OF COMPLIANCE

The environmental report shall list all federal permits, licenses, approvals, and other entitlements which must be obtained in connection with the proposed action and shall describe the status of compliance with these requirements. The environmental report shall also include a discussion of the status of compliance with applicable environmental quality standards and requirements including, but not limited to, applicable zoning and land-use regulations, and thermal and other water pollution limitations or requirements which have been imposed by federal, state, regional, and local agencies having responsibility for environmental protection. [10 CFR 51.45(d)]

9.1 MNGP Authorizations

Table 9.1-1 provides a summary of the authorizations held by MNGP for current plant operations. Authorizations in this context include any permits, licenses, approvals, or other entitlements that would continue to be in place, as appropriate, throughout the proposed SPEO, given their respective renewal schedules. Table 9.1-2 lists additional environmental authorizations and consultations related to the renewal of MNGP Unit 1 OL.

Table 9.1-1 Environmental Authorizations for Current MNGP Operations (Sheet 1 of 2)

Agency	Authority	Requirement	Number	Expiration Date	Authorized Activity
NRC	Atomic Energy Act [10 CFR Part 50]	MNGP license to operate Unit 1	DPR-22	Renewed: 11/8/2006 Expires: 9/8/2030	Operation of MNGP Unit 1.
MPCA	Clean Water Act Section 401 [33 USC 1341]	Certification of water quality standards	N/A	N/A	Section 401 Water Quality Certification issued by the state for operation of MNGP.
USACE	Clean Water Act Section 404 [33 USC 1344]	Regional general permit (Section 404)	RGP-003-MN	3/1/2023	Maintenance dredging in front of the intake apron on the Mississippi River.
Alliance for Uniform Hazmat Transportation Procedures	49 USC 5119	Uniform Program Credentials (Hazmat permit and registration)	UPM211635NV	3/31/2023	Hazardous material shipment.
Tennessee Department of Environment and Conservation (TDEC)	TDEC Rule 0400-20-10-.32	License to ship radioactive material	T-MN002-L21	12/31/2022	Shipment of radioactive material to a licensed disposal/processing facility in Tennessee.
Utah Department of Environmental Quality (UDEQ)	Utah Administrative Code R313-26	General site access permit for radioactive waste disposal	0209001562	10/18/2023	Delivery of radioactive waste to a land disposal facility located in Utah.
MPCA	Minnesota Rules Part 7045.0225	Hazardous waste generator license	MND000681639	6/30/2023	Authorizes facility to operate as a hazardous waste generator.
MPCA	Minnesota Statutes Chapters 115 and 116	NPDES permit	MN0000868	9/30/2012[(a)]	Discharges of wastewater to waters of the state.
MPCA	Minnesota Rules Part 7007.0150	Air emission permit	17100019-04	11/15/2018[(a)]	Operate air emission facility (four diesel generators, diesel fire pump, three flexible pumps, and heating boiler).

Table 9.1-1 Environmental Authorizations for Current MNGP Operations (Sheet 2 of 2)

Agency	Authority	Requirement	Number	Expiration Date	Authorized Activity
MPCA	Minnesota Rules Chapter 7150	Tank registration	Site ID: TS0051508	N/A	Underground storage tank registration.
MPCA	Minnesota Rules Chapter 7151	Tank registration	Site ID: TS0051508	N/A	Aboveground storage tank registration.
MDNR	Minnesota Statutes Chapter 103G	State dredging permit	1967-0743	3/14/2023	Maintenance dredging of sand and silt from discharge canal and intake skimmer area.
MDNR	Minnesota Statutes Chapter 103G.271	Water appropriations permit	67-0083	N/A	Groundwater withdrawals from Well #1 and Well #2.
MDNR	Minnesota Statutes Chapter 103G.272	Water appropriations permit	66-1172	N/A	Surface water withdrawals from the Mississippi River.
MDNR	Minnesota Statutes Section 97A.401	Division of Fish and Wildlife special permit	32875	12/31/2022 Renewal requested. (See Attachment D)	Collection of fish for scientific purposes.
MDNR	Minnesota Statutes Section 84D.11	Division of Ecological and Water Resources permit	511	12/31/2023	Transport of zebra mussels and other prohibited invasive species to Xcel Energy facilities or to a repair site for purposes of control, disposal, and maintenance of equipment.
City of Monticello	City of Monticello Ordinance Title V, Chapter 52	Sanitary Sewer Wastewater Discharge Agreement	N/A	N/A	Agreement to discharge domestic sanitary waste to the City of Monticello sanitary sewer collection system.

a. Permit has been administratively extended and remains in effect pending state review and approval of renewal application.

Table 9.1-2 Environmental Authorizations and Consultations for MNGP License Renewal

Agency	Authority	Requirement	Remarks
NRC	Atomic Energy Act [42 USC 2011 *et seq*.]	License renewal	Applicant for federal license must submit an ER in support of a license renewal application.
USFWS	Endangered Species Act, Section 7 [16 USC 1536]	Consultation	Requires federal agency issuing a license to consult with the USFWS, regarding federally protected species.
MPCA	Clean Water Act, Section 401 [33 USC 1341]	Certification	State-issued Section 401 certification for operation of MNGP (Attachment E).
Minnesota Historical Society	National Historic Preservation Act, Section 106	Consultation	Requires federal agency issuing a license to consider cultural impacts and consult with SHPO and/or tribal historic preservation officer.

9.2 Status of Compliance

MNGP has established control measures in place to ensure compliance with the authorizations listed in Table 9.1-1, including monitoring, reporting, and operating within specified limits. MNGP environmental compliance coordinators are responsible for monitoring and ensuring that the site complies with its environmental permits and applicable regulations. Monitoring and sampling results associated with the environmental programs are submitted to appropriate agencies, as specified in the permits and/or governing regulations.

9.3 Notices of Violations

Based on the review of records over the five-year period of 2016–2020 of various environmental programs and permits that MNGP is subject to and complies with, there have been eight NOVs issued to the facility by the NRC, federal (i.e., agencies other than the NRC), state, or local regulatory agencies.

An NOV was issued by the NRC for MNGP failing to correct oil leakage from the safety related HPCI system. On March 22, 2016, an HPCI oil leakage event resulted in a loss of the HPCI system safety function. The event was reported as a condition that could have prevented the fulfillment of a structure, system, or component to perform a mitigating function during an accident. The event was discovered during a dynamic flow test when an excessive amount of oil was observed leaking from a pipe nipple in the HPCI system. The NRC performed an inspection on September 1, 2016, and on September 15, 2016, issued an NRC Inspection Report with a preliminary "white" finding (low to moderate safety significance). On December 12, 2016, a NOV was issued by the NRC for failing to correct oil leakage from the safety-related HPCI system. This issue was entered into MNGP's corrective action program, and a root cause evaluation was performed. The oil leak on the system was repaired and the affected pipe nipples that were the source of the leak were replaced.

NRC staff completed a supplemental inspection on June 9, 2017, and concluded that the corrective actions MNGP had taken which included instituting a leak management program to ensure management and individuals are not tolerant of leaks by and applying more rigor to reviewing issues associated with safety-related and/or risk-significant equipment were sufficient to address the performance issues that led to the "white" finding. On July 21, 2017, the NRC issued a Supplemental Inspection Report and Assessment Follow-Up Letter that stated given MNGP's acceptable performance in addressing the failure to correct excessive oil leakage on the HPCI system, the white finding associated with this issue would only be considered in assessing plant performance for a total of four quarters in accordance with the guidance in Inspection Manual Chapter 0305, "Operating Reactor Assessment Program", and the NOV was closed.

Seven NOVs were issued by the MDH between August 2016 and January 2018 for carbon tetrachloride exceedance found in the water supply well for the SAF. As discussed in Section 3.6.4.2.2, a routine sampling by the MDH detected carbon tetrachloride in Well 10 at MNGP. The discovery led to the MDH taking quarterly samples from the well to assess compliance with drinking water standards. On August 4, 2016, the MDH issued its first NOV for carbon tetrachloride exceedance above the maximum contaminant level of 5.4 micrograms per liter (µg/L). MNGP stopped using the well for potable water, and started supplying the SAF building with water from Well 1 which was already serving as the water supply for the SAB.

Based on continued sampling of water from Well 10, subsequent NOVs for carbon tetrachloride exceedance were issued November 15 and December 30, 2016; April 7, May 22, and December 29, 2017; with the final NOV issued January 31, 2018. During this time, a limited site investigation was conducted in conjunction with the MPCA to address water quality issues in the vicinity of Well 10, and it appeared decommissioning the well effectively eliminated the only known point of potential exposure. Based on the results of the groundwater investigation, the MPCA issued a no further action letter on May 1, 2020, and determined the issue did not trigger notification to the National Response Center, state site assessment staff for evaluation, or the MPCA commissioner for the placement of MNGP on the permanent list of priorities. An additional review of records was conducted in July 2022 and no new NOVs or non-compliances were noted for MNGP.

9.4 Remediation Activities

Based on reviews of records, no remediation activities for non-radiological or radioactive environmental concerns have been conducted between 2016–July, 2022.

9.5 Federal, State, and Local Regulatory Standards: Discussion of Compliance

This section contains information regarding environmental programs identified in the 2013 GEIS that may or may not be applicable to the MNGP site, and the current status of compliance with each program.

9.5.1 Atomic Energy Act

9.5.1.1 Radioactive Waste

As discussed in Section 2.2.6, MNGP has radioactive waste stream handling and shipping procedures. As a generator of both LLRW and spent fuel, MNGP is subject to and complies with provisions and requirements of the Low-Level Radioactive Waste Policy Act of 1985 and the Nuclear Waste Policy Act of 1982, as subsequently amended.

9.5.2 Clean Air Act

9.5.2.1 Air Permit

As discussed in Section 3.3.3.2, MNGP has a conditional permit to operate emergency diesel generators, diesel fired generator engine and flexible pumps, and a heating boiler. Prior to its expiration, Xcel Energy applied for a permit renewal in accordance with Minnesota

Administrative Rules Part 7001.0040. The application was deemed sufficient from the state and is awaiting final review and approval.

Operation of air emission sources is maintained within the emissions, opacity, fuel sulfur content, and fuel usage (as applicable) limits established in the air permit.

9.5.2.2 Chemical Accident Prevention Provisions [40 CFR Part 68]

MNGP is not subject to the risk management plan requirements described in 40 CFR Part 68 because the amount of regulated chemicals present onsite does not exceed the threshold quantities specified in the 40 CFR 68.130.

9.5.2.3 Stratospheric Ozone [40 CFR Part 82]

Under Title VI of the CAA, the EPA is responsible for several programs that protect the stratospheric ozone layer. Regulations promulgated by the EPA to protect the ozone layer are contained in 40 CFR Part 82. Refrigeration appliances and motor vehicle air conditioners are regulated under Section 608 and 609 of the CAA, respectively. A number of service practices, refrigerant reclamation, technician certification, and other requirements are covered by these programs. MNGP is in compliance with Sections of 608 and 609 of the CAA as amended in 1990 and the implementing of regulations codified in these regulations. The program to manage stationary refrigeration appliances at MNGP is described in Xcel Energy corporate procedures and is applicable to employees, vendors, and contractors for the management of refrigerants in compliance with federal regulations.

9.5.3 Clean Water Act

9.5.3.1 Water Quality (401) Certification

Federal CWA Section 401 requires applicants for a federal license to conduct an activity that might result in a discharge into navigable waters provided the licensing agency with a certification from the state the discharge will comply with applicable CWA requirements [33 USC 1341]. The MPCA issued a 401 certification to MNGP on March 6, 1973 (Attachment E) (NMC 2005).

9.5.3.2 NPDES Permit

NPDES Permit No. MN0000868, issued by the MPCA on June 29, 2009, authorizes the discharge of wastewaters into state waters. This permit is currently administratively extended. An application for renewal was submitted and received March 29, 2012.

The NPDES permit authorizes discharges from five outfalls. As discussed in Section 3.6.1.2.1, plant effluent is discharged to the Mississippi River via NPDES outfalls and requires monitoring of water quality and effluent limits. The outfalls are depicted in Figure 3.6-3 and their associated effluent limits are listed in Table 3.6-1. Based on review of its compliance history for the previous 6 years (2016–2021), MNGP has not received any NOVs or non-conformance notifications, and is compliant with regulations and conditions set forth in the permit.

9.5.3.3 Industrial Stormwater Discharge

As discussed in Section 3.6.1.2.2, stormwater discharges associated with MNGP industrial activities are regulated and controlled through NPDES Permit No. MN0000868. Stormwater discharges under this permit are not required to apply for coverage under the general stormwater permit for industrial activity. MNGP also implements and maintains a SWPPP for the facility that identifies potential sources of pollution that would reasonably be expected to affect the quality of stormwater and identifies BMPs used to prevent or reduce the pollutants in stormwater discharges. MNGP is in compliance with the terms and conditions of the NPDES permit as it relates to stormwater.

9.5.3.4 Sanitary Wastewaters

As discussed in Section 3.6.1.2.3, MNGP sanitary wastewater has been discharged to the City of Monticello wastewater treatment plant since 1983, and there is no sanitary wastewater treatment onsite. Discharges from the MNGP sanitary sewer system to the City of Monticello is covered under a separate agreement with the City of Monticello in accordance with city ordinance Title V, Chapter 52: Wastewater Disposal System. (ALPC 2021)

9.5.3.5 Spill Prevention, Control, and Countermeasures

The EPA's Oil Pollution Prevention Rule became effective January 10, 1974, and was published under the authority of Section 311(j)(1)(C) of the federal Water Pollution Control Act. The regulation has been published in 40 CFR Part 112, and facilities subject to the rule must prepare and implement an SPCC plan to prevent any discharge of oil into or upon navigable waters of the United States or adjoining shorelines. MNGP is subject to this rule and has a written SPCC plan that identifies and describes the procedures, materials, equipment, and facilities that are utilized at the station to minimize the frequency and severity of oil spills to meet the requirements of this rule.

9.5.3.6 Reportable Spills [40 CFR Part 110]

MNGP is subject to the reporting provisions of 40 CFR Part 110 as it relates to the discharge of oil in such quantities as may be harmful pursuant to Section 311(b)(4) of the federal Water Pollution Control Act. Any discharges of oil in such quantities that may be harmful to public health, welfare, or the environment must be reported to the EPA's national response center. Based on a review of site records from 2016–2021, there have been no releases at MNGP that have triggered this notification requirement.

9.5.3.7 Reportable Spills [Minnesota Statute 115.061]

MNGP is subject to the reporting provisions of Minnesota Statute 115.061. This reporting provision requires that discharge, accidental or otherwise, of any substance or material which, if not recovered, may cause pollution of waters of the state must be immediately reported to the MPCA and the Minnesota duty officer. In addition to reporting the incident, action must be taken to recover such substance or material as rapidly and as thoroughly as possible to minimize or abate pollution to waters of the state. (MLORS 2021d) Based on a review of records from 2016–2021, there has been one release at MNGP that triggered the notification requirement.

On July 16, 2019, a leak was discovered originating from a flange between two valves in the service water sodium hypochlorite injection system. Approximately 300 gallons of water leaked into the building containing the service water and circulating water sodium hypochlorite injections systems. The leak was secured upon discovery and most of the water was contained within the building by a berm. However, approximately one-half gallon of water reached a floor drain that returns to the Mississippi River through NPDES permitted Outfall SD001. The residual water within the berm was drained to barrels and repairs to the service water system were completed within two days of the spill. Subsequent sampling of the residual water verified that sodium hypochlorite constituted less than one percent. The release was initially reported to the Minnesota duty officer due to the small amount of water that was able to escape through the floor drain, and a release sampling report was submitted to the MPCA as part of the July 2019 discharge monitoring report. Though notified, the MPCA did not provide any comment or requirements concerning the incident, and no recordable spills or violations were reported in the NPDES permit compliance summary issued by the MPCA for the reporting period of October 1, 2018, to September 30, 2019.

9.5.3.8 Facility Response Plan

MNGP is not subject to the facility response plan risk requirement described in 40 CFR 112.20 because the facility does not transfer oil over water to or from vessels and does not store oil in quantities greater than one million gallons.

9.5.3.9 Section 404 Permit

As discussed in Section 3.6.1.2.4, MNGP holds both a USACE regional general permit (RGP-003-MN) and a MDNR state dredge permit (1967-0743) to conduct maintenance dredging activities in the intake canal and Mississippi River (Table 9.1-1). No other current operations at MNGP require a Section 404 permit. MNGP complies with regulatory requirements imposed by the USACE and MDNR as they relate maintenance dredging in federal jurisdictional waters.

9.5.4 Safe Drinking Water Act

As discussed in Section 3.6.3.2, potable water for MNGP is supplied by onsite groundwater wells. Domestic water for drinking and sanitary purposes is withdrawn from groundwater by seven water supply wells, two of which are regulated under a single appropriations permit (67-0083) by the MDNR (Table 9.1-1). MNGP's potable water system is registered with the MDH as PWS ID #5860036. As an operator of a non-transient non-community public water supply system, MNGP is subject to the Safe Drinking Water Act. State governments are approved to implement these rules and drinking water standards for the EPA through waterworks regulations. Minnesota has established regulations for drinking water standards and operation and maintenance of public water systems in Minnesota administrative rules, Chapter 4720. As an operator of a non-transient non-community water system, MNGP is required to have a certified operator to operate and maintain the system. MNGP maintains an onsite certified water systems operator; therefore, the site is in compliance with this program.

9.5.5 Endangered Species Act

Potential impacts to state and federally listed species were considered in MNGP's review and analysis in Section 4.6.6, and it was concluded that none would likely be adversely affected as result of the proposed SPEO.

Section 7 of the ESA requires federal agencies to ensure that their actions are not likely to jeopardize the continued existence of species that are listed, or proposed for listing, as endangered, or threatened. Depending on the action involved, the ESA requires consultation with the USFWS and with the National Marine Fisheries Service if marine or anadromous species could be affected. Although MNGP has invited comment from the USFWS (Attachment B) during the development of this ER, a more structured consultation process with these agencies may be initiated by the NRC per Section 7 of the ESA.

9.5.6 Migratory Bird Treaty Act

The MBTA makes it unlawful to pursue, hunt, take, capture, kill, or sell birds listed, and grants protection to any bird parts, including feathers, eggs, and nests. MNGP adheres to the MBTA and does not currently hold any MBTA-related permits (see Section 4.6.6.2).

9.5.7 Bald and Golden Eagle Protection Act

The BGEPA prohibits the take, transport sale, barter, trade, import and export, and possession of eagles, making it illegal for anyone to collect eagles and eagle part, nests, or eggs without a USFWS permit. As discussed in Section 4.6.6.2, bald eagles are known to nest within and in the vicinity of MNGP. There are currently no BGEPA permitting requirements associated with MNGP operations.

9.5.8 Magnuson-Stevens Fishery Conservation and Management Act

As discussed in Section 3.7.8.5, no EFH is located in the vicinity of MNGP. Therefore, there are no Magnuson-Stevens Fishery Conservation and Management Act restrictions applicable to MNGP operations.

9.5.9 Marine Mammal Protection Act

The Marine Mammal Protection Act prohibits, with certain exceptions, the "take" of marine mammals in U.S. waters and by U.S. citizens on the high seas, and the importation of marine mammals and marine mammal products into the United States. There are currently no Marine Mammal Protection Act permitting requirements associated with MNGP operations.

9.5.10 Coastal Zone Management Act

The federal Coastal Zone Management Act [16 USC 1451 et seq.] imposes requirements on an applicant for a federal license to conduct an activity that could affect a state's coastal zone. The act requires the applicant to certify to the licensing agency that the proposed activity would be consistent with the state's federally approved coastal management program [16 USC 1456(c)(3)(A)] and provide a copy to the state for concurrence. Implementation regulations that NOAA has promulgated indicate that the requirement is applicable to renewal of federal licenses for activities not previously reviewed by the state [15 CFR 930.541(b)(1)]. The regulation requires that the license applicant provides its certification to the federal licensing agency and a copy to the applicable state agency [15 CFR 930.57(a)].

The NRC's office of Nuclear Reactor Regulation has issued guidance to its staff regarding compliance with the act. This guidance acknowledges that Minnesota has a federally approved coastal management program (NRC 2013g). Minnesota's Lake Superior Coast Program includes 31 local government units and touches 189 miles of shoreline along Minnesota's north shore of Lake Superior (MDNR 2021p). MNGP is located in Wright and Sherburne counties, which are not included in the local government units that comprise the Coastal Zone Management Program. Therefore, MNGP is not located within the Minnesota coastal zone.

9.5.11 National Historic Preservation Act

Potential impacts on historical properties are discussed in Section 4.7. As discussed in Section 3.8.6, cultural resources on the MNGP site are protected by administrative procedures. The procedures ensure that cultural resources are protected from unauthorized removal and that, in the event ground disturbance is required, consultations with a qualified archaeologist, and if necessary, with the SHPO and tribal governments are conducted.

Section 106 of the NHPA requires federal agencies having the authority to license any undertaking, prior to issuing the license, to consider the effect of the undertaking on historic properties and to afford the Advisory Council on Historic Preservation an opportunity to comment on the undertaking. Council regulations provide for the establishment of an agreement with any SHPO to substitute state review for council review [35 CFR 800.7]. Although not required of an applicant by federal law or NRC regulation to provide early consultation for the Section 106 process, Xcel Energy contacted the Minnesota SHPO for informal consultation concerning MNGP SLR and the potential effects on cultural resources within the approximate 2,000-acre site and on historic properties within a 6-mile radius of MNGP (Attachment C). Native American groups recognized as potential stakeholders were also consulted by Xcel Energy with the opportunity for comment (Attachment C).

9.5.12 Resource Conservation and Recovery Act

9.5.12.1 Nonradioactive Waste

As a generator of hazardous and nonhazardous wastes, MNGP is subject to and complies with the RCRA and specific MPCA regulations contained in Minnesota Administrative Rules Part

7045.0243. MNGP is classified as a small quantity generator of hazardous waste. As a generator of hazardous waste, MNGP also maintains a hazardous waste generator identification number (Table 9.1-1). Based on review of its compliance history for the previous six years (2016–2021), MNGP has not received any NOVs for hazardous waste management.

9.5.12.2 Reportable Spills [40 CFR Part 262]

MNGP is subject to the reporting provisions of 40 CFR 262.34(d)(5)(iv)(C) as it relates to a fire, explosion, or other release of hazardous waste which could threaten human health outside the facility boundary or when the facility has knowledge that a spill has reached a surface water. Any such event must be reported to the EPA's national response center. Based on review of records for the previous six years (2016–2021), there have been no releases at MNGP that triggered this notification requirement.

9.5.12.3 Mixed Waste

Radioactive materials are regulated by the NRC under the Atomic Energy Act of 1954, and hazardous waste are regulated by the EPA under the RCRA of 1976. Management of radioactive waste at MNGP is discussed in Section 2.2.6.5. MNGP's management of its waste streams is in compliance with applicable regulatory standards and has not resulted in any NOVs for the 2016–2021 timeframe. MNGP will continue to store and dispose of hazardous and nonhazardous waste in accordance with EPA and state regulations and dispose of the wastes in appropriately permitted treatment and disposal facilities during the proposed SPEO.

9.5.12.4 Underground Storage Tanks [Minnesota Rules Chapter 7150]

MNGP has one underground storage tank onsite registered with the MPCA. The 20,000-gallon tank contains fuel oil for the heating boiler. Other underground storage tanks onsite are exempt from registration in accordance with Minnesota Rules Part 7150.0010, Subpart 6D. (MLORS 2021e)

9.5.12.5 Aboveground Storage Tanks [Minnesota Rules Chapter 7151]

MNGP has 17 aboveground storage tanks onsite, with capacities ranging from 550 gallons to 10,000 gallons. The aboveground storage tanks contain diesel fuel, gasoline blends, lubricating oils, and other unspecified chemicals, and are all registered with the MPCA.

9.5.12.6 Reportable Spills [Minnesota Statutes Section 115.061]

MNGP is subject to the reporting provision of Minnesota Statutes Section 115.061(b) for reporting a leak or spill of more than five gallons of petroleum (MLORS 2021d; MPCA 2021i). Any such even must be reported to the Minnesota duty officer. Based on a review of site records from 2016–2021, no reportable aboveground storage tank or underground storage tank releases of hazardous substances or petroleum products requiring reporting under this regulation have occurred.

9.5.13 Pollution Prevention Act

In accordance with RCRA Section 3002(b) and 40 CFR 262.27, a small or large quantity generator must certify to the appropriate statement on the uniform hazardous waste manifest required to accompany each hazardous waste shipment that there is a waste minimization program. MNGP meets this requirement, as procedural measures are in place to minimize hazardous waste generated to the maximum extent practical.

9.5.14 Federal Insecticide, Fungicide and Rodenticide Act

The Federal Insecticide, Fungicide, and Rodenticide Act requires that pesticides distributed or sold in the United States must be registered (licensed) by the EPA. Commercially available EPA-registered herbicides, insecticides and rodenticides are applied by licensed contractors as needed. MNGP is in compliance with the requirements of this act.

9.5.15 Toxic Substances Control Act

The Toxic Substances Control Act of 1976 regulates PCBs [40 CFR Part 761] and asbestos [40 CFR Part 763], both of which may be present at MNGP. MNGP has procedures in place for the management, removal, and disposal of PCB and asbestos to ensure compliance with state and federal regulations. MNGP is in compliance with PCB and asbestos regulations applicable to the facility.

9.5.16 Hazardous Materials Transportation Act

Because MNGP ships hazardous materials regulated by the DOT offsite, the facility is subject to and complies with the applicable requirements of the Hazardous Materials Transportation Act described in Title 49 of the CFR, including the requirement to possess a current hazardous materials certificate of registration. As presented in Table 9.1-1, MNGP is registered with Alliance for Uniform Hazmat Transportation Procedures program and maintains Uniform Program Credentials. In addition, MNGP maintains and complies with the permits issued by TDEC and UDEQ for shipping radioactive material to a licensed disposal/processing facility within the states of Tennessee and Utah (Table 9.1-1).

9.5.17 Emergency Planning and Community Right-to-Know Act

MNGP is subject to and complies with Section 312 of the Emergency Planning and Community Right-to-Know Act, which requires the submission of an emergency hazardous chemical inventory report (Tier II) to the local emergency planning commission, the state emergency response commission, and the local fire department. This report, which typically includes, but is not limited to, chemicals such as anti-scalant, lead acid batteries, liquid hydrogen, liquid nitrogen, sodium hypochlorite, diesel fuel, and unleaded gasoline is submitted to these agencies annually. MNGP is in compliance with this regulation.

9.5.18 Comprehensive Environmental Response, Compensation, and Liability Act

MNGP is subject to the hazardous substance release and reporting provisions of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as subsequently amended. Any release of reportable quantities of listed hazardous substances to the environment requires a notification to the EPA's national response center, and the Minnesota duty officer as appropriate and subsequent written follow-up. Based on a review of records for the six-year period of 2016–2021, there have been no releases at MNGP that have triggered this notification.

9.5.19 Farmland Protection Policy Act

The FPPA only applies to federal programs. The term "federal program" under this act does not include federal permitting or licensing for activities on private or non-federal lands. Therefore, because the license renewal is considered a federal licensing activity and MNGP is located on non-federal lands, the FPPA is not applicable.

9.5.20 Federal Aviation Act

Coordination with the FAA is required when it becomes necessary to ensure the highest structures associated with a project do not impair the safety of aviation. Submission of a letter of notification (with accompanying maps and project description) to the FAA would result in a writing response from the FAA certifying that no hazard exits or recommending project changes and/or the installation of warning devices such as lighting.

At MNGP, the site elevation is dominated by the approximately 328-foot high off-gas stack. No SLR-related construction activities have been identified; therefore, no new notifications to the FAA are required.

9.5.21 Occupational Safety and Health Act

OSHA governs the occupational safety and health of the construction workers and operations staff. MNGP and its contractors comply with OSHA's requirements, as these are incorporated in the site's occupational health and safety practices.

9.5.22 State Water Use Program

Minnesota Statute 103G.255 requires the MDNR to manage state water resources. The Water Appropriation Permit Program requires all users withdrawing more than 10,000 gallons of water per day or one million gallons per year to have a water appropriation (water use) permit, and to submit annual water use reports to the MDNR. (MDNR 2021q) MNGP has water appropriation permits in place which authorize surface water withdrawals from the Mississippi River and groundwater withdrawals via two onsite water supply wells (Table 9.1-1). As discussed in Section 3.6.3, water appropriation permits are not required for the other five water supply wells onsite at MNGP. Surface water is used to supply MNGP's cooling water and auxiliary water systems, and groundwater withdrawals supply the plant's domestic water system. Water withdrawals are tracked monthly and provided annually to the MDNR as required. MNGP is in compliance with the requirements and conditions of the permits.

9.5.23 County Zoning Requirements

MNGP's industrial area is located within the city limits of Monticello, which has adopted a comprehensive plan as authorized by Minnesota Statute Section 462.353 Authority to Plan; Fund; Fees; Appeal. The comprehensive plan was adopted November 23, 2020. Wright and Sherburne counties provide planning services and administer land use regulations as implemented by their comprehensive plans for unincorporated areas and townships for which comprehensive plans or development regulations have not been adopted.

The Monticello 2040 Community Vision + Comprehensive Plan regulates land use within the city limits through zoning ordinances implemented in its plan. As discussed in Section 3.2, MNGP is zone as a "heavy industry" (I-2) district by the City of Monticello for principle uses associated with heavy industry and manufacturing. According to the comprehensive plan's future land use plan element, MNGP has a future land use designation of Xcel MNGP, which is a special district specifically designed for continued operation of the facility.

9.6 Environmental Reviews

MNGP has procedural controls in place to ensure all environmentally sensitive areas at MNGP, if present, are adequately protected during site operation and project planning. These controls, which encompass nonradiological environmental resource areas such as land use, air quality, surface water and groundwater, terrestrial and aquatic ecology, historic and cultural resources, waste management, and pollution prevention, consist of the following:

- Appropriate local, state, and/or federal permits are obtained or modified, as necessary.
- BMPs, including for stormwater, are implemented to protect wetlands, natural heritage areas, and sensitive ecosystems.
- Appropriate agencies are consulted on matters involving federally and state-listed threatened, endangered, and protected species; BMPs are implemented to minimize impacts to these species.
- Appropriate agencies are consulted on matters involving cultural resources and to ensure BMPs are implemented to minimize impacts to this resource.

In summary, MNGP's administrative controls ensure that appropriate local, state, and/or federal permits are obtained or modified as necessary, that cultural resources and threatened and endangered species are protected if present, and that other regulatory issues are adequately addressed, as necessary.

9.7 Alternatives

The discussion of alternatives in the environmental report shall include a discussion of whether alternatives will comply with applicable environmental quality standard and requirements [10 CFR 51.45(d)].

The natural gas and renewables, renewables and storage, and SMR nuclear alternatives discussed in Chapter 7 would be constructed and operated to comply with all applicable environmental quality standards and requirements. While alternative generation would be developed and operated in compliance with standards and requirements, additional environmental impacts associated with siting, construction, and operation would be realized. Continued compliant operation of MNGP would not result in these additional impacts.

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Attachment A: NPDES Permit

June 29, 2009

CERTIFIED MAIL NO. 7007 3020 0000 0967 6982
RETURN RECEIPT REQUESTED

Mr. Dennis Koehl
Xcel Energy
414 Nicollet Mall MP-7
Minneapolis, MN 55401-1993

RE: Final Major Modified NPDES/SDS Permit No. MN0000868
Xcel Energy - Monticello Nuclear Generating Plant
Monticello, Wright County, Minnesota

Dear Mr. Koehl:

Enclosed is the final National Pollutant Discharge Elimination System (NPDES)/State Disposal System (SDS) permit for your facility. This permit supersedes an earlier NPDES/SDS permit that was issued on October 16, 2007. Written comments received from Xcel Energy in a letter dated June 11, 2009, (Comment Letter) were considered in formulation of the terms and conditions in this permit. MPCA responses to the issues in the Comment Letter are detailed below.

Comment 1: "Page 10: Limits and Monitoring Requirements. WS002, chlorine rate limit type should be Calendar Month Maximum."

Response: The limit type has been changed as requested.

Comment 2: "Page 13: Ch. 2.4.1: SW 001: Submit a monthly DMR monthly by 21 days… (monthly is not needed twice)."

Response: This language is automatically generated in the permit based on the Discharge Monitoring Report (DMR) type and required reporting frequency, and has not been changed in the final permit. Please note that this is the same language used for DMR submittal for all other monitoring stations in this permit.

Comment 3: "Page 14: Ch. 3.2.1.b: The plant requests the option of using, in the calculation of residual oxidants during continuous treatment, the actual halogen demand (as currently stated in the permit) of the diluting waste stream or of using a zero halogen demand when sampling is impractical. Using a zero halogen demand would result in a more conservative value for TRO than when making the calculation and accounting for the halogen demand in the river water supply.)

Response: The language in 3.2.1.b. has been updated to reflect this option.

Comment 4: "Page 15: Ch. 4.2.2: The Permittee is authorized to treat the service water stream with chlorine or bromine and chlorine …"

Response: This language has been changed as indicated.

Comment 5: "Ch. 4.2.3: 'The condenser cooling water and the service water shall not be chlorinated simultaneously.' Does this mean that the two systems can be chlorinated at different times during the same day or 24 hour period? If not some guidance in the permit as to the interval required between the two system treatments would be very beneficial for the plant when designing procedures for the two treatment options."

Response: Both systems are authorized to be chlorinated within the same 24 hour period, but treatment may not be applied to both of them at the same time. If additional clarification is needed, please address any questions to the MPCA staff contacts as indicated on the cover of your permit.

It is the responsibility of the Permittee to maintain compliance with all of the terms and conditions of this permit. Please carefully review the entire permit. A "Submittals Checklist" that is specific for your facility is also enclosed for your use. You may find this checklist to be a convenient tool in tracking the due dates and status of submittals required by the final issued permit.

Questions about your permit should be directed to the appropriate staff contacts listed on the first page of your permit.

