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NUREG-2183

Environmental Impact Statement for the Construction Permit for the SHINE Medical Radioisotope Production Facility

Draft Report for Comment

Office of Nuclear Reactor Regulation

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Manuscript Completed: April 2015
Date Published: May 2015

Michelle Moser, NRC Project Manager

Office of Nuclear Reactor Regulation

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For any questions about the material in this report, please contact: Ms. Michelle Moser, Environmental Project Manager, 301-415-6509 or by e-mail at Michelle.Moser@nrc.gov.

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Responsible Agency: U.S. Nuclear Regulatory Commission (NRC), Office of Nuclear Reactor Regulation. The U.S. Department of Energy is a cooperating agency involved in the preparation of this environmental impact statement (EIS).

Title: *Environmental Impact Statement for the Construction Permit for the SHINE Medical Radioisotope Production Facility, Draft Report for Comment*

The proposed SHINE Medical Technologies, Inc. (SHINE), facility would be located in Janesville, Wisconsin.

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Office of Nuclear Reactor Regulation
Mail Stop O-11F1
11555 Rockville Pike
Rockville, MD 20852
Phone: 1-800-368-5642, extension 6509
Fax: 301-415-2002
E-mail: Michelle.Moser@nrc.gov

ABSTRACT

The U.S Nuclear Regulatory Commission (NRC) has prepared this environmental impact statement (EIS) in response to an application submitted by SHINE Medical Technologies, Inc. (SHINE), for a construction permit of a medical radioisotope production facility. The EIS includes the analysis that evaluates the environmental impacts of the proposed action and considers the following three alternatives to the proposed action: (1) the no-action alternative (i.e., the construction permit is denied), (2) two alternative sites, and (3) one alternative technology.

After weighing the environmental, economic, technical, and other benefits against environmental and other costs, and considering reasonable alternatives, the NRC staff recommends, unless safety issues mandate otherwise, the issuance of the proposed construction permit to SHINE. The NRC staff based its recommendation on the following factors:

- SHINE’s Environmental Report;
- the NRC staff’s consultation with Federal, State, and local agencies;
- the NRC staff’s independent environmental review; and
- the NRC staff’s consideration of public comments received.

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BACKGROUND

By letter dated March 26, 2013, SHINE Medical Technologies, Inc. (SHINE), submitted Part 1 of a two-part application to the U.S. Nuclear Regulatory Commission (NRC) for a construction permit for a medical radioisotope production facility (SHINE facility) in Janesville, Wisconsin. To issue a permit, the NRC is required to consider the environmental impacts of the proposed action under the National Environmental Policy Act of 1969 (42 U.S.C. 4321 et seq., herein referred to as NEPA). The NRC's environmental protection regulations that implement NEPA in Title 10 of the *Code of Federal Regulations* (10 CFR) Part 51describe several types of actions that would require an environmental impact statement (EIS). The regulation at 10 CFR 51.20 does not specifically identify construction permits and operating licenses for production and utilization facilities as an action that would require an EIS. However, for the SHINE environmental review, the NRC staff determined that an EIS was appropriate to assess the environmental impacts of the proposed action. The NRC staff made this determination because of the potential for significant environmental impacts and the unique considerations of a first-of-a-kind application for a medical radioisotope production facility with a unique application of technologies, as well as to allow public involvement in the environmental review process.

Upon acceptance of Part 1 of SHINE's application, the NRC staff began the environmental review process described in 10 CFR Part 51 by publishing a Notice of Intent in the *Federal Register* (78 FR 39343) to prepare an EIS and to conduct scoping activities. In preparation of this EIS, the NRC staff performed the following:

- conducted public scoping meetings on July 17, 2013, in Janesville, Wisconsin;
- conducted a site audit at the proposed SHINE site and alternative sites from July 30, 2013, to August 1, 2013;
- reviewed SHINE's Environmental Report;
- consulted with Federal, State, and local agencies;
- conducted a review of the guidance in *Final Interim Staff Guidance Augmenting NUREG-1537, Part 1, "Guidelines for Preparing and Reviewing Applications for the Licensing of Non-Power Reactors: Format and Content," for Licensing Radioisotope Production Facilities and Aqueous Homogeneous Reactors";* and *Part 2, "Guidelines for Preparing and Reviewing Applications for the Licensing of Non-Power Reactors: Standard Review Plan and Acceptance Criteria"*; and
- considered public comments received.

PROPOSED ACTION

The proposed Federal action is for the NRC to decide whether to issue a construction permit under 10 CFR Part 50 that would allow construction of a medical radioisotope production facility. If the NRC were to issue a construction permit, SHINE could build the proposed facility on a 91-acre (37-hectare) site in Rock County, which is located about 4 miles (6 kilometers) south of the city center of Janesville, Wisconsin. The SHINE facility would produce, package, and ship medical radioisotopes, specifically molybdenum-99, iodine-131, and xenon-133.

The U.S. Department of Energy is a cooperating agency on this EIS. If the NRC issues the required permits and licenses, the proposed Federal action for the U.S. Department of Energy

National Nuclear Security Administration is to decide whether to provide cost-sharing financial support to SHINE under a cooperative agreement to accelerate the commercial production of medical radioisotopes without the use of highly enriched uranium. The funding would help accelerate activities, such as construction, purchase of equipment, and initial operation using a subcritical fission process.

PURPOSE AND NEED FOR ACTION

The purpose of this proposed Federal action is to evaluate the applicant's proposal to construct a facility that would ultimately produce medical radioisotopes. The determination of need and the decision to produce radioisotopes are at the discretion of applicants or other medical radioisotope production decisionmakers. This definition of purpose and need reflects the NRC's recognition that, unless there are findings in the safety review required by the Atomic Energy Act of 1954, as amended, or findings in the environmental analysis under NEPA that would lead the NRC to reject a construction permit application, the agency does not have a role in the planning decisions as to whether a particular radioisotope production facility should be constructed and operated.

The proposed Federal action for the U.S. Department of Energy National Nuclear Security Administration is to decide whether, if the NRC grants a permit(s) and license(s), to provide cost-sharing financial support to SHINE under a cooperative agreement to accelerate the establishment of the commercial production of medical radioisotopes without the use of highly enriched uranium. The funding would help to accelerate activities such as construction, purchase of equipment, and initial operation using a subcritical fission process if the NRC were to give SHINE a construction permit and operating license.

ENVIRONMENTAL IMPACTS OF CONSTRUCTION, OPERATIONS, AND DECOMMISSIONING

The EIS evaluates the potential environmental impacts of the proposed action. The environmental impacts from the proposed action are designated as SMALL, MODERATE, or LARGE. The following definitions of these three significance levels, as presented in the final interim staff guidance to NUREG–1537, apply:

> **SMALL:** Environmental effects are not detectable or are so minor that they would neither destabilize nor noticeably alter any important attribute of the resource. In assessing radiological impacts, the NRC has concluded that those impacts that do not exceed permissible levels in the agency'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.

Table ES–1 summarizes the NRC staff's findings on the level of impacts on environmental resources from the construction, operations, and decommissioning of the SHINE facility.

Table ES–1. Summary of NRC Conclusions on the Environmental Impacts of Construction, Operations, and Decommissioning of the Proposed SHINE Facility

Resource Area	Impacts
Land Use and Visual Resources	SMALL
Air Quality and Noise	SMALL
Geologic Environment	SMALL
Water Resources	SMALL
Ecological Resources	SMALL
Historic and Cultural Resources	SMALL
Socioeconomic Impacts	SMALL
Human Health	SMALL
Waste Management	SMALL
Transportation	SMALL to MODERATE
Accidents	SMALL
Environmental Justice	See note below.[a]
Cumulative Impacts	
Land Use and Visual Resources	SMALL
Air Quality and Noise	SMALL
Geologic Environment	SMALL
Water Resources	SMALL
Ecological Resources	MODERATE
Historic and Cultural Resources	SMALL
Socioeconomics Impacts	SMALL
Human Health	SMALL
Waste Management	SMALL
Transportation	SMALL to MODERATE
Environmental Justice	See note below.[a]

[a] There would be no disproportionately high and adverse impacts to minority and low-income populations and subsistence consumption from the proposed action and from cumulative impacts.

ALTERNATIVES

The NRC staff considered the environmental impacts associated with the following alternatives to constructing the SHINE facility at the Janesville site:

- the no-action alternative;
- construction, operations, and decommissioning of the SHINE facility at the Chippewa Falls site (Alternative Site No. 1);
- construction, operations, and decommissioning of the SHINE facility at the Stevens Point site (Alternative Site No. 2); and
- construction, operations, and decommissioning of a linear-accelerator-based facility at the SHINE site (alternative technology).

The NRC staff evaluated each alternative using the same resource areas that were used in evaluating impacts from the proposed action. The NRC staff determined that the no-action alternative would result in SMALL impacts to all resource areas. However, the no-action alternative does not fulfill the purpose and need of the project. The environmentally preferred alternatives are the construction, operations, and decommissioning of the SHINE facility and the linear-accelerator-based facility at the Janesville site. The impacts associated with the proposed action and the alternative technology would be SMALL for all resource areas with the exception of traffic, which would incur SMALL to MODERATE impacts. The NRC staff determined that the construction, operations, and decommissioning of building the SHINE facility at the alternative sites would likely result in greater impacts than the proposed action.

RECOMMENDATION

After weighing the environmental, economic, technical, and other benefits against environmental and other costs, and considering reasonable alternatives, the NRC staff recommends, unless safety issues mandate otherwise, the issuance of the proposed construction permit to SHINE. The NRC staff based its recommendation on the following factors:

- SHINE’s Environmental Report;
- the NRC staff’s consultation with Federal, State, and local agencies;
- the NRC staff’s independent environmental review; and
- the NRC staff’s consideration of public comments received.