Sincerely,

Jeff Stollenwerk
Supervisor, Water Quality Permits Unit
Duluth Office
Industrial Division

JS/BES:lmg

Enclosures

cc: Mr. Patrick Flowers, Xcel Energy
Mr. Dan Orr, Monticello Plant
George Azevedo, US EPA Region 5, Chicago

STATE OF MINNESOTA

Minnesota Pollution Control Agency

Industrial Division

National Pollutant Discharge Elimination System (NPDES) and State Disposal System (SDS) Permit MN0000868

PERMITTEE:	Northern States Power Co dba Xcel Energy		
FACILITY NAME:	Monticello Nuclear Generating Plant		
RECEIVING WATER:	Mississippi River (Class 1B,2Bd,3B,3C,4A,4B,5,6 water) [ORVW]		
CITY OR TOWNSHIP:	Monticello	**COUNTY:**	Wright
ISSUANCE DATE:	October 16, 2007	**EXPIRATION DATE:**	September 30, 2012
MODIFICATION DATE:	June 29, 2009		

The state of Minnesota, on behalf of its citizens through the Minnesota Pollution Control Agency (MPCA), authorizes the Permittee to operate a disposal system at the facility named above and to discharge from this facility to the receiving water named above, in accordance with the requirements of this permit.

The goal of this permit is to protect water quality in accordance with Minnesota and US statutes and rules, including Minn. Stat. chs. 115 and 116, Minn. R. chs. 7001, 7050, and the US Clean Water Act.

This permit is effective on the issuance date identified above, as modified on June 29, 2009. This permit expires at midnight on the expiration date identified above.

Signature: Michael J. Tibbetts

Michael J. Tibbetts *for* Minnesota Pollution Control Agency
Manager, Land and Water Quality Permits Section
Industrial Division

Submit DMRs to:
Attention: Discharge Monitoring Reports
Minnesota Pollution Control Agency
520 Lafayette Rd N
St Paul, MN 55155-4194

Submit Other WQ Reports to:
Attention: WQ Submittals Center
Minnesota Pollution Control Agency
520 Lafayette Rd N
St Paul, MN 55155-4194

Questions on this permit?

- For DMR and other permit reporting issues, contact: Linda Brooks, 651-296-7239.
- For specific permit requirements or permit compliance status, contact: Chelsea Domeier 651-757-2310.
- General permit or NPDES program questions, contact: MPCA Customer Assistance Center, 651-297-2274 or 800-646-6247.

Table of Contents

Required Submittals

316(b) Cooling Water Intake Structure Data within 3 months of permit issuance
316(b) Cooling Water System Data within 3 months of permit issuance
316(b) Source Water Physical Description within 3 months of permit issuance
Electrical Energy Emergency Biological Monitoring Plan within 30 days of permit issuance
Results of IM/E Sampling Data within 1 year of permit issuance
Dredged Material Annual Report February 1 of each year
Stormwater Pollution Prevention Plan 180 days after permit issuance
Discharge Monitoring Reports (DMRs) 21 days after end of each month
Application for Permit Reissuance 180 days before permit expiration
Phosphorus Management Plan 180 days before permit expiration

Facility Description

The Xcel - Monticello Nuclear Generating Plant facility (Facility) is located at NW 1/4 of Section 33, Township 122 North, Range 25 West, Monticello, Wright County, Minnesota. The facility is a boiling water reactor nuclear fueled steam electric generating plant. Water used at the plant for condenser cooling, service water cooling, and fire protection is withdrawn from wells and the Mississippi River. Water used for condenser cooling is cooled by cooling towers and the discharge canal prior to discharge to meet the permitted thermal effluent limitations during specified periods of the year. The wastewater treatment system at the facility includes the cooling tower system, waste holdup or retention pond, turbine building normal waste sump, intake screen backwash system, and yard area storm drains. Infrequent disposal of specific wastewaters are allowed on specific land application sites in accordance with Minnesota Pollution Control Agency (MPCA) approval.

The plant cooling waters are discharged, at times via cooling towers, to the plant discharge canal. Surface discharge station SD001 represents the plant discharge out of the canal. The canal discharges to the Mississippi River from a discharge structure designed to dissipate energy and prohibit fish entry into the discharge canal. Surface discharge station SD003 represents the discharge from the waste holdup pond also referred to as the retention pond. The holdup pond receives reverse osmosis system wastewater, building drain waters, heating boiler blowdown, diesel generator cooling water, filter backwashes, and occasional fire protection waters. After meeting permit discharge limitations the holdup pond discharge, SD003, is routed to the discharge canal. Surface discharge SD004 represents the turbine building normal waste discharge from the heating boiler deaerator, waterbox scavenging system drainage, lube oil seal water, reverse osmosis system wastewater, and miscellaneous floor and area drainage. After meeting permit discharge limitations SD004 is discharged to the plant intake area located adjacent to the Mississippi River. Surface discharge SD005 includes the plant intake screen wash water and is discharged to the Mississippi River. Surface discharge SD006 consists of the stormwater runoff from the plant yard, periodic fire protection system water, plant intake screen wash water during impingement studies, and may also include roof drainage. Sanitary wastewater is discharged to the city of Monticello wastewater treatment plant. The plant also land applies specific wastewater at approved locations at the plant site. These wastewaters are generated intermittently and may consist of wash waters from steam cleaning, equipment cleaning, heat exchanger cleaning, and other miscellaneous washwaters. A flow diagram for the facility is shown on page 6. Sediment cleaning of plant cooling water systems is managed in the site's dredged material facilities, which also entails upland placement.

Chemical additives are used in various systems at the plant including boiler feedwaters, cooling water treatment, and other miscellaneous uses. Chemical disinfection of various waste streams is authorized in this modified permit for the purpose of controlling problems associated with microbiological activity, as well as problematic conditions that could result from the presence of zebra mussels in the Facility's water systems. The MPCA has reviewed and approved of these chemical additives which are on file at the facility. New chemical additives or changes in dosages of chemicals additives must be approved by the MPCA in accordance with the permit.

Sediment removed (dredged material) under the scope of this permit consists primarily of silt, sand, and rocks. Dredge material typically includes a maximum of 600 cubic yards of sediment from the intake bay which is removed either mechanically or hydraulically approximately every two years and a maximum of 350 cubic yards of sediment from the traveling screen bay/service water bay area which is removed hydraulically approximately every 12–18 months. The volume of dredge material may vary with the possibility of more material being removed depending on river water quality and sediment characteristics. Mechanically dredged material and at times small volumes of hydraulic cleaning sediment from cooling systems are taken directly upland for dewatering and disposal. Hydraulically dredged material and material from cooling system cleaning is placed in a permitted concrete dewatering basin with multiple storage cells. Effluent from the dewatering basin is routed to the cooling tower basin and eventually to the discharge canal where it constitutes part of SD001.

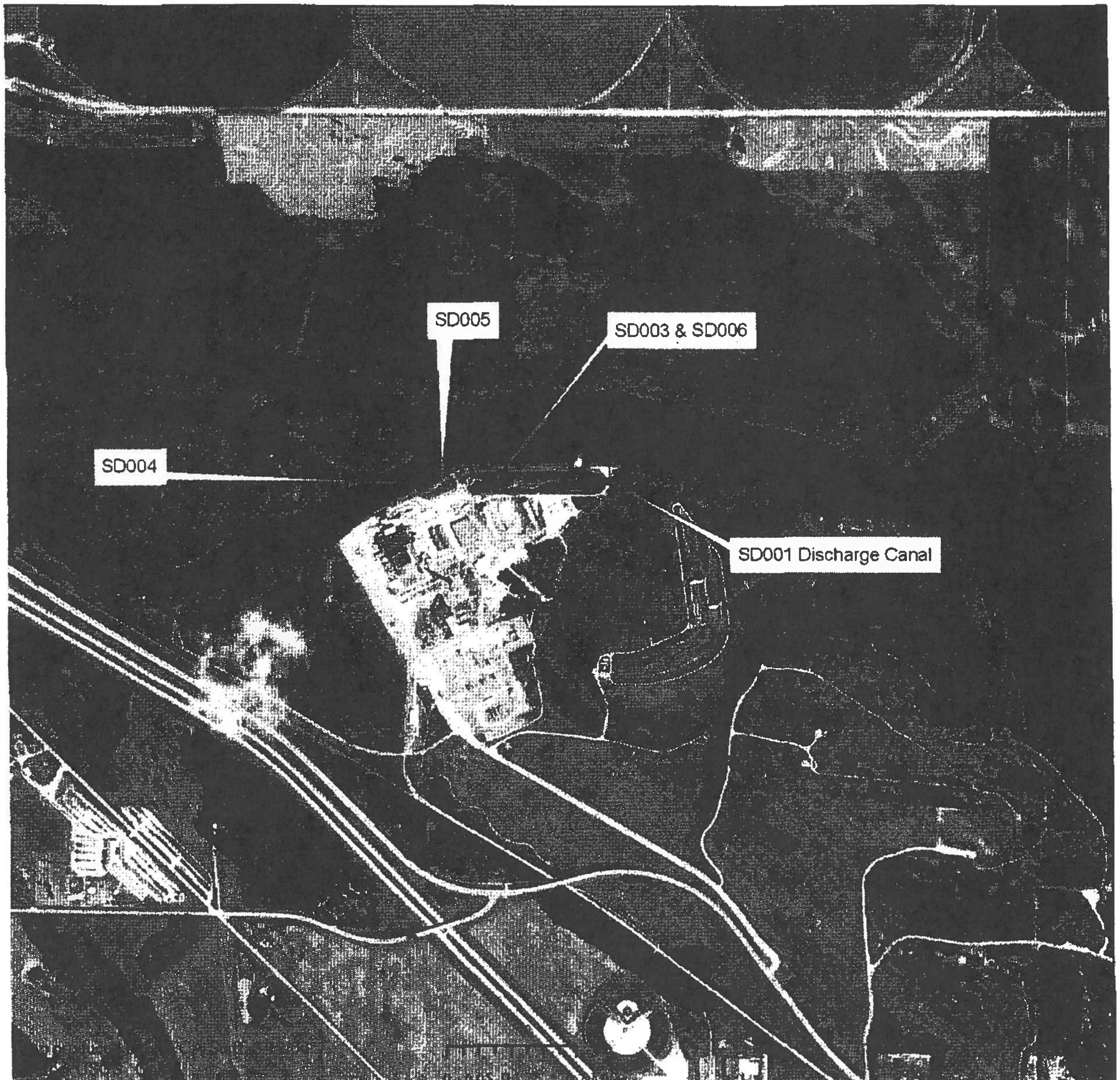
The location of designated monitoring stations is specified on the attached "Summary of Stations and Station Locations" report.

The location of the facility is shown on the attached aerial photo.

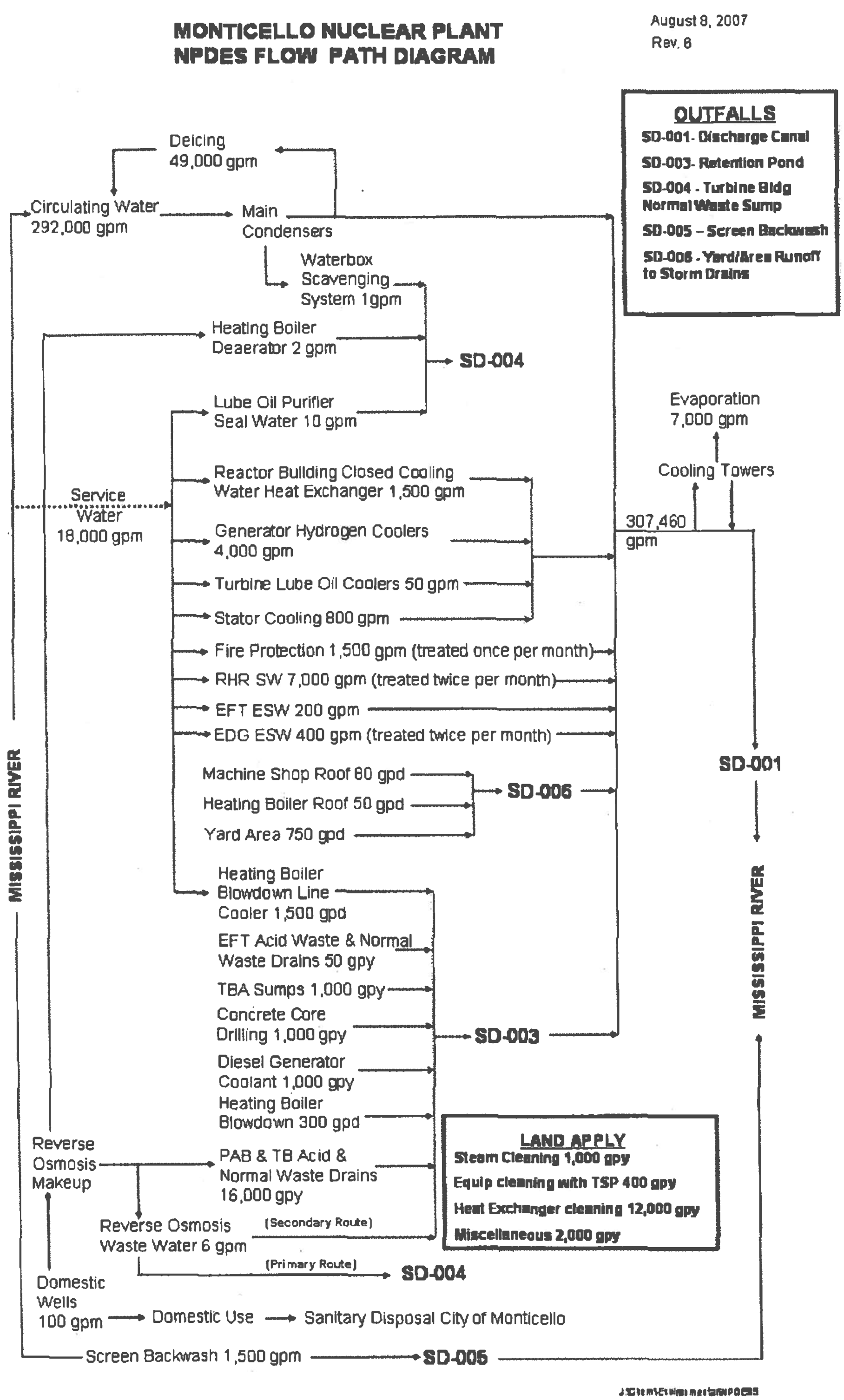
The Mississippi River was designated an Outstanding Resource Value Water (ORVW) on November 5, 1984. The calculated design flow of this facility on the date of ORVW designation is 456 mgd.

In accordance with MPCA rules regarding nondegradation for ORVWs, the design flow of the facility as of November 5, 1984, and associated mass loading are the baseline design flow and mass loading. This baseline flow and mass loading will be used to determine whether nondegradation review is required for any change in the discharge. Any change that results in an increased mass loading of one or more pollutants is subject to nondegradation review in accordance with Minn. R. 7050.0180.

Photo of Facility and Discharge Stations



Facility Flow Diagram



Xcel - Monticello Nuclear Generating Plant
Summary of Stations

Surface Discharge Stations

Station	Type of Station	Local Name	PLS Location
SD001	Effluent To Surface Water	Plant Cooling Water Discharge	NW Quarter of Section 33, Township 122 North, Range 25 West
SD003	Effluent To Surface Water	Holdup Pond Effluent Discharge	NW Quarter of Section 33, Township 122 North, Range 25 West
SD004	Effluent To Surface Water	Turbine Bldg Sump & Misc Discharge	NW Quarter of Section 33, Township 122 North, Range 25 West
SD005	Effluent To Surface Water	Screen Backwash Discharge	NW Quarter of Section 33, Township 122 North, Range 25 West
SD006	Effluent To Surface Water	Screen Bkwsh & Roof/Yard Drain	NW Quarter of Section 33, Township 122 North, Range 25 West

Surface Water Stations

Station	Type of Station	Local Name	PLS Location
SW001	Stream/River/Ditch, Upstream	water intake	NW Quarter of Section 33, Township 122 North, Range 25 West

Waste Stream Stations

Station	Type of Station	Local Name	PLS Location
WS001	Internal Waste Stream	Mid-downstream discharge canal	NW Quarter of Section 33, Township 122 North, Range 25 West
WS002	Internal Waste Stream	Condenser Cooling Water	
WS003	Internal Waste Stream	Service Water	

The Permittee shall comply with the limits and monitoring requirements as specified below.

SD 001

Parameter	Limit	Units	Limit Type	Effective Period	Sample Type	Frequency	Notes
Flow	Monitor Only	mgd	Calendar Month Average	Jan-Dec	Estimate	1 x Month	
Flow	Monitor Only	mgd	Calendar Month Maximum	Jan-Dec	Estimate	1 x Month	
Flow	Monitor Only	MG	Calendar Month Total	Jan-Dec	Estimate	1 x Month	
Oxidants, Total Residual (Bromine), Continuous	Monitor Only	mg/L	Daily Maximum	Jan-Dec	Grab	1 x Day	6
Oxidants, Total Residual (Bromine), Intermittent	Monitor Only	mg/L	Instantaneous Maximum	Jan-Dec	Grab	1 x Day	6
Oxidants, Total Residual (Chlorine), Continuous	Monitor Only	mg/L	Daily Maximum	Jan-Dec	Grab	1 x Day	6
Oxidants, Total Residual (Chlorine), Intermittent	0.2	mg/L	Instantaneous Maximum	Jan-Dec	Grab	1 x Day	6
Phosphorus, Total (as P)	Monitor Only	mg/L	Calendar Month Average	Jan-Dec	Grab	1 x Month	
Plant Capacity Factor, Percent of Capacity	Monitor Only	%	Calendar Month Average	Jan-Dec	Calculation	1 x Month	
Temperature, Water	80	Deg F	Daily Maximum	Dec-Feb	Measurement, Continuous	1 x Day	5
Temperature, Water	85	Deg F	Daily Maximum	Mar, Nov	Measurement, Continuous	1 x Day	5
Temperature, Water	95	Deg F	Daily Maximum	Apr-Oct	Measurement, Continuous	1 x Day	5

SD 003

Parameter	Limit	Units	Limit Type	Effective Period	Sample Type	Frequency	Notes
Flow	Monitor Only	mgd	Calendar Month Average	Jan-Dec	Estimate	1 x Month	2
Flow	Monitor Only	mgd	Calendar Month Maximum	Jan-Dec	Estimate	1 x Month	2
Flow	Monitor Only	MG	Calendar Month Total	Jan-Dec	Estimate	1 x Month	2
pH	9.0	SU	Calendar Month Maximum	Jan-Dec	Grab	1 x Week	4
pH	6.0	SU	Calendar Month Minimum	Jan-Dec	Grab	1 x Week	4
Phosphorus, Total (as P)	Monitor Only	mg/L	Calendar Month Average	Jan-Dec	Grab	1 x Month	2
Solids, Total Suspended (TSS)	9.9	kg/day	Calendar Month Average	Jan-Dec	Grab	1 x Week	2
Solids, Total Suspended (TSS)	30	mg/L	Calendar Month Average	Jan-Dec	Grab	1 x Week	3
Solids, Total Suspended (TSS)	33.2	kg/day	Daily Maximum	Jan-Dec	Grab	1 x Week	2
Solids, Total Suspended (TSS)	100	mg/L	Daily Maximum	Jan-Dec	Grab	1 x Week	2

The Permittee shall comply with the limits and monitoring requirements as specified below.

SD 004

Parameter	Limit	Units	Limit Type	Effective Period	Sample Type	Frequency	Notes
Flow	Monitor Only	mgd	Calendar Month Average	Jan-Dec	Estimate	1 x Month	
Flow	Monitor Only	mgd	Calendar Month Maximum	Jan-Dec	Estimate	1 x Month	
Flow	Monitor Only	MG	Calendar Month Total	Jan-Dec	Estimate	1 x Month	
Oil & Grease, Total Recoverable (Hexane Extraction)	4.2	kg/day	Calendar Month Average	Jan-Dec	Grab	1 x Week	
Oil & Grease, Total Recoverable (Hexane Extraction)	10	mg/L	Calendar Month Average	Jan-Dec	Grab	1 x Week	
Oil & Grease, Total Recoverable (Hexane Extraction)	15	mg/L	Daily Maximum	Jan-Dec	Grab	1 x Week	
Oil & Grease, Total Recoverable (Hexane Extraction)	6.3	kg/day	Maximum Calendar Week Average	Jan-Dec	Grab	1 x Week	
pH	9.0	SU	Calendar Month Maximum	Jan-Dec	Grab	1 x Week	4
pH	6.0	SU	Calendar Month Minimum	Jan-Dec	Grab	1 x Week	4
Solids, Total Suspended (TSS)	12.7	kg/day	Calendar Month Average	Jan-Dec	Grab	1 x Week	
Solids, Total Suspended (TSS)	30	mg/L	Calendar Month Average	Jan-Dec	Grab	1 x Week	1
Solids, Total Suspended (TSS)	42.3	kg/day	Daily Maximum	Jan-Dec	Grab	1 x Week	
Solids, Total Suspended (TSS)	100	mg/L	Daily Maximum	Jan-Dec	Grab	1 x Week	1

SD 005, SD 006

Parameter	Limit	Units	Limit Type	Effective Period	Sample Type	Frequency	Notes
Flow	Monitor Only	mgd	Calendar Month Average	Jan-Dec	Estimate	1 x Month	
Flow	Monitor Only	mgd	Calendar Month Maximum	Jan-Dec	Estimate	1 x Month	
Flow	Monitor Only	MG	Calendar Month Total	Jan-Dec	Estimate	1 x Month	

SW 001

Parameter	Limit	Units	Limit Type	Effective Period	Sample Type	Frequency	Notes
Phosphorus, Total (as P)	Monitor Only	mg/L	Calendar Month Average	Jan-Dec	Grab	1 x Month	
Temperature, Water	Monitor Only	Deg F	Calendar Month Average	Jan-Dec	Measurement, Continuous	1 x Day	
Temperature, Water	Monitor Only	Deg F	Calendar Month Maximum	Jan-Dec	Measurement, Continuous	1 x Day	
Temperature, Water	Monitor Only	Deg F	Calendar Month Minimum	Jan-Dec	Measurement, Continuous	1 x Day	

The Permittee shall comply with the limits and monitoring requirements as specified below.

WS 001

Parameter	Limit	Units	Limit Type	Effective Period	Sample Type	Frequency	Notes
Oxidants, Total Residual (Bromine), Continuous	0.014	mg/L	Daily Maximum	Jan-Dec	Calculation	1 x Day	6
Oxidants, Total Residual (Bromine), Intermittent	0.05	mg/L	Daily Maximum	Jan-Dec	Grab	1 x Day	7
Oxidants, Total Residual (Chlorine), Continuous	0.038	mg/L	Daily Maximum	Jan-Dec	Calculation	1 x Day	6

WS 002

Parameter	Limit	Units	Limit Type	Effective Period	Sample Type	Frequency	Notes
Bromine (as Br)	Monitor Only	kg/day	Calendar Month Maximum	Jan-Dec	Measurement	1 x Day	
Chlorination	2.0	hr/day	Daily Maximum	Jan-Dec	Measurement	1 x Day	
Chlorine Rate	Monitor Only	kg/day	Calendar Month Maximum	Jan-Dec	Measurement	1 x Day	

WS 003

Parameter	Limit	Units	Limit Type	Effective Period	Sample Type	Frequency	Notes
Bromine (as Br)	Monitor Only	kg/day	Calendar Month Maximum	Jan-Dec	Measurement	1 x Day	
Chlorination	Monitor Only	hr/day	Daily Maximum	Jan-Dec	Measurement	1 x Day	
Chlorine Rate	Monitor Only	kg/day	Calendar Month Maximum	Jan-Dec	Measurement	1 x Day	

Notes:
1 -- Calendar week average (seven consecutive days) concentration shall not exceed 45 mg/l.
2 -- During discharge only.
3 -- During discharge only. In addition to the monthly average and daily maximum TSS limitations, the calendar week average concentration shall not exceed 45 mg/l.
4 -- During discharge only. pH measured as soon as practicable after sample collection and no later than one hour after collection.
5 -- Limitation applies to the maximum daily average temperature at the end of the discharge canal. See Chapter 5 Section 2 for additional thermal discharge limitation requirements.
6 -- Total residual oxidants are expressed as chlorine.
7 -- Total residual oxidants are expressed as chlorine. The 0.05 mg/l total residual oxidant daily maximum concentration applies for monitoring conducted midway downstream in the discharge canal above the fish weir when bromine or bromine and chlorine is used. The once per day monitoring frequency applies only during periods when monitoring is conducted at this location for intermittent treatment. If monitoring is not conducted at this location for intermittent treatment, the result shall be reported as zero for that month, and the notes on the DMR shall indicate that no samples for intermittent treatment were collected.

Chapter 1. Surface Discharge Stations

1. Sampling Location

1.1 Samples for Station SD003, SD004, SD005, and SD006 shall be taken at locations representative of their individual discharges prior to mixing with any other waste streams.

1.2 Total residual oxidant samples for Station SD001 shall be taken from the main discharge line into the discharge canal. Samples for total residual oxidants may also be taken at a point midway downstream in the discharge canal when bromine or bromine and chlorine are used for the intermittent treatment. Under this scenario the maximum total residual oxidant may not exceed 0.05 mg/L.

2. Sampling Protocol

2.1 Per the limits and monitoring section of this permit the flow and temperature of the discharge to the Mississippi River from the discharge canal via SD001 is required to be monitored continuously. In the event that the continuous monitoring equipment is subject to down time due to maintenance, plant outages, or computer trips an alternate estimation monitoring method submitted to the MPCA on January 7, 1999 and updated on March 19, 2001 may be used if necessary.

3. Surface Discharges

3.1 Floating solids or visible foam shall not be discharged in other than trace amounts.

3.2 Oil or other substances shall not be discharged in amounts that create a visible color film.

3.3 The Permittee shall install and maintain outlet protection measures at the discharge stations to prevent erosion if necessary.

4. Winter Sampling Conditions

4.1 The Permittee shall sample flows at the designated monitoring stations including when this requires removing ice to sample the water. If the station is completely frozen throughout a designated sampling month, the Permittee shall check the "No Discharge" box on the Discharge Monitoring Report (DMR) and note the ice conditions in Comments on the DMR.

5. Discharge Monitoring Reports

5.1 The Permittee shall submit monitoring results for discharges in accordance with the limits and monitoring requirements for this station. If no discharge occurred during the reporting period, the Permittee shall check the "No Discharge" box on the Discharge Monitoring Report (DMR).

6. Requirements for Specific Stations

6.1 SD 001, SD 003, SD 004, SD 005, SD 006: Submit a monthly DMR monthly by 21 days after the end of each calendar month following permit issuance.

7. Special Requirements

Use and Discharge of Alkyl Phenol Ethoxylates

7.1 Detergents of chemical products that contain alkyl phenol ethoxylates (APEs) used at the plant in processes or systems which discharge to a surface discharge shall be substituted with detergents or products not containing APEs or linear alcohol ethoxylates (LAE).

Chapter 1. Surface Discharge Stations

7. Special Requirements

Continued Fishery Monitoring

7.2 The Permittee shall continue to monitor the fisheries near the plant in a manner consistent with the Fisheries Study Plan submitted to the MPCA December 28, 1979 and any subsequent approved revisions. Monitoring shall occur 4 times per year using electrofishing methods during May, July, September, and late October. In addition to electrofishing, 6 fish seining runs per year shall be completed. Any changes to the prescribed fisheries monitoring must be approved by the MPCA.

A biennial environmental monitoring report for the fisheries monitoring shall be submitted to the MPCA by May 1 on even numbered years summarizing the previous 2 years monitoring activities, beginning with the year 2008.

Prohibition of Discharge of Metal Cleaning Wastes

7.3 The Permittee is prohibited from discharge of any metal cleaning wastes or wastewaters without approval of the MPCA.

Surface Runoff from Land Application Areas

7.4 The Permittee is approved for land application of specific wastewaters including steam cleaning waters (approximately 1000 gallons per year), equipment cleaning waters (approximately 400 gallons per year), heat exchanger cleaning waters (approximately 12,000 gallons per year), and miscellaneous (approximately 2000 gallons per year). Land application of these waters shall be completed in a manner to prevent any runoff from the land application sites, and shall be limited only to those waters approved by the MPCA. Land application of any other waters must receive approval by the MPCA. New chemical additives, or changes in chemical additives, used in cleaning processes to be subsequently land applied shall receive approval for use by the MPCA.

Chapter 2. Surface Water Stations

1. Sampling Location

1.1 Samples for Station SW001 shall be taken at a point representative of the plant intake cooling water.

2. Discharge Monitoring Reports

2.1 The Permittee shall submit monitoring results in accordance with the limits and monitoring requirements for this station. If flow conditions are such that no sample could be acquired, the Permittee shall check the "No Flow" box and note the conditions on the Discharge Monitoring Report (DMR).

3. Winter Sampling Conditions

3.1 The Permittee shall sample flows at the designated monitoring stations including when this requires removing ice to sample the water. If the station is completely frozen throughout a designated sampling month, the Permittee shall check the "No Flow" box on the Discharge Monitoring Report (DMR) and note the ice conditions in Comments on the DMR.

4. Requirements for Specific Stations

4.1 SW 001: Submit a monthly DMR monthly by 21 days after the end of each calendar month following permit issuance.

Chapter 3. Waste Stream Stations

1. Sampling Location

1.1 Samples for Station WS001 shall be taken at a point midway downstream in the discharge canal above the fish weir.

2. Sampling Frequency

2.1 Results for this station shall be reported as follows:

a. If samples are collected for total residual oxidants when bromine or bromine and chlorine are used for intermittent treatment of condenser cooling water, results for those samples shall be reported on the DMR. If no samples are collected at this location for intermittent treatment of condenser cooling water, the Permittee shall report zero for intermittent total residual oxidants for bromine, and shall note the DMR as required in the Limits and Monitoring section of this Permit.

b. If continuous halogen treatment is applied to the service water stream, or to the condenser cooling water for zebra mussel treatment, results for total residual oxidants for continuous treatment shall be calculated for the mid-canal location using actual flow rates for the chlorinated waste stream and diluting waste streams, the measured halogen residual at SD001 for continuous treatment, and the halogen demand of the diluting waste streams. If sampling for the actual halogen demand of the diluting waste streams is impractical, the calculation shall assume zero halogen demand for these streams.

c. If there is no continuous treatment is applied, and no samples are collected at this station for intermittent treatment with bromine, the DMR shall be marked "no discharge."

3. Requirements for Specific Stations

3.1 WS 001: Submit a monthly DMR monthly by 21 days after the end of each calendar month following permit issuance.

Chapter 4. Industrial Process Wastewater

1. Authorization

1.1 This permit authorizes the Permittee to treat and dispose of industrial process wastewater in accordance with the provisions of this chapter.

Chapter 4. Industrial Process Wastewater

2. Special Requirements

Mobile and Rail Equipment Service Areas

2.1 Mobile equipment and rail equipment service areas in the facility shall be operated in compliance with the following:

a. The Permittee shall collect and dispose of locomotive traction sand, degreasing wastes, motor oil, oil filters, oil sorbent pads and booms, transmission fluids, power steering fluids, brake fluids, coolant/antifreeze, radiator flush wastewater and spent solvents in accordance with applicable solid and hazardous waste management rules. These materials shall not be discharged to surface or ground waters of the state.

b. Except as otherwise permitted the steam-cleaning of mobile equipment and rail equipment, except for limited outdoor cleaning of large drills and shovels, shall be conducted in wash bays that drain to wastewater treatment systems that include the removal of suspended solids and flammable liquids. The only washing of mobile equipment done in outside areas shall be to remove mud and dirt that has accumulated during outside work.

c. The Permittee shall not use solvent-based cleaners, such as brake cleaning and degreasing, to wash mobile and rail equipment unless the cleaning fluids are completely contained and not allowed to flow to surface or ground waters of the state. Soaps and detergents used in washing shall be biodegradable.

d. Mobile and rail equipment maintenance and repairs shall not be conducted in wash bays.

e. Hazardous materials shall not be stored or handled in wash bays.

f. The Permittee shall inspect wastewater containment systems regularly, and repair any leaks that are detected immediately.

g. If the Permittee discovers that recoverable amounts of petroleum products have entered wastewater containment systems, they shall be recovered immediately and reported to the MPCA.

h. Spill cleanup procedures shall be posted in mobile and rail equipment maintenance and repair areas.

Service Water Chlorination/Dechlorination

2.2 The Permittee is authorized to treat the service water stream with chlorine or bromine and chlorine, for the purpose of controlling microbiologically influenced corrosion.

2.3 Except as allowed in Part 2.5 of this Chapter, chlorination of the condenser cooling water stream is authorized at a rate not to exceed 2.0 hours per day. The condenser cooling water and the service water shall not be chlorinated simultaneously.

2.4 The effluent limitations for total residual oxidants (TRO) for intermittent treatment shall apply when the Permittee is applying oxidants for treatment of the condenser cooling water for a period of not more than 2.0 hours per day. The effluent limitations for TRO for continuous treatment shall apply at all other times.

Zebra Mussel Treatment

2.5 Chlorine/bromine may be used for periods up to 7 days to simultaneously treat the cooling water system and service water systems for zebra mussels, provided all water that has been treated with oxidants is dechlorinated prior to discharge.

During these treatments, the 2.0 hour per day limitation on chlorination of recirculating cooling water shall not apply, and the effluent limitations for total residual oxidants during continuous treatment shall apply.

Chapter 4. Industrial Process Wastewater

2. Special Requirements

2.6 Prior to initating treatment for zebra mussels, the Permittee shall submit for MPCA review and approval a Zebra Mussel Treatment Plan (Plan). The Plan must include, at minimum, expected duration of treatment; expected dosing rates of chemicals; and proposed dosing controls and/or monitoring methods to ensure that there is adequate dechlorination to meet effluent limitations for total residual oxidants during continuous treatment.

Disinfection of Intermittent Water Streams

2.7 The Permittee is authorized to treat intermittent service water streams with didecyl dimethyl ammonium chloride (DDAC) for the purpose of controlling MIC in systems that make use of these streams.

2.8 Water treated with DDAC shall be tested for residual DDAC prior to discharge. Tested water that indicates potential to discharge a detectable level of DDAC residual to the Mississippi River shall be treated with bentonite slurry prior to being sent to the discharge canal in order to remove possible toxicity resulting from active DDAC residual. Bentonite shall be dosed at a minimum mass ratio of bentonite to residual DDAC of 3:1.