ABBREVIATIONS AND ACRONYMS

^{0}C	degree(s) Celsius
^{0}F	degree(s) Fahrenheit
ac	acre(s)
ACHP	Advisory Council on Historic Preservation
ADAMS	Agencywide Documents Access and Management System
AEGL	Acute Exposure Guideline Level
AERMOD	American Meteorological Society/Environmental Protection Agency Regulatory Model
ALARA	as low as is reasonably achievable
APE	area of potential effect
AQCR	air quality control region
BGEPA	Bald and Golden Eagle Protection Act
bgs	below ground surface
BIA	U.S. Bureau of Indian Affairs
BLS	U.S. Bureau of Labor Statistics
BMP	best management practice
B.P.	before present
bu	bushel(s)
CAA	Clean Air Act
Ci	curie
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
cfs	cubic feet per second
CH_4	methane
cm	centimeter
CO	carbon monoxide
CO_2	carbon dioxide
CO_{2eq}	carbon dioxide equivalent
CRMP	cultural resource management plan
CWA	Clean Water Act
dB	decibel(s)
dBA	decibels on the A-weighted scale
DBA	design-basis accident

DOE	U.S. Department of Energy
DOL	U.S. Department of Labor
DOT	U.S. Department of Transportation
EA	environmental assessment
ECHO	Enforcement and Compliance History Online [air data search tool]
EIA	Energy Information Administration
EIS	environmental impact statement
EO	Executive Order
EPA	U.S. Environmental Protection Agency
ER	Environmental Report
ERPG	Emergency Response Planning Guideline
ESA	Endangered Species Act
ES&H	Environment, Health, and Safety [Manager]
FAA	U.S. Federal Aviation Administration
FEMA	U.S. Federal Emergency Management Agency
FHWA	U.S. Federal Highway Administration
FR	Federal Register
ft	foot (feet)
ft^2	square foot (feet)
FWS	U.S. Fish and Wildlife Service
GAI	Golder Associates, Inc.
gal	gallon(s)
GHG	greenhouse gas
GM	General Motors
gpd	gallons per day
gpm	gallons per minute
GTCC	greater than Class C
GWP	global warming potential
ha	hectare(s)
HAP	hazardous air pollutant
HEPA	high-efficiency particulate air
HEU	highly enriched uranium
hp	horsepower
hr	hour(s)
IAEA	International Atomic Energy Agency

in.	inch
IOM	Institute of Medicine
JBWI	Rockford, Illinois–Janesville–Beloit, Wisconsin, Interstate
K	kindergarten
km	kilometer(s)
kph	kilometer(s) per hour
km^2	square kilometer(s)
L	liter(s)
L_{DN}	day-night sound intensity level
Lpd	liter(s) per day
m	meter(s)
m^2	square meter(s)
m^3	cubic meter(s)
m^3/day	cubic meter(s) per day
m^3/min	cubic meter(s) per minute
mi^3/s	cubic mile(s) per second
mg/L	milligram(s) per liter
mg/m^3	milligram(s) per cubic meter
mgd	million gallon(s) per day
m/s	meter(s) per second
MAR	material at risk
MBTA	Migratory Bird Treaty Act
mgd	million gallons per day
MHA	maximum hypothetical accident
mi	mile
min	minute
mph	mile(s) per hour
mi^2	square mile(s)
µg	microgram
µm	microns
$µg/m^3$	microgram per cubic meter
MMI	Modified Mercalli Intensity
MOA	memorandum of agreement
MOI	maximum offsite individual
mrem	milliroentgen equivalent man

MSL	mean sea level
mSv	millisievert
MT	metric ton(s)
NAAQS	National Ambient Air Quality Standards
NAC	noise abatement criteria
NCDC	National Climatic Data Center
NCES	National Center for Education Statistics
NEA	Nuclear Energy Agency
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NNSA	National Nuclear Security Administration
NO_2	nitrogen dioxide
NO_x	nitrogen oxide
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NPS	U.S. National Park Service
NRC	U.S. Nuclear Regulatory Commission
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NUREG	NRC technical report designation (Nuclear Regulatory Commission)
OSHA	Occupational Safety and Health Administration
PAC	protective action criterion/criteria
PGA	peak ground acceleration
PM	particulate matter
ppb	parts per billion
ppm	parts per million
PSAR	preliminary safety analysis report
PSD	prevention of significant deterioration
RCA	radiation-controlled area
RCRA	Resource Conservation and Recovery Act
ROI	region of influence
RM	river mile
SER	safety evaluation report
SHINE	SHINE Medical Technologies, Inc.

SHPO	State Historic Preservation Office
SIL	significant impact level
SNM	Society of Nuclear Medicine and Molecular Imaging
SO_2	sulfur dioxide
SPCC	Spill Prevention, Control, and Countermeasure
SSC	species of special concern
TDS	total dissolved solids
TEEL	Temporary Emergency Exposure Limit
TIF	Tax Increment Finance
TMDL	total maximum daily load
TNM	traffic noise model
TPY	tons per year
TSP	total suspended particles
TSV	target solution vessel
µg	microgram(s)
µm	micron(s)
U.S.	United States
U.S.C.	United States Code
USCB	U.S. Census Bureau
USDA	U.S. Department of Agriculture
USDOI	U.S. Department of Interior
USGCRP	U.S. Global Change Research Program
USGS	U.S. Geological Service
VOC	volatile organic compound(s)
WAC	Wisconsin Administrative Code
WDOA	Wisconsin Department of Administration
WDATCP	Wisconsin Department of Agriculture Trade and Consumer Protection
WDNR	Wisconsin Department of Natural Resources
WDOT	Wisconsin Department of Transportation
WDPI	Wisconsin Department of Public Instruction
WDR	Wisconsin Department of Revenue
WDWD	Wisconsin Department of Workforce Development
WGNHS	Wisconsin Geological and Natural History Survey
WHS	Wisconsin Historical Society

WI	Wisconsin
WPDES	Wisconsin Pollutant Discharge Elimination System
WTP	Wastewater Treatment Plant
yd^3	cubic yard(s)
Y-12	Y-12 National Security Complex

1.0 INTRODUCTION

By letter dated March 26, 2013, SHINE Medical Technologies, Inc. (SHINE), submitted Part 1 of a two-part application to the U.S. Nuclear Regulatory Commission (NRC) for a construction permit under Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50 that would allow construction of a medical radioisotope production facility (SHINE facility) in Janesville, Wisconsin (SHINE 2013). The Atomic Energy Act of 1954 (42 U.S.C. 2011 et seq.) authorizes the NRC to issue construction permits for production and utilization facilities. To issue a construction permit, the NRC is required to consider the environmental impacts of the proposed action under the National Environmental Policy Act of 1969 (42 U.S.C. 4321 et seq., herein referred to as NEPA). The NRC's environmental protection regulations that implement NEPA in 10 CFR Part 51 describe several types of actions that would require an environmental impact statement (EIS). Construction permits and operating licenses for production and subcritical utilization facilities are not specifically identified in 10 CFR 51.20 as an action that would require an EIS. Such activities may require an environmental assessment (EA) or an EIS, depending on their potential for significant impacts that may affect the quality of the human environment (NRC 2012).

An EA is used to determine whether the impacts from the proposed action may be significant and whether a finding of no significant impact can be made. If, based on the EA, the NRC concludes that the proposed action could result in significant impacts to the human environment, the agency should prepare an EIS. In some cases, the NRC may decide to prepare an EIS rather than an EA—if there is the potential for significant impacts to the human environment or the proposed action involves a matter that the Commission, in the exercise of its discretion, has determined should be covered by an EIS. For the SHINE environmental review, the NRC staff determined that an EIS was appropriate to assess the environmental impacts of the proposed action. The NRC staff made this determination because of the potential for significant environmental impacts and the unique considerations of a first-of-a-kind application for a medical radioisotope production facility with a unique application of technologies, as well as to allow public involvement in the environmental review process.

1.1 Background

Nuclear medicine practitioners frequently use a variety of radioisotopes to diagnose and treat illnesses in patients. Out of the many radioisotopes in use, three are relevant for this EIS—molybdenum-99, iodine-131, and xenon-133.

1.1.1 Molybdenum-99

Molybdenum-99 is the radioisotope currently in highest demand (NRC 2012) for medical use. Molybdenum-99 decays with a 66-hour half-life to technetium-99m, which in turn decays with a 6-hour half-life to technetium-99. Technetium-99m is the most commonly used medical radioisotope in the world. It is used in about 20 to 25 million medical diagnostic procedures annually, or about 80 percent of all diagnostic nuclear medicine procedures (IAEA 2013). Uses for technetium-99m include the following (SHINE 2013):

- bone scans,
- lung perfusion imaging,
- kidney scans and functional imaging,

- liver scans,
- sentinel lymph node localization,
- cardiac perfusion imaging,
- brain perfusion imaging,
- gall bladder function imaging,
- blood pool imaging,
- thyroid and salivary gland imaging, and
- Meckel's scans.

Molybdenum-99 is commonly produced through the neutron activation of naturally occurring molybdenum or as a by-product of uranium-235 fission. No U.S. domestic producers of molybdenum-99 exist. Almost the entire U.S. supply of molybdenum-99, as well as about 85 percent of the world's supply, is produced at the National Research Universal reactor in Chalk River, Ontario, Canada, or at the High Flux Reactor in Petten, the Netherlands (National Research Council 2009). The only other international producers are located in South Africa, Australia, Belgium, Poland, Czech Republic, and France. Serious domestic and international shortages over the last decade resulted from planned and unplanned maintenance shutdowns at these facilities (National Research Council 2009). In addition to issues of production reliability, global demand for the radioisotope is increasing, and transporting the radioisotope across international borders is becoming more difficult (National Research Council 2009).

1.1.2 Iodine-131

Iodine-131 is produced for medical use through irradiation of tellurium-130 or as a by-product of uranium-235 fission. Iodine-131 has a half-life of about 8 days. Uses of iodine-131 include the following: (1) radiation therapy and (2) radioactive labeling for diagnostic pharmaceuticals (SHINE 2013).

Three companies—DRAXIMAGE, Covidien, and MDS Nordion—supply iodine-131 for the U.S. market (Nuclear Energy Agency (NEA) 2011). As with molybdenum-99, reactor shutdowns have caused recent shortages in iodine-131. For example, in November 2013, the National Research Universal reactor shutdown led to a global shortage of a variety of medical isotopes (NEA 2011; Bloomberg 2013).

1.1.3 Xenon-133

Xenon-133 is produced as a by-product of uranium-235 fission. Its half-life is about 5 days. Uses of xenon-133 include the following: (1) lung imaging, (2) diagnostic evaluation of pulmonary function, and (3) assessment of cerebral blood flow (SHINE 2013).

The domestic supply of xenon-133 also has been susceptible to shortages because of production and availability issues (Society of Nuclear Medicine and Molecular Imaging (SNM) 2013).

1.2 Proposed Federal Action

The proposed Federal action is for the NRC to decide whether to issue a construction permit under 10 CFR Part 50 that would allow construction of a medical radioisotope production facility (which would include utilization facilities). If the NRC were to issue a construction permit, SHINE could build the proposed facility on a 91-acre (37-hectare) site in Rock County, which is located about 4 mi (6 km) south of the city center of Janesville, Wisconsin. The issuance of a construction permit is a separate licensing action from the issuance of an operating license. If the NRC issues a construction permit, then SHINE must submit a separate application for an operating license, pursuant to the NRC's requirements, and must obtain NRC approval before it can operate the medical radioisotope production facility. If the NRC were to issue an operating license, SHINE could operate the proposed SHINE facility and produce radioisotopes, including molybdenum-99, iodine-131, and xenon-133 (SHINE 2013). To conduct an efficient and effective environmental review, this EIS covers the potential impacts from construction, operations, and decommissioning. If SHINE were to submit an application for an operating license, the NRC staff would prepare a supplement to this EIS in accordance with 10 CFR 51.95(b).

As described in Section 1.6, the U.S. Department of Energy (DOE) is a cooperating agency on this EIS. If the NRC issues the required permits and licenses, the proposed Federal action for the DOE National Nuclear Security Administration (NNSA) is to decide whether to provide additional cost-sharing financial support to SHINE under a cooperative agreement to accelerate the commercial production of medical radioisotopes without the use of highly enriched uranium. The funding would help accelerate activities such as construction, purchase of equipment, and initial operation using a subcritical fission process. Funding of these activities is a different action from the lease and takeback of uranium by DOE/NNSA. If SHINE were to request that NNSA provide it with low-enriched uranium or take back waste for which SHINE has no other disposal path, such activities would require a review under NEPA before DOE/NNSA could make any decision about these activities.

1.3 Purpose and Need for the Proposed Federal Action

> A curie (Ci) is a unit of measurement describing the radioactive disintegration rate of a substance; 1 Ci is 3.700×10^{10} disintegrations per second (Institute of Medicine (IOM) 1995).
>
> The term "6-day Ci" comes from producers to determine the number of curies present in a shipment 6 days after it leaves the production facility (National Research Council 2009).

The purpose of and need for this proposed Federal action is to evaluate the applicant's proposal to construct a facility that would ultimately produce medical radioisotopes. For the past 2 decades, the United States has relied on imported medical radioisotopes, such as molybdenum-99, iodine-131, and xenon-133. Molybdenum-99, for example, is used to perform about 50,000 medical procedures daily in the United States. Global shortages of medical radioisotopes in 2009 and 2010 have highlighted the need for prompt action to ensure a reliable domestic supply. Demand in the United States for molybdenum-99 is approximately 5,000 6-day curies (Ci) (2×10^{14} and 3×10^{14} 6-day becquerels) (Bq) per week. This demand is expected to increase about 0.5 percent per year (OECD 2014). In recent years, U.S. policy has aimed to ensure a reliable supply of medical radioisotopes while minimizing the use of highly enriched uranium for civilian purposes through, among other things, supporting commercial projects that produce medical radioisotopes domestically without the use of highly enriched uranium (NNSA 2011; White House 2012).

In response to these shortages, and pursuant to the January 2013 enactment of the National Defense Authorization Act for fiscal year 2013, Title XXXI, Subtitle F, known as the American Medical Isotopes Production Act of 2012 (42 U.S.C. 3171 et seq.), DOE/NNSA has entered into cooperative agreements with domestic commercial firms. These agreements enable DOE/NNSA to engage in cost-sharing activities to accelerate domestic endeavors to demonstrate and produce a reliable supply of molybdenum--99 using technologies that do not rely on the use of highly enriched uranium, in accordance with Section 988 of the Energy Policy Act of 2005 (42 U.S.C. 16352) (NNSA 2011).

The proposed action for the NRC is to decide whether to issue a construction permit, which would allow SHINE to construct a medical radioisotope production facility that uses low-enriched uranium to produce molybdenum-99, iodine-131, and xenon-133. If the construction permit is granted, SHINE would then have to apply for an operating license. The NRC would conduct a separate review to decide on issuing an operating license. If the facility is licensed to operate, SHINE expects to produce up to 8,200 6-day Ci (3.0×10^{14} 6-day Bq) of molybdenum-99 per week (SHINE 2013).

1.4 U.S. Nuclear Regulatory Commission Environmental Review

The NRC's process to review applications for construction permits consists of two separate, parallel reviews. The safety review evaluates the applicant's ability to meet the NRC regulatory safety requirements. The NRC staff documents the findings of the safety review in a Safety Evaluation Report. The environmental review, governed by the requirements in 10 CFR Part 51, evaluates the environmental impacts of, and alternatives to, the proposed action. This draft EIS presents the results of this evaluation. The NRC considers the findings in both the EIS and the Safety Evaluation Report in its decision to grant or deny the issuance of a construction permit.

To guide its assessment of the environmental impacts of the proposed action or alternative actions, the NRC established a standard of significance for impacts using the Council on Environmental Quality terminology for "significantly" (40 CFR 1508.27). Based on this, the NRC established three levels of significance for potential impacts: SMALL, MODERATE, and LARGE, as defined below.

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.

> The **American Medical Isotopes Production Act of 2012** directs DOE to improve the reliability of a domestic supply of molybdenum-99 by carrying out a technology-neutral program to support non-Federal entities in the United States in developing capabilities to produce molybdenum-99 without the use of highly enriched uranium.

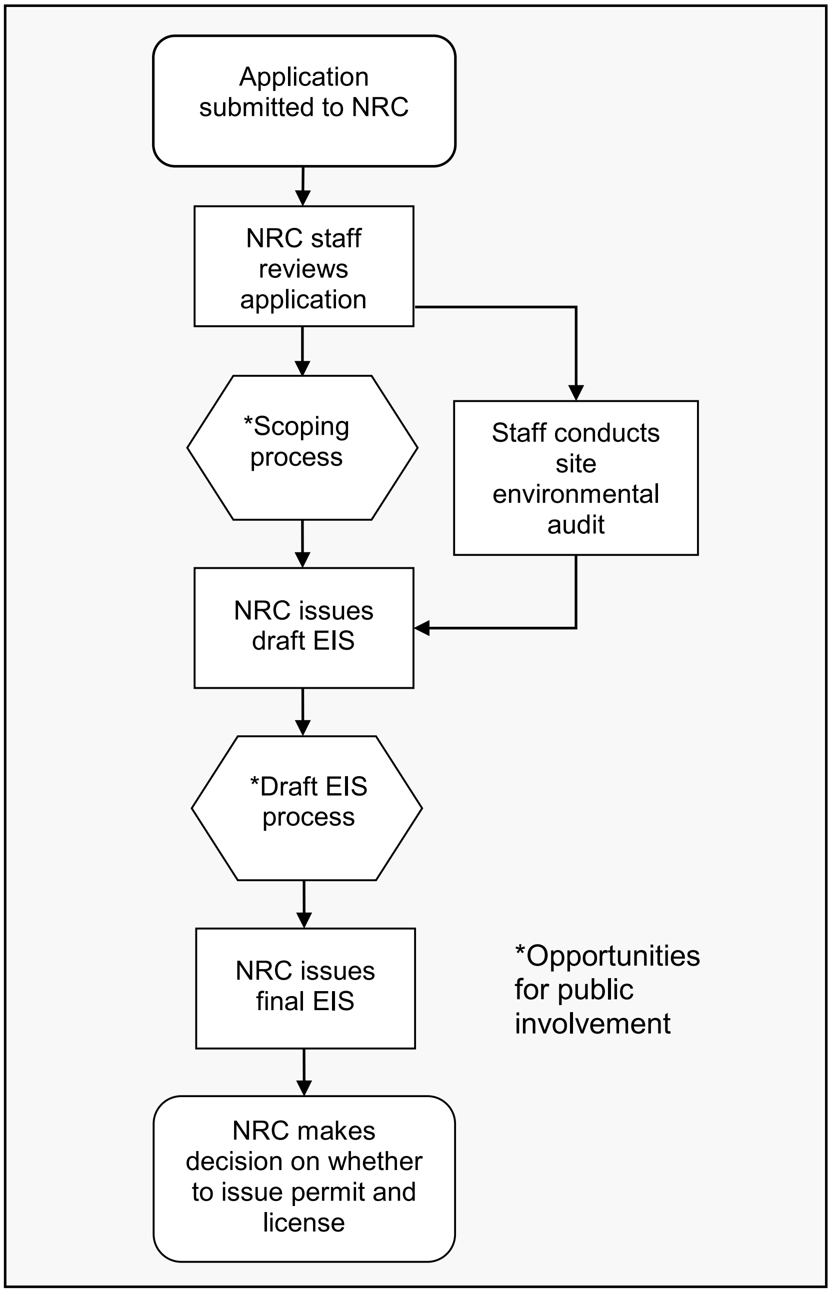
In March 2013, SHINE submitted its Environmental Report (SHINE 2013) with Part 1 of its application for a construction permit. After reviewing Part 1 of the application for sufficiency, on July 1, 2013, the NRC staff published a Notice of Acceptance for Docketing in the *Federal Register* (78 FR 39342) and a separate *Federal Register* notice of its intent to prepare an EIS and conduct a scoping process (78 FR 39343). The July 1, 2013, scoping notice began the 60-day scoping period.

On July 17, 2013, the NRC held two public scoping meetings in Janesville, Wisconsin. The NRC's report entitled, "Environmental Impact Statement Scoping Process Summary Report for the SHINE Medical Radioisotope Production Facility," presents the comments received during the scoping process (NRC 2015).

In July and August 2013, the NRC staff conducted a site audit at the proposed and alternative SHINE facility sites to verify information in SHINE's Environmental Report. During the site audit, the NRC staff met with SHINE personnel; reviewed specific documentation; toured the proposed and alternative sites; and met with interested Federal, State, and local agencies.

Figure 1–1 shows the major milestones in the public review of an EIS. After the scoping period and site audit, the NRC staff compiles its findings in a draft EIS. The draft EIS is available for public comment for 45 days. During this time, the NRC staff hosts public meetings and collects public comments. Based on the information gathered, the NRC staff will amend the draft EIS findings as necessary and then publish a final EIS.

Figure 1–1. Environmental Review Process



1.5 Cooperating Agency

NEPA lays the groundwork for coordination between the lead agency preparing an EIS and other Federal agencies that may have special expertise on an environmental issue or that have jurisdiction by law. These other agencies, referred to as “cooperating agencies,” are responsible for assisting the lead agency through early participation in the NEPA process, including scoping. The cooperating agencies provide technical input to the environmental analysis and provide staff support, as needed, to the lead agency.

The American Medical Isotopes Production Act of 2012 directs DOE and the NRC to ensure, to the maximum extent practicable, that environmental reviews for facilities to produce medical radioisotopes are complementary and not duplicative.

The NRC makes license decisions under the Atomic Energy Act of 1954, as amended, and DOE makes funding decisions under the American Medical Isotopes Production Act of 2012 and the Energy Policy Act of 2005 (42 U.S.C. 16352). The NRC is required to conduct an environmental review under NEPA to decide whether to grant SHINE a construction permit. DOE is required to conduct an environmental review under NEPA for providing financial support to SHINE. The NRC and DOE decided to enter into a cooperative agreement to make the most effective and efficient use of Federal resources in reviewing SHINE’s proposal. On December 1, 2014, and February 3, 2015, the NRC and DOE signed a Memorandum of Agreement on the review of the SHINE application (DOE and NRC 2015). The goal of this agreement is to develop one EIS that serves the NRC licensing process and the DOE funding process. Although both agencies must meet NEPA requirements, they also must meet mission requirements. As a cooperating agency, DOE/NNSA plans to adopt the final EIS in accordance with the DOE/NEPA implementing procedures in 10 CFR 1021.103.

The Memorandum of Agreement designates the NRC as the lead Federal agency and DOE as a cooperating agency in developing an EIS for the proposed SHINE facility. Under Federal law, each agency has jurisdiction related to parts of the proposed project as major Federal actions that could significantly affect the quality of the human environment.