After demonstrating to the MPCA that the methods of disinfection and storage are sufficient to prevent discharge of detectable DDAC, the Permittee may request authorization to conduct DDAC treatment on intermittent use streams without sampling for residual prior to discharge. Upon review and approval of such a request, this permit will be minor modified to include the appropriate authorization and conditions. ( )

3. Prohibited Discharges

3.1 This permit does not authorize the discharge of sewage, wash water, scrubber water, spills, oil, hazardous substances, or equipment/vehicle cleaning and maintenance wastewaters to ditches, wetlands or other surface waters of the state, except as authorized by this permit.

3.2 The Permittee shall prevent the routing of pollutants from the facility to a municipal wastewater treatment system in any manner unless authorized by the pretreatment standards of the MPCA and the municipal authority.

3.3 The Permittee shall not transport pollutants to a municipal wastewater treatment system that will interfere with the operation of the treatment system or cause pass-through violations of effluent limits or water quality standards.

4. Toxic Substance Reporting

4.1 The Permittee shall notify the MPCA immediately of any knowledge or reason to believe that an activity has occurred that would result in the discharge of a toxic pollutant listed in Minnesota Rules, pt. 7001.1060, subp. 4 to 10 or listed below that is not limited in the permit, if the discharge of this toxic pollutant has exceeded or is expected to exceed the following levels:

a. for acrolein and acrylonitrile, 200 ug/L;

b. for 2,4-dinitrophenol and 2-methyl-4,6-dinitrophenol, 500 ug/L;

c. for antimony, 1mg/L;

d. for any other toxic pollutant listed in Minnesota Rules, pt. 7001.1060, subp. 4 to 10, 100 ug/L; or

e. five times the maximum concentration value identified and reported for that pollutant in the permit application. (Minnesota Rules, pt. 7001.1090, subp. 2.A)

4.2 The Permittee shall notify the MPCA immediately if the Permittee has begun or expects to begin to use or manufacture as an intermediate or final by-product a toxic pollutant that was not reported in the permit application under Minnesota Rules, pt. 7001.1050, subp. 2.J. (Minnesota Rules, pt. 7001.1090, subp. 2.B)

Chapter 4. Industrial Process Wastewater

5. Hydrotest Discharges

5.1 The Permittee shall notify the MPCA prior to discharging hydrostatic test waters from units from which discharges are not authorized as part of this permit.

6. Polychlorinated Biphenyls (PCBs)

6.1 PCBs, including but not limited to those used in electrical transformers and capacitors, shall not be discharged or released to the environment.

7. Application for Permit Reissuance

7.1 The permit application shall include analytical data as part of the application for reissuance of this permit. These analyses shall be done on individual samples taken during the twelve-month period before the reissuance application is submitted.

7.2 The permit application shall include analytical data for monitoring stations SD001, SD003, and SD004 for parameters in accordance with Minnesota Rules 7001.1060 and 7001.1061 and instructions of the applicable EPA Permit Application Form 2C.

Chapter 5. Steam Electric

1. Authorization

1.1 The Permittee is authorized to discharge once-through, noncontact cooling water in accordance with and in compliance with the effluent limitations, restrictions, and conditions contained elsewhere in this permit.

1.2 The Permittee is authorized to discharge cooling tower blowdown in accordance with and in compliance with the effluent limitations, restrictions, and conditions contained elsewhere in this permit.

1.3 The Permittee is not prohibited from a discharge of cooling water for use as a de-icing agent at the intake structure should the need arise.

2. Applicable Effluent Limitations - Thermal Limitation

Thermal Discharge Limitations

2.1 In accordance with the Federal Water Pollution Control Act, this permit may be re-opened to insert a more restrictive thermal limit or the requirement to conduct a 316(a) study if it has been shown that the thermal component(s) of the surface water discharges affect the safety and propagation of a balanced, indigenous population of shellfish, fish, and wildlife in and on Mississippi River.

2.2 The thermal waste streams shall not impact the safety and propagation of a balanced, indigenous population of shellfish, fish, and wildlife in and on the Mississippi River.

2.3 When in power operation, both circulating water pumps at the screenhouse shall be operated to limit temperature rise through the condenser and thereby minimize cold shock potential, except in the event that one of the pumps is out of service due to equipment fialure or performance of maintenance to prevent equipment failures.

2.4 All existing cooling towers shall be operated whenever the ambient river temperature measured at some point unaffected by the plant's discharge is consistently at or above 20 degrees C (68 degrees F), except in the event the cooling towers or a portion of the cooling towers are out of service due to equipment failure or performance of maintenance to prevent equipment failure. In such case the portion of the cooling towers out of service shall be limited to those portions requiring said repair or maintenance.

Chapter 5. Steam Electric

2. Applicable Effluent Limitations - Thermal Limitation

2.5 As described in the Limits and Monitoring Section in no case shall the maximum daily average temperature at the end of the discharge canal exceed the following limiting temperatures:

1. During the months April through October: 35 degrees C (95 degrees F)
2. During the months November and March: 29.4 degrees C (85 degrees F)
3. During the months December through February: 26.7 degrees C (80 degrees F)

2.6 In cases when the ambient river temperature is below 20 degrees C (68 degrees F), but low river flow would otherwise cause the average daily mixed river temperature immediately below the discharge to exceed 30 degrees C (86 degrees F), the Permittee shall operate the cooling towers except as provided in section 2.4 above.

2.7 Whenever the Permittee is required by the terms of its water appropriation permit, dated March 12, 1970 and any subsequent revisions, from the Minnesota Department of Natural Resources to operate the cooling towers in a partial recirculation or closed cycle mode, the Permittee may discharge heated water in excess of the thermal limitations described in the Limits and Monitoring Section and in section 2.5 above. Exceedance of any thermal limitations shall be minimized to the extent possible under these conditions.

Exceedance of Permit Thermal Limitations Under Energy Emergencies

2.8 This provision is meant to provide for limited and infrequent short-term exceedances of the permit thermal limitations solely under extreme and relatively unique circumstances (such as an unusual heat wave). This provision does not preclude the MPCA from subsequently requiring Xcel Energy to resolve any recurring thermal limitation exceedances through installation of additional cooling equipment, or other measures to remove excess heat, in the event that thermal exceedances become relatively frequent or are the result of inadequate design under normal (non-emergency) conditions.

This provision does not preclude the MPCA from taking any enforcement action pursuant to thermal limitation exceedances if the above conditions are not followed.

2.9 The thermal limitations of this permit may be exceeded for a limited period under extreme conditions of electrical energy emergencies or under conditions that are the immediate result of electrical energy emergencies. Exceedance of the thermal limitations may occur only during electrical energy emergencies. For purposes of this permit an "electrical energy emergency" is defined as the time period when Northern States Power Company's, d/b/a Xcel Energy (Permittee or Xcel Energy), generating system is in System Conditioning Operating Code Red, or when in System Code Orange (danger) if degradation to Code Red appears likely absent corrective action.

2.10 System Code Red (emergency) occurs when the energy supply is subject to, but not limited to, partial power interruptions, curtailment of energy supply to controlled customers and peak controlled customers, power interruption to commercial customers, and reduction of peak voltage. It represents a situation where all electrical reserves have been exhausted, the electrical grid is unstable, and electrical demand has exceeded electrical supply. Code Red is also commonly referred to as a "brown-out". A Code Red may also lead to interruption to retail customers and power interruption, commonly referred to as a rotating "black-out".

System Code Orange (danger) occurs when the entire electrical system is vulnerable to instability due a single failure, such as a potential transmission fault, loss of a generating unit, or other technical failure. It represents a situation where electric power demand is currently being met but utility equipment is being operated at or near maximum dependable capacity and remaining energy reserves are extremely low or non existent. Under Code Orange energy controlled customers and energy peak customers are being curtailed, external energy is unavailable, and loss of an Xcel electrical generating unit or external purchase would result in Xcel being unable to meet required NERC (North American Electric Reliability Council) operating requirements.

Chapter 5. Steam Electric

2. Applicable Effluent Limitations - Thermal Limitation

2.11 Thermal limitation exceedances may occur only under the following conditions:

1. Thermal limitation exceedances will only be considered under an electrical energy emergency. Xcel Energy shall base decisions regarding thermal limitation exceedances on engineering and operational measures necessary to maintain stable regional energy supplies and protect critical generation and transmission equipment. Xcel Energy shall take all reasonable corrective actions available to avoid thermal limitation exceedances.

2. Thermal limitation exceedances are allowable only after Xcel Energy has exhausted all other reasonable alternatives or determined them to be inadequate. These alternatives include, but are not limited to, use of all available Xcel Energy power generation including Xcel Energy oil burning facilities and reserves, energy purchases, demand side management measures, curtailment of non-essential auxiliary load, and public appeals for voluntary energy conservation measures. Energy costs, either incurred at Xcel Energy generating facilities or through energy purchased, shall not be a factor in exhausting these alternatives.

3. Xcel Energy shall restore operations to return to compliance with permit thermal limitations as soon as possible upon termination of the electrical energy emergency, that is, upon return to a stable system Code Orange (danger) or better system code. The duration of thermal limitation exceedances shall be minimized.

2.12 4. Xcel Energy shall limit the severity of thermal limitation exceedances to the extent possible. Xcel Energy shall maintain any existing cooling tower systems and other cooling systems used to remove heat from cooling water to be discharged, so that these cooling systems are completely available during energy emergencies.

5. Xcel Energy shall attempt to notify the MPCA in advance of its intent to exercise this provision to exceed the permit thermal limitations under an electrical energy emergency. If Xcel Energy is unable to provide advance notification, due to sudden problems caused by storms, unplanned loss of critical generation or transmission, or similar circumstances causing conditions to rapidly deteriorate, Xcel Energy shall notify MPCA staff as soon as possible after the initial response actions are completed. If the event occurs after normal business hours or a weekend Xcel Energy shall notify the State Duty Officer and provide follow up notification to MPCA the next business day.

6. Xcel Energy shall institute monitoring for any environmental impacts during exceedances of the thermal limitations. Specifically Xcel Energy shall institute periodic biological observations of the zone of influence of the thermal discharge on the receiving water and any plant discharge canal, to monitor for signs of dead or distressed fish and other aquatic life. Any dead or distressed fish observed shall be tabulated and recorded by Xcel Energy staff and reported within one day, or the next business day if on a weekend, to the MPCA and the Minnesota Department of Natural Resources (MDNR).
Xcel Energy shall submit a monitoring plan for biological observations during electrical energy emergencies, within 30 days after issuance of this permit.

2.13 7. Xcel Energy shall comply with the Minnesota Department of Natural Resources (MDNR) requirements concerning any costs or charges levied by the MDNR for fish or other aquatic organisms lost due to any thermal limitation exceedances.

8. Unless otherwise specified by the MPCA, during an electrical energy emergency Xcel Energy shall provide a daily summary of the status of plant operations, the nature and extent of any permit deviations or exceedances of the thermal limitations, any mitigating actions being taken, and any observed environmental impacts. The daily summaries shall be provided by telephone and e-mail message to the MPCA during business days. Daily summaries during the weekend shall be provided by e-mail message.

Chapter 5. Steam Electric

2. Applicable Effluent Limitations - Thermal Limitation

2.14 9. Xcel Energy shall provide a written summary of any thermal limitation exceedances pursuant to an electrical energy emergency within 30 days of termination of the energy emergency. The summary shall address at a minimum:

a. The specific cause of the electrical energy emergency and information describing the conditions leading to the energy emergency which may include, but are not limited to, weather conditions and power demands.

b. The system code that Xcel Energy was operating under and all steps that Xcel took to lower energy demand and/or increase energy output in order to prevent a thermal limitation exceedance. These steps include, but are not limited to, items such as operation of peaking and oil burning plants, internal load reduction measures, energy purchases, public appeals for voluntary energy reduction, implementation of curtailment of service to interruptible customers, power interruption to commercial customers, etc.

c. A statement confirming that the electrical energy emergency leading to exceedances of thermal limitations was unintentional and that there was no known, viable engineering alternative for deviation from the plant□s permitted thermal limitations. A similar statement confirming that the electrical energy emergency leading to exceedances of thermal limitations resulted from factors beyond Xcel Energy's control and did not result from operator error, improperly designed facilities, lack of preventative maintenance, or increases in production beyond the design capacity of the treatment facility (cooling equipment).

2.15 d. A written summary of the technical aspects of the facility that are involved with cooling and maintaining compliance with thermal limitations.

e. Information on any alternatives to a thermal limitation exceedance and impacts that would likely have occurred if power generation was reduced in order to avoid a thermal limitation exceedance. Such impacts may include public health and safety, public security issues, damage to generating plants, disruption of commercial and industrial processes, and related potential impacts.

f. If it is determined that the thermal limitation exceedance was the result of inadequate design, operations or maintenance, the actions Xcel Energy will take to avoid a future thermal limitation exceedance.

Fish Kill Liability

2.16 The Permittee shall be responsible for fish kills in the receiving water (Mississippi River) and the circulating water system due to thermal shock and chemical treatments.

3. Chlorination

3.1 In accordance with 40 CFR 423.12(b)(8) total residual chlorine may not be discharged from any single generating unit for more than two hours per day unless the discharger demonstrates to the permitting authority that discharge for more than two hours is required for macroinvertebrate control.

3.2 Any changes in the current program used at the plant for condenser and cooling tower treatment using bromine and/or chlorine biocides which may affect the capability of the plant to meet State Water Quality Standards, including applicable toxicity standards, shall be reported to the MPCA. Toxicity testing may be required for any changes to demonstrate continued non-toxicity of the discharge.

4. Intake Screens

4.1 The Permittee shall operate the intake traveling screens in a continuous mode whenever the water temperature consistently exceeds 50 degrees F, or at some other schedule proposed by the Permittee and approved by the MPCA, except during periods when repairs or maintenance are necessary to prevent equipment failure.

4.2 Water used to rinse the intake screens shall be free of chlorine and chemical additives.

Chapter 5. Steam Electric

4. Intake Screens

4.3 The Permittee shall dispose of large debris collected off of the trash racks in such a manner so as to prevent the materials from re-entering waters of the state.

4.4 The Permittee shall be responsible for fish kills in the receiving water (Mississippi River) and the circulating water system due to thermal shock and chemical treatments. Impingement and entrainment effects have been the subject of past studies as reported to the state, and intake technology research, development and installation are the subject of Chapter 5 Parts 4.5 to 4.9 per Section 316(b) of the Clean Water Act.

316(b) Compliance

4.5 The Permittee shall operate the intake structures consistent with Section 316(b) of the Clean Water Act and consistent with the MPCA-approved 1978 report "Section 316(b) Demonstration for the Monticello Nuclear Generating Plant on the Mississippi River at Monticello, MInnesota. MPCA approved the report based on best professional judgement. Specifically the Permittee shall operate the screens in such a way that minimizes undesirable and unacceptable adverse environmental impacts, including entrainment and impingement; reductions of threatened, endangered, or other protected species; damage to critical aquatic organisms, including important elements of the food chain; diminishment of a population's compensatory reserve; losses to populations, including reductions of indigenous species populations, commercial fishery stocks, and recreational fisheries; and stresses to overall communities or ecosystems as evidenced by reductions in diversity or other changes in system structure or function.

4.6 The Permittee shall submit the following within three months of permit issuance:

1. Source Water Physical Description
2. Cooling Water Intake Structure Data
3. Cooling Water System Data

4.7 The Source Water Physical Description shall including the following:
A narrative description and scaled drawings showing the physical configuration of all source water bodies used by the facility, including areal dimensions, depths, salinity and temperature regimes, identification of hydrological and geomorphological features, as well as the methods used to conduct any physical studies to determine the area of influence of the intakes and the results of such studies and maps.

The Cooling Water Intake Structure Data shall include the following:
A narrative description of the configuration of each of the facility cooling water intake structures and where the intake(s) are located in the water body and the water column; latitude and longitude in degrees, minutes, and seconds for each intake structure, including design intake flows, daily hours of operation, number of days of the year in operation, and seasonal changes, if applicable; a flow distribution and water balance diagram that includes all sources of water to the facility, recirculating flows, and discharges; and engineering drawings of the cooling water intake structures.

The Cooling Water System Data shall include the following:
A narrative description of the operation of each cooling water system, its relationship to the cooling water intake structures, proportion of the design intake flow that is used in the system, the number of days of the year the system is in operation, and seasonal changes in the operation of the system, if applicable; and engineering calculations and supporting data to support the narrative description.

4.8 The Permittee submitted a Proposal for Information Collection (PIC) for MPCA review and approval on October 18, 2005. Consistent with the MPCA approved PIC the Permittee completed one year of weekly 24-hour impingement sampling on September 29, 2006 and one season of weekly 24-hour entrainment sampling on September 28, 2006.

Chapter 5. Steam Electric

4. Intake Screens

4.9 The Permittee shall submit the results of the impingement mortality and entrainment sampling efforts to the MPCA within one year of permit reissuance. The results should include a list of actions the Permittee is considering to reduce impingement mortality and entrainment at the facility.

If MPCA review of the evaluation data leads to the conclusion that the facility needs to install technology or modify operations to reduce impingement mortality and/or entrainment the permit may be reopened to include a compliance schedule developed using best professional judgment.

Chapter 6. Dredged Material Management

1. Authorization

1.1 This permit is intended to regulate the storage, disposal and/or reuse of dredged material.

1.2 This permit authorizes the Permittee to store, dispose, and/or reuse dredged material in accordance with the provisions of this permit.

1.3 This permit does not authorize or otherwise regulate dredging activity. However, dredging activity is subject to the water quality standards specified in Minnesota Rules chs. 7050 and 7060.

Initiation of dredge activities shall not commence until the Permittee has obtained all federal, state and/or local approvals that may be required for a particular project, including but not limited to state permits regulating activities in the bed of public waters as defined in Minn. Stat. sec. 105 from the Minnesota Department of Natural Resources (DNR), federal permits for dredged or fill material from the US Army Corps of Engineers (USCOE), and local permits from the appropriate Soil and Water Conservation District, county or local unit of government (LUG).

1.4 Compliance with the terms and conditions of this permit releases the Permittee from the requirement to obtain a separate permit for construction and/or industrial activities at the storage, disposal and/or reuse site that would otherwise require the Permittee to obtain a construction and/or industrial storm water permit in accordance with the Clean Water Act and Agency rules, except where the use or reuse of dredged material is occurring at a location separate from other activity covered by this permit.

2. Sampling and Analyses

2.1 An initial characterization of found sediment in the routine maintenance area to be primarily sand with some silt. A round of confirmation characterization sediment samples from the proposed dredge site must be completed prior to the next dredge maintenance project. Subsequent characterizations will be conducted only if needed due to expansion of the maintenance dredging area and/or due to review of the confirmation characterization data. Results of the sediment confirmation characterization must be compiled and submitted to the MPCA prior to the start of the next maintenance project. Characterization shall consist of at least a grain size analysis and, if applicable, baseline and additional sediment analysis per Tables 3 and 4 of Appendix 1. The Permittee completed this characterization for previously permitted dredge activities.

Any expansion in maintenance dredging areas or a request from the MPCA may trigger additional characterization activities consistent with this permit.

Chapter 6. Dredged Material Management

2. Sampling and Analyses

2.2 Grain Size Analysis

The Permittee shall complete a sieve grain size analysis using ASTM Method C-136 for the gradation analysis and ASTM Method D-2487 for classification. The minimum number of samples required for the analysis shall be determined using table 3 in Appendix 1. If the sieve analysis obtained is greater than 95 percent sands then the material is acceptable for Tier 1 or 2 use and additional analytical sampling is not required.

2.3 Baseline Sediment Analysis

Dredged material not excluded from additional analysis (as determined by the grain size analysis), must be analyzed for the constituents listed in Table 1 and Table 2 of Appendix 1.

2.4 Additional Analysis

If it is established through a review of past activities at the site that there is a reasonable likelihood for a pollutant to be present in sediment at a dredge site, the dredged material must be analyzed for additional analyte(s) in accordance with Table 2 and Table 4 in Appendix 1.

3. Rehandling, Off-Loading and Transportation of Dredged Material

3.1 Dredged materials shall be managed in a manner so as to minimize the amount of material returned by spillage, erosion or other discharge to waters of the state during rehandling, off-loading and/or transportation activities.

3.2 Dredged material hauled on federal, state, or local highways, roads, or streets must be hauled in such a way as to prevent dredged material from leaking, spilling, or otherwise being deposited in the right-of-way. Dredged material deposited on a public roadway must be immediately removed and properly disposed.

3.3 Tracked soil and/or dredged material shall be removed from impervious surfaces that do not drain back to the dredged material storage, disposal and/or reuse facility within 24 hours of discovery, and placed in the storage, disposal and/or reuse facility site.

3.4 Areas for the rehandling and/or off-loading of dredged material shall be sloped away from surface water or otherwise controlled.

4. Storage, Disposal and/or Reuse of Dredged Material

4.1 Authorization. Prior to the use of a new (different from already disclosed) site for the storage, disposal, and/or reuse of dredged material, the Permittee shall obtain written MPCA approval for such use.

4.2 General. Any site used for the storage, disposal and/or reuse of a dredged material shall be operated and maintained by the Permittee to control runoff, including stormwater, from the facility to prevent the exceedance of water quality standards specified in Minnesota Rules, chs. 7050 and 7060.

4.3 The Permittee may dispose of dredged material at a permitted solid waste landfill, through on-site disposal, or through reuse for a beneficial purpose, as follows:
a. Temporary storage and/or treatment of dredged material at the dredge project site. Temporary storage of dredged material is subject to the requirements of part 4.4 of this chapter.
b. Disposal of dredged material at the dredge project site. Disposal of dredged material is subject to parts 4.5 through 4.36 of this chapter.
c. Reuse of dredged material for beneficial purposes. Reuse of dredged material is subject to parts 4.37 through 4.39 of this chapter.

Chapter 6. Dredged Material Management

4. Storage, Disposal and/or Reuse of Dredged Material

A. Temporary Storage and/or Treatment of Dredged Material

4.4 All of the following requirements apply to the temporary storage and/or treatment of dredged material:
a. Temporary storage shall not exceed 1 year. Storage or accumulation of dredged material for more than 1 year constitutes disposal, and is subject to the disposal facility requirements of parts 4.5 through 4.36 of this chapter.
b. Dredged materials shall be managed in a manner so as to minimize the amount of material returned by spillage, erosion or other discharge to waters of the state. Best management practices for the management of dredged materials are outlined in the MPCA fact sheet, "Best Management Practices for the Management of Dredged Material".
c. If dikes, berms or silt fences have been constructed to contain temporary stockpiles of dredged material, they shall not be removed until all material has been removed from the stockpile.

B. Disposal of Dredged Material

4.5 The existing dredge dewatering and disposal facilities have been reviewed and approved by MPCA staff precluding review in regard to Parts 4.6 to 4.17. Notification of a new dredge disposal facility or expansion in the existing facility shall be submitted for MPCA review and approval.

4.6 Disposal facilities shall be constructed/operated in accordance with local requirements, including the requirement to obtain a permit, license, or other governmental approval to initiate construction.

4.7 Initial Site Plan. An initial site plan shall be prepared and submitted for MPCA review and approval. The initial site plan shall consist of volume calculations for the final permitted capacity and a map of the facility. The map of the facility shall include the permitted boundaries, dimensions, site contours (at contour intervals of two feet or less), soil boring locations with surface elevations and present and planned pertinent features, including but not limited to roads, screening, buffer zone, fencing, gate, shelter and equipment buildings, and surface water diversion and drainage. The initial site plan must be signed by a land surveyor registered in Minnesota or a professional engineer registered in Minnesota.

An initial site plan consistent with this requirement was previously submitted to the MPCA. If a new disposal location is proposed a new site plan shall be prepared and submitted for MPCA review and approval.

4.8 Delineation and Identification of Permitted Waste Boundary. The perimeter or outer limit of a dredged material disposal facility shall be indicated by permanent posts or signage. In addition, a permanent sign, identifying the operation and showing the permit number of the site, shall be posted at the dredged material disposal facility.

Site Selection and Use

4.9 Locational Prohibitions. All of the following locational standards apply to any facility for the disposal of dredged material:
a. The disposal facility must be located entirely above the high water table.
b. The disposal facility must not be located within a shoreland or wild and scenic river land use district governed by Minn. R. chapters 6105 and 6120.
c. The disposal facility must not be located within a wetland, unless the Permittee has obtained all federal, state and/or local approvals that may be required for a particular project.
d. The disposal area shall not be located in an area which is unsuitable because of topography, geology, hydrology, or soils.

4.10 Separation Distances. A minimum separation distance of 50 feet must be maintained between the boundaries of the disposal facility and the site property line.

Chapter 6. Dredged Material Management

4. Storage, Disposal and/or Reuse of Dredged Material

Design Requirements

4.11 The following design standards apply to a facility used for the disposal of dredged materials:
a. An earthen containment dike, or other MPCA approved embankment and/or other sediment control measure(s), shall be established around the perimeter of the dredged material disposal facility (permitted waste boundary).
b. Site preparation shall allow for orderly development of the site. Initial site preparations shall include clearing and grubbing, topsoil stripping and stockpiling, fill excavation, if appropriate, drainage control structures, and other design features necessary to construct and operate the facility.
c. Surface water runoff shall be diverted around dredged materials disposal facilities to prevent erosion, and protect the structural integrity of exterior embankments from failure.
d. Slopes and drainageways shall be designed to prevent erosion. Slopes longer than 200 feet shall be interrupted with drainageways.
e. Final slopes for the fill area shall be a minimum two percent and a maximum 20 percent, and shall be consistent with the planned ultimate use for the site.
g. Final cover shall consist of at least 18 inches of soil with the top 12 inches capable of sustaining vegetative growth.
h. For a system that will impound water (e.g. hydraulic dredging) with a constructed dike over 6 feet in height, or that impound more than 15 acre-feet of water, the system is subject to Minn. R. parts 6115.0300 through 6115.0520 [state Dam Safety Program]. Contact state Dam Safety Program staff at (651) 296-0521 for more information.

4.12 Site Stabilization. The Permittee shall stabilize the dredged material disposal facility before any disposal in the facility is allowed, as follows:
a. The exterior slope of all permanent dikes or berms shall be no steeper than 3 to 1 (horizontal to vertical). The exterior slopes of all permanent dikes or berms must be seeded and a soil fixative (e.g. mulch, blanket) applied within 72 hours of the completion of any grading work on the slopes.
b. If grading work is completed too late in the growing season to seed or plant the desired species, then the Permittee must propagate an annual cover crop that can be dormant seeded or planted and must apply a soil fixative to the site. At the very minimum, the Permittee must apply a soil fixative to the exterior slopes of all permanent dikes or berms prior to the first snowfall.
c. Silt fences, if used, must be properly installed. The silt fences shall be tall enough and installed at a sufficient distance from the base of the permanent dikes/berms or temporary stockpiles to create a reasonable secondary containment area.

4.13 Operational Plan. An Operational Plan of the site and immediately adjacent area shall be developed and implemented, and shall show progressive development of trench and/or area fills and any phase construction. The scale of the development plan shall not be greater than 200 feet per inch.

4.14 Facilities for the disposal of dredged material shall be designed by a professional engineer registered in the state of Minnesota, and in accordance with the criteria in parts 4.11 and 4.12 of this chapter. The Permittee shall construct the facility in accordance with these design plans and specifications under the direct supervision of a professional engineer registered in the state of Minnesota.

4.15 Certification Required. Prior to use of a facility for the disposal of dredged material under this part, the Permittee shall obtain and submit written certification from an engineer licensed in Minnesota stating that the disposal facility meets the requirements of parts 4.11 and 4.12 of this chapter, and has been constructed in accordance with the design plans and specifications.

Chapter 6. Dredged Material Management

4. Storage, Disposal and/or Reuse of Dredged Material

Site Management, Limitations, and Restrictions

4.16 New or Expanded Facilities. All of the following requirements apply to the construction of new or expanded facilities used for the disposal of dredged material:
a. The Permittee shall plan for and implement construction practices that minimize erosion and maintain dike integrity.
b. Erosion control measures shall be established on all downgradient perimeters prior to the initiation of any upgradient land-disturbing construction activities.
c. Surface runoff must be directed around and away from the storage and/or disposal facility site, until the site is stabilized, usually by assuring that vegetative cover is well-established.
d. Sediment control practices shall be designed and implemented to minimize sediment from entering surface waters. The timing of the installation of sediment control practices may be adjusted to accommodate short-term activities such as equipment access. Any short-term activity must be completed as quickly as possible and the sediment control practices must be installed immediately after the activity is completed. However, sediment control practices must be installed before the next precipitation event even if the activity is not complete.
e. All erosion and sediment control measures shall remain in place until final stabilization has been established. Permanent cover or final stabilization methods are used to prevent erosion, such as the placement of rip rap, sodding, or permanent seeding or planting. Permanent seeding and planting must have a uniform perennial vegetation cover of at least 70 percent density to constitute final stabilization.

4.17 Management of Disposal Facilities. The following standards apply to a facility used for the disposal of dredged material:
a. Each fill phase shall be outlined with grade stakes, and staked for proper grading and filling.
b. All trenches or fill areas shall be staked with permanent markers.
c. A permanent benchmark shall be installed on-site and show its location on the facility as-built plan.
d. Run-on and run-off of stormwater shall be controlled. The owner or operator must implement management practices designed to control run-on and run-off of stormwater from the disposal facility.
e. Vegetative cover shall be established within 120 days of reaching the final permitted capacity of the dredged material disposal facility, or within 120 days of the inactivation or completion of a phase of the facility thereof.
f. If the disposal facility contains any particulate matter that may be subject to wind dispersion, the owner or operator shall cover or otherwise manage the dredged material to control wind dispersion.
g. Nuisance conditions resulting from the disposal of dredged material shall be controlled and managed by the facility owner or operator.
h. Cover slopes shall be surveyed and staked during placement.

Inspection and Maintenance

4.18 Periodic Site Inspections. The Permittee shall inspect the disposal facility to ensure integrity of the erosion control measures, system stability and dredged material containment. At a minimum, the facility shall be inspected:
a. prior to the initial placement of any dredged material in the facility; and,
b. within 24 hours of each significant storm event and/or the subsidence of flood events; or,
c. at least once per month if a and/or b, above, are not occurring.
Inspections may be less frequent once a project is complete assuming all material has been transported to an off-site permitted facility; has been reused in accordance with this permit and is vegetated; or has been stabilized within the facility.

4.19 Recordkeeping. The Permittee shall record the date of each inspection, any problem identified with the facility, and the action(s) taken to correct any identified problem. The Permittee shall keep these inspection records on site and available to MPCA staff upon request.

4.20 Nonfunctioning erosion and sediment control measures shall be repaired, replaced or supplemented with functioning erosion and/or sediment control measures within three days of discovery.

Chapter 6. Dredged Material Management

4. Storage, Disposal and/or Reuse of Dredged Material

4.21 Dikes and berms constructed to contain hydraulically dredged material and the attendant liquid must be maintained free of all types of animal burrows. Animal burrows should be backfilled with compacted material within three days of discovery.

4.22 Where dredging and disposal have been suspended due to frozen ground conditions, the inspections and maintenance shall begin as soon as weather conditions warrant, or prior to resuming dredged material placement in the disposal facility, whichever occurs first.

Sediment Removal and Disposal

4.23 Dredged material shall be removed from disposal facilities in a manner so as to not damage the integrity and effectiveness of the containment structure or area.

4.24 Dredged material removed from a storage, disposal, and/or reuse facility shall be managed in accordance with this chapter.

4.25 Recordkeeping. The Permittee shall record the dates, the volume of dredged material removed from the disposal facility, and the method and location of the disposition (disposal or reuse) of such materials. This information shall be submitted with the annual 'Dredged Material Report', as specified in the 'Annual Report' part of this chapter.

Closure and Post-Closure Requirements

4.26 The Permittee must cease to dispose of dredged materials and immediately close the dredged material disposal facility when:
a. the Permittee declares the dredged material disposal facility closed;
b. all fill areas reach final permitted capacity;
c. an agency permit held by the facility expires, and renewal of the permit is not applied for, or is applied for and denied;
d. an agency permit for the facility is revoked; and/or,
e. an agency order to cease operations is issued.

4.27 Closure Plan. The Permittee shall prepare and submit a 'Closure Plan' for the final closure of a dredged material disposal facility for MPCA review and approval.

4.28 The 'Closure Plan' shall identify the steps needed to close the entire site at the end of its operating life. The closure plan shall include the following elements:
a. A description of how and when the entire facility will be closed. The description shall include the estimated year of closure and a schedule for completing each fill phase.
b. An estimate of the maximum quantity of dredged material in storage at any time during the life of the facility.
c. A cost estimate including an itemized breakdown for closure of each fill phase and the total cost associated with closure activities at dredged material disposal facilities.

4.29 A copy of the approved 'Closure Plan' and all revisions to the plan shall be kept at the facility until closure is completed and certified. At the time of closure, the agency will issue a closure document in accordance with Minn. R. part 7001.3055.

4.30 Amendment of Plan. The Permittee may amend the 'Closure Plan' (plan) any time during the life of the facility. The Permittee shall amend the plan whenever changes in the operating plan or facility design affect the closure procedures needed, and whenever the expected year of closure changes. Required amendments shall be completed within 60 days of any change or event that affects the closure plan.

4.31 Notification of Final Facility Closure. The Permittee shall notify the commissioner at least 90 days before final facility closure activities are to begin, except if the permit for the facility has been revoked.

Chapter 6. Dredged Material Management

4. Storage, Disposal and/or Reuse of Dredged Material

4.32 Closure Performance Standard. The Permittee must close the dredged material disposal facility in a manner that eliminates, minimizes, or controls the escape of pollutants to ground water or surface waters, to soils, or to the atmosphere during the postclosure period.

4.33 Completion of Closure Activities. Within 30 days after receiving the last shipment of dredged material for disposal, the Permittee must begin the final closure activities outlined in the approved 'Closure Plan' for the dredged material disposal facility. Closure activities must be completed according to the approved 'Closure Plan'. The commissioner may approve a longer period if the owner or operator demonstrates that the closure activities will take longer due to adverse weather or other factors not in the control of the Permittee.