1.6 Consultation and Correspondence

The Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq.), and the National Historic Preservation Act of 1966 (16 U.S.C. 470 et seq.) require Federal agencies to consult with applicable State and Federal agencies and groups before taking actions that may affect endangered species, fisheries, and historic and archaeological resources. In addition to correspondence, as part of formal consultation requirements, the NRC staff contacted Federal, State, regional, local, and tribal agencies with environmental expertise in the areas that the proposed project could potentially affect. Agencies contacted during the formal consultation processes and the SHINE environmental review process included the following:

- U.S. Fish and Wildlife Service,
- Wisconsin Department of Natural Resources,
- Citizen Potawatomi Nation,
- Bad River Band of the Lake Superior Tribe of Chippewa Indians,
- St. Croix Chippewa Indians of Wisconsin,
- Menominee Indian Tribe of Wisconsin,
- Flandreau Santee Sioux Tribe of South Dakota,

- Iowa Tribe,
- Forest County Potawatomi Community,
- Hannahville Indian Community,
- Ho-Chunk Nation of Wisconsin,
- Sac and Fox Nation,
- Lower Sioux Indian Community,
- Prairie Band of Potawatomi Nation,
- Prairie Island Indian Community,
- Santee Sioux Nation,
- Sisseton-Wahpeton Oyate of the Lake Traverse Reservation,
- Spirit Lake Tribe,
- Upper Sioux Community,
- Peoria Tribe of Indians of Oklahoma,
- Winnebago Tribe of Nebraska,
- Advisory Council on Historic Preservation, and
- Wisconsin State Historic Preservation Office.

Chapter 9 provides a list of those who received a copy of this EIS. Appendix C contains a chronological list of all correspondence sent and received during the environmental review.

1.7 Status of Compliance

SHINE is responsible for complying with applicable NRC regulations and other Federal, State, and local requirements. Appendix B to this EIS includes a list of the permits and licenses that Federal, State, and local authorities must issue to SHINE before construction or operation of the proposed facility.

1.8 References

10 CFR Part 50. *Code of Federal Regulations*, Title 10, *Energy*, Part 50, "Domestic licensing of production and utilization facilities."

10 CFR Part 51. *Code of Federal Regulations*, Title 10, *Energy*, Part 51, "Environmental protection regulations for domestic licensing and related regulatory functions."

10 CFR Part 1021. *Code of Federal Regulations*, Title 10, *Energy*, Part 1021, "National Environmental Policy Act implementing procedures."

40 CFR Part 1508. *Code of Federal Regulations*, Title 40, *Protection of Environment*, Part 1508, "Terminology and index."

78 FR 39342. U.S. Nuclear Regulatory Commission. "SHINE Medical Technologies, Inc.—notice; acceptance for docketing." *Federal Register* 78(126):39342–39343. July 1, 2013.

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Endangered Species Act of 1973, as amended. 16 U.S.C. §1531 et seq.

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[IOM] Institute of Medicine. 1995. *Isotopes for Medicine and the Life Sciences*. Washington, DC: The National Academies Press. February 10, 1995.

National Environmental Policy Act of 1969, as amended. 42 U.S.C. §4321 et seq.

National Historic Preservation Act of 1966. 16 U.S.C. §470 et seq.

[NEA] Nuclear Energy Agency. 2011. *The Supply of Medical Radioisotopes—The Path to Reliability*. Organisation for Economic Co-operation and Development. Available at <http://www.oecd-nea.org/med-radio/reports/med-radio-reliability.pdf> (accessed 14 June 2013).

[NNSA] National Nuclear Security Administration. 2011. *NNSA Works to Minimize the Use of HEU in Medical Isotope Production*. NNSA Fact Sheet 20100125. November 1, 2011. Available at <http://www.nnsa.energy.gov/mediaroom/factsheets/factsheet20100125> (accessed 14 June 2013).

[NRC] National Research Council. 2009. *Medical Isotope Production Without Highly Enriched Uranium*. Washington, DC: The National Academies Press. Available at <http://www.nap.edu/catalog.php?record_id=12569> (accessed 13 June 2013).

[NRC] U.S. Nuclear Regulatory Commission. 2012. *Final Interim Staff Guidance Augmenting NUREG-1537, Part 1, "Guidelines for Preparing and Reviewing Applications for the Licensing of Non-Power Reactors: Format and Content," and Part 2, "Guidelines for Preparing and Reviewing Applications for the Licensing of Non-Power Reactors: Standard Review Plan and Acceptance Criteria," for Licensing Radioisotope Production Facilities and Aqueous Homogeneous Reactors.* Washington, DC: NRC. October 17, 2012. ADAMS Nos. ML12156A069 and ML12156A075.

[NRC] U.S. Nuclear Regulatory Commission. 2015. *Environmental Impact Statement Scoping Process Summary Report for the SHINE Medical Radioisotope Production Facility.* ADAMS No. ML15062A111.

[OECD] Organisation for Economic Co-operation and Development–Nuclear Energy Agency. 2014. *The Supply of Medical Radioisotopes—Medical Isotope Supply in the Future: Production Capacity and Demand Forecast for the 99Mo/99mTc Market, 2015-2020.* Organisation for Economic Co-operation and Development. Available at <http://www.oecd-nea.org/med-radio/reports/sen-hlgmr2014-2.pdf> (accessed 26 February 2015).

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[SNM] Society of Nuclear Medicine and Molecular Imaging. 2013. *Xenon-133 Shortage Information*. Available at <http://interactive.snm.org/index.cfm?PageID=11637> (accessed 14 June 2013).

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2.0 PROPOSED FEDERAL ACTION

The proposed Federal action for the U.S. Nuclear Regulatory Commission (NRC) is to decide whether to issue a construction permit that would allow SHINE Medical Technologies, Inc. (SHINE), to construct a medical radioisotope production facility that would produce, package, and ship medical radioisotopes, specifically molybdenum-99, iodine-131, and xenon-133. This facility would employ a new medical radioisotope production technology that uses a nonreactor-based subcritical fission process.

The proposed Federal action for the U.S. Department of Energy (DOE) National Nuclear Security Administration (NNSA) is to decide whether, if the NRC grants a permit(s) and license(s), to provide cost-sharing financial support to SHINE under a cooperative agreement to accelerate the establishment of the commercial production of medical radioisotopes without the use of highly enriched uranium (HEU). The funding would help to accelerate activities such as construction, purchase of equipment, and initial operation using a subcritical fission process if the NRC were to give SHINE a construction permit and operating license.

2.1 Site Location and Layout

SHINE would construct and operate the proposed facility on land annexed by the City of Janesville, Wisconsin, which is located approximately 4 mi (6.4 km) south of the city center of Janesville, 13 mi (21 km) north of the Wisconsin-Illinois border, and 63 mi (101 km) west of Lake Michigan. The proposed site encompasses approximately 91 acres (ac) (37 hectares (ha)) of undeveloped land that is currently bordered by U.S. Highway 51 and the Southern Wisconsin Regional Airport to the west and cultivated crop lands to the north, south, and east (Figures 2–1 and 2–2) (SHINE 2013a). The SHINE facility would comprise five main buildings with associated support structures (e.g., storage sheds, storage tanks, and water tanks) and other engineered features (e.g., stormwater swales and parking lots) (Figure 2–3) (SHINE 2013a, 2013b). The five main buildings in which SHINE would conduct the majority of its operations are:

(1) Production Facility Building,

(2) Support Facility Building,

(3) Waste Staging and Shipping Building,

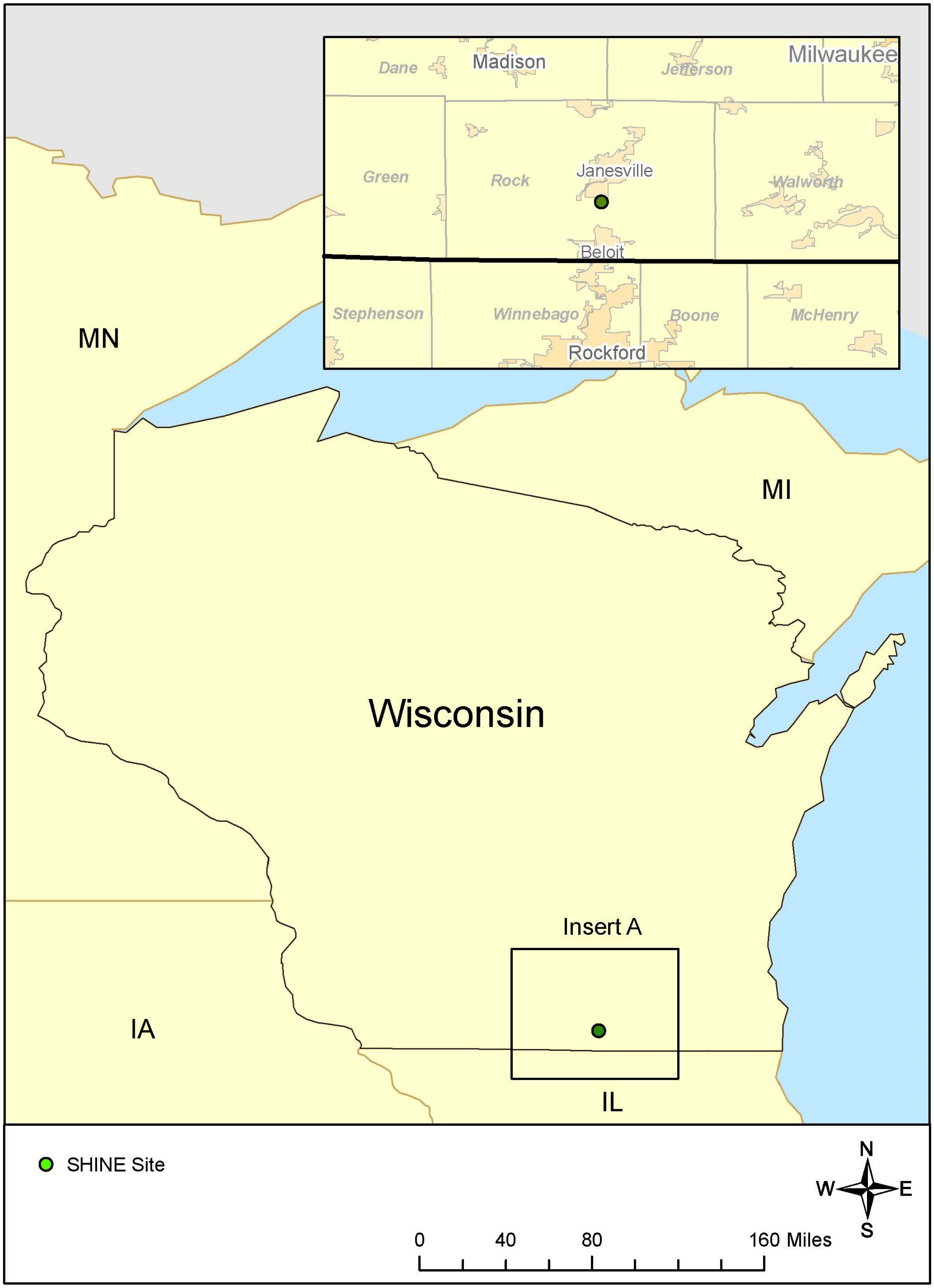
(4) Diesel Generator Building, and

(5) Administration Building.