4.34 Closure Procedures.
a. Complete the appropriate activities outlined in the approved 'Closure Plan'.
b. Complete final closure activities consisting of submitting to the county recorder and the commissioner a detailed description of the waste types accepted at the facility and what the facility was used for, together with a survey plat of the site. The plat must be prepared and certified by a land surveyor registered in Minnesota. The landowner must record a notation on the deed to the property or on some other instrument normally examined during a title search, that will in perpetuity notify any potential purchaser of the property of any special conditions or limitations for use of the site, as set out in the 'Closure Plan' and closure document.

4.35 Certification of Closure. When final facility closure is completed, the Permittee shall submit to the commissioner certification by the Permittee and an engineer registered in Minnesota that the facility has been closed in accordance with this chapter.

The certification shall contain the following elements:
a. a completed and signed 'Site Closure Record';
b. documentation of closure, such as pictures, showing the construction techniques used during closure; and,
c. a copy of the notation carrying the recorder's seal which has been filed with the county recorder.

4.36 Post-Closure Care. After final closure, the Permittee shall comply with the following requirements:
a. restrict access to the facility by use of gates, fencing, or other means to prevent further disposal at the site, unless the site's final use allows access;
b. maintain the integrity and effectiveness of the final cover, including making repairs to the final cover system as necessary to correct the effects of settling, subsidence, gas and leachate migration, erosion, root penetration, burrowing animals, or other events;
c. prevent run-on and run-off from eroding or otherwise damaging the final cover;
d. protect and maintain surveyed benchmarks

C. Beneficial Use or Re-Use of Dredged Material

4.37 Prior to the use or reuse of a dredged material, the Permittee shall determine the appropriate "suitable reuse category" of the dredged material to be used or reused, as described below.

Chapter 6. Dredged Material Management

4. Storage, Disposal and/or Reuse of Dredged Material

4.38 Suitable Reuse Categories. The suitable reuse category of a dredged material is based on the analyzed characteristics of the dredged material (sampled prior to dredging or in a spoil pile after dreding) and appropriately applied Soil Reference Values (SRVs), which are listed in Table 2 of Appendix 1 to this permit.

For the purposes of this permit, dredged material intended for the beneficial use or reuse is categorized into three tiers: Tier 1, Tier 2, and Tier 3. If the sieve analysis obtained by a #200 sieve is greater than 95 percent sands then the material is acceptable for Tier 1 or 2 use and additional analytical sampling is not required.

a. Tier 1 material is authorized to be used or reused at/on sites with a residential property use category. Tier 1 material is characterized by a contaminant level that is at or below all respective analyte concentrations listed in the Tier 1 SRV column for any contaminant that can be reasonably expected to be present in the dredged material.
b. Tier 2 material is authorized to be used or reused on/at sites with an industrial or recreational use category. Tier 2 material is characterized by a contaminant level that is at or below all respective analyte concentrations listed in the Tier 2 SRV column for any contaminant that can be reasonably expected to be present in the dredged material.
c. Tier 3 material is NOT authorized to be used or reused under this permit. Tier 3 material is characterized by a contaminant level that is greater than any respective analyte concentrations listed in the Tier 2 SRV column for any contaminant that can be reasonably expected to be present in the dredged material.

4.39 Storage Prior to Reuse. Storage of dredged material prior to reuse or use is subject to the temporary storage requirements of this chapter, or the disposal requirements of this chapter, as applicable.

5. Annual Report

5.1 Submit an annual 'Dredged Material Report' by February 1 of each year following permit issuance, for the preceding calendar year. The Permittee shall provide this report even if no dredging occurred during the preceding calendar year. Report on the form provided by the MPCA in the Appendices section of this permit, or another MPCA approved form.

Chapter 6. Dredged Material Management

5. Annual Report

5.2 The annual 'Dredged Material Report' shall be on a form provided by the Commissioner, or another MPCA approved form, and shall include the following elements:

a. Dates of dredging;

b. Volume of material placed into storage or disposal facility;

c. Any incidents, such as spills, unauthorized discharge and/or other permit violations which may have occurred;

d. Water level records for the disposal facilities of hydraulic dredging projects;

e. Such information as the MPCA may reasonably require of the Permittee pursuant to Minn. R. 7001 and Minn. Stat. chap. 115 and 116 as amended;

f. For disposal facilities, the dates of 'Periodic Site Inspections' required by this chapter, and the status of erosion control measures at the disposal facility;

g. For disposal facilities, the dates, the volume of dredged material removed from the disposal facility, and the method and location of the disposition (disposal or reuse) of such materials.

h. For facilities that used or reused dredged material during the previous calendar year, the following information shall also be provided:

i. A written description of the use or reuse of the dredged material;

ii. A written determination of the use category and appropriate Soil Reference Values (SRVs), as described by part this chapter; and,

iii. The results of an evaluation of the level of contaminants in the dredged material proposed for reuse for the respective SRVs, as described in part 4.42 of this chapter.

6. Definitions

6.1 "Beneficial Re-use" means the re-use of dredged material, after the material has been dewatered, in projects such as, but not limited to: road base, building base or pad, etc.

6.2 "Carriage, or Conveyance, Water" means the water portion of a slurry of water and dredged material.

6.3 "Carriage Water Return Flow" means the carriage water which is returned to a receiving water after separation of the dredged material from the carriage water in a disposal, rehandling or treatment facility.

6.4 "Disposal Facility" means a structure, site or area for the disposal of dredged material.

6.5 "Dredged Material" means any material removed from the bed of any waterway by dredging.

6.6 "Dredging" means any part of the process of the removal of material from the beds of waterways; transport of the material to a disposal, rehandling or treatment facility; treatment of the material; discharge of carriage or interstitial water; and disposal of the material.

6.7 "Erosion Control" means methods employed to prevent erosion. Examples include: soil stabilization practices, horizontal slope grading, temporary or permanent cover, and construction phasing. (look for SW definition)

6.8 "Flood Event" means that the surface elevation of a waterbody has risen to a level that causes the inundation or submersion of areas normally above the Ordinary High Water Level.

Chapter 6. Dredged Material Management

6. Definitions

6.9 "Interstitial, or Pore, Water" means water contained in the interstices or voids of soil or rock in the dredged material.

6.10 "Ordinary High-Water Level (OHWL)" means the boundary of waterbasins, watercourses, public waters, and public waters wetlands, and shall be an elevation delineating the highest water level which has been maintained for a sufficient period of time to leave evidence upon the landscape, commonly that point where the natural vegetation Cs from predominantly aquatic to predominantly terrestrial. For watercourses, the ordinary high water level is the elevation of the top of the bank of the channel. For reservoirs and flowages, the ordinary high water level is the operating elevation of the normal summer pool. (Minn. Stat. chap. 103G.005 Subd. 14 and MN Rule 6120.2500 Subp. 11.)

6.11 "Rehandling Facility" means a temporary storage site or facility used during the transportation of dredged material to a treatment or disposal facility.

6.12 "Stabilized" means staked sod, riprap, wood fiber blanket, or other material that prevents erosion from occurring has covered the exposed ground surface. Grass seed is not stabilization.

6.13 "Upland Disposal" means the disposal of dredged materials landward from the ordinary high-water level of a waterway or waterbody.

6.14 "Impoundment" means a natural or artificial body of water or sludge confined by a dam, dike, floodgate, or other barrier.

6.15 "Beach Nourishment" means the disposal of dredged material on the beaches or in the water waterward starting at or above the Ordinary High Water Level (OHWL) for the purpose of adding to, replenishing, or preventing the erosion of, beach material.

6.16 "Discharges of Dredged Material" means any addition of dredged material into waters of the state and includes discharges of water from dredged material disposal operations including beach nourishment, upland, or confined disposal which return to waters of state. Material resuspended during normal dredging operations is considered "de minimis" and is not a dredged material discharge.

6.17 "Final Stabilization" means that all soil disturbing activities at the site have been completed, and that a uniform perennial vegetative cover (a density of 70 percent cover for unpaved areas and areas not covered by permanent structures) has been established or equivalent permanent stabilization measures have been employed. Examples of vegetative cover practices can be found in Supplemental Specifications to the 1988 Standard Specifications for Construction (Minnesota Department of Transportation, 1991).

6.18 "Unconfined Disposal" means the deposition of dredged material, in water, on the bed of a waterway.

6.19 "Design capacity" means the total volume of compacted dredged materials, along with any topsoil, intermittent, intermediate, and/or final cover, as calculated from final contour and cross-sectional plan sheets that define the areal and vertical extent of the fill area.

6.20 "Storage Facility" means a structure, site or area for the holding of dredged material for more than 48 hours in quantities equal to or greater than ten cubic yards. Storage for more than 1 year constitutes disposal.

6.21 "Significant Storm Event" means a storm event that is greater than 1.0 inches in magnitude and that occurs at least 72 hours from the previously measurable (greater than 1.0 inch rainfall) storm event. The 72-hour storm event interval may be waived where:

a. the preceding measurable storm event did not result in a measurable discharge from the facility; or,

b. the Permittee documents that less than a 72-hour interval is representative for local storm events during the season when sampling is being conducted.

Chapter 7. Stormwater Management

1. Authorization

1.1 This chapter authorizes the Permittee to discharge stormwater associated with industrial activity in accordance with the terms and conditions of this chapter.

1.2 The Permittee shall comply with the general stormwater permit for industrial activity once it is reissued and becomes effective. The Permittee will retain coverage for stormwater discharges under this NPDES/SDS permit and therefore is not required to apply for coverage under the general stormwater permit for industrial activity. However, the Permittee shall comply with any steam electric generating specific requirements included in the yet-to-be-reissued general stormwater permit for industrial activity that do not appear in this permit.

2. Prohibited Discharges

2.1 This permit, unless specifically authorized by another chapter, does not authorize the discharge of sewage, wash water, scrubber water, spills, oil, hazardous substances, or equipment/vehicle cleaning and maintenance wastewaters to ditches, wetlands or other surface waters of the state.

2.2 This permit does not authorize discharges from sites for which Environmental Assessment Worksheets or Environmental Impact Statements are required, in accordance with Minn. R. ch. 4410, until that environmental review is completed.

3. Water Quality Standards

3.1 The Permittee shall operate and maintain the facility and shall control runoff, including stormwater, from the facility to prevent the exceedance of water quality standards specified in Minnesota Rules, chs. 7050 and 7060.

3.2 The Permittee shall limit and control the use of materials at the facility that may cause exceedances of ground water standards specified in Minnesota Rules, ch. 7060. These materials include, but are not limited to, detergents and cleaning agents, solvents, chemical dust suppressants, lubricants, fuels, drilling fluids, oils, fertilizers, explosives and blasting agents.

4. Stormwater Pollution Prevention Plan

4.1 Submit the most recent version of the facility Stormwater Pollution Prevention Plan within 180 days of permit issuance. Subsequent plan revisions shall be maintained on site and made available for review upon request.

4.2 The Permittee has developed and implemented a Stormwater Pollution Prevention Plan (Plan) to address the specific conditions at the industrial facility. The Permittee shall maintain an up-to-date Plan. The goal of the Plan is to eliminate or minimize contact of stormwater with significant materials that may result in pollution of the runoff. If contact cannot be eliminated or reduced, stormwater that has contacted significant material should be treated before it is discharged from the site.

4.3 The Plan shall be implemented at the site before the Permittee is covered under this permit.

4.4 The Stormwater Pollution Prevention Plan shall include a description of appropriate Best Management Practices for protection of surface and ground water quality at the facility, and a schedule for implementing the practices. The Plan shall also include the procedures to be followed by designated staff employed by the Permittee to implement the plan.

4.5 The Permittee shall comply with its Stormwater Pollution Prevention Plan.

Chapter 7. Stormwater Management

4. Stormwater Pollution Prevention Plan

Plan Contents

4.6 Complete a drainage map. The map should indicate the following items at or adjacent to the facility:

a. drainage areas and directions of stormwater runoff (indicated by arrows);

b. discharge outfalls from the site (structures that carry stormwater runoff from the facility such as ditches or storm sewers);

c. the name and location of waters of the state that receive facility stormwater runoff (if waters of the state are too distant from the facility to be indicated on the site map, indicate the name, direction and shortest distance to the lake, river, stream or wetland that receives runoff from your site);

d. areas where significant materials are exposed to stormwater;

e. locations of storm sewer inlets and an indication of which, if any, structures have floor drains or loading dock drains that are connected to storm sewers; and

f. locations and types of Best Management Practices (BMPs) currently installed at the facility to reduce or eliminate pollutants to stormwater.

4.7 Complete an inventory of exposed significant materials. Indicate the types of significant materials handled or stored at the site that may potentially contact stormwater. The following are examples of materials that, if exposed to stormwater, must be included in the inventory:

a. raw materials, such as fuels; solvents; petroleum products; detergents; plastic pellets; materials used in food processing or production; stockpiled sand, salt or coal;

b. by-products or intermediate products, such as wood dust, chips or bark; screened limestone, taconite or gravel by-product, recycled blacktop;

c. finished materials, such as metallic products, including scrap metal and recycled or scrap motor vehicle parts, old process equipment/machinery, taconite pellets;

d. waste products, such as ashes, sludge, solid and liquid waste, slag;

e. hazardous substances designated under section 101(14) of the Comprehensive Environmental Response Compensation and Liability Act (CERCLA);

f. any chemical the facility is required to report under section 313 of the Emergency Planning and Community Right-to-Know Act (EPCRA).

Chapter 7. Stormwater Management

4. Stormwater Pollution Prevention Plan

4.8 Evaluate facility areas for exposure of significant materials to stormwater. In creating the inventory of exposed significant materials, the Permittee must, at a minimum, evaluate the following areas at the industrial site (as well as other areas where appropriate) to determine whether or not significant materials are exposed in these areas:

a. vehicle and equipment maintenance, parking and storage areas including fueling and washing/cleaning areas, to determine if there is discolored soil in these areas as a result of fuel and lubricant leaks and spills;

b. liquid storage tanks and other bulk material stockpile areas;

c. loading and unloading areas;

d. outdoor manufacturing, processing or storage areas and industrial plant yards, to determine if there is discolored soil in these areas as a result of leaked or spilled solvents, fuels, or lubricants;

e. dust or particulate generating areas including dust collection devices that may release dust;

f. rooftops contaminated by industrial activity or operation of a pollution control device;

g. on-site waste disposal areas, such as waste ponds, dumpsters, solid waste storage or management areas; and

h. exposed (non-vegetated) soil areas where there is a potential for erosion to occur.

4.9 Describe appropriate BMPs, including structural and non-structural BMPs, that will be used at the facility to minimize or eliminate pollution of stormwater at the site. The description must include an objective for each BMP, as well as a description of how to evaluate proper functioning of the BMP and any maintenance requirements of the BMP. BMPs should target significant materials and areas identified in subparts 7 and 8 of this part. The following general categories of BMPs shall be considered and one or more shall be incorporated into the facility's Plan if significant materials are exposed to stormwater on-site:

a. Source reduction: reduce or eliminate the significant materials that are exposed to stormwater. Materials management practices should be evaluated to determine whether inventories of exposed materials can be reduced or eliminated. This can include clean-up of equipment yards, periodic checking of dust control equipment to ensure minimal accumulation of dust in the area of control equipment, removal and treatment of petroleum contaminated soil, consolidation of materials from multiple areas into one area, and training employees regarding proper handling and disposal of materials. Significant materials may also be moved indoors or covered with a tarp or structure to eliminate contact with precipitation.

b. Diversion: divert stormwater drainage away from exposed significant materials through use of curbing, berms, sewers or other forms of drainage control or elevate exposed significant material above surrounding drainage.

c. Treatment: where contact of stormwater with significant materials is unavoidable, use treatment devices to reduce the concentration and amount of pollutants in the discharge. Such devices include oil/water separators, stormwater detention/retention ponds, and vegetative swales.

Chapter 7. Stormwater Management

4. Stormwater Pollution Prevention Plan

4.10 Evaluate all discharge conveyances from the site (storm sewers, pipes, tile lines, ditches, etc.) to determine if unpermitted liquids other than stormwater are being discharged from these devices. This should be done during dry weather when stormwater discharge is not occurring. The evaluation should cover sewer inlets and floor drains to determine which inlets/drains are connected to sanitary sewer lines, storm sewer lines, or septic tanks/drainage fields; appropriate methods such as dye or smoke testing or video imaging should be used to determine the source of discharges.

The Plan must certify that discharges from the site have been evaluated for the presence of non-stormwater discharges. The certification shall indicate the date of testing, location of testing, describe the method used to determine the source of discharges and the results of testing. Discharge of non-stormwater (such as sanitary sewer or floor drain connections to storm sewers) is not authorized by this permit; before such discharge may continue, authorization under an appropriate NPDES permit must be obtained.

4.11 Develop a preventive maintenance program. The program must require regular inspection and maintenance of stormwater management devices (e.g. cleaning oil/water separators and catch basins), as well as inspecting and testing plant equipment and systems to uncover conditions that could cause breakdowns or failures resulting in discharges of pollutants (e.g. hydraulic leaks, torn bag-house filters) to surface waters.

4.12 Develop a spill prevention and response procedure. In order to develop this procedure, Permittees should evaluate where spills have occurred and where they have the potential to occur. Determine drainage points for potential spill areas and develop appropriate spill prevention and containment measures, should a spill occur. Detailed procedures for cleaning-up spills shall be identified and made available to appropriate personnel. If your facility has any other spill contingency plan that satisfies the above requirements, that plan may be incorporated by reference into this Plan to satisfy this requirement.

4.13 Develop and implement an employee training program to inform appropriate personnel of the components and goals of the Plan. Training shall address spill response, good housekeeping and materials management practices. The Plan shall identify periodic dates for such training.

4.14 Identify personnel responsible for managing and implementing the Plan as well as those responsible for the reporting requirements of this permit. This should include the facility contact person as indicated on the permit application. Identified personnel must be available at reasonable times of operation.

5. Temporary Protection and Permanent Cover

5.1 The Permittee shall provide and maintain temporary protection or permanent cover for the exposed areas at the facility.

5.2 Temporary protection methods are used to prevent erosion on a short-term basis, such as the placement of mulching straw, wood fiber blankets, wood chips, erosion control netting, or temporary seeding.

5.3 Permanent cover or final stabilization methods are used to prevent erosion, such as the placement of rip rap, sodding, or permanent seeding or planting. Permanent seeding and planting must have a uniform perennial vegetation cover of at least 70 percent density to constitute final stabilization.

Chapter 7. Stormwater Management

6. Inspection and Maintenance

6.1 Site inspections shall be conducted at least once every two months throughout the calendar year. During winter months, the inspections shall be conducted during non-frozen conditions. Inspections shall be conducted by an appropriately trained personnel at the facility site, as identified in part 4.13 of this chapter. The purpose of inspections is to: 1) determine whether structural and non-structural BMPs require maintenance or changes, and 2) evaluate the completeness and accuracy of the Plan.

At least one inspection during a reporting period shall be conducted while stormwater is discharging from the facility. Inspections may be documented using an inspection form provided by the MPCA. A Storm Water Site Inspection Form is provided in the appendices section of this permit.

6.2 Inspections shall be documented and a copy of all documentation shall remain on the permitted site whenever Permittee staff are availbale on the site, and be available upon request. The inspection form developed for the General Storm Water Permit for Industrial Activity may be used for recording inspection results, and is included in the appendices section of this permit.

6.3 The following compliance items will be inspected, and documented where appropriate:

a. evaluate the facility to determine that the Plan accurately reflects site conditions as described in subpart 6 of this part, and document any inaccuracies;

b. evaluate the facility to determine whether new exposed materials have been added to the site since completion of the Plan, and document any new significant materials;

c. during the inspection conducted during the runoff event, observe the runoff to determine if it is discolored or otherwise visibly contaminated, and document observations; and,

d. determine if the non-structural and structural BMPs as indicated in the Plan are installed and functioning properly.

6.4 The Permittee shall ensure that temporary protection and permanent cover for the exposed areas at the site are maintained.

6.5 Indicate the date and time of the inspection as well as the name of the inspector on the inspection form.

6.6 If a sedimentation basin is utilized or installed, when the depth of sediment collected in the final sedimentation basin above the outfall reaches one-half of the riser height, or one-half of the basin design hydraulic storage volume, the Permittee shall drain the basin and remove the sediment within three days of discovery. No outflow from the sedimentation basin shall occur while sediment is being removed from that basin. The sediment removed from the basin shall be disposed of at a site which drains to sedimentation basin(s) at the facility.

6.7 If conditions are observed at the site that require changes in the Plan, such changes shall be made to the Plan prior to submission of the annual report for that calendar year.

6.8 The Permittee shall minimize vehicle tracking of gravel, soil or mud onto paved surfaces at the facility.

6.9 If the findings of a site inspection indicate that BMPs are not meeting the objectives as identified in subpart 4.9 of this part, corrective actions must be initiated within 30 days and the BMP restored to full operation as soon as field conditions allow.

6.10 The Permittee shall remove tracked material from the road surface and return it to the facility within one (1) day of discovery so that the materials are retained on site or drained to sedimentation basin(s) at the facility.

Chapter 7. Stormwater Management

7. Sedimentation Basin Design and Construction

New Sedimentation Basins

7.1 Sedimentation basins shall be designed by a registered professional engineer, and installed under the direct supervision of a registered professional engineer.

7.2 The basin shall provide at least 1800 cubic feet, per acre drained, of hydraulic storage volume below the top of the outlet riser pipe.

7.3 Inlet(s) and outlet(s) shall be designed to prevent short circuiting and the discharge of floating debris.

7.4 The inlet(s) shall be placed at an elevation at least above one-half of the basin design hydraulic storage volume.

7.5 The outlet(s) shall consist of a perforated riser pipe wrapped with filter fabric and covered with crushed gravel. The perforated riser pipe shall be designed to allow complete drawdown of the basin(s).

7.6 Permanent erosion control, such as rip rap, splash pads or gabions shall be installed at the outlet(s) to prevent downstream erosion.

7.7 The basins shall be designed to allow for regular removal of accumulated sediment by a backhoe or other suitable equipment.

7.8 The Permittee may propose an alternative infiltration or sedimentation basin design for MPCA review and approval.

8. Application of Chemical Dust Suppressants

8.1 If chemical dust suppressants are applied in areas that drain directly (untreated) to surface waters, the Permittee shall submit a Chemical Dust Suppressant Annual Report due 31 days after the end of each calendar year following the application of a chemical dust suppressant.

8.2 The Chemical Dust Suppressant Annual Report shall include:

a. a record of the dates, methods, locations and amounts by volume of chemical application at the facility;

b. whether the product was applied in the preceding year; and,

c. the results of a chemical analysis of the materials applied each year.

8.3 If a material applied is mixed with water or another solvent before application, the chemical analysis shall be done on the aqueous or other mixture that is representative of the solution applied. This analysis shall be conducted during the same calendar year of application. This analysis shall include the parameters that may be determined by U.S. Environmental Protection Agency (EPA) Methods 624 and 625 which are described in 40 CFR Part 136.

8.4 Chemical dust suppressants, if used, shall not be applied within 100 feet that runoff to surface receiving waters identified in the 'Facility Description' section of this permit. These materials also shall not be applied within 100 feet of ditches that conduct surface flow to the surface receiving waters identified on Page 1 of this permit.

9. Reporting

9.1 The Permittee shall, upon request of the Agency, submit within a reasonable time the information and reports that are relevant to compliance with this Chapter, including the Plan, inspection reports, annual reports, original laboratory sheets from analyses conducted on the waste stream, and BMP plans and specifications.

Chapter 7. Stormwater Management

10. Records

10.1 The Plan shall be retained for the duration of the permit. A copy of the Plan shall remain on the permitted site whenever Permittee staff are available on the site, and be available upon request. The Permittee shall maintain the following records for the period of permit coverage:

a. dates of inspections;

b. findings of inspections;

c. corrective actions taken;

d. documentation of all changes to the Plan; and,

e. a copy of annual reports.

11. Notification

11.1 If the Permittee discharges stormwater into a municipal storm sewer, the Permittee shall notify the operator of the municipal storm sewer of the existence of this permit.

12. Request for Termination of Stormwater Permit Coverage

12.1 All Permittees regulated by 40 CFR 122.26(b)(14)(i) through (ix) and (xi) may request termination of permit coverage by applying for the no exposure exclusion from permitting. The Permittee must submit (form provided by the Agency) a written certification that a condition of no exposure exists at the facility and that the facility meets the definition of no exposure of industrial activities and materials to storm water.

The application for the no exposure exclusion must be completed by the Permittee and sent to: MPCA, Industrial Storm Water Program, 520 Lafayette Rd N, St Paul, MN 55155-4194.

Failure to complete an accurate application will result in the facility being denied the no exposure exclusion from permitting. The facility must submit the application to the Agency once every five years.

12.2 The no exposure exclusion is conditional. The facility must maintain a condition of no exposure at the facility in order for the no exposure exclusion to remain applicable. In the event of any change or circumstance that causes exposure of industrial activies or materials to stormwater, the facility must comply with the stormwater requirements of this chapter.

12.3 The no exposure certification is non-transferrable. In the event that the facility operator changes, then the new operator must submit a new no exposure certification to the MPCA, Industrial Stormwater Program, 520 Lafayette Rd N, St Paul, MN 55155-4194.

12.4 The Commissioner retains the authority to require the facility operator to comply with the requirements of this chapter, even when an industrial operator certifies no exposure, if the Commissioner has determined that the discharge is contributing to the violation of, or interfering with the attainment or maintenance of water quality standards, including designated uses.

13. Definitions

13.1 "No exposure" means all industrial materials and activities are protected by a storm resistant shelter to prevent exposure to rain, snow, snow melt, and/or runoff. industrial activities or materials include, but are not limited to, material handling equipment or activities, industrial machinery, raw materials, intermediate products, by-products, final products, or waste products.

13.2 "Non-stormwater discharge" means any discharge not comprised entirely of stormwater discharges authorized by a NPDES permit.

Chapter 7. Stormwater Management

13. Definitions

13.3 "Runoff" means any liquid that drains over land from any part of a facility.

Chapter 8. Phosphorus Management Plan

1. General Requirements

1.1 Phosphorus is a common constituent in many wastewater discharges and a pollutant that has the potential to negatively impact the quality of Minnesota's lakes, wetlands, rivers and streams. Therefore, phosphorus discharges are being carefully evaluated throughout the state.

The Permittee is required to complete and submit a Phosphorus Management Plan (PMP) to the MPCA as detailed in this section. If the Permittee has already submitted a PMP, the Permittee must update that PMP and submit the updated PMP to the MPCA as detailed in this section.

While the PMP does not require specific reductions at this time, the MPCA strongly encourages the Permittee to identify and eliminate/reduce sources of phosphorus to, and improve phosphorus management within, the permitted facility.

For additional information about completing the PMP below, please contact the MPCA's Customer Assistance Center at (800)646-6247.

1.2 The Permittee shall submit a Phosphorus Management Plan (PMP) to the MPCA 180 days prior to permit expiration.

At a minimum, the PMP shall include the following:

a. A summary of influent and effluent concentrations, and mass loadings.

b. Identification of existing and potential sources of elevated phosphorus concentrations and/or loading to the facility.

c. An evaluation of past and present operations to determine procedures that minimize phosphorus use.

d. A summary of any phosphorus reduction activities implemented during the last five years.

e. Phosphorus management and reduction goals for the next five years using the information collected in A through D above.

f. A plan to implement phosphorus management and reduction measures during the next five years.Submit a Phosphorus Management Plan by 180 days before permit expiration.

1.3 The Permittee shall monitor phosphorus concentration at SD001, SD003, and SW001 once a month for at least two years. After two years of monthly phosphorus monitoring of the influent, effluent, and internal discharge point SD003 the Permittee may request a reduction or elimination of the phosphorus monitoring requirements. A reduction in monitoring frequency or elimination of monitoring requirements is not effective until approved by the MPCA. The Permittee shall be notified in writing if a change to the monitoring requirements has been authorized.

Chapter 9. Total Facility Requirements

1. General Requirements

General Requirements

1.1 Incorporation by Reference. The following applicable federal and state laws are incorporated by reference in this permit, are applicable to the Permittee, and are enforceable parts of this permit: 40 CFR pts. 122.41, 122.42, 136, 403 and 503; Minn. R. pts. 7001, 7041, 7045, 7050, 7060, and 7080; and Minn. Stat. Sec. 115 and 116.

1.2 Permittee Responsibility. The Permittee shall perform the actions or conduct the activity authorized by the permit in compliance with the conditions of the permit and, if required, in accordance with the plans and specifications approved by the Agency. (Minn. R. 7001.0150, subp. 3, item E)

1.3 Toxic Discharges Prohibited. Whether or not this permit includes effluent limitations for toxic pollutants, the Permittee shall not discharge a toxic pollutant except according to Code of Federal Regulations, Title 40, sections 400 to 460 and Minnesota Rules, parts 7050.0100 to 7050.0220 and 7052.0010 to 7052.0110 (applicable to toxic pollutants in the Lake Superior Basin) and any other applicable MPCA rules. (Minn. R. 7001.1090, subp.1, item A)

1.4 Nuisance Conditions Prohibited. The Permittee's discharge shall not cause any nuisance conditions including, but not limited to: floating solids, scum and visible oil film, acutely toxic conditions to aquatic life, or other adverse impact on the receiving water. (Minn. R. 7050.0210 subp. 2)

1.5 Property Rights. This permit does not convey a property right or an exclusive privilege. (Minn. R. 7001.0150, subp. 3, item C)

1.6 Liability Exemption. In issuing this permit, the state and the MPCA assume no responsibility for damage to persons, property, or the environment caused by the activities of the Permittee in the conduct of its actions, including those activities authorized, directed, or undertaken under this permit. To the extent the state and the MPCA may be liable for the activities of its employees, that liability is explicitly limited to that provided in the Tort Claims Act. (Minn. R. 7001.0150, subp. 3, item O)

1.7 The MPCA's issuance of this permit does not obligate the MPCA to enforce local laws, rules, or plans beyond what is authorized by Minnesota Statutes. (Minn. R. 7001.0150, subp.3, item D)

1.8 Liabilities. The MPCA's issuance of this permit does not release the Permittee from any liability, penalty or duty imposed by Minnesota or federal statutes or rules or local ordinances, except the obligation to obtain the permit. (Minn. R. 7001.0150, subp.3, item A)

1.9 The issuance of this permit does not prevent the future adoption by the MPCA of pollution control rules, standards, or orders more stringent than those now in existence and does not prevent the enforcement of these rules, standards, or orders against the Permittee. (Minn. R. 7001.0150, subp.3, item B)

1.10 Severability. The provisions of this permit are severable, and if any provisions of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances and the remainder of this permit shall not be affected thereby.

1.11 Compliance with Other Rules and Statutes. The Permittee shall comply with all applicable air quality, solid waste, and hazardous waste statutes and rules in the operation and maintenance of the facility.

1.12 Inspection and Entry. When authorized by Minn. Stat. Sec. 115.04; 115B.17, subd. 4; and 116.091, and upon presentation of proper credentials, the agency, or an authorized employee or agent of the agency, shall be allowed by the Permittee to enter at reasonable times upon the property of the Permittee to examine and copy books, papers, records, or memoranda pertaining to the construction, modification, or operation of the facility covered by the permit or pertaining to the activity covered by the permit; and to conduct surveys and investigations, including sampling or monitoring, pertaining to the construction, modification, or operation of the facility covered by the permit or pertaining to the activity covered by the permit. (Minn. R. 7001.0150, subp.3, item I)

Chapter 9. Total Facility Requirements

1. General Requirements

1.13 Control Users. The Permittee shall regulate the users of its wastewater treatment facility so as to prevent the introduction of pollutants or materials that may result in the inhibition or disruption of the conveyance system, treatment facility or processes, or disposal system that would contribute to the violation of the conditions of this permit or any federal, state or local law or regulation.

Sampling

1.14 Representative Sampling. Samples and measurements required by this permit shall be conducted as specified in this permit and shall be representative of the discharge or monitored activity. (40 CFR 122.41 (j)(1))

1.15 Additional Sampling. If the Permittee monitors more frequently than required, the results and the frequency of monitoring shall be reported on the Discharge Monitoring Report (DMR) or another MPCA-approved form for that reporting period. (Minn. R. 7001.1090, subp. 1, item E)

1.16 Certified Laboratory. A laboratory certified by the Minnesota Department of Health shall conduct analyses required by this permit. Analyses of dissolved oxygen, pH, temperature and total residual oxidants (chlorine, bromine) do not need to be completed by a certified laboratory but shall comply with manufacturers specifications for equipment calibration and use. (Minn. Stat. Sec. 144.97 through 144.98 and Minn. R. 4740.2010 and 4740.2050 through 4740.2120) (Minn. R. 4740.2010 and 4740.2050 through 2120)

1.17 Sample Preservation and Procedure. Sample preservation and test procedures for the analysis of pollutants shall conform to 40 CFR Part 136 and Minn. R. 7041.3200.

1.18 Equipment Calibration: Flow meters, pumps, flumes, lift stations or other flow monitoring equipment used for purposes of determining compliance with permit shall be checked and/or calibrated for accuracy at least twice annually. (Minn. R. 7001.0150, subp. 2, items B and C)

1.19 All monitoring and analytical instruments used to monitor as required by this permit shall be calibrated and maintained at a frequency necessary to ensure accuracy. The Permittee shall measure flows to ensure accuracy within plus or minus ten percent of the true flow values. The Permittee shall maintain written records of all calibrations and maintenanc

1.20 Maintain Records. The Permittee shall keep the records required by this permit for at least three years, including any calculations, original recordings from automatic monitoring instruments, and laboratory sheets. The Permittee shall extend these record retention periods upon request of the MPCA. The Permittee shall maintain records for each sample and measurement. The records shall include the following information (Minn. R. 7001.0150, subp. 2, item C):

a. The exact place, date, and time of the sample or measurement;

b. The date of analysis;

c. The name of the person who performed the sample collection, measurement, analysis, or calculation; and

d. The analytical techniques, procedures and methods used; and

e. The results of the analysis.

Chapter 9. Total Facility Requirements

1. General Requirements

1.21 Completing Reports. The Permittee shall submit the results of the required sampling and monitoring activities on the forms provided, specified, or approved by the MPCA. The information shall be recorded in the specified areas on those forms and in the units specified. (Minn. R. 7001.1090, subp. 1, item D; Minn. R. 7001.0150, subp. 2, item B)

Required forms may include:

Supplemental Report Form (Supplemental)
Individual values for each sample and measurement must be recorded on the Supplemental which, if required, will be provided by the MPCA. Supplementals shall be submitted with the appropriate DMRs. You may design and use your own Supplemental; however it must be approved by the MPCA. Note: Required Summary information MUST also be recorded on the DMR. Summary information that is submitted ONLY on the Supplemental does not comply with the reporting requirements.

1.22 Submitting Reports. DMRs and Supplementals shall be submitted to:

MPCA
Attn: Discharge Monitoring Reports
520 Lafayette Road North
St. Paul, Minnesota 55155-4194.

DMRs and Supplementals shall be postmarked by the 21st day of the month following the sampling period or as otherwise specified in this permit. A DMR shall be submitted for each required station even if no discharge occurred during the reporting period. (Minn. R. 7001.0150, subps. 2.B and 3.H)

Other reports required by this permit shall be postmarked by the date specified in the permit to:

MPCA
Attn: WQ Submittals Center
520 Lafayette Road North
St. Paul, Minnesota 55155-4194

1.23 Incomplete or Incorrect Reports. The Permittee shall immediately submit an amended report or DMR to the MPCA upon discovery by the Permittee or notification by the MPCA that it has submitted an incomplete or incorrect report or DMR. The amended report or DMR shall contain the missing or corrected data along with a cover letter explaining the circumstances of the incomplete or incorrect report. (Minn. R. 7001.0150 subp. 3, item G)

1.24 Required Signatures. All DMRs, forms, reports, and other documents submitted to the MPCA shall be signed by the Permittee or the duly authorized representative of the Permittee. Minn. R. 7001.0150, subp. 2, item D. The person or persons that sign the DMRs, forms, reports or other documents must certify that he or she understands and complies with the certification requirements of Minn. R. 7001.0070 and 7001.0540, including the penalties for submitting false information. Technical documents, such as design drawings and specifications and engineering studies required to be submitted as part of a permit application or by permit conditions, must be certified by a registered professional engineer. (Minn. R. 7001.0540)

Chapter 9. Total Facility Requirements

1. General Requirements

1.25 Detection Level. The Permittee shall report monitoring results below the reporting limit (RL) of a particular instrument as "<" the value of the RL. For example, if an instrument has a RL of 0.1 mg/L and a parameter is not detected at a value of 0.1 mg/L or greater, the concentration shall be reported as "<0.1 mg/L." "Non-detected," "undetected," "below detection limit," and "zero" are unacceptable reporting results, and are permit reporting violations. (Minn. R. 7001.0150, subp. 2, item B)

Where sample values are less than the level of detection and the permit requires reporting of an average, the Permittee shall calculate the average as follows:

a. If one or more values are greater than the level of detection, substitute zero for all nondetectable values to use in the average calculation.

b. If all values are below the level of detection, report the averages as "<" the corresponding level of detection.

c. Where one or more sample values are less than the level of detection, and the permit requires reporting of a mass, usually expressed as kg/day, the Permittee shall substitute zero for all nondetectable values. (Minn. R. 7001.0150, subp. 2, item B)

1.26 Records. The Permittee shall, when requested by the Agency, submit within a reasonable time the information and reports that are relevant to the control of pollution regarding the construction, modification, or operation of the facility covered by the permit or regarding the conduct of the activity covered by the permit. (Minn. R. 7001.0150, subp. 3, item H)

1.27 Confidential Information. Except for data determined to be confidential according to Minn. Stat. Sec. 116.075, subd. 2, all reports required by this permit shall be available for public inspection. Effluent data shall not be considered confidential. To request the Agency maintain data as confidential, the Permittee must follow Minn. R. 7000.1300.

Noncompliance and Enforcement

1.28 Subject to Enforcement Action and Penalties. Noncompliance with a term or condition of this permit subjects the Permittee to penalties provided by federal and state law set forth in section 309 of the Clean Water Act; United States Code, title 33, section 1319, as amended; and in Minn. Stat. Sec. 115.071 and 116.072, including monetary penalties, imprisonment, or both. (Minn. R. 7001.1090, subp. 1, item B)

1.29 Criminal Activity. The Permittee may not knowingly make a false statement, representation, or certification in a record or other document submitted to the Agency. A person who falsifies a report or document submitted to the Agency, or tampers with, or knowingly renders inaccurate a monitoring device or method required to be maintained under this permit is subject to criminal and civil penalties provided by federal and state law. (Minn. R. 7001.0150, subp.3, item G., 7001.1090, subps. 1, items G and H and Minn. Stat. Sec. 609.671)

1.30 Noncompliance Defense. It shall not be a defense for the Permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit. (40 CFR 122.41(c))

1.31 Effluent Violations. If sampling by the Permittee indicates a violation of any discharge limitation specified in this permit, the Permittee shall immediately make every effort to verify the violation by collecting additional samples, if appropriate, investigate the cause of the violation, and take action to prevent future violations. Violations that are determined to pose a threat to human health or a drinking water supply, or represent a significant risk to the environment shall be immediately reported to the Minnesota Department of Public Safety Duty Officer at 1(800)422-0798 (toll free) or (651)649-5451 (metro area). In addition, you may also contact the MPCA during business hours. Otherwise the violations and the results of any additional sampling shall be recorded on the next appropriate DMR or report.

Chapter 9. Total Facility Requirements

1. General Requirements

1.32 Unauthorized Releases of Wastewater Prohibited. Except for conditions specifically described in Minn. R. 7001.1090, subp. 1, items J and K, all unauthorized bypasses, overflows, discharges, spills, or other releases of wastewater or materials to the environment, whether intentional or not, are prohibited. However, the MPCA will consider the Permittee's compliance with permit requirements, frequency of release, quantity, type, location, and other relevant factors when determining appropriate action. (40 CFR 122.41 and Minn. Stat. Sec 115.061)

1.33 Discovery of a release. Upon discovery of a release, the Permittee shall:

a. Take all reasonable steps to immediately end the release.

b. Notify the Minnesota Department of Public Safety Duty Officer at 1(800)422-0798 (toll free) or (651)649-5451 (metro area) immediately upon discovery of the release. In addition, you may also contact the MPCA during business hours at 1(800) 657-3864.

c. Recover as rapidly and as thoroughly as possible all substances and materials released or immediately take other action as may be reasonably possible to minimize or abate pollution to waters of the state or potential impacts to human health caused thereby. If the released materials or substances cannot be immediately or completely recovered, the Permittee shall contact the MPCA. If directed by the MPCA, the Permittee shall consult with other local, state or federal agencies (such as the Minnesota Department of Natural Resources and/or the Wetland Conservation Act authority) for implementation of additional clean-up or remediation activities in wetland or other sensitive areas.

d. Collect representative samples of the release. The Permittee shall sample the release for parameters of concern immediately following discovery of the release. The Permittee may contact the MPCA during business hours to discuss the sampling parameters and protocol. In addition, Fecal Coliform Bacteria samples shall be collected where it is determined by the Permittee that the release contains or may contain sewage. If the release cannot be immediately stopped, the Permittee shall consult with MPCA regarding additional sampling requirements. Samples shall be collected at least, but not limited to, two times per week for as long as the release continues.

e. Submit the sampling results as directed by the MPCA. At a minimum, the results shall be submitted to the MPCA with the next DMR.

1.34 Upset Defense. In the event of temporary noncompliance by the Permittee with an applicable effluent limitation resulting from an upset at the Permittee's facility due to factors beyond the control of the Permittee, the Permittee has an affirmative defense to an enforcement action brought by the Agency as a result of the noncompliance if the Permittee demonstrates by a preponderance of competent evidence:

a. The specific cause of the upset;

b. That the upset was unintentional;

c. That the upset resulted from factors beyond the reasonable control of the Permittee and did not result from operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventative maintenance, or increases in production which are beyond the design capability of the treatment facilities;

d. That at the time of the upset the facility was being properly operated;

e. That the Permittee properly notified the Commissioner of the upset in accordance with Minn. R. 7001.1090, subp. 1, item I; and

f. That the Permittee implemented the remedial measures required by Minn. R. 7001.0150, subp. 3, item J.

Chapter 9. Total Facility Requirements

1. General Requirements

Operation and Maintenance

1.35 The Permittee shall at all times properly operate and maintain the facilities and systems of treatment and control, and the appurtenances related to them which are installed or used by the Permittee to achieve compliance with the conditions of the permit. Proper operation and maintenance includes effective performance, adequate funding, adequate operator staffing and training, and adequate laboratory and process controls, including appropriate quality assurance procedures. The Permittee shall install and maintain appropriate backup or auxiliary facilities if they are necessary to achieve compliance with the conditions of the permit and, for all permits other than hazardous waste facility permits, if these backup or auxiliary facilities are technically and economically feasible Minn. R. 7001.0150. subp. 3, item F.

1.36 In the event of a reduction or loss of effective treatment of wastewater at the facility, the Permittee shall control production or curtail its discharges to the extent necessary to maintain compliance with the terms and conditions of this permit. The Permittee shall continue this control or curtailment until the wastewater treatment facility has been restored or until an alternative method of treatment is provided. (Minn. R. 7001.1090, subp. 1, item C)

1.37 Solids Management. The Permittee shall properly store, transport, and dispose of biosolids, septage, sediments, residual solids, filter backwash, screenings, oil, grease, and other substances so that pollutants do not enter surface waters or ground waters of the state. Solids should be disposed of in accordance with local, state and federal requirements. (40 CFR 503 and Minn. R. 7041 and applicable federal and state solid waste rules)

1.38 Intake screen backwash water and contents may be returned to the river.

1.39 Scheduled Maintenance. The Permittee shall schedule maintenance of the treatment works during non-critical water quality periods to prevent degradation of water quality, except where emergency maintenance is required to prevent a condition that would be detrimental to water quality or human health. (Minn. R. 7001.0150. subp. 3, item F and Minn. R. 7001.0150. subp. 2, item B)

1.40 Control Tests. In-plant control tests shall be conducted at a frequency adequate to ensure compliance with the conditions of this permit. (Minn. R. 7001.0150. subp. 3, item F and Minn. R. 7001.0150. subp. 2, item B)

Changes to the Facility or Permit

1.41 Permit Modifications. No person required by statute or rule to obtain a permit may construct, install, modify, or operate the facility to be permitted, nor shall a person commence an activity for which a permit is required by statute or rule until the Agency has issued a written permit for the facility or activity. (Minn. R. 7001.0030)

Permittees that propose to make a change to the facility or discharge that requires a permit modification must follow Minn. R. 7001.0190. If the Permittee cannot determine whether a permit modification is needed, the Permittee must contact the MPCA prior to any action. It is recommended that the application for permit modification be submitted to the MPCA at least 180 days prior to the planned change.

1.42 Construction. No construction shall begin until the Permittee receives written approval of plans and specifications from the MPCA (Minn. Stat. Sec. 115.03(f)).

Plans, specifications and MPCA approval are not necessary when maintenance dictates the need for installation of new equipment, provided the equipment is the same design size and has the same design intent. For instance, a broken pipe, lift station pump, aerator, or blower can be replaced with the same design-sized equipment without MPCA approval.

If the proposed construction is not expressly authorized by this permit, it may require a permit modification. If the construction project requires an Environmental Assessment Worksheet under Minn. R. 4410, no construction shall begin until a negative declaration is issued and all approvals are received or implemented.

Chapter 9. Total Facility Requirements

1. General Requirements

1.43 Report Changes. The Permittee shall give advance notice as soon as possible to the MPCA of any substantial changes in operational procedures, activities that may alter the nature or frequency of the discharge, and/or material factors that may affect compliance with the conditions of this permit. (Minn. R. 7001.0150, subp. 3, item M)

1.44 Chemical Additives. The Permittee shall receive prior written approval from the MPCA before increasing the use of a chemical additive authorized by this permit, or using a chemical additive not authorized by this permit, in quantities or concentrations that have the potential to change the characteristics, nature and/or quality of the discharge.

The Permittee shall request approval for an increased or new use of a chemical additive at least 60 days, or as soon as possible, before the proposed increased or new use.

This written request shall include at least the following information for the proposed additive:

a. The process for which the additive will be used;

b. Material Safety Data Sheet (MSDS) which shall include aquatic toxicity, human health, and environmental fate information for the proposed additive;

c. A complete product use and instruction label;

d. The commercial and chemical names and Chemical Abstract Survey (CAS) number for all ingredients in the additive (If the MSDS does not include information on chemical composition, including percentages for each ingredient totaling to 100%, the Permittee shall contact the supplier to have this information provided); and

e. The proposed method of application, application frequency, concentration, and daily average and maximum rates of use.

Upon review of the information submitted regarding the proposed chemical additive, the MPCA may require that additional information be submitted for consideration. Also, this permit may be modified to restrict the use or discharge of a chemical additive and include additional influent and effluent monitoring requirements. (Minn. R. 7001.0170)

1.45 MPCA Initiated Permit Modification, Suspension, or Revocation. The MPCA may modify or revoke and reissue this permit pursuant to Minn. R. 7001.0170. The MPCA may revoke without reissuance this permit pursuant to Minn. R. 7001.0180.

1.46 TMDL Impacts. Facilities that discharge to an impaired surface water, or to a watershed or drainage basin that contains impaired waters, may be required, at some future date, to comply with additional permits, or permit requirements, including additional restriction or relaxation of limits and monitoring as authorized by the CWA 303(d)(4)(A)) and 40 CFR 122.44.1.2.i, based on the conclusions of any applicable US EPA approved Total Maximum Daily Load (TMDL) studies, their associated implementation plans or additional sampling or monitoring.

1.47 Permit Transfer. The permit is not transferable to any person without the express written approval of the Agency after compliance with the requirements of Minn. R. 7001.0190. A person to whom the permit has been transferred shall comply with the conditions of the permit. (Minn. R., 7001.0150, subp. 3, item N)

Chapter 9. Total Facility Requirements

1. General Requirements

1.48 Facility Closure. The Permittee is responsible for closure and postclosure care of the facility. The Permittee shall notify the MPCA of a significant reduction or cessation of the activities described in this permit at least 180 days before the reduction or cessation. The MPCA may require the Permittee to provide to the MPCA a facility Closure Plan for approval.

Facility closure that could result in a potential long-term water quality concern, such as the ongoing discharge of wastewater to surface or ground water, may require a permit modification or reissuance.

The MPCA may require the Permittee to establish and maintain financial assurance to ensure performance of certain obligations under this permit, including closure, postclosure care and remedial action at the facility. If financial assurance is required, the amount and type of financial assurance, and proposed modifications to previously MPCA-approved financial assurance, shall be approved by the MPCA.

1.49 Permit Reissuance. If the Permittee desires to continue permit coverage beyond the date of permit expiration, the Permittee shall submit an application for reissuance at least 180 days before permit expiration. If the Permittee does not intend to continue the activities authorized by this permit after the expiration date of this permit, the Permittee shall notify the MPCA in writing at least 180 days before permit expiration.

If the Permittee has submitted a timely application for permit reissuance, the Permittee may continue to conduct the activities authorized by this permit, in compliance with the requirements of this permit, until the MPCA takes final action on the application, unless the MPCA determines any of the following (Minn. R. 7001.0040 and 7001.0160):

a. The Permittee is not in substantial compliance with the requirements of this permit, or with a stipulation agreement or compliance schedule designed to bring the Permittee into compliance with this permit;

b. The MPCA, as a result of an action or failure to act by the Permittee, has been unable to take final action on the application on or before the expiration date of the permit;

c. The Permittee has submitted an application with major deficiencies or has failed to properly supplement the application in a timely manner after being informed of deficiencies.

Attachment B: Threatened and Endangered Species Consultation Letters

Xcel Energy®

2807 West County Road 75
Monticello, MN 55362

March 17, 2022

L-MT-SLR-22-002

Lisa Joyal
Endangered Species Environmental Review Coordinator
Division of Ecological and Water Resources
Minnesota Department of Natural Resources
500 Lafayette Rd., Box 25
St. Paul, MN 55155

Subject: Monticello Nuclear Generating Plant Unit 1 Subsequent License Renewal

Dear Ms. Joyal:

Northern States Power Company, a Minnesota corporation, doing business as Xcel Energy (hereafter "NSPM") is preparing an application for renewing the operating license for Monticello Nuclear Generating Plant Unit 1 (MNGP) for an additional 20 years (see Table 1). As part of the license renewal process, the Nuclear Regulatory Commission (NRC) may request a formal or informal consultation with your agency. It is our intent by this letter to introduce you to the project, and to make available any data you need to ensure an efficient and effective consultation process, and to request the following:

- Confirmation from you on the identified list of species (see Table 2), and
- Input on listed species under your jurisdiction and important habitats within the surrounding area of the MNGP plant.

Table 1. MNGP Licensing Dates

MNGP Unit	Initial License Expiration Date	Current License Expiration Date	Subsequent License Expiration Date
Unit 1	September 8, 2010	September 8, 2030	September 8, 2050

As part of the process, the NRC requires that the subsequent license renewal application include an environmental report (ER) that assesses the impacts from continued operation and any refurbishment to be undertaken to enable the continued operation of the unit. The ER addresses the potential to impact species listed or proposed for listing as threatened or endangered in accordance with the Endangered Species Act (ESA), and important plant and animal habitats, including critical habitats as defined by the ESA and essential fish habitat as identified under the Magnuson-Stevens Fishery Conservation and Management Act.

This letter seeks input from the Minnesota Department of Natural Resources (MDNR) regarding the effects that license renewal activities may have on listed species (or candidates proposed for listing), important plant habitats within the plant's environs, and any questions or additional information necessary for the consultation process. Figures depicting the MNGP site (Figure 1), the vicinity within a 6-mile radius of MNGP (Figure 2), and a table of listed species potentially occurring near the MNGP site, or within Wright and Sherburne counties (counties within a 6-mile radius of the site) that are state listed as threatened or endangered (Table 2) are enclosed. A brief discussion of the plant and its operations during the renewal period is provided below.

MNGP is located within the city limits of Monticello, Minnesota. The MNGP site is situated on approximately 2,000 acres on the north and south banks of the Mississippi River, with portions of the property located in both Wright and Sherburne counties. In accordance with NRC regulations, the transmission lines within the scope of the license renewal environmental report are those located within the MNGP site boundary.

During the license renewal term, NSPM proposes to continue operating the unit as currently operated. There are currently no ground-disturbing activities other than those to maintain existing structures and operations anticipated at the MNGP site during the subsequent license renewal period. Additionally, NSPM does not anticipate any refurbishment as a result of the technical and aging management program information that will be submitted in accordance with the NRC license renewal process.

NSPM does not anticipate the continued operation of MNGP to adversely affect the environment or any cultural or historic resources.

As stated earlier, this letter seeks your input on the proposed continued operation of MNGP regarding listed species and important habitats within the environs of the plant. We appreciate you notifying us of your comments and any information you believe NSPM should consider in the preparation of the ER. Your input is requested by 05/16/2022. NSPM plans to include this letter and any response you provide in the final ER.

Should you or your staff have any questions or comments, please contact Paul Young at 612-337-2165 or via email at paul.b.young@xcelenergy.com.

Sincerely,

Christopher P. Domingos
Site Vice President, Monticello and Prairie Island Nuclear Generating Plants
Northern States Power Company – Minnesota

Attachments:
Table 2. Threatened or Endangered Species occurring near MNGP or within Wright and Sherburne Counties, Minnesota
Figure 1. MNGP Site
Figure 2. MNGP 6-mile Vicinity

Table 2. Threatened or Endangered Species Occurring Near MNGP or within Wright and Sherburne Counties, Minnesota

Common Name	Legal Status	Habitat within MNGP Vicinity (6-mile radius)
Mammals		
Northern long-eared bat	FT	Yes
Eastern spotted skunk	ST	Yes
Insects		
Monarch butterfly	FC	Yes
Rusty patched bumble bee	FE	Yes
Uncas skipper	SE	No
Birds		
Common tern	ST	No
Loggerhead shrike	SE	Yes
Horned grebe	SE	Yes
Fish		
Pugnose shiner	ST	Yes
Mussels		
Elktoe	ST	Yes
Plants		
Annual skeletonweed	ST	No
Beach heather	ST	No
Blunt-lobed grapefern	ST	Yes
Butternut	SE	Yes
Clinton's bulrush	ST	Yes
Cross-leaved milkwort	SE	Yes
Hooded arrowhead	ST	Yes
Lance-leaf violet	ST	Yes
Ram's head orchid	ST	Yes
Rock sandwort	ST	Yes
Seaside three-awn	ST	Yes
Swamp blackberry	ST	Yes
Tall nutrush	SE	Yes
Tubercled rein orchid	ST	Yes
Reptiles		
Blanding's turtle	ST	Yes

FE = federally endangered; FT = federally threatened; SE = state endangered; ST = state threatened; FC = federal candidate species

Table 2 Sources:

MDNR 2021. Rare Species Guide. Retrieved from <https://www.dnr.state.mn.us/rsg/index.html> (accessed September 16-17, 2021)

Sources continued:

USFWS 2021. IPaC Resource List. Retrieved from <https://ecos.fws.gov/ipac/location/GIYNBWMLQZCHTM76AMX4LXSQCI/resources> (accessed September 18, 2021).

Figure 1. MNGP Site

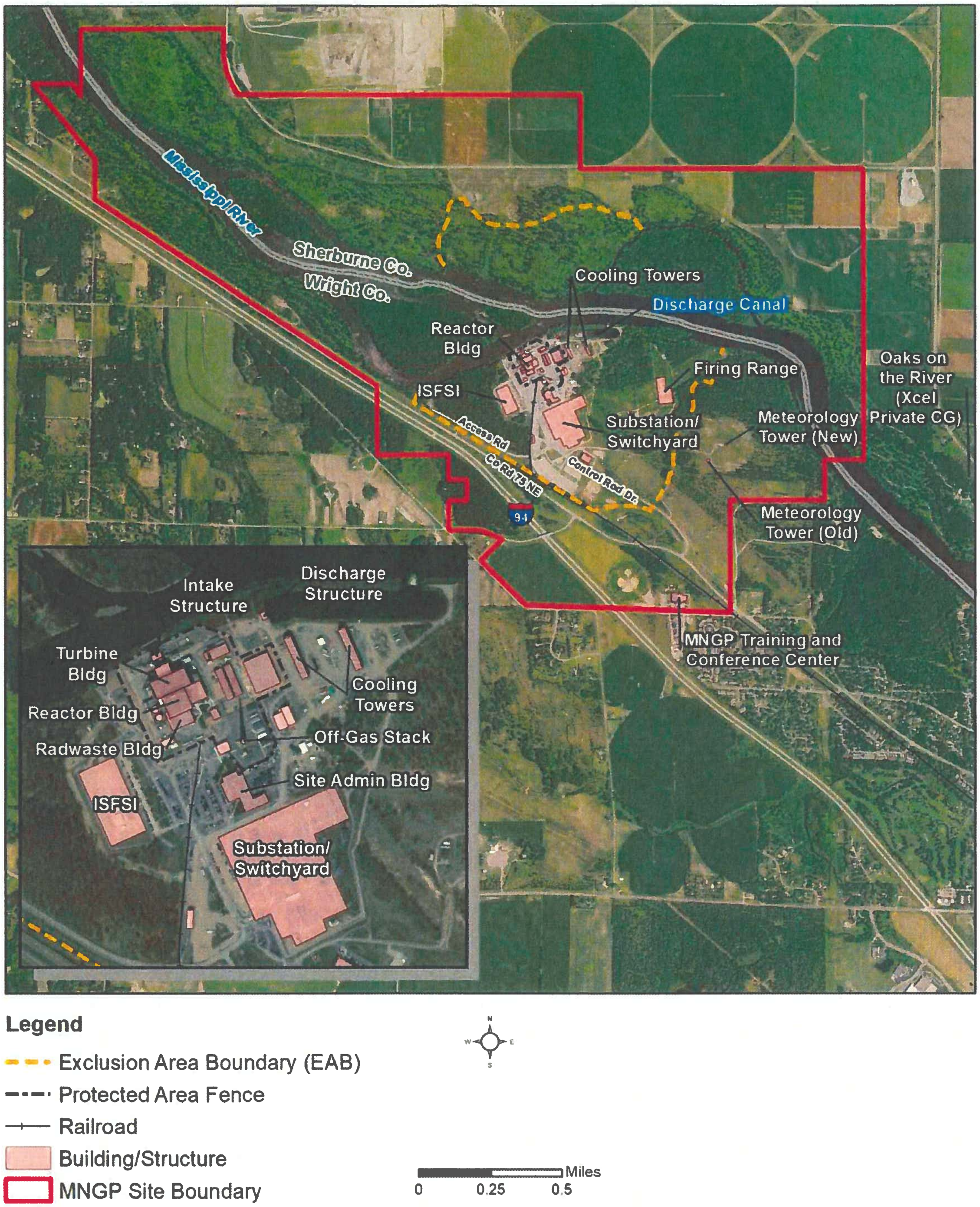
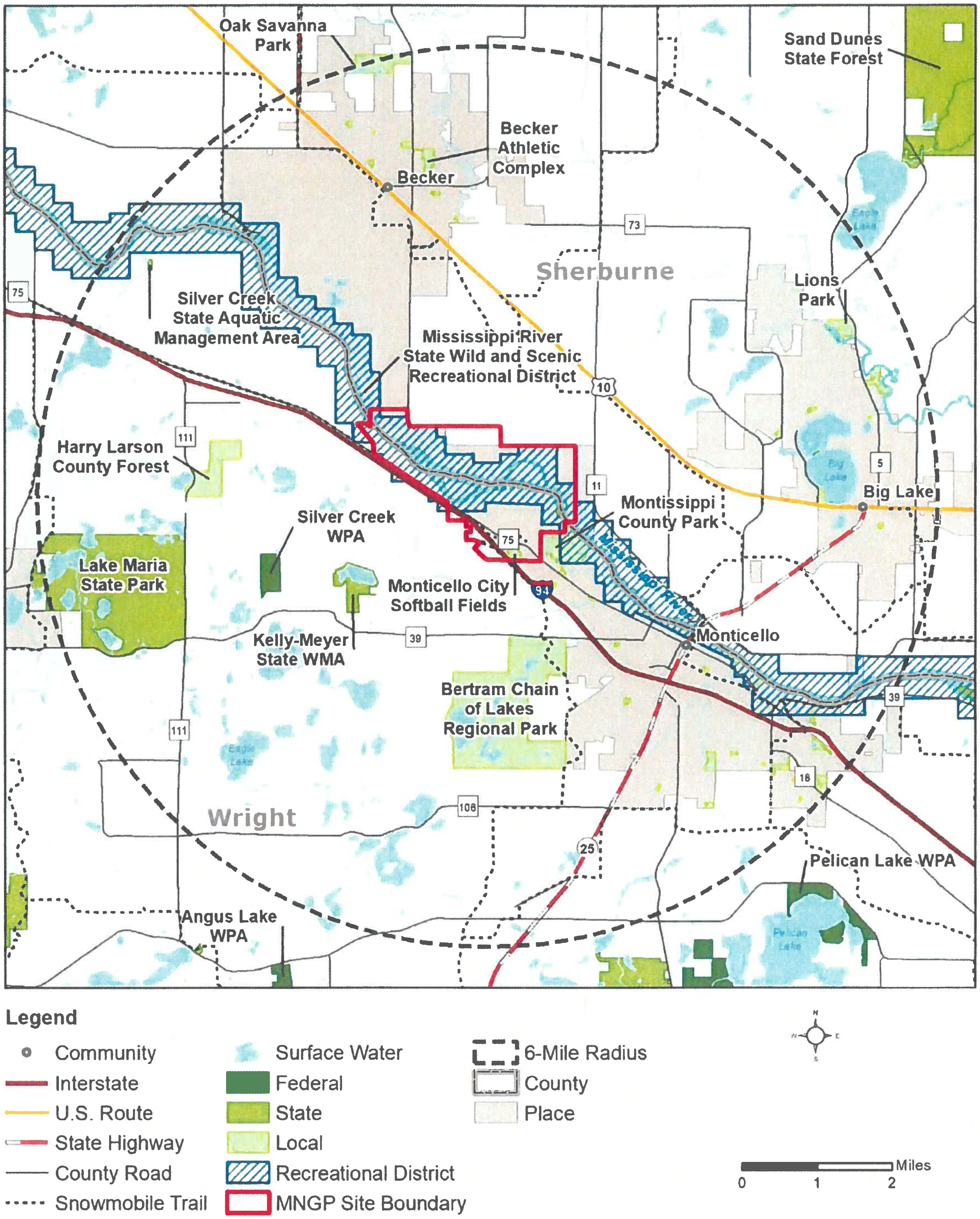


Figure 2. MNGP 6-mile Vicinity



Minnesota Department of Natural Resources
Division of Ecological & Water Resources
500 Lafayette Road, Box 25
St. Paul, MN 55155-4025

August 9, 2022
Correspondence # MCE 2022-00475

Stephen Sollum
Xcel Energy

RE: Natural Heritage Review of the proposed Monticello Nuclear Generating Plant SLR,
T33N R28W Sections 17-21, 28, T122N R25W Sections 30, 32-34, and T121N R25W Sections 4-5;
Sherburne and Wright Counties

Dear Stephen Sollum,

As requested, the Minnesota Natural Heritage Information System has been reviewed to determine if the proposed project has the potential to impact any rare species or other significant natural features. Based on the project details provided with the request, the following rare features may be impacted by the proposed project:

State-listed Species

- Black sandshell (*Ligumia recta*), a state-listed mussel species of special concern, has been documented in the Mississippi River in the vicinity of the proposed project. Mussels may be negatively affected by riverbed disturbance, changes in water flow, and deterioration in water quality including sedimentation/siltation, nutrient loading, and possibly temperature alterations.

- Peregrine falcons (*Falco peregrinus*), a state-listed species of special concern, have nested on the stack for many years. We recommend any activities that will impact this structure be done outside of the nesting season (April through July). If the birds exhibit unusual behaviors or other signs of potential distress during operation or maintnenance, especially during the nesting season, please contact Erica Hoaglund, (651-259-5772 or erica.hoaglund@state.mn.us).

- Please visit the DNR Rare Species Guide for more information on the habitat use of these species and recommended measures to avoid or minimize impacts. For further assistance with these species, please contact the appropriate DNR Regional Nongame Specialist or Regional Ecologist.

Federally Protected Species

- To ensure compliance with federal law, conduct a federal regulatory review using the U.S. Fish and Wildlife Service's (USFWS) online Information for Planning and Consultation (IPaC) tool.

Environmental Review and Permitting

- Please include a copy of this letter and the MCE-generated Final Project Report in any state or local license or permit application. Please note that measures to avoid or minimize disturbance to the above rare features may be included as restrictions or conditions in any required permits or licenses.

The Natural Heritage Information System (NHIS), a collection of databases that contains information about Minnesota's rare natural features, is maintained by the Division of Ecological and Water Resources, Department of Natural Resources. 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. However, the NHIS is not an exhaustive inventory and thus does not represent all of the occurrences of rare features within the state. Therefore, ecologically significant features for which we have no records may exist within the project area. If additional information becomes available regarding rare features in the vicinity of the project, further review may be necessary.

For environmental review purposes, the results of this Natural Heritage Review are valid for one year; the results are only valid for the project location and project description provided with the request. If project details change or the project has not occurred within one year, please resubmit the project for review within one year of initiating project activities.

The Natural Heritage Review does not constitute project approval by the Department of Natural Resources. Instead, it identifies issues regarding known occurrences of rare features and potential impacts to these rare features. Visit the Natural Heritage Review website for additional information regarding this process, survey guidance, and other related information. For information on the environmental review process or other natural resource concerns, you may contact your DNR Regional Environmental Assessment Ecologist.

Thank you for consulting us on this matter, and for your interest in preserving Minnesota's rare natural resources.

Sincerely,

James Drake

James Drake
Natural Heritage Review Specialist
James.F.Drake@state.mn.us

Cc: Melissa Collins

Xcel Energy®

2807 West County Road 75
Monticello, MN 55362

March 17, 2022

L-MT-SLR-22-004

Shauna Marquardt
Deputy Field Office Supervisor
U.S. Fish and Wildlife Service
Minnesota-Wisconsin Ecological Services Field Office
4101 American Blvd. East
Bloomington, MN 55425

Subject: Monticello Nuclear Generating Plant Unit 1 Subsequent License Renewal

Dear Ms. Marquardt:

Northern States Power Company, a Minnesota corporation, doing business as Xcel Energy (hereafter "NSPM") is preparing an application for renewing the operating license for Monticello Nuclear Generating Plant Unit 1 (MNGP) for an additional 20 years (see Table 1). NSPM is contacting you for assistance in assessing the impacts from continued operation during the subsequent license period.

Table 1. MNGP Licensing Dates

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This letter seeks input from the U.S. Fish and Wildlife Service (USFWS) regarding such effects in the vicinity of MNGP. Also, as part of the renewal process, the NRC may request consultation with your agency regarding the subsequent license renewal application. To facilitate our assessment and a smooth consultation by the NRC, we are contacting you early in the application process seeking input regarding the effects that license renewal activities may have on listed species (or candidates proposed for listing) and important plant habitats within the plant's environs and any questions or additional information necessary for the consultation process. Figures depicting the MNGP site (Figure 1), the vicinity within a 6-mile radius of MNGP (Figure 2), and a table of listed species potentially occurring near the MNGP site, or within Wright and Sherburne counties (counties within a 6-mile radius of the site) that are currently federally or state listed as threatened or endangered (Table 2) are enclosed. A brief discussion of the plant and its operations during the renewal period is provided below.

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Should you or your staff have any questions or comments, please contact Paul Young at 612-337-2165 or via email at paul.b.young@xcelenergy.com.