The five main buildings would be concentrated in the central portion of the SHINE site and would collectively cover approximately 91,000 square feet (ft^2) (about 8,500 square meters (m^2)). The largest of the proposed buildings would be the Production Facility Building, which would extend approximately 284 ft (87 m) in length and 194 ft (59 m) in width and would have an estimated height of approximately 58 ft (18 m) above grade (SHINE 2014a). The tallest exhaust vent stack would be slightly higher, extending approximately 66 ft (20 m) above grade (SHINE 2014a).

Other features associated with the proposed SHINE facility include support structures, such as storage sheds, storage tanks, and water tanks, and engineered features, such as a new paved entrance road, parking lots, an engineered stormwater swale, berms, ditches, culverts, fences, and a rolling gate. Site improvements to accommodate the five main buildings, support structures, and additional engineered features would result in a total estimated facility footprint of approximately 350,000 ft^2 (about 32,500 m^2) (SHINE 2013b, 2014a). The new road would extend east from a proposed main entrance along U.S. Highway 51 and would provide commuter and commercial vehicle access to the site. The nearest major intersection to the proposed site is located approximately 1 mi (1.6 km) north where U.S. Highway 51 connects with State Trunk Highway 11 (SHINE 2013a).

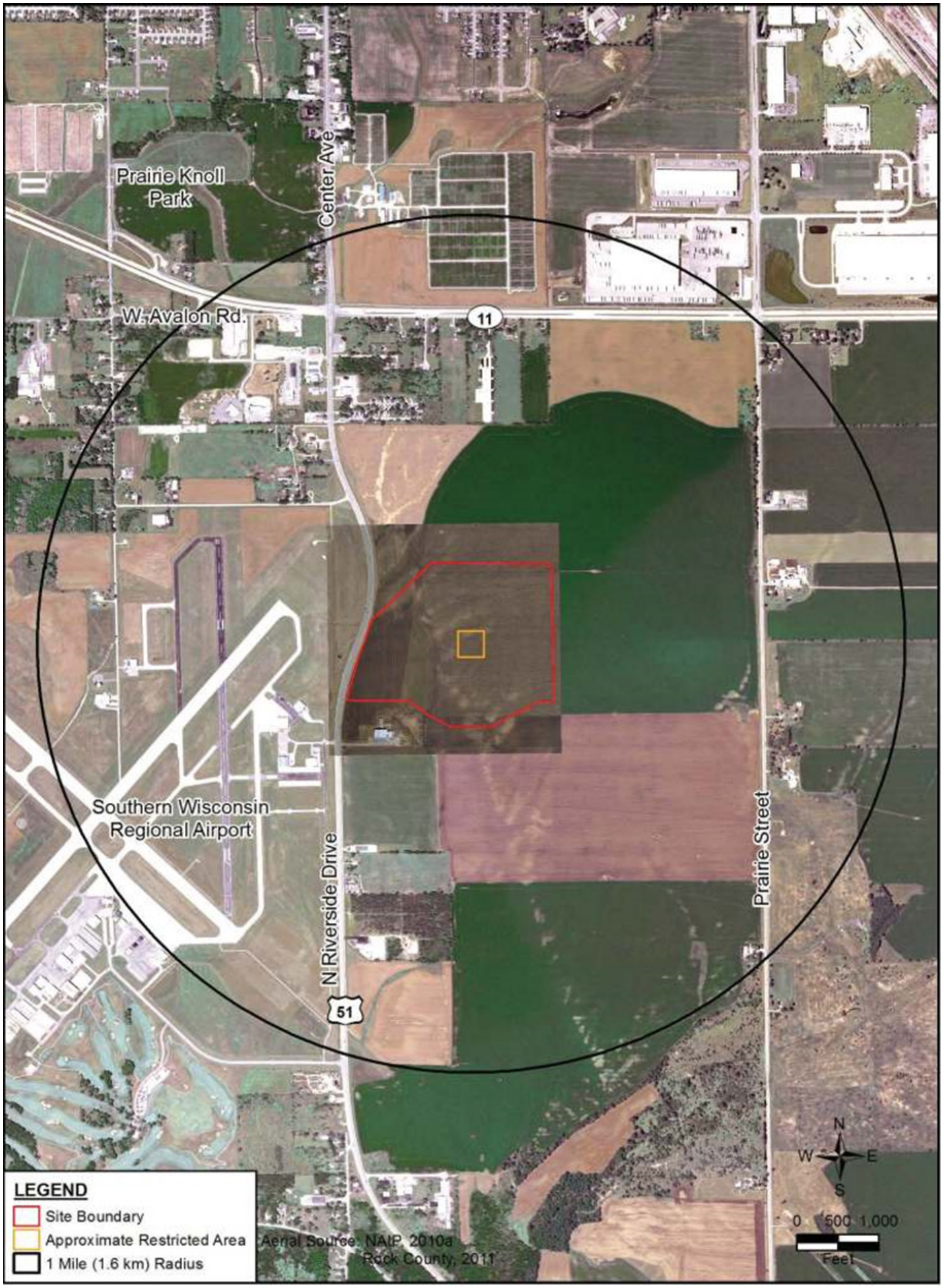
1 **Figure 2–1. Region Surrounding the Proposed SHINE Facility**



2

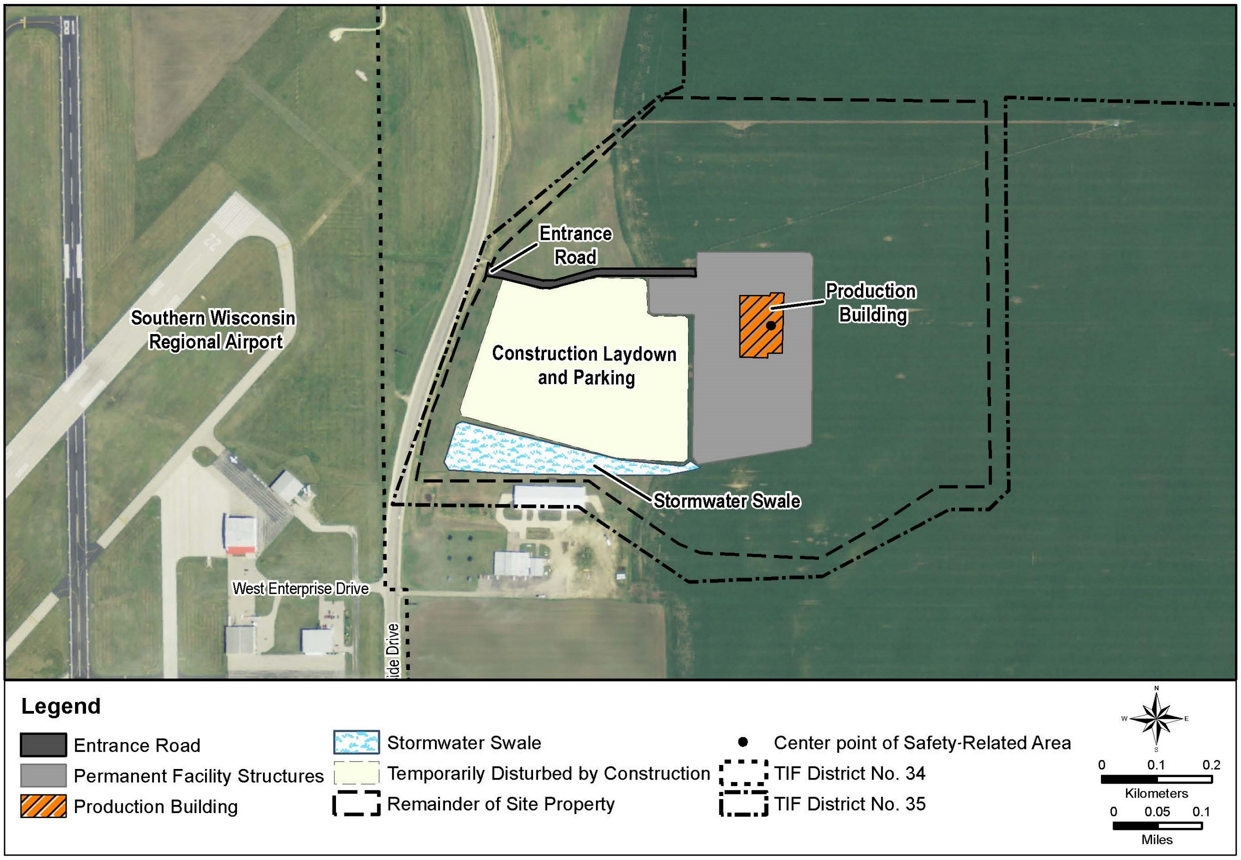
3 Source: SHINE 2013a

Figure 2–2. Proposed SHINE Facility and Surrounding Area Within a 1-mi (1.6-km) Radius



Source: SHINE 2013a

Figure 2–3. Proposed SHINE Facility Conceptual Site Layout



Source: SHINE 2013a, 2013b

2.2 Construction Activities

The construction period for the proposed SHINE facility would extend for 18 months and would require a peak construction workforce of approximately 451 workers (SHINE 2014a).

Construction activities would include earthmoving, excavation, pile driving, facility build-out, installation of roads and parking areas, concrete batch plant operation, and delivery of construction-related materials and components. Materials needed to construct the SHINE facility would include concrete, structural steel, miscellaneous steel, steel liner, asphalt, stone granular material, and roofing materials (SHINE 2013a). Table 2–1 presents the estimated amounts needed for each of these materials.

Commercial trucks would be used for shipping construction materials to the project site, including feed materials necessary for operating the concrete batch plant that would be located on site (SHINE 2013b, 2014a). SHINE estimates that the facility would require, on average, approximately 420 truck deliveries and 9 offsite waste shipments each month during construction (SHINE 2014a).

Table 2–1. Estimated Construction Material Requirements

Material	Amount
Concrete	27,700 $yd^{3(a)}$ (21,178 $m^{3(a)}$)
Structural Steel	140 tons (127 MT[a])
Miscellaneous Steel	30 tons (27 MT)
Steel Liner	100 tons (91 MT)
Asphalt	2,200 yd^3 (1,682 m^3)
Stone Granular Material	16,000 yd^3 (12,233 m^3)
Roofing	150 tons (136 MT)

[a] yd^3 = cubic yard(s), m^3 = cubic meter(s), and MT = metric ton(s).