Sincerely,

Christopher P. Domingos
Site Vice President, Monticello and Prairie Island Nuclear Generating Plants
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Blunt-lobed grapefern	ST	Yes
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Clinton's bulrush	ST	Yes
Cross-leaved milkwort	SE	Yes
Hooded arrowhead	ST	Yes
Lance-leaf violet	ST	Yes
Ram's head orchid	ST	Yes
Rock sandwort	ST	Yes
Seaside three-awn	ST	Yes
Swamp blackberry	ST	Yes
Tall nutrush	SE	Yes
Tubercled rein orchid	ST	Yes
Reptiles		
Blanding's turtle	ST	Yes

FE = federally endangered; FT = federally threatened; SE = state endangered; ST = state threatened; FC = federal candidate species

Table 2 Sources:

MDNR 2021. Rare Species Guide. Retrieved from <https://www.dnr.state.mn.us/rsg/index.html> (accessed September 16-17, 2021)

USFWS 2021. IPaC Resource List. Retrieved from <https://ecos.fws.gov/ipac/location/GIYNBWMLQZCHTM76AMX4LXSQCI/resources> (accessed September 18, 2021).

Figure 1. MNGP Site

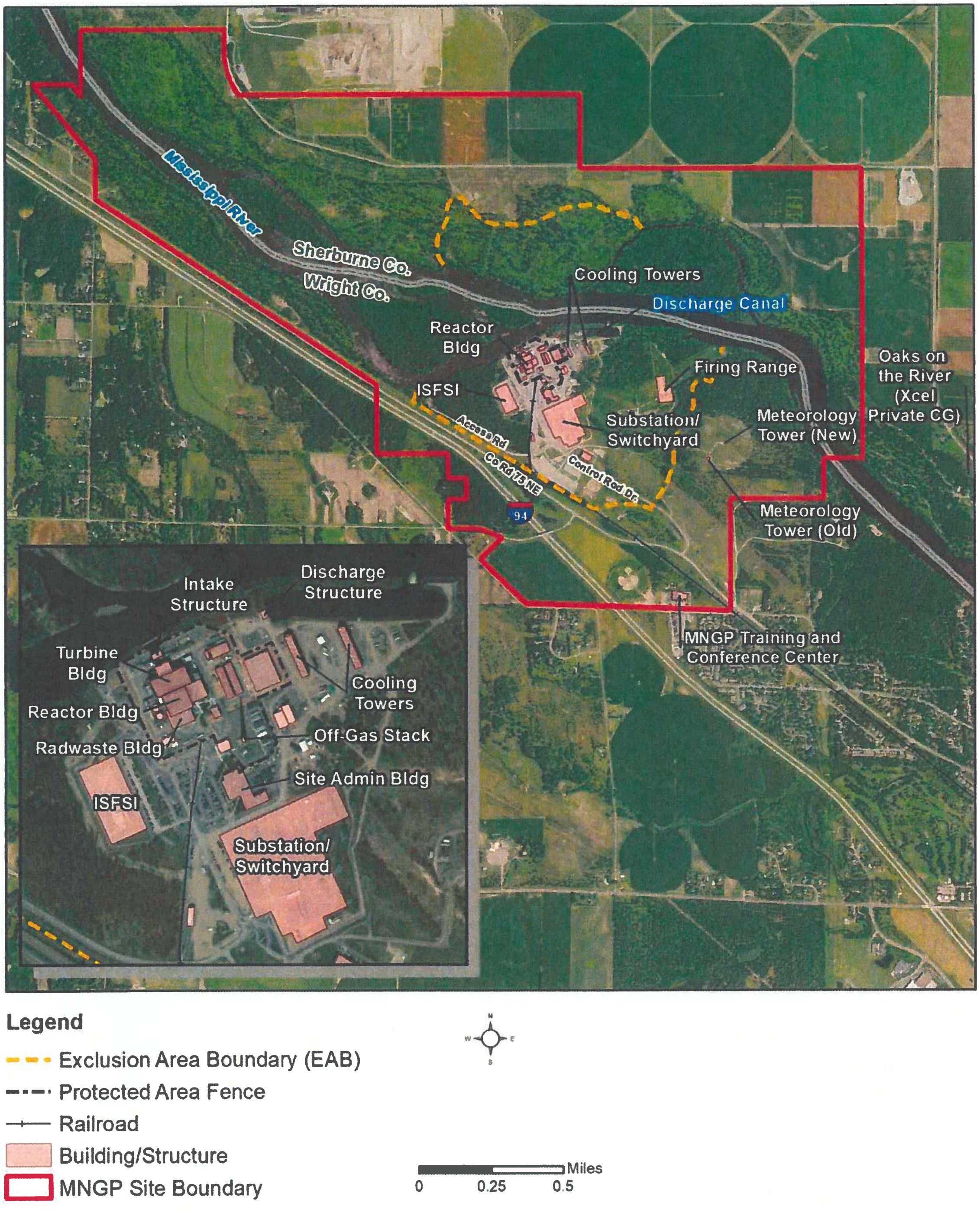
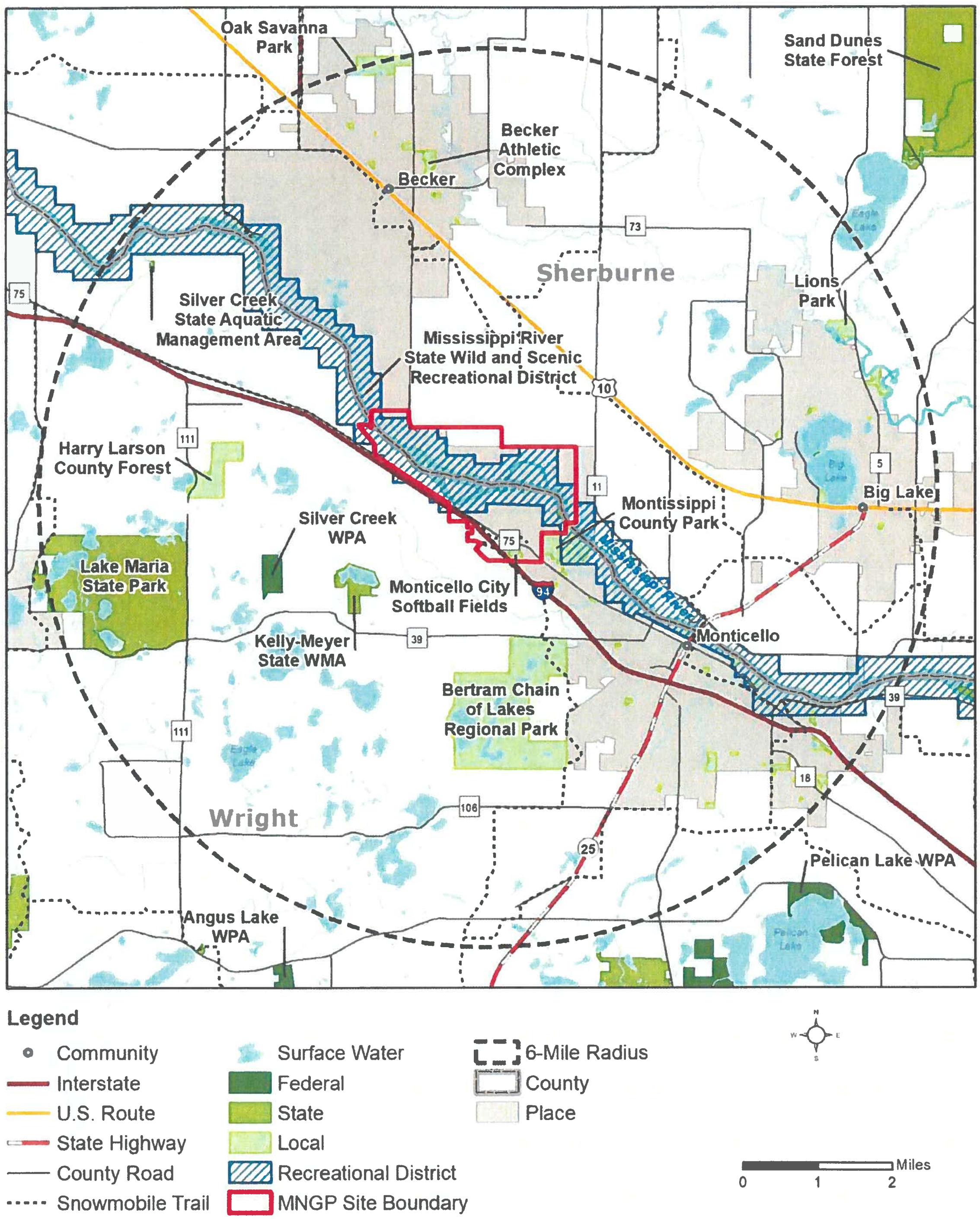


Figure 2. MNGP 6-mile Vicinity



Attachment C: Cultural Resource Consultation Letters

Xcel Energy®

2807 West County Road 75
Monticello, MN 55362

March 17, 2022

L-MT-SLR-22-003

Sarah Beimers
Environmental Review Program Manager
State Historic Preservation Office
Administrative Building #203
50 Sherburne Ave.
St. Paul, MN 55155

Subject: Monticello Nuclear Generating Plant Unit 1 Subsequent License Renewal

Dear Ms. Beimers:

Northern States Power Company, a Minnesota corporation, doing business as Xcel Energy (hereafter "NSPM") is preparing an application for renewing the operating license for Monticello Nuclear Generating Plant Unit 1 (MNGP) for an additional 20 years (see Table 1). As part of the process, the U.S. Nuclear Regulatory Commission (NRC) requires that the subsequent license renewal application include an environmental report (ER) that assesses the impacts from continued operation and any refurbishment to be undertaken to enable the continued operation of the unit. The ER addresses the potential to impact historic and cultural resources including tribal cultural resources on or near the MNGP site.

Table 1. MNGP Licensing Dates

MNGP Unit	Initial License Expiration Date	Current License Expiration Date	Subsequent License Expiration Date
Unit 1	September 8, 2010	September 8, 2030	September 8, 2050

This letter seeks input form the Minnesota State Historic Preservation Office regarding such effect in the vicinity of MNGP.

Also, a part of the renewal process, the NRC may request consultation in accordance with Section 106 of the National Historic Preservation Act of 1966, as amended (16 USC 470), and the federal Advisory Council on Historic Preservation regulations (36 CFR 800) with your agency regarding the subsequent license renewal application. The timeframe for the NRC consultation request is anticipated to be within a few months of NSPM's application submittal, currently scheduled for early 2023.

To facilitate our preparation of the license renewal ER and a smooth consultation by the NRC, we are contacting you early in the application process seeking input regarding the effects that license renewal activities may have on historic and cultural resources within the plant's environs, and any questions or additional information necessary for the consultation process. Figures depicting the MNGP site (Figure 1), the vicinity within a 6-mile radius of MNGP

(Figure 2), and a table of known archaeological sites and historic properties in the plant's vicinity (Table 2) are enclosed. A brief discussion of the plant and its operations during the renewal period of operation is provided below.

MNGP is located within the city limits of Monticello, Minnesota. The MNGP site is situated on approximately 2,000 acres on the north and south banks of the Mississippi River, with portions of the property located in both Wright and Sherburne counties. In accordance with NRC regulations, the transmission lines within the scope of the license renewal environmental report are those located within the MNGP site boundary.

During the license renewal term, NSPM proposes to continue operating the unit as currently operated. There are currently no ground-disturbing activities other than those to maintain existing structures and operations anticipated at the MNGP site during the subsequent license renewal period. Currently, NSPM does not anticipate any refurbishment as a result of the technical and aging management program information that will be submitted in accordance with the NRC license renewal process.

NSPM does not anticipate the continued operation of MNGP to adversely affect the environment or any cultural or historic resources.

As stated earlier, this letter seeks your input on the proposed continued operation of MNGP on historic and cultural resources, including tribal cultural resources, within the environs of the plant. Please notify us of concerns and any information you believe NSPM should consider in the preparation of the ER. Your input is requested by 05/16/2022. NSPM plans to include this letter and any response you provide in the final ER.

Should you or your staff have any questions or comments, please contact Paul Young at 612-337-2165 or via email at paul.b.young@xcelenergy.com.

Sincerely,

Christopher P. Domingos
Site Vice President, Monticello and Prairie Island Nuclear Generating Plants
Northern States Power Company – Minnesota

Attachments:
Table 2. Archaeological Sites and Historic Properties within a 6-mile radius of MNGP
Figure 1. MNGP Site
Figure 2. MNGP 6-mile Vicinity

Table 2. Archaeological Sites and Historic Properties within a 6-mile Radius of MNGP

Site ID #/Name	USGS Topographic Quadrangle	Type	NRHP Status/SHPO Evaluation
21WR0176	Monticello	Undetermined lithic scatter	Undetermined
21WR0175	Monticello	Undetermined lithic scatter	Undetermined
21WR0177	Monticello	Pre-Contact lithic and artifact scatter	Undetermined
21WR0178	Monticello	Pre-Contact lithic scatter	Undetermined
21WR0179	Monticello	Pre-Contact lithic and artifact scatter	Undetermined
21WR0180	Monticello	Post-Contact Euro-American farmstead surface features	Undetermined
21WR0181	Monticello	Post-Contact Euro-American farmstead surface features	Undetermined
21WR0182	Monticello	Post-Contact Euro-American farmstead surface features and artifact scatter	Undetermined
21WR0183	Monticello	Post-Contact Euro-American farmstead surface features and artifact scatter	Undetermined
21WR0184	Monticello	Post-Contact Euro-American farmstead surface features and artifact scatter	Undetermined
21WR0185	Monticello	Post-Contact Euro-American farmstead surface features and artifact scatter	Undetermined
21WR0186	Monticello	Post-Contact Euro-American farmstead surface features and artifact scatter	Undetermined
21WRK	Monticello	Undetermined lithic scatter	Undetermined
21SH0008	Big Lake	Woodland burial mounds	Destroyed
21SH0035	Becker	Undetermined lithic scatter	Not eligible (not a site)
21SH0036	Becker	Middle Woodland lithic scatter	Not eligible (not a site)
21SH0045	Monticello	Undetermined lithic scatter consisting of a single quartz flake	Destroyed
21SH0046	Monticello	Post-Contact EuroAmerican farmstead trash pit	Undetermined
21SH0068	Silver Creek	Pre-Contact lithic	Undetermined
21WR0049	Silver Creek	Late Woodland lithic scatter	Undetermined
21WR0051	Silver Creek	Archaic and Woodland artifact scatter	Undetermined
21WR0052	Silver Creek	Undetermined artifact scatter	Undetermined
21WR0060	Silver Creek	Woodland artifact scatter	Undetermined
21WR0061	Silver Creek	Undetermined lithic scatter	Undetermined
21WR0075	Silver Creek	Brainerd Woodland artifact scatter	Undetermined
21WR0076	Silver Creek	Transitional Woodland artifact scatter	Undetermined
21WR0165	Silver Creek	Pre-Contact lithic scatter	Undetermined

Site ID #/Name	USGS Topographic Quadrangle	Type	NRHP Status/SHPO Evaluation
21WRJ	Silver Creek	Paleo, Archaic, and Woodland lithic scatters	Undetermined
21WR0117	Silver Creek	Middle to Late Woodland artifact scatter	Not eligible
21SH0028	Becker	Archaic and Woodland artifact scatter	Undetermined
21SH0003	Big Lake	Woodland burial mounds	Undetermined
21SH0004	Becker	Woodland burial mounds	Undetermined
21SH0005	Becker	Woodland burial mounds	Undetermined
21SH0006	Becker	Woodland burial mounds	Undetermined
SHp	Becker	Woodland burial mounds and a reported early post contact Euro-American cemetery	Undetermined
79001273/David Hannaford Farmstead	Monticello	Frame Federal built 1870	Listed on the NHRP in 1979
79001274/Nicherson/Tarbox House, Shed and Barn	Monticello	Frame Queen Anne and shingle, built 1889	Listed on the NHRP in 1979
79001275/Rand, Rufus, Summer House and Carriage Barn	Monticello	Frame Queen Anne, built 1884	Listed on the NHRP in 1979
WR-WCC-014/Simpson Methodist Church	Monticello	Not listed	SHPO lists as "on the NRHP"
SH-XXX-002/Minnesota Hwy 10	Cable	Minnesota highway, Elk River to St. Cloud	SHPO certified eligible finding
SH-BLC-003/Knights of Maccabees Hall	Big Lake	Not listed	SHPO certified eligible finding
SH-BLC-008/Big Lake School	Big Lake	Not listed	SHPO certified eligible finding
SH-BLT-009/Great Northern Railway branch line	Big Lake	Not listed	SHPO certified eligible finding
SH-BLT-010/Northern Pacific Railway branch line	Big Lake	Not listed	SHPO certified eligible finding
Riverside Cemetery	Monticello	Cemetery	Protected by state burial laws
St. Henrys/Calvary Cemetery	Monticello	Cemetery	Protected by state burial laws

Site ID #/Name	USGS Topographic Quadrangle	Type	NRHP Status/SHPO Evaluation
Helm Cemetery	Monticello	Cemetery	Protected by state burial laws
Hillside Cemetery	Monticello	Cemetery	Protected by state burial laws
Our Lady of the Lake Catholic Cemetery	Big Lake	Cemetery	Protected by state burial laws
Big Lake Cemetery	Big Lake	Cemetery	Protected by state burial laws
Immaculate Conception Catholic Cemetery	Becker	Cemetery	Protected by state burial laws
Becker Cemetery	Becker	Cemetery	Protected by state burial laws

Sources:
MOSAP (Minnesota Office of the State Archaeologist Portal). 2021. Archaeological site 2 Records. Retrieved from (accessed 3 September 18, 2021)

USGS (U.S. Geological Survey). 2021. TopoView. Retrieved from 13 (accessed September 23, 2021)

Figure 1. MNGP Site

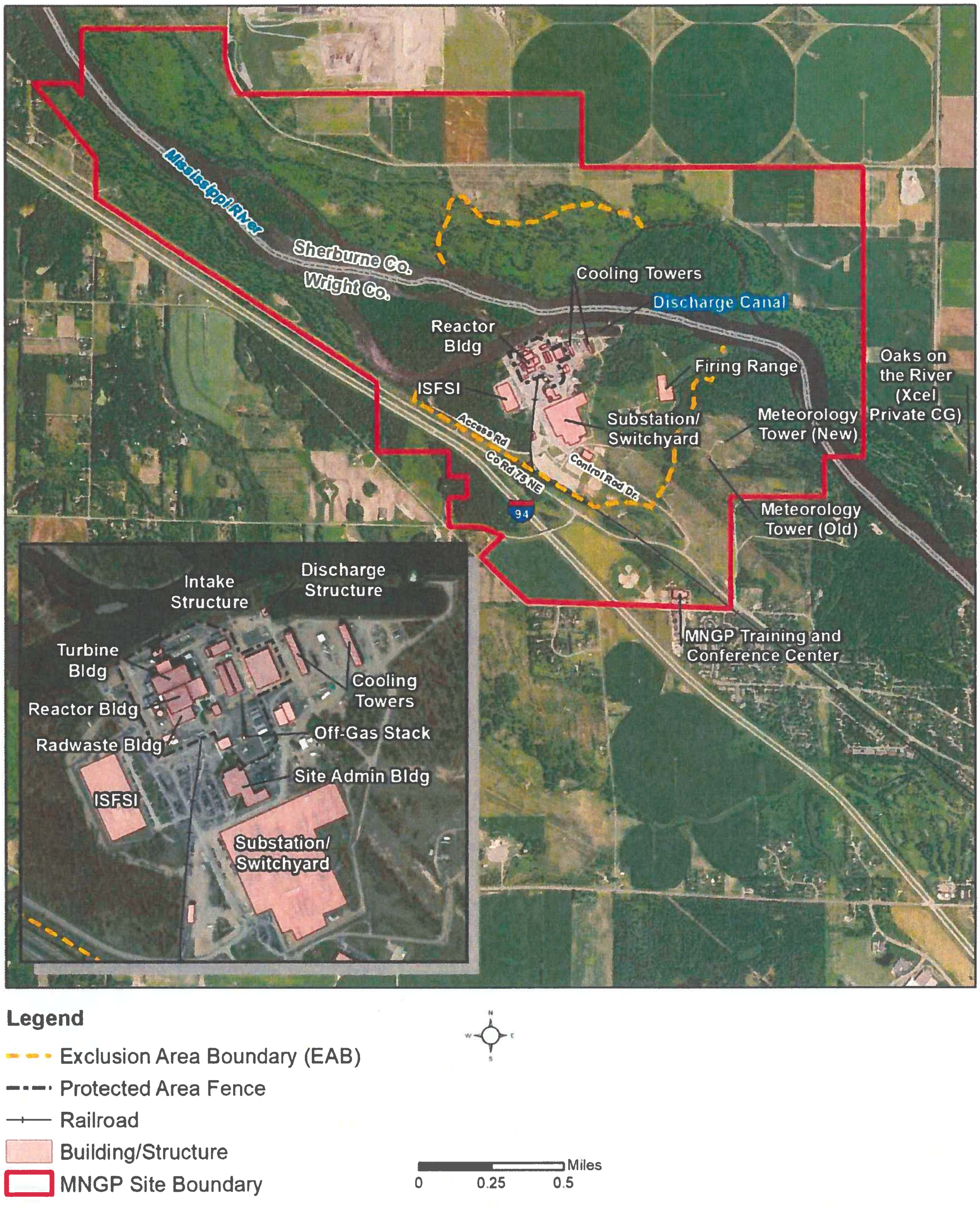
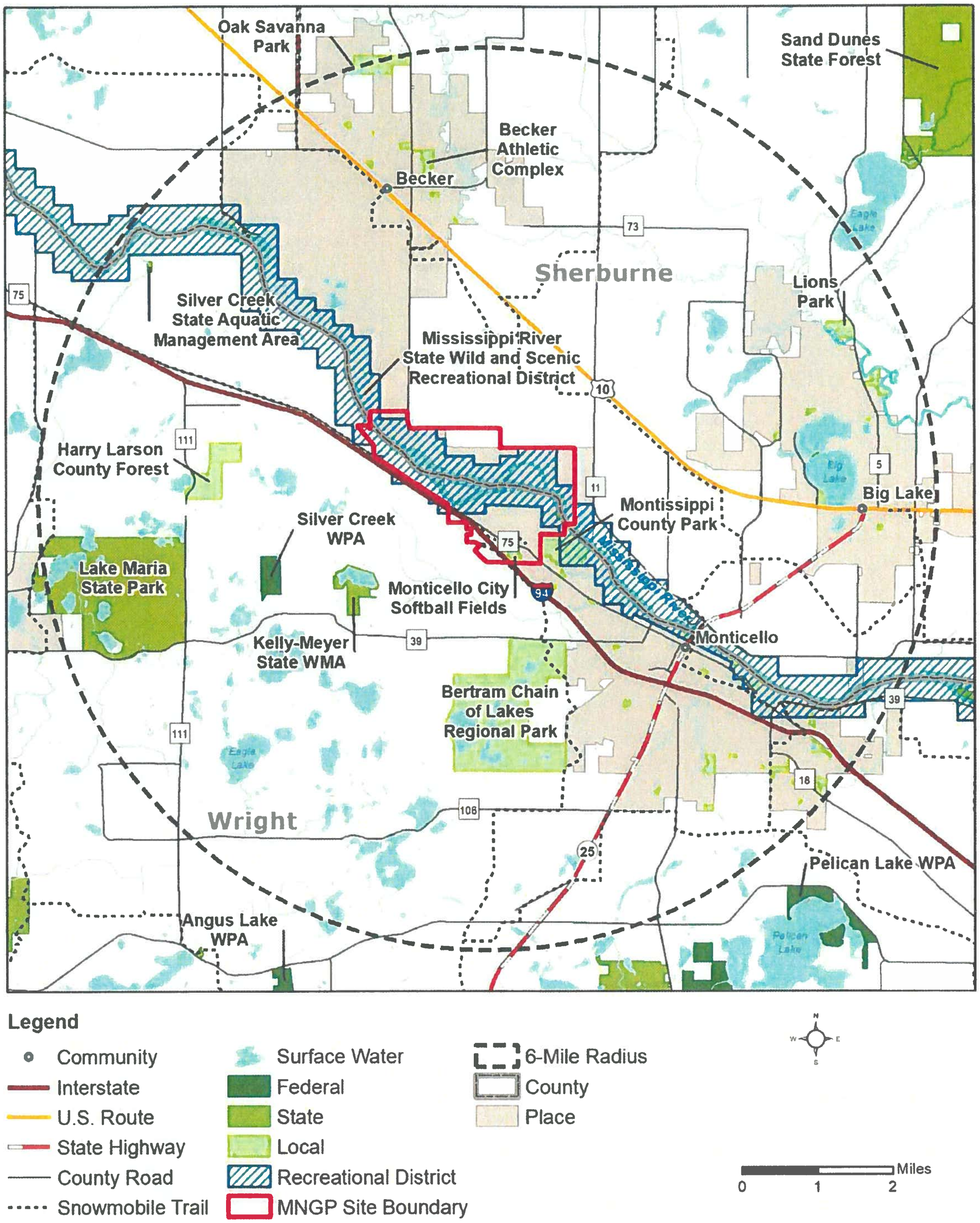


Figure 2. MNGP 6-mile Vicinity



DEPARTMENT OF ADMINISTRATION
STATE HISTORIC PRESERVATION OFFICE

April 29, 2022 **VIA E-MAIL**

Christopher Domingos
Monticello Nuclear Generating Plant
Northern States Power Company – Minnesota
2807 West County Road 75
Monticello MN 55362

RE: Monticello Nuclear Generating Plant Unit 1 Subsequent License Renewal
Wright County, Minnesota
SHPO Number: 2022-1087

Dear Mr. Domingos,

Thank you for contacting our office regarding the preparation of an application to the U.S. Nuclear Regulatory Commission (NRC) for renewing the operating license for the Monticello Nuclear Generating Plant (MNGP). Based upon information received in our office on March 18, 2022, we understand that the license renewal application to the NRC also includes the preparation of an Environmental Report (ER) which assesses potential impacts of the license renewal (continued operation and any refurbishment) on "historic and cultural resources including tribal cultural resources on or near the MNGP site."

Because the NRC has not yet initiated consultation regarding a federal undertaking pursuant to the agency's responsibilities under Section 106 of the National Historic Preservation Act (54 U.S.C. § 306108) and its implementing federal regulations, "Protection of Historic Properties" (36 CFR Part 800), any comments and recommendations made by our office at this time are to be considered advisory-only.

We have completed a review of your letter dated March 17, 2022, a submittal which included the following:

- Figure 1: MNGP Site;
- Figure 2: MNGP 6-mile Vicinity; and
- Table 2: Archaeological Sites and Historic Properties within a 6-mile Radius of MNGP.

We understand by your March 17th letter that the relicensing of the MNGP by the NRC would facilitate continuation of operations as they are currently and would not result in any ground disturbing activities "other than those to maintain existing structures and operations." Because we are not intimately familiar with current MNGP operations and the potential effects – including direct, indirect, and cumulative effects – that these operations may have on archaeological sites, cultural landscapes, and the historic built environment, as consultation moves forward, we request additional information regarding the scope and nature of "current operations" including maintenance of existing structures. In addition to potential direct, physical effects (demolition, alteration, ground disturbance, new construction), please include a description of other potential effects such as visual, auditory, atmospheric, etc., that are typical to MNGP operations which may have the potential to affect archaeological and historic properties.

In addition to documenting the MNGP Site (Figure 1), you have identified a larger area encompassing a 6-mile radius around the site (Figure 2). We assume that this 6-mile area, for purposes of our review and comment at this time, is consistent with consideration and assessment of other potential resource impacts as part of your ER preparation. We also assume that, once the NRC initiates Section 106 consultation, the agency will define an Area of Potential Effect (APE) appropriate to the scope and nature of the federal undertaking and per the definition found under 36 CFR § 800.16(d) and that APE may differ from both the MNGP Site and 6-mile radius boundary.

The list of currently recorded archaeological sites and historic/architectural properties within a 6-mile radius of the MNGP Site, as included in Table 2 of your March 17th submission, is somewhat misleading as it does not account for all possible historic properties – all property types that are either listed in or eligible for listing in the National Register of Historic Places (NRHP) – within the defined area.

In regard to archaeological property types, the Table 2 list accurately reflects currently recorded archaeological sites within the 6-mile radius. While a handful of these sites have been previously evaluated and determined either eligible or not eligible for listing in the NRHP, the majority of the sites have never been evaluated. Also, our records indicate that a comprehensive archaeological survey of the MNGP Site and its immediate surroundings has not yet been undertaken. We recommend that, at a minimum, an archaeological survey be completed for areas within the MNGP Site which may be subject to ground disturbance as part of the relicensing.

In regard to historic/architectural property types listed in Table 2, this list includes properties currently listed in the NRHP as well as those that have been subject to intensive level survey and evaluation, and subsequently determined eligible for listing in the NRHP as part of other federal project reviews. Because the entire area has not been subject to an up-to-date comprehensive survey, there may be many other historic properties within the 6-mile radius of MNGP which have not yet been identified. Our database includes over 150 unevaluated properties 50 years or older within the cities of Big Lake, Becker, and Monticello, most of which were inventoried during statewide windshield surveys in the early 1980s. This number does not include additional inventoried and unevaluated properties in rural townships within the 6-mile radius.

We note that the MNGP was completed and began operations in 1971. As such, the property is now over 50 years old, the minimum age for consideration in the NRHP. Therefore, we recommend that the MNGP be subject to intensive level survey and evaluation to determine eligibility for listing in the NRHP.

At this time, while there are some identified historic properties within the project vicinity, the identification efforts should not be considered complete, and, as such, we do not yet have full understanding of all historic properties that may be affected by the proposed relicensing. Therefore, the statement offered in your March 17th letter that the continued operation of the MNGP will not adversely affect "historic resources" may be premature.

In consultation with our office and others, the federal agency will determine an appropriate level of effort to identify historic properties within a defined APE as part of Section 106 review process. Following consultation regarding the results of historic property identification efforts, the federal agency will then assess potential adverse effects to historic properties which may be caused by the proposed federal undertaking. Again, while all of this will be required as part of the Section 106 review process, it is unclear to our office the level of historic property identification effort needed to support any resource impact conclusions included in the ER.

Your March 17th letter requests our office's input regarding the continued operation of the MNGP and potential effects to tribal cultural resources. This is not our office's expertise. Tribes possess the expertise in identifying and assessing NRHP eligibility of properties with religious and cultural significance to their Tribe, both on and off tribal lands. Also, the term "cultural resources" covers a range of resources, including sacred sites, archaeological sites, and archaeological collections, all of which may or may not be eligible for listing in the NRHP. We recommend that you engage those Tribes with an ancestral interest in the project area to provide you with information regarding tribal cultural resources.

Please feel free to contact me if you have any questions regarding our comment letter. I can be reached at (651) 201-3290 or by e-mail at sarah.beimers@state.mn.us.

Sincerely,

Sarah J. Beimers

Sarah J. Beimers
Environmental Review Program Manager

Xcel Energy®

2807 West County Road 75
Monticello, MN 55362

September 23, 2022

L-MT-SLR-22-030

Sarah Beimers
Environmental Review Program Manager
State Historic Preservation Office
Administrative Building #203
50 Sherburne Ave.
St. Paul, MN 55155

Subject: Additional Information Regarding Monticello Nuclear Generating Plant Unit 1 Subsequent License Renewal

Dear Ms. Beimers:

Thank you for responding to our initial letter, dated March 17, 2022, regarding the upcoming Monticello Nuclear Generating Plant Unit 1 (MNGP) Subsequent License Renewal (SLR). As stated in the original letter, Xcel is seeking input from the Minnesota State Historic Preservation Office regarding the MNGP SLR project. Your response to our letter dated April 29, 2022 contained several requests for additional information regarding the project. These requests are addressed below and summarized as follows:

- Need for an Archaeological Survey
- Potential Eligibility of Structures for Listing in the National Register of Historic Places (NRHP)
- Consultation with Native American Tribes
- Ongoing Maintenance and Operations at MNGP
- Currently recorded Archaeological Sites and Historic/Architectural Properties

Need for an Archaeological Survey

As noted in your April 29, 2022 letter, an archaeological survey was suggested to be completed for areas within the MNGP site which may be subject to ground disturbance as part of this relicensing. No specific ground-disturbing activities are identified to occur as part of the SLR. Potential ground-disturbing activities associated with general operations and maintenance will undergo an environmental review prior to the activity that includes a cultural resources evaluation. All potential operations and maintenance activities are anticipated to occur on previously disturbed ground. Therefore, there is no requirement to conduct an archeology survey at this time.

Potential Eligibility of Structures for Listing in the NRHP

Also as noted in the letter, MNGP was completed and began operations in 1971, therefore the property is over 50 years old. As recommended in your letter, Xcel is currently working with a contractor to conduct an architectural survey and evaluation to determine eligibility for listing in the NRHP. We will collaborate with you during the survey to optimize the evaluation and reporting process.

Consultation with Native American Tribes
Another recommendation was for MNGP to seek input from the Native American Tribes with an ancestral interest in the project area. Earlier this year, Xcel sent consultation letters to the applicable Tribes in the project area to inform them of the SLR and request their input. The list of Tribes contacted included those who owned land within the 50-mile region, as well as Tribes listed in the Housing and Urban Development's Tribal Directory Assessment Tool (TDAT). The TDAT tool identifies Tribes with current and ancestral interest at a county level. As such, Xcel believes this recommendation has been met by our consultation process.

Ongoing Maintenance and Operations at MNGP
MNGP has had over 50 years of operating experience at this location and during that time, no culturally significant or historically significant resources have been documented within the project area. There are two procedures regarding excavation activities at MNGP. Per these procedures, if an item of potential cultural or historical significance is discovered, all work will be suspended and an archeologist will be contacted to determine the next steps. As noted in our initial consultation letter, there are currently no ground-disturbing activities anticipated, other than those to maintain existing structures and operations, anticipated as part of the SLR. The maintenance and operations activities are anticipated to occur only in the already disturbed land areas. An example of a maintenance activity that could involve ground-disturbance would be an inspection of buried underground piping. While soil disturbance would occur, it would occur in areas already disturbed as part of construction of MNGP. If any projects with ground-disturbing activities were planned to occur on undisturbed portions of the site, the projects would undergo an environmental review, and if applicable, cultural resource surveys would be conducted.

Currently Recorded Archaeological Sites and Historic/Architectural Properties
Your letter also noted that the list of sites provided in Table 2 was somewhat misleading. We appreciate your feedback and have added clarification in the environmental report that the list includes the NRHP listed or eligible properties only. Additionally, we have added content that notes the number of undetermined structures within the 6-mile vicinity.

Finally, as you noted in your letter, the official Section 106 consultation will take place between SHPO and the NRC. The Environmental Report, included in the MNGP SLR Application as Appendix E, will be submitted to the NRC. Upon the NRC's acceptance, the Environmental Report will be docketed and made public via the NRC's Agencywide Documents Access and Management System (ADAMS). At this point, SHPO will have access to Xcel's historic and cultural resources analyses, including the evaluations of potential impacts associated with continued operation.

Xcel trusts that the information provided here supplies sufficient clarification for you at this stage of the project. As stated earlier, we will be reaching out to discuss the architectural survey and evaluation. Should you or your staff have any questions or comments, please contact Paul Young at 612-337-2165 or via email at paul.b.young@xcelenergy.com.

Sincerely,

Christopher P. Domingos
Site Vice President, Monticello and Prairie Island Nuclear Generating Plants
Northern States Power Company – Minnesota

As noted in ER Section 9.5.11, Xcel Energy sent consultation letters to Native American groups recognized as potential stakeholders with the opportunity for comment. A list of these recipients is provided below. An example consultation letter sent by Xcel Energy is provided in this attachment, as are all responses received.

Table C-1 List of Native American Group Recipients

Native American Tribe	Name	Title
Shakopee Mdewakanton Sioux Community	Leonard Wabasha	
Apache Tribe of Oklahoma	Bobby Komardley	Chairman
Bad River Band of Lake Superior Tribe of Chippewa Indians of the Bad River Reservation, Wisconsin	Edith Leoso	Tribal Historic Preservation Officer
Cheyenne and Arapaho Tribes, Oklahoma	Max Bear	Tribal Historic Preservation Officer
Flandreau Santee Sioux Tribe of South Dakota	Garrie Kills-A-Hundred	Tribal Historic Preservation Officer
Fond du Lac Band of the Minnesota Chippewa Tribe	Jill Hoppe	Tribal Historic Preservation Officer
Fort Belknap Indian Community of Fort Belknap Reservation of Montana	Michael Blackwolf	Tribal Historic Preservation Officer
Grand Portage Band of the Minnesota Chippewa Tribe	Maryann Gagnon	Tribal Historic Preservation Officer
Minnesota Chippewa Tribe	Rob Hull	Tribal Historic Preservation Officer - Grand Portage Band
Keweenaw Bay Indian Community, Michigan	Alden Connor	Tribal Historic Preservation Officer
Lac du Flambeau Band of Lake Superior Chippewa Indians of the Lac Du Flambeau Reservation of Wisconsin	Melinda Young	Tribal Historic Preservation Officer
Lac Vieux Desert Band of Lake Superior Chippewa Indians	Alina Shively	Tribal Historic Preservation Officer
Leech Lake Band of the Minnesota Chippewa Tribe	Amy Burnette	Tribal Historic Preservation Officer
Lower Sioux Indian Community in the State of Minnesota	Cheyanne St. John	Tribal Historic Preservation Officer
Menominee Indian Tribe of Wisconsin	David Grignon	Tribal Historic Preservation Officer
Mille Lacs Band of Ojibwe (The Mille Lacs Band of the Minnesota Chippewa Tribe Mille Lacs Band of Ojibwe)	Terry Kemper	Tribal Historic Preservation Officer

Native American Tribe	Name	Title
Prairie Island Indian Community in the State of Minnesota	Noah White	Tribal Historic Preservation Officer
Red Cliff Band of Lake Superior Chippewa Indians of Wisconsin	Christopher Boyd	Tribal Historic Preservation Officer
Santee Sioux Nation, Nebraska	Misty Frazier	Tribal Historic Preservation Officer
Sisseton-Wahpeton Oyate of the Lake Traverse Reservation, South Dakota	Dianne Desrosiers	Tribal Historic Preservation Officer
Sokaogon Chippewa Community, Wisconsin	Garland McGeshick	Chairperson
Spirit Lake Tribe, North Dakota	Susie Fox	Tribal Historic Preservation Officer
Upper Sioux Community, Minnesota	Samantha Odegard	Tribal Historic Preservation Officer
White Earth Band of the Minnesota Chippewa Tribe	Jaime Arsenault	Tribal Historic Preservation Officer

2807 West County Road 75
Monticello, MN 55362

May 11, 2022

L-MT-SLR-22-006

Leonard Wabasha
Shakopee Mdewakanton Sioux Community
2330 Sioux Trail NW
Prior Lake, MN 55372

Subject: Monticello Nuclear Generating Plant Unit 1 Subsequent License Renewal

Dear Mr. Wabasha:

Northern States Power Company, a Minnesota corporation, doing business as Xcel Energy (hereafter "NSPM") is preparing an application for renewing the operating license for Monticello Nuclear Generating Plant Unit 1 (MNGP) for an additional 20 years (see Table 1). This process is known as a "subsequent license renewal", and as part of the process the U.S. Nuclear Regulatory Commission (NRC) requires that the license renewal application include an environmental report (ER) that assesses the impacts from continued operation and any refurbishment to be undertaken to enable the continued operation of the unit.

Table 1. MNGP Licensing Dates

MNGP Unit	Initial License Expiration Date	Current License Expiration Date	Subsequent License Expiration Date
Unit 1	September 8, 2010	September 8, 2030	September 8, 2050

NSPM is contacting you with the intent of introducing the project and to make available any data you need to ensure an efficient and effective consultation process, and to request the following:

- Input from you regarding tribal cultural resources within the plant's surrounding area, and
- Confirmation from you on our impact assessment due to the continued operation of MNGP that, absence of ground disturbing activities other than those to maintain existing structures and operations and no refurbishment, there will be no anticipated impacts to cultural resources within the plant's environs.

MNGP is located within the city limits of Monticello, Minnesota. The MNGP site is situated on approximately 2,000 acres on the north and south banks of the Mississippi River, with portions of the property located in both Wright and Sherburne counties. In accordance with NRC regulations, the transmission lines within the scope of the license renewal environmental report are those located within the MNGP site boundary. During the subsequent license renewal term, NSPM proposes to continue operating the unit as currently operated. There are currently no ground-disturbing activities other than those to maintain existing structures and operations anticipated at the MNGP site during the subsequent license renewal period. NSPM does not anticipate any refurbishment as a result of the technical and aging management program information that will be submitted in accordance with the NRC license renewal process, nor is the continued operation of MNGP anticipated to adversely affect the environment or any cultural or historic resources.

While environmental impacts of the existing facility were assessed during original and initial renewal licensing, subsequent license renewal is unlikely to have significant additional or different impacts. The NRC may request a consultation with the Minnesota State Historic Preservation Office (SHPO) and your tribe regarding the subsequent license renewal. Should the NRC consultation take place, the time frame for its conduct is anticipated to be within a few months of NSPM's application submittal, currently scheduled for early 2023.

To facilitate preparation of the license renewal ER and a smooth consultation by the NRC, we are contacting you early in the application process seeking input regarding the effects that subsequent license renewal activities may have on cultural resources within the plant's environs and any questions or additional information necessary for the consultation process. Figures depicting the MNGP site (Figure 1) and the vicinity within a 6-mile radius of MNGP (Figure 2) are enclosed.

As stated earlier, this letter seeks your input regarding cultural resources within the plant's surrounding area, and confirmation from you that there will be no anticipated impacts to tribal cultural resources within the plant's environs. We appreciate you notifying us of your comments and any information you believe NSPM should consider in the preparation of the ER. We request that you send your letter response to Paul Young (see contact information below). NSPM plans to include this letter and any response you provide in the ER.

Should you or your staff have any questions or comments, please contact Paul Young at 612-337-2165 or via email at paul.b.young@xcelenergy.com.

Sincerely,

Christopher P. Domingos
Site Vice President, Monticello and Prairie Island Nuclear Generating Plants
Northern States Power Company – Minnesota

Attachments:
Figure 1. MNGP Site
Figure 2. MNGP 6-mile Vicinity

Figure 1. MNGP Site

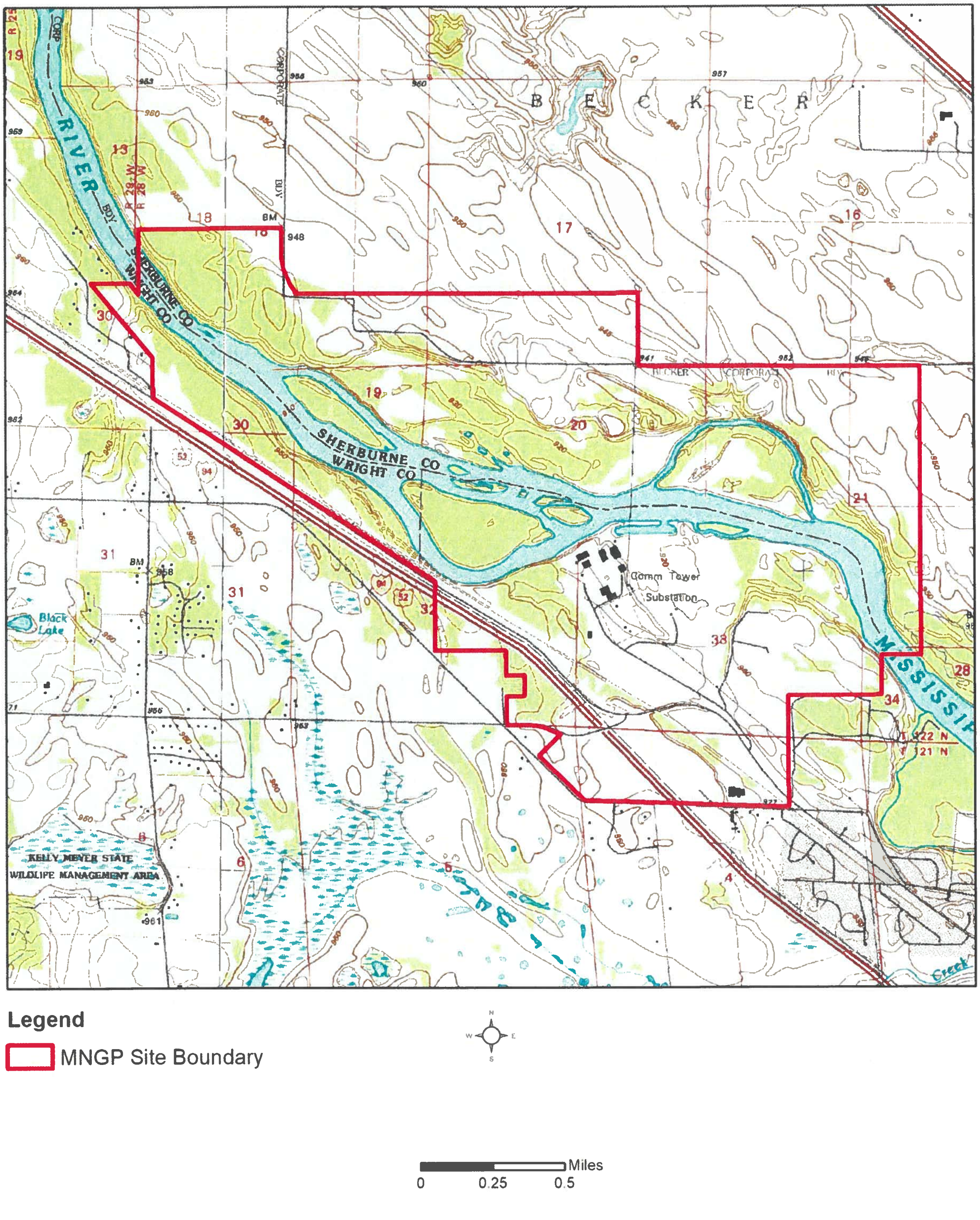
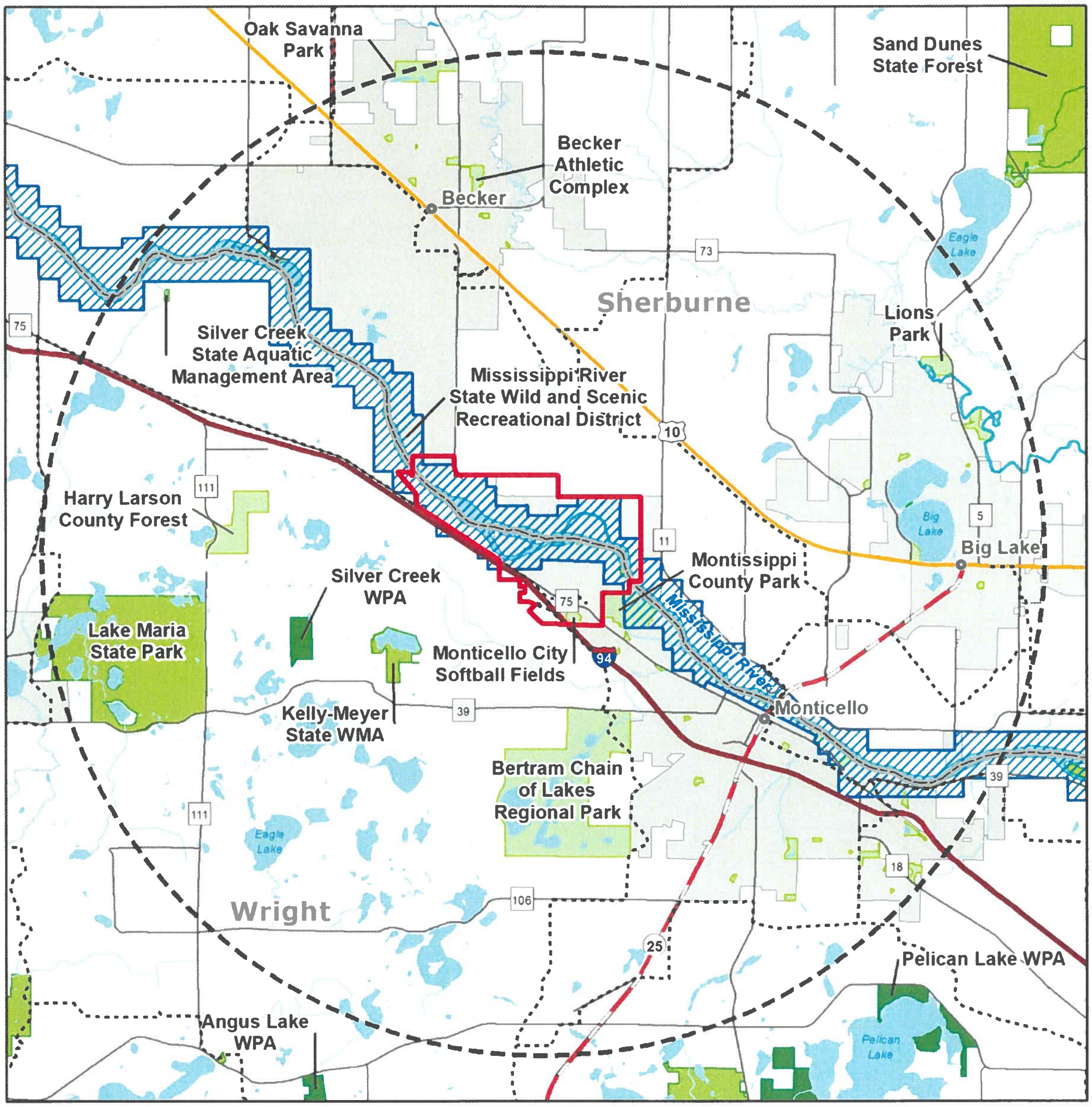


Figure 2. MNGP 6-mile Vicinity



Legend

- Community
- Interstate
- U.S. Route
- State Highway
- County Road
- Snowmobile Trail
- Surface Water
- Federal
- State
- Local
- Recreational District
- MNGP Site Boundary
- 6-Mile Radius
- County
- Place

0 1 2 Miles

Sollom, Stephen E

From: Leonard Wabasha (TO) <leonard.wabasha@shakopeedakota.org>
Sent: Monday, May 23, 2022 7:20 AM
To: Sollom, Stephen E
Cc: Young, Paul B
Subject: RE: Monticello Nuclear Generating Plant Unit 1 Subsequent License Renewal

Follow Up Flag: Follow up
Flag Status: Flagged

EXTERNAL - STOP & THINK before opening links and attachments.

Dear Stephen Sollom,

Thank you for your correspondence regarding the relicensing renewal for the Monticello Nuclear Generating Plant. As there are no proposed ground disturbing activities planned at this time, we have no concerns with the relicensing process. In the future should ground disturbing activities be proposed please contact the Shakopee Mdewakanton Sioux Community for consultation. Thank You and Have a Great Day!

Respectfully,

LEONARD WABASHA
Director of Cultural Resources • Cultural Resources
Shakopee Mdewakanton Sioux Community
d: 952.496.6120
shakopeedakota.org
Leonard.Wabasha@shakopeedakota.org

From: Sollom, Stephen E <stephen.sollom@xcelenergy.com>
Sent: Friday, May 20, 2022 4:35 PM
To: Leonard Wabasha (TO) <leonard.wabasha@shakopeedakota.org>
Cc: Young, Paul B <paul.b.young@xcelenergy.com>
Subject: Monticello Nuclear Generating Plant Unit 1 Subsequent License Renewal

This message came from **outside the organization**. Do Not click on links, open attachments or respond unless you know the content is safe.

Mr. Wabasha

With many people working from home and/or doing a hybrid work schedule we wanted to send an electronic copy of letter that was sent to your office this week.

Please let myself or Paul Young know if you have any questions regarding the attached letter.

Thank you.

Steve Sollom
Xcel Energy
Senior Engineer, P.E.
Subsequent License Renewal
414 Nicollet Mall; 414-5 Minneapolis, MN 55401
E: stephen.sollom@xcelenergy.com

Sollom, Stephen E

From: Evan J. Schroeder <EvanSchroeder@FDLREZ.COM>
Sent: Thursday, August 4, 2022 10:32 AM
To: Sollom, Stephen E
Cc: Wayne Dupuis
Subject: Monticello Nuclear Generating Plant Unit 1 Subsequent License Renewal

Follow Up Flag: Follow up
Flag Status: Flagged

Steve,

I just wanted to let you know that I have taken over for Jill Hoppe as the THPO for Fond du Lac. I also wanted to check in on the status of the Monticello Nuclear Generating Plant Unit 1 Subsequent License Renewal. The letter provided didn't really speak to what the level of ground disturbance would be. Have SHPO or any other Tribal Nations/Bands weighed in on this?

Miigwech,

Evan Schroeder
Tribal Historic Preservation Officer
Anishinaabe Izhitwaawin Ganawenjigewin Ozhibii'gewigamig
Fond du Lac Band of Lake Superior Chippewa
P: (218) 878-7129

Sollom, Stephen E

From: Sollom, Stephen E
Sent: Thursday, September 15, 2022 2:29 PM
To: Evan J. Schroeder
Subject: Follow up to Monticello Nuclear Generating Plant Unit 1 Subsequent License Renewal

Evan

Thank you for meeting with us today on Teams.

Based on our discussion today, we have answered your questions/comments and at this time no further information is needed.

If you have additional questions/comments please reach out to Paul Young or myself.

Thank you.

Steve Sollom
Xcel Energy
Senior Engineer, P.E.
Subsequent License Renewal
414 Nicollet Mall; 414-5 Minneapolis, MN 55401
E: stephen.sollom@xcelenergy.com

Attachment D: Other Consultation Letters

Xcel Energy®

2807 West County Road 75
Monticello, MN 55362

March 17, 2022

L-MT-SLR-22-001

Tom Hogan
Director, Division of Environmental Health
Minnesota Department of Health
P.O. Box 64975
St. Paul, MN 55164-0975

Subject: Monticello Nuclear Generating Plant Unit 1 Subsequent License Renewal

Dear Mr. Hogan:

Northern States Power Company, a Minnesota corporation, doing business as Xcel Energy (hereafter "NSPM") is preparing an application for renewing the operating license for Monticello Nuclear Generating Plant Unit 1 (MNGP) for an additional 20 years (see Table 1). As part of the license renewal process, the Nuclear Regulatory Commission (NRC) may request a formal or informal consultation with your agency.

Table 1. MNGP Licensing Dates

MNGP Unit	Initial License Expiration Date	Current License Expiration Date	Subsequent License Expiration Date
Unit 1	September 8, 2010	September 8, 2030	September 8, 2050

As part of the process, the NRC requires that the subsequent license renewal application include an environmental report (ER) that assesses the impacts from continued operation and any refurbishment to be undertaken to enable the continued operation of the unit. MNGP has a thermal discharge to the Mississippi River which is permitted by the administratively extended Minnesota Pollution Control Agency-issued National Pollutant Discharge Elimination System (NPDES) permit No. MN0000868. The presence and numbers of thermophilic organisms can be increased by the addition of heat. The ER is to assess public health impacts resulting from thermophilic organisms including the enteric pathogens *Salmonella spp*., *Shigella spp*., and *Pseudomonas aeruginosa*. Thermophilic organisms also include the bacteria Legionella spp. and free-living amoebae of the genera *Naegleria* (*Naegleria fowleri*).

It is our intent by this letter to introduce you to the project, to make available any data you need to ensure an efficient and effective consultation process, and to request input from the Minnesota Department of Health (DPH) regarding:

- Identifying any questions or additional information needs DPH may have regarding our thermophilic organism impact assessment summarized below.

- Requesting confirmation from DPH that continued operation of MGNP will create no potential public health hazards from thermophilic organisms due to MNGP discharge-related warming of the Mississippi River.

MNGP is located within the city limits of Monticello, Minnesota. The MNGP site is situated on approximately 2,000 acres on the north and south banks of the Mississippi River, with portions of the property located in both Wright and Sherburne counties. The Mississippi River near MNGP is used for recreational purposes, including fishing and boating. During the license renewal term, NSPM proposes to continue operating the unit as currently operated. Figures depicting the MNGP site (Figure 1) and the vicinity within a 6-mile radius of MNGP (Figure 2) are enclosed. A brief discussion of the plant and its operations during the renewal period is provided below.

MNGP releases heated water to its discharge canal and then to the Mississippi River. The heated water is first circulated through the plant's two mechanical draft cooling towers if cooling is needed to meet NPDES discharge limits. The NPDES permit's daily maximum temperature discharge limits are 80°F December – February, 85°F March and November, and 95°F April – October. Lower temperatures would occur in the river itself due to mixing of the discharge water and the river. The temperatures of MNGP's thermal plume in the Mississippi River would be unlikely to enhance the growth or survival of thermophilic organisms.

As stated earlier, this letter seeks your input on the proposed continued operation of MNGP regarding potential public health impacts from thermophilic organisms. We appreciate you notifying us of your comments and any information you believe NSPM should consider in the preparation of the ER. Your input is requested by 05/16/2022. NSPM plans to include this letter and any response you provide in the final ER.

Should you or your staff have any questions or comments, please contact Paul Young at 612-337-2165 or via email at paul.b.young@xcelenergy.com.

Sincerely,

Christopher P. Domingos
Site Vice President, Monticello and Prairie Island Nuclear Generating Plants
Northern States Power Company – Minnesota

Attachments:
Figure 1. MNGP Site
Figure 2. MNGP 6-mile Vicinity

Figure 1. MNGP Site

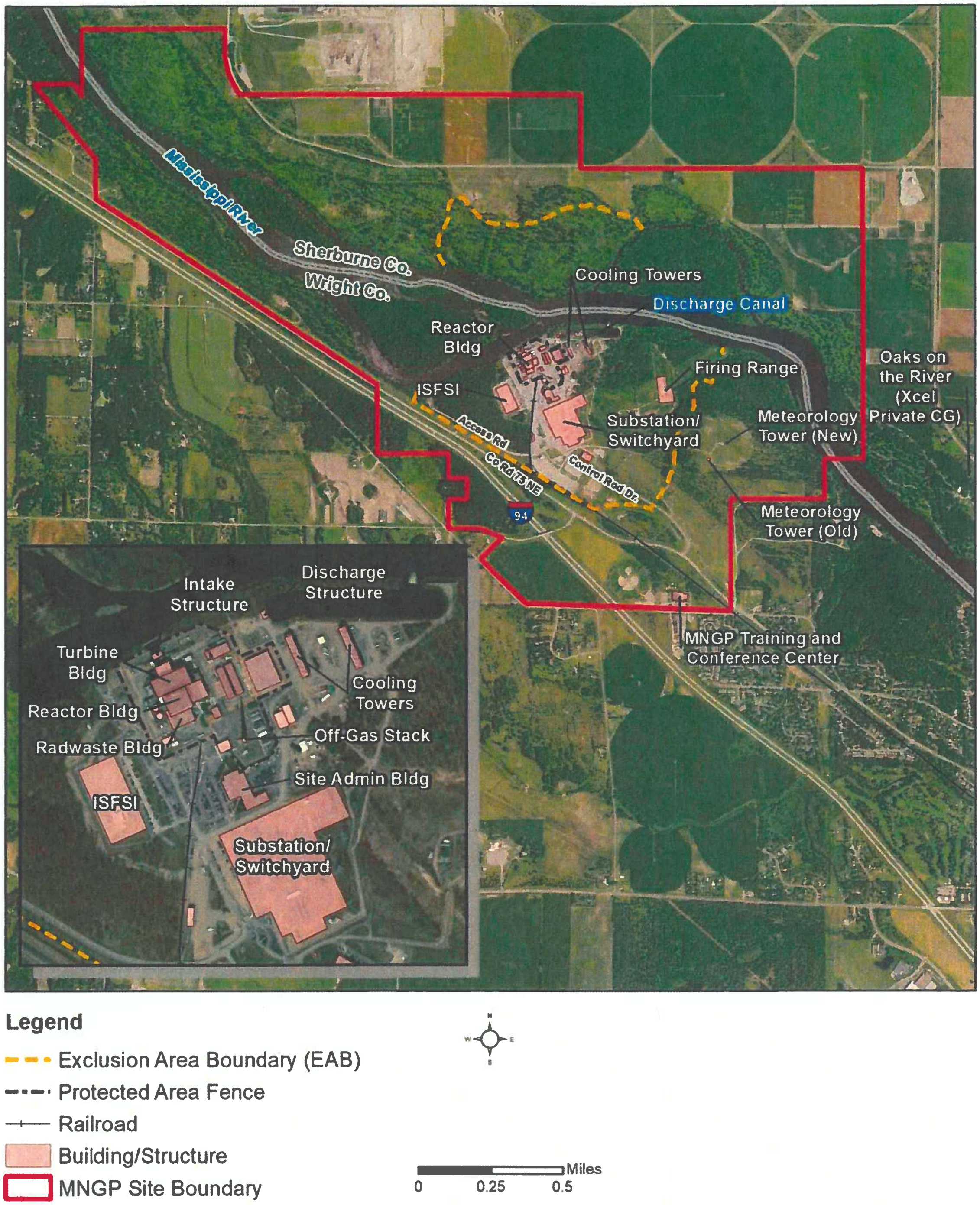
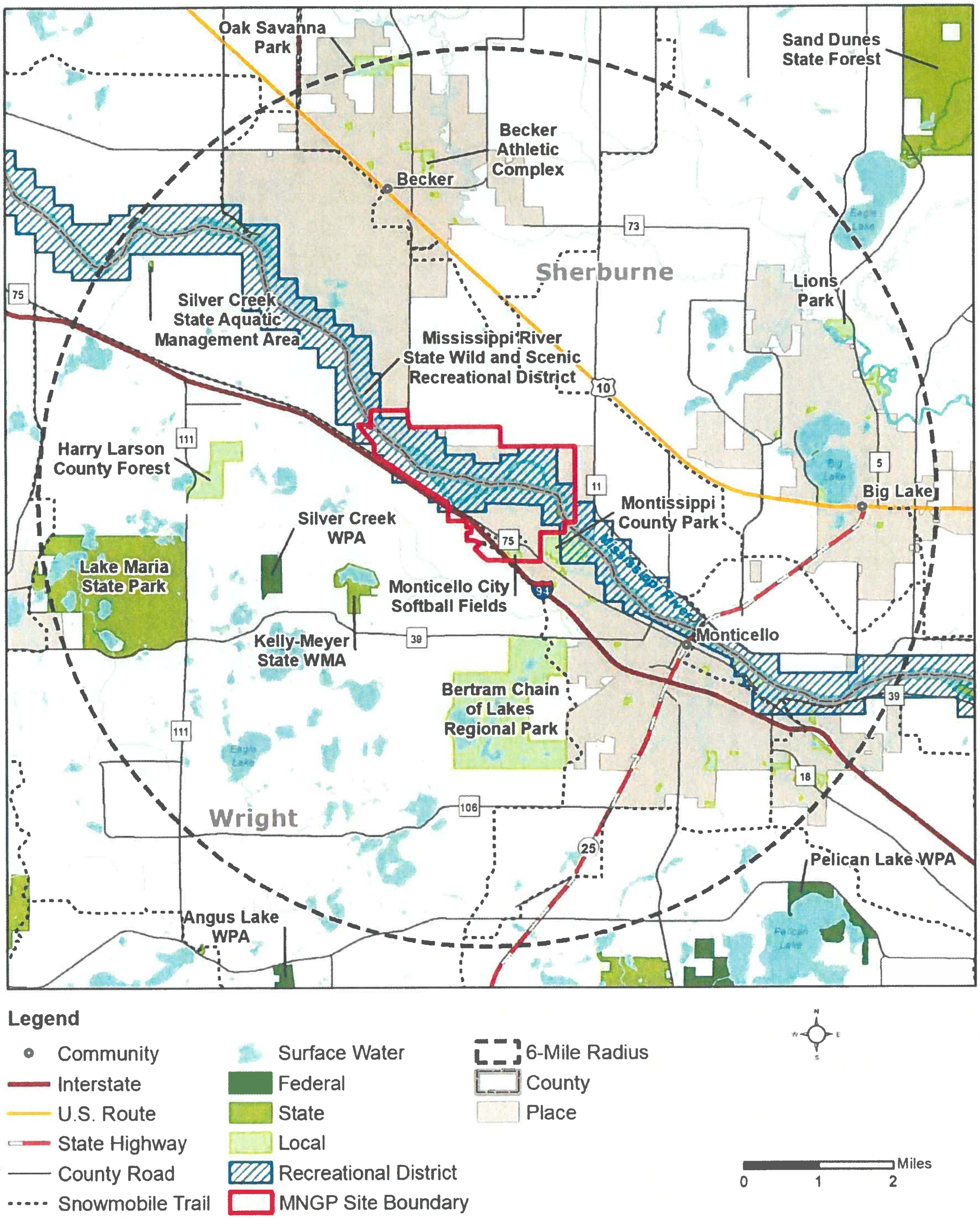


Figure 2. MNGP 6-mile Vicinity



July 19, 2022

Mr. Christopher P. Domingos
Site Vice President, Monticello and Prairie Island Nuclear Generating Plants
Xcel Energy
2807 West County Road 75
Monticello, MN 55362

RE: Monticello Nuclear Generating Plant Unit 1 Subsequent License Renewal

Dear Mr. Domingos:

This letter is in response to your letter dated March 17, 2022 regarding the Monticello Nuclear Generating Plant (MNGP) Unit 1 Subsequent License Renewal. Your letter asked for input from the Minnesota Department of Health (MDH) on the discharge of heated water to the Mississippi River near the plant, and confirmation that the continued operation of MNGP will create no potential public health hazards from thermophilic organisms due to the discharge.

MDH considered several potential questions associated with the discharge of heated water from MNGP: potential impact on fish populations, and human health risks related to exposure to thermophilic or cyanotoxin producing organisms. For background purposes and to address the first question, the following text is from chapter 6 of a recent unpublished, Draft Environmental Impact Statement (EIS) for additional spent fuel storage at MNGP reviewed by MDH:

"Potential non-radiological impacts to the natural environment are related to the use Mississippi River water for heat rejection from the MNGP. Water from the river is withdrawn through an intake structure, circulated through the MNGP condenser and through cooling towers, and is then discharged back into the river.

Impacts to fish can occur if they are injured or killed by screens and other filtering systems when water is withdrawn from the Mississippi River. Fish can also be impacted by heat shock if the water discharged back into the river is at too high a temperature. Analysis based on several years of sampling and monitoring fish communities in the Mississippi River indicates that impacts to fish communities in the river as a result of MNGP operations are minimal. Sampling upstream and downstream of the plant show similar, stable populations of fish species.

Xcel Energy is required by the Clean Water Act to use the best technology available to minimize adverse impacts related to its circulating water system at the MNGP. Further, the MNGP has a national pollutant discharge elimination system (NPDES) permit from the MPCA that addresses potential impacts to fish communities in the Mississippi River (e.g., by limiting discharge water temperatures). In sum, potential impacts to fish communities as a result of continued operation of the MNGP are anticipated to be minimal."

MDH considers this a satisfactory response to our first question. Fish are a source of lean protein that many people rely on, and any reduction in fish populations available to anglers downstream of the facility could be considered a public health concern. MDH also notes that there is no apparent pattern or difference in fish contaminant levels (mainly mercury) based on species or size in the Mississippi River both above and below the plant.

With regards to potential human health risks related to exposure to thermophilic organisms, MDH has a few concerns regarding *N. fowleri*. Naegleria grows best at higher temperatures, up to 115 degrees F, but it is not true that it is rarely found in water cooler than 95 degrees. In fact, the two recent human cases that were identified in Minnesota both occurred in situations where water temperatures were below 95 degrees F. Additionally, this section seems to suggest that because the thermal plume would be well below "optimal growth at 115" it's unlikely to *enhance* growth. Discharge water of 94.8 degrees F is obviously very warm and could increase the risk of Naegleria, and the risk increases as temperatures rise.

With regard to Legionella, this supporting documentation does not seem to take into account wind patterns, aerosol drifting, and other factors which we know can be a concern for aerosol dispersion and deposition even some distance from the site. Studies have shown that Legionella can travel a substantive distance at times and still cause infection. From the supporting information submitted to MDH with your letter:

"Public exposure to aerosolized Legionella from nuclear plant operations is not a concern because such exposure would be confined to a small area of the site near the cooling towers, the discharge canal, and the discharge structure. The cooling towers and discharge canal are within the plant's fenced area. The riverbank area surrounding the discharge structure is posted as restricted and monitored by MNGP security; buoys indicate the area near the discharge structure is restricted."