Source: SHINE 2013a

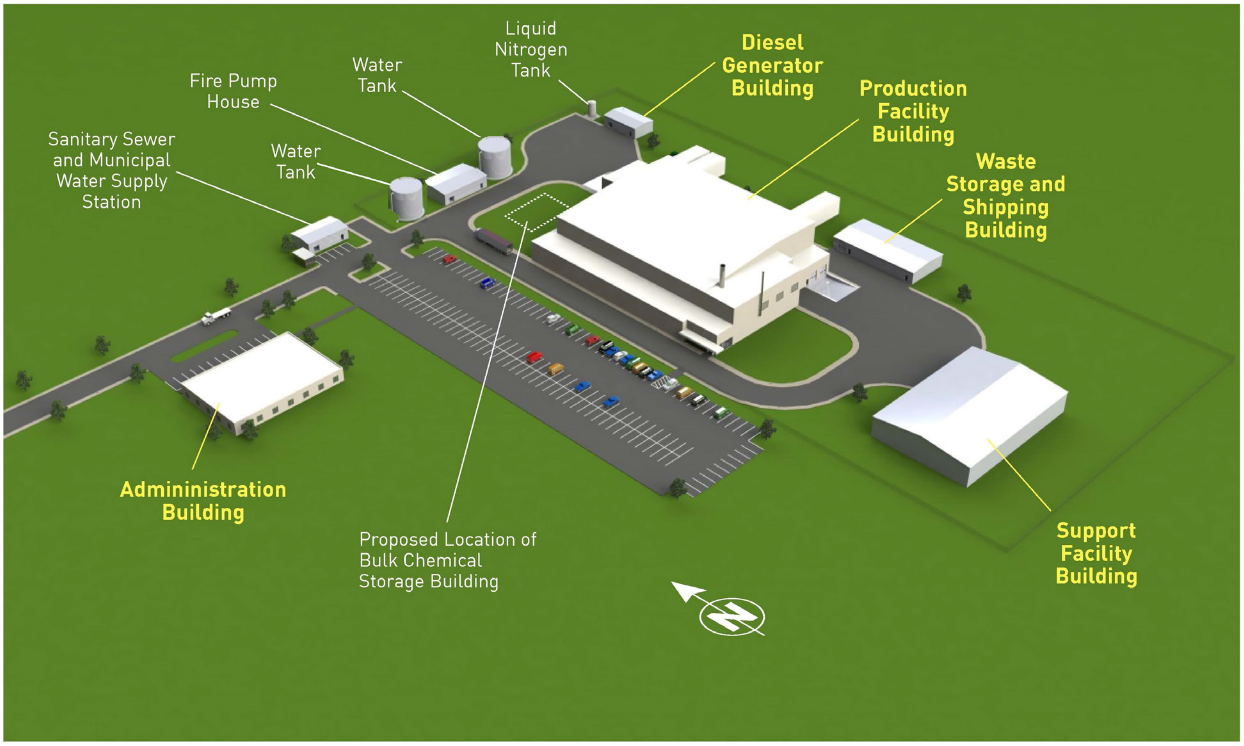
Although most building foundations would be excavated to a depth of 5 ft (1.5 m) below grade, portions of the Production Facility Building would require excavation to a depth of approximately 40 ft (12 m). Areas of the site would also be excavated to support installation of sanitary sewer and natural gas pipelines, an underground electrical distribution line, a municipal water line, and an underground diesel storage tank. In addition, drainage ditches and swale areas would be excavated to manage stormwater runoff. SHINE estimates that approximately 278,000 yd^3 (213,000 m^3) of material would be excavated to support construction activities (SHINE 2013a). All excavated material would be disposed of or used on site (SHINE 2013b). SHINE projects that construction equipment necessary to support these activities would consume approximately 295,000 gallons (gal) (1,117,000 liters (L)) of diesel fuel (SHINE 2013b).

Overall, construction activities would disturb approximately 41 ac (17 ha) of the proposed SHINE site. Of this total, SHINE projects that approximately 15 ac (6 ha) would be temporarily disturbed by construction activities, and approximately 26 ac (11 ha) would be permanently converted to industrial use (SHINE 2014a).

Figure 2–4 presents a conceptual illustration of the completed SHINE facility.

Before full commercial operation, SHINE may conduct some preoperational testing activities. During this time, the SHINE facility equipment would undergo a thorough commissioning phase, which would involve a series of test operations designed to ensure that the facility is functioning as designed (SHINE 2013a, 2014). For the purposes of this environmental analysis, the NRC staff included the activities and impacts of preoperational activities as part of the construction phase in the impacts assessment in Chapter 4.

Figure 2–4. Conceptual View of the Proposed SHINE Facility



Source: Modified from SHINE 2014b, 2015

2.3 Facility Operations

The proposed SHINE facility would commence full operations upon completion of construction and preoperational startup activities. This environmental impact statement (EIS) considers SHINE's activities over its proposed 30-year operating period (SHINE 2014a).

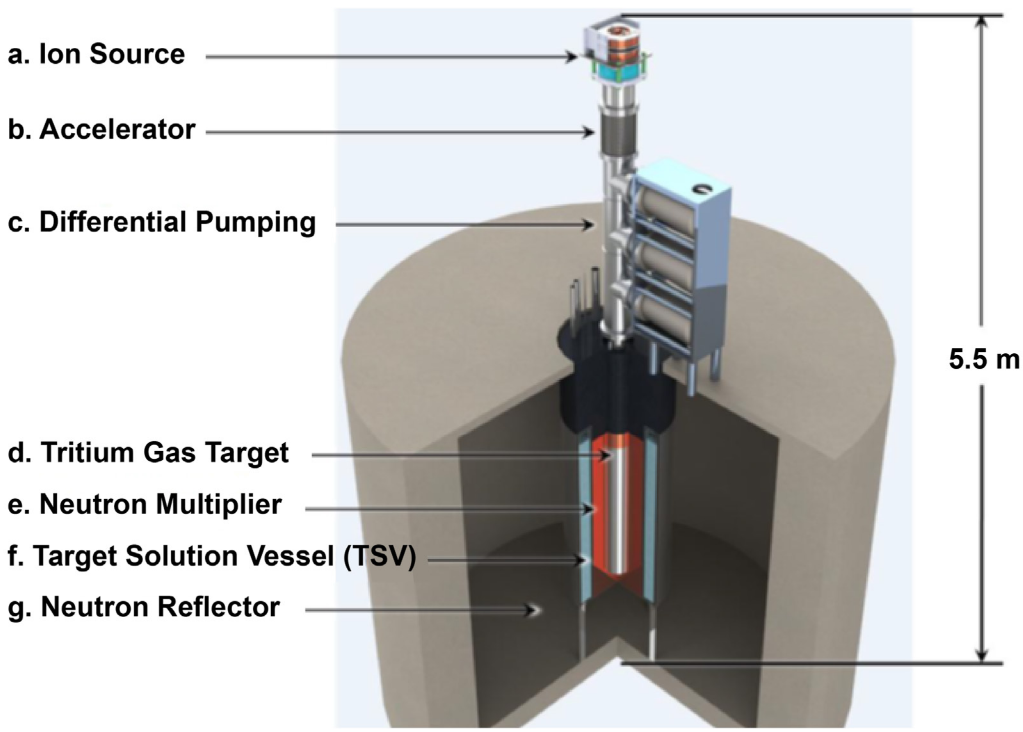
During operations, SHINE anticipates obtaining LEU metal or oxide for use as fuel (target material) from the Y-12 National Security Complex (Y-12 facility) in Oak Ridge, Tennessee (SHINE 2013a). For the purposes of this analysis, the NRC staff assumed that the Y-12 facility would obtain the necessary agreements and approvals to provide fuel (target material) to SHINE. The fuel would be transported 650 mi (1,046 km) by truck from Oak Ridge, Tennessee, to the proposed SHINE facility in Janesville, Wisconsin. SHINE would temporarily store LEU metal or oxide in the target solution preparation area.

SHINE would produce and ship several batches of molybdenum-99, xenon-133, and iodine-131 per week, with production schedules normally staggered to accommodate customer requirements. Operational activities would require an average of 150 workers and a monthly average of 36 truck shipments/deliveries and 1 offsite waste shipment (SHINE 2013a, 2013b, 2014a).

2.3.1 Proposed Technology

The SHINE process would involve a new nonreactor-based technology to manufacture medical radioisotopes using a subcritical fission process (SHINE 2013a). The main components designed and developed by SHINE to support this approach are (1) a neutron driver assembly in which a deuterium ion source would be accelerated into a tritium gas target chamber to generate neutrons and (2) a subcritical operating assembly in which these neutrons would bombard a target solution to produce radioisotopes. See Section 2.3.2 below for additional details. A light-water pool would surround the target solution vessel to provide shielding and to act as a neutron reflector. Figure 2–5 shows a conceptual cutaway view of these components. An individual irradiation unit would comprise the neutron driver, subcritical operating assembly, light-water pool, and surrounding biological shielding; the SHINE facility would operate up to eight of these irradiation units in concert to meet radioisotope production design objectives (SHINE 2013a). The irradiation units would each interface with associated cooling, off-gas, and tritium recycle support systems. Figure 2–6 depicts a conceptual model of an irradiation unit showing the ion accelerator configured above the subcritical operating assembly.

Figure 2–5. Cutaway Conceptual Interior View of the SHINE Device



Source: Pitas et al. 2013

Figure 2–6. Conceptual Model of an Irradiation Unit

Source: Pitas et al. 2013

2.3.2 Radioisotope Production Process Overview

The SHINE production process would use an accelerator and neutron multiplier to produce neutrons that would enter a tank containing a target solution with the fissile uranium-235 isotope. As these neutrons collide with the uranium-235, the uranium splits and forms other radioisotopes, including molybdenum-99, xenon-133, and iodine-131. For descriptive purposes of this EIS, SHINE's overall process can be divided into four primary stages:

(1) neutron production,

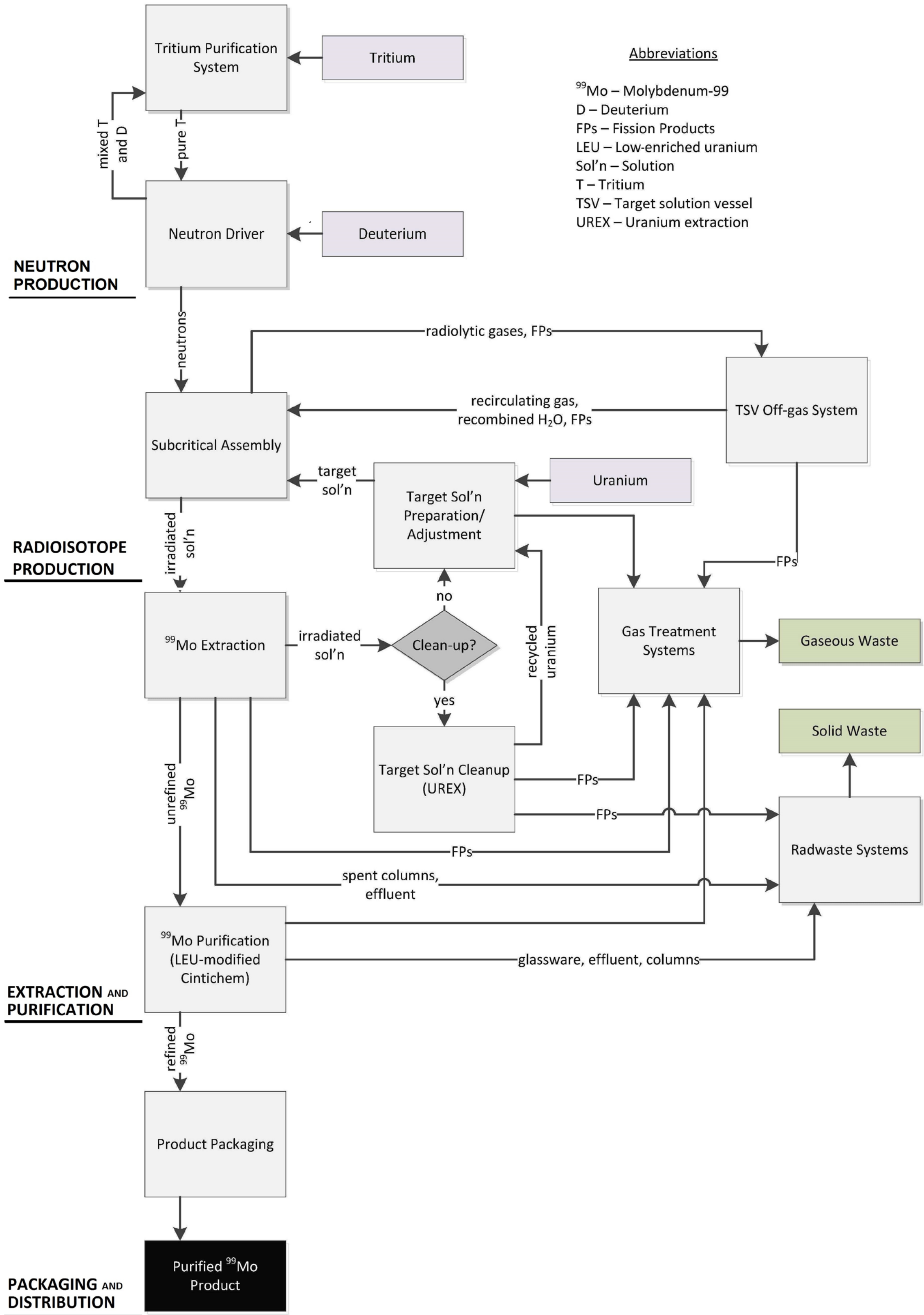
(2) radioisotope production through uranium fission,

(3) radioisotope extraction and purification, and

(4) packaging and distribution.

Most of these activities, other than during product distribution, would take place within a radiologically controlled area. This area includes the irradiation facility and radioisotope production facility, both of which are collocated within a single building, the Production Facility Building, on the SHINE site, as described in the SHINE Environmental Report (SHINE 2013a). As illustrated in Figure 2–7, several sub-processes would occur within each of these primary activities. The following sections present an overview of the key factors associated with each of these processes.

1 **Figure 2–7. SHINE Radioisotope Production System Flow Diagram**

2 

3 Source: Modified from SHINE 2013b

2.3.2.1 Neutron Production

The first stage in the SHINE radioisotope production process is the production of neutrons, which induce the fission of uranium, resulting in the formation radioisotopes. During the irradiation stage, a neutron driver affixed above a subcritical operating assembly would accelerate deuterium ions into a chamber filled with tritium gas. This chamber would be centered within the subcritical operating assembly in a vessel containing LEU target solution in the form of uranyl sulfate. The resulting ion beam would strike the heavier hydrogen atoms in the tritium gas and produce lighter hydrogen atoms and neutrons. These additional neutrons would pass through a neutron multiplier, which would produce additional neutrons. The neutrons then pass into the LEU target solution, causing the uranium-235 in the solution to fission (split) and produce byproduct materials, including molybdenum-99, xenon-133, and iodine-131 (SHINE 2013a).

> **Low-enriched uranium** (LEU) fuel means fuel in which the weight percent of U-235 in the uranium is less than 20 percent.
>
> **Highly enriched uranium** (HEU) fuel means fuel in which the weight percent of U-235 in the uranium is 20 percent or greater (10 CFR 50.2).
>
> The United States encourages the use of LEU or other non-HEU-based technologies to produce medical radioisotopes because of the additional proliferation concerns associated with HEU (White House 2012).

The target solution vessel would be surrounded by a light-water pool. This pool would be used to control the temperature of the target solution vessel, reflect neutrons back into the vessel, and absorb radiation and heat resulting from the fission process (SHINE 2013a).

2.3.2.2 Radioisotope Production Though Uranium Fission

The next stage in the SHINE radioisotope production process would involve irradiating an aqueous LEU target solution with neutrons using one or more of the irradiation units, as described in Section 2.3.1. During the radioisotope production stage, SHINE proposes to maintain the target solution in each irradiation unit at a subcritical level (i.e., a level at which the uranium-235 fission and the consequent neutron production in the target solution vessel would not be self-sustaining). Molybdenum-99, xenon-133, and iodine-131 production would occur within the target solution from fission during the irradiation cycle. An off-gas system would be used during this stage to recover xenon-133 and iodine-131 gases released from the target solution. At the end of the irradiation cycle in each irradiation unit, the target solution would be removed from the target solution vessel and transferred through piping to one of three hot cells (shielded nuclear radiation containment chambers) located within the Production Facility Building in which the molybdenum-99 would be selectively extracted and purified (SHINE 2013a, 2013b, 2013c).

2.3.2.3 Extraction and Purification

Extraction and purification would occur within the hot cell area. Molybdenum-99 extraction would occur as a batch process in which the irradiated uranyl sulfate target solution would be passed through an adsorption column to extract the isotopes. The extracted isotopes would then undergo dissolution and evaporation processes to yield a high-purity molybdenum-99 product.

The purification process would remove impurities through small-scale additions of reagents and through precipitation, filtration, and boiling.

LEU remaining in the target solution would be recycled and would undergo cleanup for use as the target solution for subsequent cycles because only a small amount of uranium-235 is used up during each production run. Preparation and cleanup of the target solution, radioisotope extraction and purification, and any tanks containing target solution generate radioactive off-gases that a radioactive gas treatment system captures. Radioactive waste materials removed from the target solution would be stored temporarily pending offsite disposal. Similarly, captured deuterium and tritium would be returned for reuse in the neutron generation process (SHINE 2013a). Section 2.7 discusses radioactive effluents and wastes and transportation of these materials. In addition, Table 19.2.5–1 in the SHINE Environmental Report (SHINE 2013a) provides estimates of the type and quantity of radioactive wastes associated with the proposed SHINE facility.

2.3.2.4 Packaging and Distribution

Following extraction and purification, the separated radioisotopes would be packaged and distributed. Because radioactive decay reduces the amount of the radioisotopes over time, the packaged material would be shipped to customers as soon as possible. The molybdenum-99 product would be packaged in stainless steel bottles (SHINE 2014a). The iodine-131 product would be packaged in solution vials (SHINE 2013b). The xenon-133 product would be packaged in gas cylinders (SHINE 2013b). These time-sensitive packages would use U.S. Department of Transportation (DOT)-approved containers for radioactive material (SHINE 2013a). SHINE intends to ship these radioisotopes to regional customers by air from the Southern Wisconsin Regional Airport and by truck; both methods would use an exclusive use carrier (SHINE 2013b). As discussed in Title 49 of the *Code of Federal Regulations* (49 CFR) 173.403, exclusive use means that sole use of the transport vehicle (i.e., airplane and truck) will be for shipment of the radioactive material and that personnel trained in handling radioactive material must follow special procedures for loading and unloading the material.

At full operational capacity, the SHINE facility could produce up to 8,200 6-day curies (Ci 6-day) per week of the medical radioisotope molybdenum-99 and 2,000 Ci per week each of iodine-131 and xenon-133 (SHINE 2013a, 2013b). To meet this production schedule, each irradiation unit would need to operate continuously for about 5.5 days with radioisotope production functions operating closer to 7 days per week (SHINE 2013a, 2013b).

2.4 Power Requirements

Wisconsin Power and Light Company (a wholly owned subsidiary of Alliant Energy) would supply electrical power to the proposed SHINE facility (SHINE 2013a). Each irradiation unit is projected to use 62.8 kilowatts (SHINE 2013b). Overall, the proposed SHINE facility would require a total connected capacity of approximately 2,900 kilovolt-amperes and annually consume approximately 17.5 million kilowatt-hours—an amount approximately equal to the annual electrical power consumption of 2,000 Wisconsin households (SHINE 2013b; EIA 2009).

SHINE would equip the facility with an uninterruptible electrical power supply system to power safety-related systems and equipment for safe shutdown of the facility in the event of a loss of offsite power. This system would use two independent 250-volt direct-current battery system trains along with the associated chargers, inverters, and distribution systems. SHINE would also maintain and test a standby diesel generator to provide longer term backup power to selected equipment. SHINE would also maintain and test a diesel-driven fire pump system and would use approximately 1,860 gal (7,000 L) of diesel fuel annually to test this system (SHINE 2013b). The diesel fuel oil for this system would be stored on site in an approximately 30,000-gal (114,000-L) underground storage tank (SHINE 2013a).

SHINE would use a pipeline-derived natural-gas supply for boilers and facility heating, ventilation, and air conditioning. SHINE estimates that total annual natural gas consumption would be 62,000-million British thermal units (SHINE 2013b).

2.5 Water Use, Treatment, and Discharges

2.5.1 Water Use

The proposed SHINE facility would obtain water during construction and operations from the Janesville Water Utility (SHINE 2013a). To support this requirement, the City of Janesville is planning to construct a water main and sanitary sewer main along U.S. Highway 51 near the northwestern boundary of the proposed SHINE site (SHINE 2013a).

During construction, water would primarily be needed for drinking (potable) and sanitary systems, mixing concrete, and supporting dust suppression activities (SHINE 2013a, 2013b). During operations, this water would also be used for drinking and sanitary systems and for facility heating and cooling, fire suppression, and industrial purposes. During operations, SHINE would use most of its water for cooling and as process water in medical radioisotope production. A water-based fire protection system would be used throughout the proposed SHINE facility. An onsite fire water tank would support the planned automatic fire suppression system and would provide an estimated flow of 390 gal per minute (1,480 L per minute). Section 4.4 discusses specific water requirements associated with the proposed action.

2.5.2 Water Treatment

The SHINE facility would use three separate water treatment processes: a demineralization process, a cooling water treatment process, and a facility heating water treatment process (SHINE 2013a). Demineralization, also known as ion exchange, refers to the exchange of ions between a solid substance and an aqueous solution (makeup water). The demineralization treatment process would treat water to control the amount of chemicals in the water needed for the molydenum-99 purification process. Most of the water from the facility demineralized water system would be used for the primary closed-loop cooling system and the light-water pool system. See Section 2.6.1 for further discussion on the cooling system. SHINE estimates that periodic makeup water would be less than 10 percent of the system capacity per year (SHINE 2013a).

During the cooling water treatment process, water would be treated with chemicals to reduce corrosion and scaling before its introduction to the closed-loop cooling water system. In addition, chemicals will be periodically added to maintain water chemistry to keep the system properly functioning. The types of chemicals added to this water could include biocides, corrosion inhibitors, and scale inhibitors.

During the heating water treatment process, feedwater for the boiler used for building heating would be separately treated through demineralization or the addition of chemicals, or both, to reduce corrosion and scaling in the boiler (SHINE 2013a).