There is no mention of it in the documentation, but we assume the cooling towers have an ASHRAE compliant Legionella water management program. Documentation provided by Xcel describes *outbreaks* of Legionella in Minnesota. However, MDH also knows that there are single cases of Legionella for which the source is never identified, so it's difficult to say that cooling towers do not cause or contribute to an elevated risk for Legionnaire's disease, though there is no evidence showing that there is elevated risk from this site.

Additional documentation of that should be included in the Environmental Report for the site regarding the potential for Legionella dispersion, as should an expanded discussion of the potential for enhanced growth of *N. fowleri*. A third issue that was not discussed in the supporting documentation that could potentially be associated with the warmer water discharge is "algal" or cyanobacterial blooms. The temperatures that Xcel describes in the discharge are in the range associated with increased cyanobacteria growth. Any cyanotoxins produced could potentially affect people swimming or boating in the area downstream. However, since the discharge at these temperatures has been occurring for years already at the site, it would seem that cyanobacterial blooms would have occurred already. Documentation to that effect would be helpful.

If you have any questions regarding this letter, please do not hesitate to contact me (contact info below) or James Kelly of my staff at 651-201-4910 or james.kelly@state.mn.us.

Sincerely,

Tom Hogan, Director
Environmental Health Division
PO Box 64975
St. Paul, MN 55164-0975
651-201-4675
tom.hogan@state.mn.us
www.health.state.mn.us

cc: Ray Kirsch, Minnesota Department of Commerce

Xcel Energy®

2807 West County Road 75
Monticello, MN 55362

October 21, 2022

L-MT-SLR-22-031

Tom Hogan
Director, Division of Environmental Health
Minnesota Department of Health
P.O. Box 64975
St. Paul, MN 55164-0975

Subject: Response to Correspondence Dated July 19, 2022

Dear Mr. Hogan:

Northern States Power Company, a Minnesota corporation, doing business as Xcel Energy (hereafter "NSPM") appreciates your response to our initial letter, dated March 17, 2022, regarding the upcoming Monticello Nuclear Generating Plant Unit 1 (MNGP) Subsequent License Renewal (SLR). As stated in the original letter, NSPM is seeking input from the Minnesota Department of Health (MDH) regarding the MNGP SLR project. In your response letter, you indicated there are some additional questions with MNGP's thermal discharge temperature regarding public health risk *Naegleria fowleri* (*N. fowleri*) infection, cooling towers operation regarding public health risk *Legionella*, and "algal" and cyanobacterial blooms. The following provides additional information.

Thermal Discharge

As explained in our previous letter, MNGP's National Pollutant Discharge Elimination System (NPDES) permit discharge limit is 95 °F from April through October. Discharge temperature is recorded for compliance with the plant's NPDES permit limit within the discharge canal at the approximate location depicted in Figure 1. Thus, the maximum daily temperature of 94.8 °F indicated in the letter does not represent the water temperature found in the river at the discharge outlet.

MNPG replaced its two cooling towers after many years of service with new, upgraded ones with slightly greater cooling capacity. One cooling tower was placed into operation in 2021, and the other cooling tower in 2022. Use of the new cooling towers with greater cooling capacity will result in lower discharge temperatures than with the old cooling towers and facilitate the plant to remain in compliance with the discharge temperature limit. The lower discharge temperature will reduce temperatures in the river at the discharge point.

As required by the NPDES permit, MNGP records intake and discharge temperatures. Graphs of monthly average intake and discharge temperatures were prepared for 2016-2021. The monthly average temperature recorded at the plant's cooling water intake structure which represents the river's ambient temperature is presented in Figure 2 and the monthly average temperature recorded within the discharge canal is presented in Figure 3. Peak summer ambient river water temperatures are between 75 °F and 79 °F. The average discharge canal temperature from May to September peaked at about 92.5 °F and are generally 90 °F and below.

Once the discharge canal water flows into the Mississippi River, it quickly mixes with river water. A 2009 thermal plume study predicted that the temperature rise over ambient river temperature would be 2.8 °F at the discharge point. Applying this rise in temperature over ambient would have the average summer water temperatures of the river at the discharge outlet peaking at 82 °F. The area immediately surrounding the discharge structure is also restricted by buoys in the river to prevent public access.

As the discharged water continues to mix with river water and flow downstream, temperatures would continue to decrease. The nearest downstream public river access is the Montissippi Park boat launch which is approximately 1.3 miles downstream.

The river along MNGP is not known for swimming and diving. The strong river flow and rocks in the river make swimming and diving hazardous. The plant's river frontage is also posted for security reasons warning boaters to not linger. Therefore, recreational users of the river near the plant's discharge would be boaters rather than swimmers, which is an activity that is unlikely to expose individuals to the infection route of *N. fowleri*; water into the nasal passages.

Cooling Towers and *Legionella*

In your response letter, you also indicated a concern with MNGP's cooling towers with regard to public health risk of infection of *Legionella*. The following provides additional information.

- The cooling towers at MNGP were replaced in 2021 and 2022.
- These new towers were equipped with drift eliminators.
- The cooling towers are used as needed rather than continuously.
- The cooling towers were operated 129 to 179 days per year in recent years.
- The cooling towers' circulating water is treated with biocides and scale inhibitors to maintain adequate disinfection and prevent biofilm and scale formation, which provide a habitat and nutrients for *Legionella*.
- The cooling towers' circulating water is treated with biocides and monitored for halogen residual.

"Algal" and Cyanobacterial Blooms

Your letter also mentioned a concern of cyanobacterial blooms. Cyanobacteria is not one of the microorganisms for particular concern identified by the Nuclear Regulatory Commission (NRC) for nuclear power plant thermal discharges. Further, the Mississippi River at MNGP is not a slow-moving, shallow body of water, which is the waterbody type where heat and nutrients that could promote cyanobacteria growth would result in a “algal bloom”. Also, as presented above, the river is an area of boating rather than swimming, an activity of low risk for algae toxins exposure. Although the “alga” and cyanobacterial blooms is not something that is formally tracked at MNGP, interviews were conducted of MNGP staff that concluded no “algal”/cyanobacterial blooms have been observed at the discharge of the facility.

Conclusion

As part of the review of relevant information, it is important to note that the NRC defines environmental effects for issues evaluated for license renewal at three levels: SMALL, MODERATE, or LARGE. Definitions of these three levels are as follows:

SMALL: For the issue, environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource. For the purposes of assessing radiological impacts, the Commission has concluded that those impacts that do not exceed permissible levels in the Commission's regulations are considered small

MODERATE: For the issue, environmental effects are sufficient to alter noticeably but not to destabilize important attributes of the resource.

LARGE: For the issue, environmental effects are clearly noticeable and are sufficient to destabilize important attributes of the resource.

NSPM concludes that the microbiological hazard to the public attributable to MNGP’s thermal discharge to the Mississippi River would be SMALL from continued operation of MNGP because (1) MNGP’s thermal discharge’s mixing with the ambient river water would result in temperatures less than the optimum growth temperatures for the thermophilic microorganisms of concern, (2) the area immediately surrounding the thermal discharge’s outlet to the Mississippi River is restricted, (3) the recreational activity in the Mississippi River along the MNGP plant is boating which presents low risk of infection from the microorganisms of concern, and (4) the influence of MNGP’s thermal discharge on river water temperature would continue to decrease downstream and the nearest public access to the Mississippi River downstream is more than one mile distance from the thermal discharge’s outlet to the river.

NSPM also concludes that the microbiological hazard to the public attributable to continued operation of MNGP’s cooling water system’s two cooling towers would be SMALL because (1) the cooling towers are located within the plant’s protected area and are not accessible to the public, (2) the circulating water is treated with biocides and scale inhibitors, and (3) the higher risk of *Legionella* exposure is presented by indoor or confined spaces.

NSPM seeks MDH’s concurrence with the above conclusions and would appreciate a written response for inclusion in its SLR application submittal to the NRC planned for January 2023. Should you or your staff have any questions or comments, please contact Paul Young at 612-337-2165 or via email at paul.b.young@xcelenergy.com.

Sincerely,

Christopher P. Domingos
Site Vice President, Monticello and Prairie Island Nuclear Generating Plants
Northern States Power Company – Minnesota

Attachments:
Figure 1. MNGP Discharge Canal Temperature Location
Figure 2. MNGP Average Monthly River Temperature at the Intake Structure
Figure 3. MNGP Average Monthly Discharge Canal Water Temperature

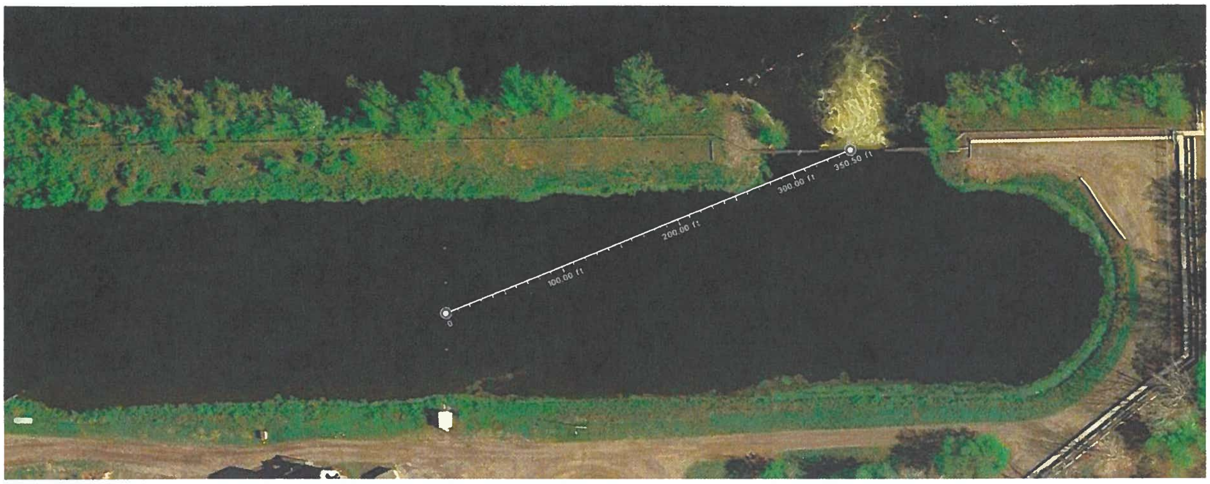


Figure 1. MNGP Discharge Canal Temperature Location

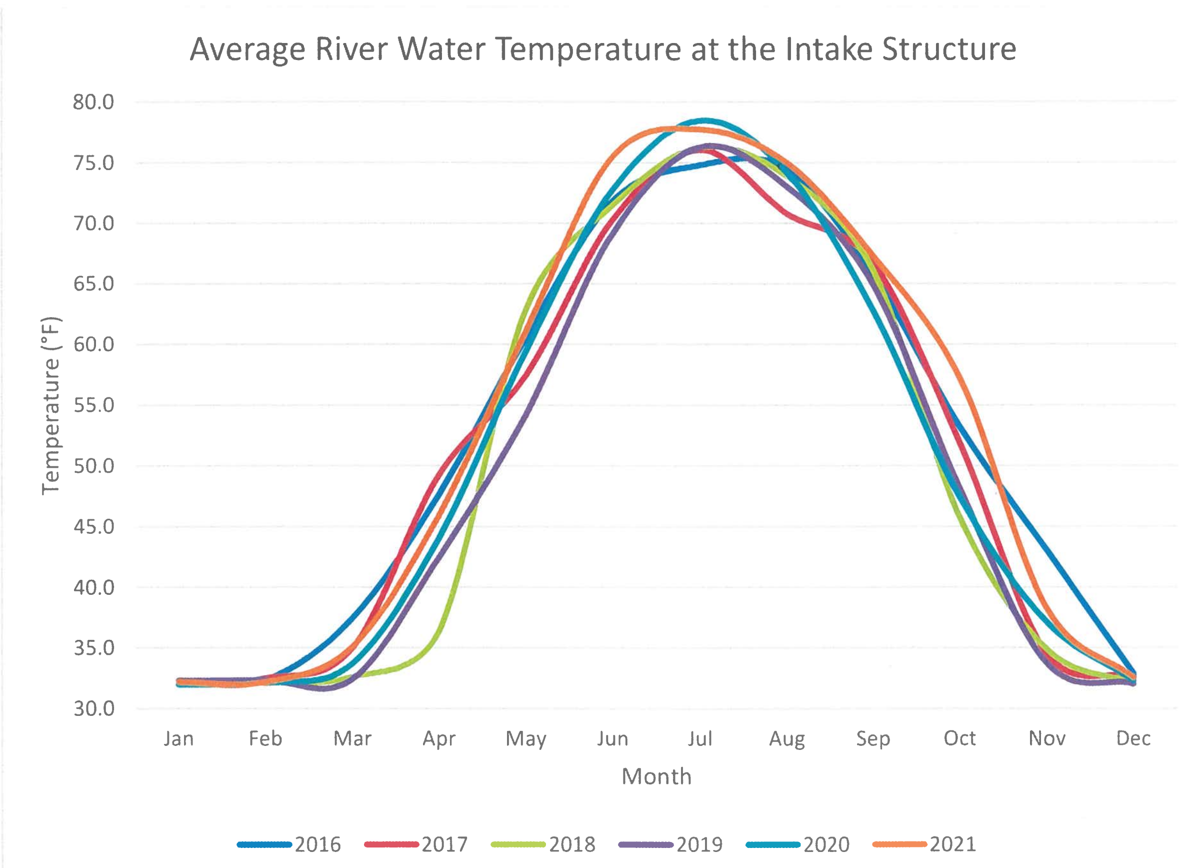


Figure 2. MNGP Average Monthly River Temperature at the Intake Structure.

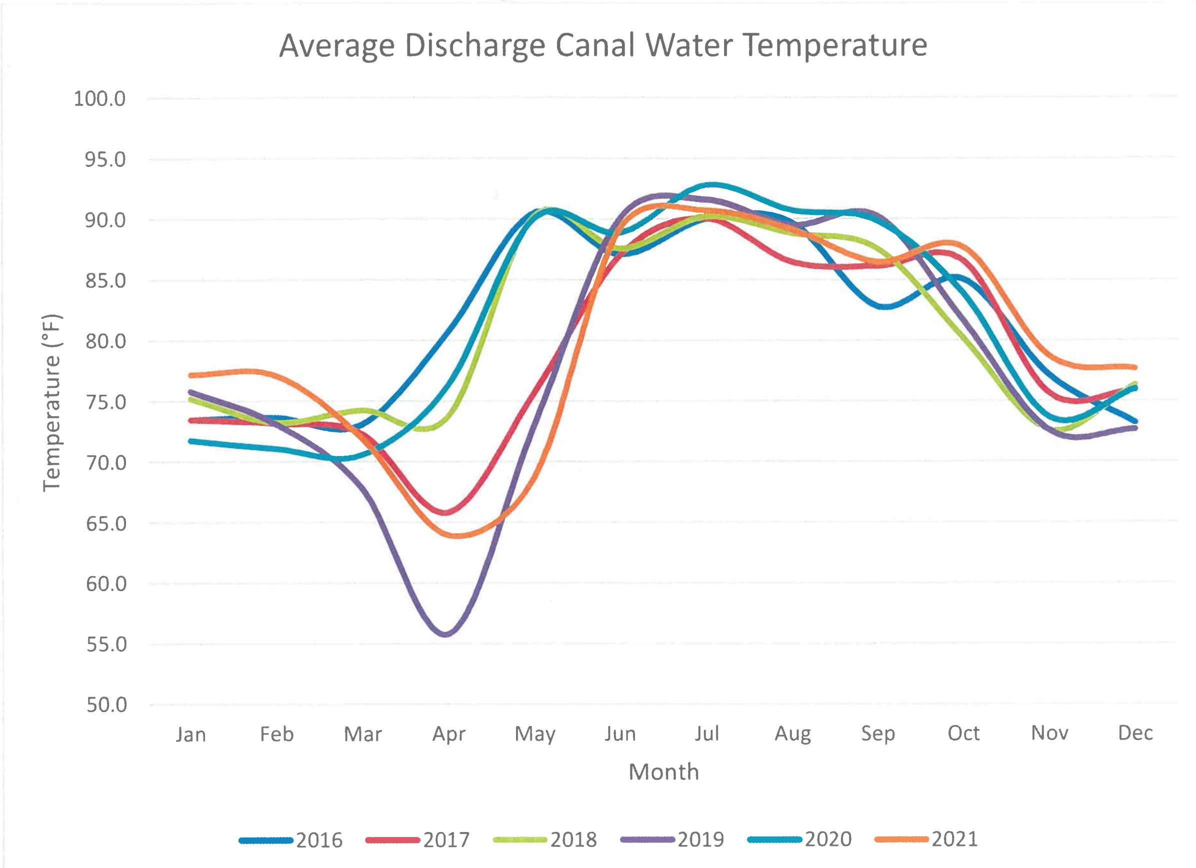


Figure 3. MNGP Average Monthly Discharge Canal Water Temperature

DEPARTMENT OF HEALTH

Protecting, Maintaining and Improving the Health of All Minnesotans

November 15, 2022

Mr. Christopher P. Domingos
Site Vice President, Monticello and Prairie Island Nuclear Generating Plants
Xcel Energy
2807 West County Road 75
Monticello, MN 55362

RE: Monticello Nuclear Generating Plant Unit 1 Subsequent License Renewal

Dear Mr. Domingos:

This letter is in response to your letter dated October 21, 2022 with additional information regarding the Monticello Nuclear Generating Plant (MNGP) Unit 1 Subsequent License Renewal.

The Minnesota Department of Health (MDH) has reviewed the information provided in your October 21 letter, and in a subsequent conversation between James Kelly of my staff and Stephen Sollom of Xcel. Based on this information MDH concurs with Xcel Energy that the potential for environmental effects from the renewal of Xcel Energy's Monticello operating license renewal is small.

If you have any questions regarding this letter, please do not hesitate to contact me (contact info below) or James Kelly of my staff at 651-201-4910 or james.kelly@state.mn.us.

Sincerely,

Tom Hogan, Director
Environmental Health Division
PO Box 64975
St. Paul, MN 55164-0975
651-201-4675
tom.hogan@state.mn.us
www.health.state.mn.us

cc: Ray Kirsch, Minnesota Department of Commerce

Xcel Energy®

November 14, 2022

Melissa Treml
Fisheries Research Manager
Minnesota Department of Natural Resources
500 Lafayette Road
St. Paul, MN 55155-4020

Subject: Special Permit No. 32875 Renewal Request

Dear Ms. Treml:

Please find attached, a list of fish that were collected from the Mississippi River and kept by Xcel Energy-Environmental Services for various analyses during 2022 under MDNR Special Permit No. 32875, which expires 12/31/22. Carp, smallmouth bass and freshwater drum were collected near the Prairie Island plant and kept for radiological analysis; shorthead redhorse and smallmouth bass were kept at Monticello for radiological analysis. Smallmouth bass were collected for trace metals bio-accumulation monitoring program conducted near the Sherburne County Plant.

The upstream sampling area for fish collected for the Radiological and Environmental Monitoring Program (REMP) at Prairie Island is located 1000 feet upstream of the plant intake to approximately 3 miles upstream in both the main Mississippi River channel and connecting backwaters. The downstream sampling area is Lock and Dam #3 to the Hwy 63 bridge over both the main Mississippi River channel and the Wisconsin Channel. The electrofishing runs are terminated after approximately 450 seconds of shocking time, or when the end of the run is reached, whichever occurs first. Fish kept for analysis are sent to Wisconsin Department of Health and to Environmental Inc. Midwest Labs in Northbrook, IL.

The sampling area for fish collected for the Radiological and Environmental Monitoring Program (REMP) at the Monticello plant covers 3 miles of stream. Radiological samples were sent to GEL Laboratories, LLC in Charleston, SC. Fish collected in the vicinity of the Sherburne County Plant were collected with angling gear and are analyzed for metals at Xcel Energy's lab in Minneapolis.

All fish data collected from Prairie Island and Monticello is entered into the MNDNR fisheries software program and downloaded at the Lake City Fisheries office into the MNDNR database. I am requesting renewal of collection permit 32875 containing similar language to conduct fisheries studies and collect samples for biological and radiological evaluation during 2023. All collection activities will occur on the Mississippi River.

Please reissue the permit to:

Bradley Giese, Environmental Analyst
Prairie Island Environmental Lab
Northern States Power Company, a Minnesota corporation
1717 Wakonade Drive East
Welch, Minnesota 55089

Also attached are the sampling notifications e-mails that were sent to state agency personnel.

If you need additional information or clarification for renewal of this permit, please email me or call me on my cell phone (651) 380-5118. Thank you.

Sincerely,

Bradley Giese

Bradley Giese
Environmental Analyst

Attachments

C: Kevin Stauffer, MDNR - Lake City

Attachment E: 401 Certification Letter

MINNESOTA POLLUTION CONTROL AGENCY
717 Delaware Street S.E./ Minneapolis, Minnesota 55440

March 6, 1973

Mr. L. Manning Muntzing
Director of Regulation
U.S. Atomic Energy Commission
Washington, D.C. 20545

Re: Certification for AEC Provisional Operating License DPR-22 and Application for Conversion of Said License to a Full-Term Operating License - Northern States Power Company - Monticello Plant

Dear Mr. Muntzing:

Northern States Power Company has requested State certification from the Minnesota Pollution Control Agency (hereinafter the Agency) pursuant to Section 401 of the Federal Water Pollution Control Act, as amended by the Federal Water Pollution Control Act Amendments of 1972, P.L. 92-500, for its nuclear generating plant at Monticello, Minnesota. This request pertains to Provisional Operating License No. DPR-22 issued September 8, 1970, by the U.S. Atomic Energy Commision and an application dated June 15, 1972, for conversion of the Provisional Operating License No. DPR-22 to a full-term operating license.

Pursuant to the provisions of Section 401(a)(1), the undersigned hereby certifies that there is not an applicable effluent limitation or other limitation under Sections 301(b) and 302, and there is not an applicable standard under Sections 306 and 307 of the Federal Water Pollution Control Act.

Pursuant to Section 401(d), the appropriate requirements of the State of Minnesota in connection with the Monticello Plant are set forth in State Regulations WPC 15, 25 and 29, and the general conditions and special conditions relating to convention wastes set forth in permit No. 5633, dated May 20, 1969, as modified by the Agency by an agreement accepted by the Agency on May 8, 1972. Copies of the foregoing Regulations, permit provisions and agreement are attached hereto.

The applicant, Northern States Power Company, discharges from the Monticello plant a maximum of 648 cubic feet per second of industrial wastewater to the Mississippi River. This activity is in accord with the current requirements of the Agency as expressed by the permit provisions and agreement between the Agency and the Company concerning the discharge of heated wastewater to the Mississippi River.

It is expressly made a condition of this certification, that nothing herein shall prevent the future adoption and establishment of any additional, more stringent water pollution control requirements applied to the discharge than those now in existence, or for further certification to the U.S. Environmental Protection Agency or issuance of a permit by the State under Section 402 of the Act.

No requirements for permits or licenses by any units of government are waived by this certification.

This certification is made on the basis of information submitted by the applicant and also other information made available to the Agency. Any omission, misrepresentation or error in the information submitted renders this certification null and void. Any change in the operations of the applicant's facility which results in a discharge of a lesser quality than that upon which this certification is based, without the written consent of the Agency, renders this certification null and void.

This certification is intended to satisfy the certification requirements of present Federal law with respect to the provisional license from the Atomic Energy Commission for the Monticello Plant, and the application to the AEC for conversion of such license to a full-term operating license.

On June 29, 1971, Northern States Power Company applied for a State certification for the Monticello plant pursuant to Section 21(b)(1) of the Federal Water Pollution Control Act, as amended by the Water Quality Improvement Act of 1970, P.L. 91-224, and a public notice of the application for such certification was given by the Agency on March 8, 1972. We further certify in connection with such application that there is reasonable assurance that the operation of the plant will be conducted in a manner which will not violate presently applicable water quality standards.

The issuance of this certification does not and is not intended to preclude the Agency from presenting issues and evidence at the forthcoming hearing concerning the application for conversion to a full-term operating license for the Monticello plant.

Yours very truly,

Grant J. Merritt
Executive Director

GJM/dg
Attachments
cc: David F. McElroy, President, Northern States Power Company
A. R. Rehnquist, Director of Legal Services, Northern States Power Company
A. Manzardo, EPA, Chicago
L. Breimhurst, EPA, Minneapolis

Minnesota Pollution Control Agency

50-263

December 19, 1977

Mr. Victor Stello
Office of Nuclear Reactor Regulation
Division of Operating Reactors
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

RE: Certification for NRC Provisional Operating License DPR-22 and Application for Conversion of Said License to a Full-Term Operating License - Northern States Power Company, Monticello Plant

Dear Mr. Stello:

On March 6, 1973, pursuant to Section 401(a)(1) of the Federal Water Pollution Control Act Amendments of 1972, the Minnesota Pollution Control Agency issued a certification for the above-referenced nuclear generating plant. It is my understanding that the Nuclear Regulatory Commission has determined that a recertification is necessary prior to issuance of a full-term operating license.

Since the issuance of the prior certification, the Minnesota Pollution Control Agency has issued a National Pollutant Discharge Elimination System permit (Permit No. MN 0000868) pursuant to Section 402 of the Act and State Disposal System permit (same permit number) pursuant to Minn. Stat. §115.07 (1976) for the Monticello nuclear generating plant. In addition, the Minnesota Pollution Control Agency and Northern States Power Company have entered into a stipulation agreement regarding the reduction of the chlorine discharges from the plant. Copies of these permits and the stipulation agreement are enclosed.

To the extent Northern States Power is in compliance with the above-referenced permits and stipulation agreement and any modifications of such documents, the undersigned certifies that there is reasonable assurance that the plant is being operated in a manner that will not violate Minnesota water quality standards and other applicable limitations under Section 301(b) of the Act.

In addition, the undersigned certifies that to the best of my knowledge there is no standard applicable to the Monticello plant under Sections 302, 306, and 307 of the Act.

This certification is made on the basis of information submitted by Northern States Power and also other information made available to the Agency. Any omission, misrepresentation or error in the information submitted renders this certification null and void. Any change in the operations of the applicant's facility which results in a discharge of a lesser quality than that upon which this certification is based, without the written consent of the Agency, renders this certification null and void.

It is expressly made a condition of this certification, that nothing herein shall prevent the future adoption and establishment of any additional, more stringent water pollution control requirements applied to the discharge than those now in existence. Further, no requirements for permits or licenses by any units of government are waived by this certification.

Yours truly,

Sandra Gardebring

Sandra S. Gardebring
Executive Director

Enclosures

cc: Steven Lewis, NRC
Joseph Bizzano, NSP
Jay Silberg, NSP
Gary Welk, NSP
A. Manzardo, EPA, Chicago

Xcel Energy®

2807 West County Road 75
Monticello, MN 55362

March 17, 2022

L-MT-SLR-22-005

Douglas Wetzstein
Industrial Division Director
Minnesota Pollution Control Agency
520 Lafayette Rd N.
St. Paul, MN 55155

Subject: Monticello Nuclear Generating Plant Unit 1 Subsequent License Renewal

Dear Mr. Wetzstein:

Northern States Power Company, a Minnesota corporation, doing business as Xcel Energy (hereafter "NSPM") is preparing an application for renewing the operating license for Monticello Nuclear Generating Plant Unit 1 (MNGP) for an additional 20 years (see Table 1). NSPM is contacting you for assistance in assessing the impacts from continued operation during the subsequent license period.

Table 1. MNGP Licensing Dates

MNGP Unit	Initial License Expiration Date	Current License Expiration Date	Subsequent License Expiration Date
Unit 1	September 8, 2010	September 8, 2030	September 8, 2050

The U.S. Nuclear Regulatory Commission (NRC) requires that the subsequent license renewal applicant provide a certification or waiver pursuant to Clean Water Act (CWA) Section 401. The subsequent license renewal application also includes an environmental report (ER) that assesses the impacts from continued operation and any refurbishment undertaken to enable the continued operation of the unit. The ER addresses the potential impact on air quality, water resources, terrestrial and aquatic ecology resources, and socioeconomics.

As part of the renewal process, the NRC may consult your agency regarding the license renewal and, in particular, the 401 certification. To facilitate our preparation of the subsequent license renewal ER and a smooth consultation by the NRC, we are contacting you early in the application process. Figures depicting the MNGP site (Figure 1) and the vicinity within a 6-mile radius of MNGP (Figure 2) are enclosed. A brief discussion of the plant and its operations during the extended period of operation is provided below.

MNGP was issued a water quality certification pursuant to the CWA Section 401 by the Minnesota Pollution Control Agency (MPCA) on March 6, 1973, and currently operates under an administratively extended MPCA-issued National Pollutant Discharge Elimination System (NPDES) permit No. MN0000868. This letter seeks to confirm the MPCA 1973 certification remains valid for the proposed subsequent license period.

MNGP is located within the city limits of Monticello, Minnesota. The MNGP site is situated on approximately 2,000 acres on the north and south banks of the Mississippi River, with portions of the property located in both Wright and Sherburne counties. In accordance with NRC regulations, the transmission lines within the scope of the license renewal environmental report are those located within the MNGP site boundary.

During the license renewal term NSPM proposes to continue operating the unit as currently operated. There are currently no ground-disturbing activities other than those to maintain existing structures and operations anticipated at the MNGP site during the subsequent license renewal period. Additionally, NSPM does not anticipate any refurbishment as a result of the technical and aging management program information that will be submitted in accordance with the NRC license renewal process.

NSPM does not anticipate the continued operation of MNGP to adversely affect the environment or any cultural or historic resources.

We would appreciate a response to this letter confirming the authorization mentioned under CWA Section 401. Your input is requested by 05/16/2022. It is also possible that the NRC will contact you directly regarding a CWA Section 401 certification or waiver. NSPM plans to include this letter and any response you provide in the final ER.

Should you or your staff have any questions or comments, please contact Paul Young at 612-337-2165 or via email at paul.b.young@xcelenergy.com.

Sincerely,

Christopher P. Domingos
Site Vice President, Monticello and Prairie Island Nuclear Generating Plants
Northern States Power Company – Minnesota

Attachments:
Figure 1. MNGP Site
Figure 2. MNGP 6-mile Vicinity

Figure 1. MNGP Site

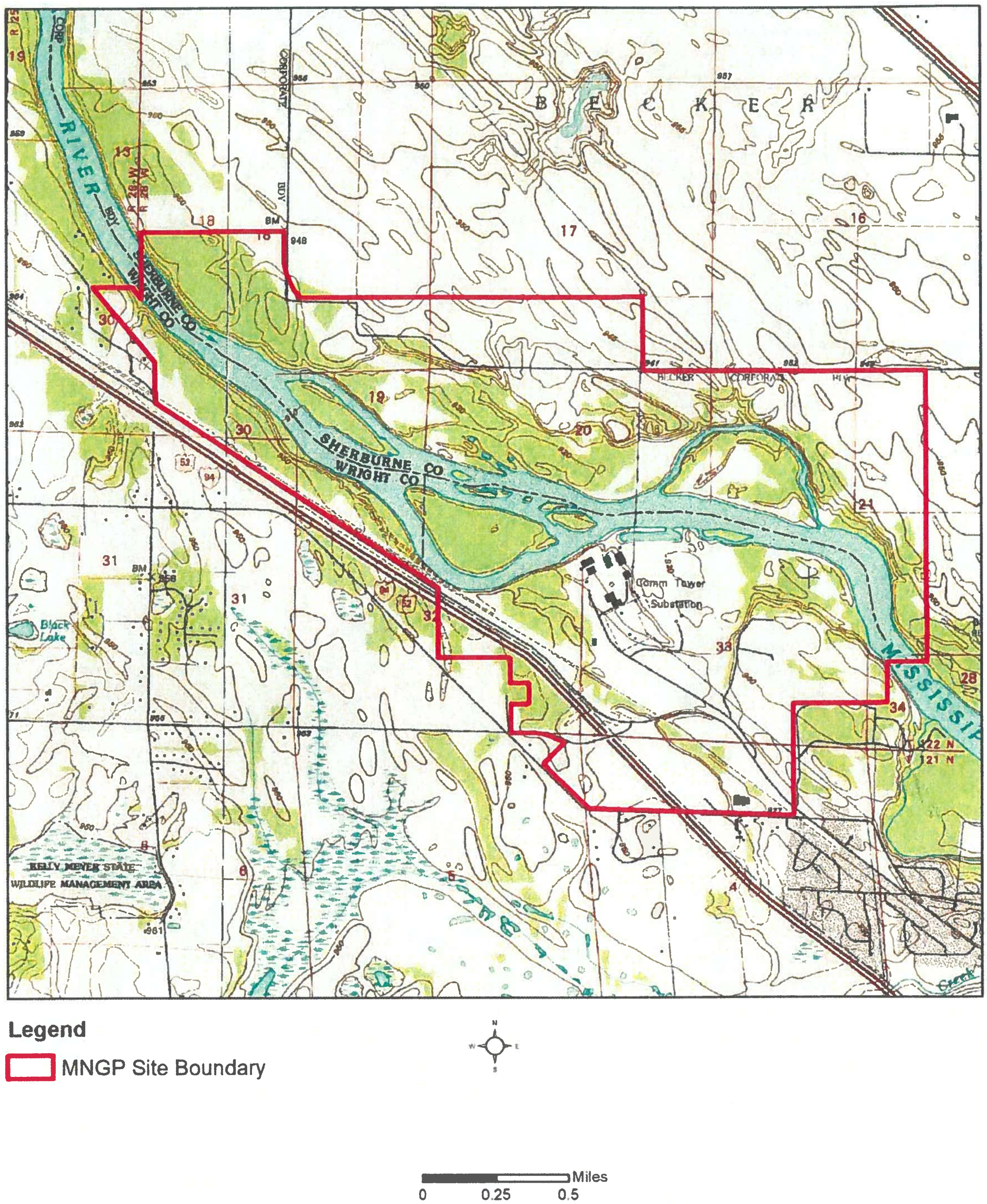


Figure 2. MNGP 6-mile Vicinity