2.5.3 Water Discharges

All wastewater generated outside the radiologically controlled area would be discharged directly to the City of Janesville sanitary sewer system and would be sent to the Janesville Wastewater Treatment Plant in accordance with Janesville City Ordiance 13.16 (City of Janesville 2013; SHINE 2013a, 2013b). All wastewaters generated in the radiologically controlled area would either be evaporated or solidified and disposed of in accordance with SHINE’s waste management plan and applicable laws and regulations (Section 2.6).

The SHINE closed-loop chilled water system would require approximately 10,000 gal (38,000 L) of water that would be flushed once per year and discharged to the Janesville Wastewater Treatment Plant in accordance with Janesville City Ordiance 13.16 (SHINE 2013b).

2.6 Cooling and Heating Dissipation Systems

2.6.1 Cooling Systems

The SHINE cooling systems would remove unwanted heat from the target solution vessel and other heat-sensitive processes. Cooling systems would also control building ambient air temperature in association with heating, ventilation, and air conditioning needs. The irradiation units would have both primary and secondary cooling systems. The primary cooling system would include the primary closed-loop cooling system and the light-water pool system. The primary closed-loop cooling system would remove heat from the target solution vessel by actively circulating water along the vessel sidewalls. The light-water pool system would actively cool the neutron multiplier and tritium target chamber through forced convection and would passively cool the irradiation units. The secondary cooling system is a closed-loop system that would provide cooling to all of the process areas within the radiological controlled area and would transfer heat to the facility's chilled water supply and distribution system. The secondary cooling system would remove heat from the primary cooling system through a heat exchanger. The facility's chilled water supply and distribution system would then ultimately dissipate the heat to the environment (SHINE 2013a).

2.6.2 Heating Systems

SHINE would use one natural-gas-fired boiler in the Production Facility Building to provide heating water to the heating, ventilation, and air conditioning handlers. Based on the rated capacity of the boiler, SHINE projects annual natural gas consumption at 7.67×10^7 standard cubic feet (2.17×10^6 standard cubic meters) (SHINE 2013a). Additionally, natural-gas-fired heaters would heat the Diesel Generator Building, the Waste Staging and Shipping Building, the Support Facility Building, and the Administration Building for a total of four natural-gas-fired heaters.

2.7 Storage, Treatment, and Transportation of Radioactive and Nonradioactive Waste

Construction, operations, and decommissioning would result in the accumulation of radioactive and nonradioactive wastes. SHINE does not anticipate any long-term storage of radioactive or nonradioactive materials, such as medical radioisotope products, target solution, reagents, or resulting wastes (SHINE 2013a). SHINE would treat and temporarily store the solid radioactive and nonradioactive waste generated as part of the radioisotope production process within the facility until it could ship the waste off site for disposal (SHINE 2013a). Subpart K and Appendix G to 10 CFR Part 20 (NRC) and 49 CFR Part 172 (DOT) include regulations to protect public health and safety during transportation of radioactive fuel, radioactive wastes, and medical radioisotopes. The additional detailed information below describes the generation, storage, waste management activities, waste minimization and pollution prevention measures, and transportation of radioactive and nonradioactive waste.

2.7.1 Radioactive Wastes

Operations of the SHINE facility would generate liquid, solid, and gaseous radioactive waste during the following activities:

- neutron generator operation (i.e., a portion of the neutron driver that would be periodically replaced);
- target solution preparation (i.e., used uranium metal transport containers, protective equipment used by facility workers, and spent filtration media);
- the target solution vessel waste gas removal system (i.e., spent filtration media);
- molybdenum-99 recovery system operation (i.e., spent filtration media and spent solutions);
- target solution cleanup (i.e., spent filtration media, spent solvent, and spent production solutions);
- radioisotope production and purification processes (i.e., laboratory glassware and liquid wastes);
- liquid radioactive waste volume reduction (i.e., evaporation and solidification process); and
- maintenance activities (SHINE 2013a).

2.7.1.1 Gaseous Waste

Radioactive effluents from the radioisotope production process include both particulates and gas. The gaseous radioactive effluents would be routed through two separate, but connected, ventilation systems: the target solution vessel system and the process vessel vent system (SHINE 2013a).

The facility ventilation system divides the operating areas into zones, each of which has a specific hazard and appropriate protection features (SHINE 2013a). This design protects the workers and members of the public by minimizing the potential spread of radioactive contamination within the facility and by controlling the amount of radioactive effluents released into the environment. SHINE would use high-efficiency particulate filters and carbon bed filters to treat gaseous radioactive effluents to reduce their radioactivity before they are released through a vent stack in the Production Facility Building (SHINE 2013a). SHINE expects the gaseous radioactive effluents released into the environment to contain measurable quantities of noble gases (i.e., xenon and krypton), radioactive iodine, and tritium. Table 2–2 lists the quantity of radionuclides that SHINE estimates the facility would release annually. Section 4.9 describes the monitoring of gaseous effluents and radioactive waste, NRC and other radiation protection requirements, and SHINE’s waste management process to ensure occupational and public health.

Table 2–2. Gaseous Radioactive Effluents

Effluent	Rate[a]
krypton-85 (Kr-85)	< 120 Ci/yr[b]
iodine-131 (I-131)	< 1.5 Ci/yr
xenon-133 (Xe-133)	< 17,000 Ci/yr
tritium (H-3)	< 4,400 Ci/yr

[a] The rate is based on 50 weeks of operation.

[b] Ci/yr = curie(s) per year.

Source: SHINE 2013a

2.7.1.2 Liquid and Solid Waste

The NRC classifies low-level waste in 10 CFR 61.55 as Class A, Class B, Class C, or greater than Class C (GTCC) waste, depending on the types and concentrations of radionuclides in the waste. Class A wastes generally contain short-lived radionuclides at relatively low concentrations, whereas the half-lives and concentrations of radionuclides in the Class B and C wastes are progressively higher. Because of the higher half-lives and concentrations of radionuclides in Class B wastes, these wastes must meet more rigorous requirements with regard to their form to ensure stability after disposal (e.g., by adding chemical stabilizing agents, such as cement, to the waste, or by placing the waste in a disposal container or structure that provides stability after disposal). Class C wastes must meet the more rigorous requirements of Class B, and they require additional measures at the disposal facility to protect against inadvertent intrusion (e.g., by increasing the thickness and hardness of the cover over the waste disposal cell). GTCC wastes contain radionuclides at concentrations that are higher than that allowed for Class C wastes and that are not generally acceptable for near-surface disposal methods.

Operation of the SHINE facility would generate radioactive waste ranging from NRC Class A waste to GTCC wastes (see Table 19.2.5–1 in the SHINE Environmental Report [SHINE 2013a]). SHINE would accumulate and temporarily store liquid wastes to allow for various activities such as radioactive decay, pH adjustment, and volume reduction using an evaporative process. In addition, SHINE would disassemble neutron generators to reduce the volume of low-level waste sent for disposal.

SHINE would solidify some liquid wastes before disposal on site. For example, it would solidify evaporator bottoms and spent ion-exchange column media from the target solution cleanup system. Waste from proprietary processes may be solidified in a hot cell using Portland cement before shipment and disposal (SHINE 2013a).

After SHINE treats, solidifies, and packages liquid radioactive waste, the waste would be temporarily stored on site only long enough for radioactive decay before offsite disposal shipment and for efficient frequency of disposal shipments (SHINE 2013a). Class A waste could accumulate up to 1 year. No liquid radioactive effluents would be released into the environment.

After temporary storage, radioactive waste would be transported by truck to one of the following licensed low-level radioactive waste facilities for further treatment, long-term storage, or final disposal (SHINE 2013a):

(1) EnergySolutions, Clive, Utah (1,450 mi) (2,220 km);

(2) Waste Control Specialists, Andrews, Texas (1,305 mi) (2,088 km); or

(3) Diversified Scientific Services, Inc., Kingston, Tennessee (660 mi) (1,056 km).

When transporting waste, SHINE must adhere to the applicable regulatory packaging and transportation requirements for radioactive material in 10 CFR Parts 20 and 71 (NRC), the State of Wisconsin's Administrative Code, and 49 CFR Parts 172 and 173 (DOT) (SHINE 2013a). These regulations help ensure safety on the public roadways. The waste generated at the proposed SHINE facility would be one of three DOT packaging classifications: LSA, Type A, or Type B packages. An LSA package contains low levels of radioactive material. A Type A package contains higher radioactivity levels than those in an LSA package and meets additional integrity and shielding requirements. A Type B package contains a greater quantity of radioactive material than that of a Type A package and meets additional integrity and shielding requirements (49 CFR Part 173). The NRC staff notes that the lettering system for package types is not related to the lettering system for waste classification.

A provision of the American Medical Isotopes Production Act of 2012 (42 U.S.C. 2065(c)(3)(A)(ii)) states that DOE would take title to, and be responsible for, the final disposition of radioactive waste created by the irradiation, processing, or purification of uranium leased from DOE if it determines that the producer (e.g., SHINE) does not have access to a disposal path. For example, if a disposal pathway for GTCC waste does not exist, DOE will be responsible for its safe storage and disposal.

2.7.2 Nonradioactive Waste

The proposed SHINE facility would generate nonradioactive waste as part of construction, routine operations, maintenance, cleaning, and decommissioning activities.

<u>Liquid Waste</u>

Nonradioactive liquid waste would be generated during construction. For example, lubricating oil, hydraulic oil, and grease might be necessary to assemble various pieces of equipment and systems. During operations, nonradioactive liquid waste would include hazardous waste, such as chemicals. Table 2–3 lists the expected inventory and quantity of chemicals that would be used during operation of the proposed SHINE facility. Some chemicals would be in liquid form and would be controlled and confined in containers, tanks, pipes, and hot cells.

SHINE would release small amounts of nonradioactive chemicals into the city sewer system as a result of routine facility maintenance activities and routine laboratory analytical procedures using chemicals. SHINE would have administrative controls in place to ensure that its nonradioactive effluents meet the requirements pertaining to the types, quantity, and concentrations specified as acceptable for processing by the City of Janesville wastewater treatment facility (SHINE 2013a). Additionally, sanitary wastewater from the proposed SHINE facility would be sent to the City of Janesville wastewater treatment facility for treatment and disposal. Section 2.5 of this document contains more information on the liquid nonradioactive waste discharges from the proposed SHINE facility.

SHINE does not intend to treat or permanently store hazardous wastes on site (SHINE 2013a). SHINE would dispose of hazardous wastes generated at the facility at a licensed hazardous waste disposal site. Because SHINE will not store or treat hazardous wastes on site, it will not require a hazardous waste treatment or storage permit under the Resource Conservation and Recovery Act of 1976 (42 U.S.C. 6901 et seq.).

Solid Waste

During construction, operations, and decommissioning, SHINE expects to generate the following nonradioactive solid wastes:

- wood from crates,
- packaging from receiving activities,
- used personal protective equipment,
- broken mechanical parts,
- metal shavings,
- piping,
- wires,
- batteries (alkaline and lithium),
- air filters,
- expired lights and fixtures,
- paper,
- hoses,
- empty plastic containers, and
- expired ink cartridges.

SHINE would temporarily collect and store nonradioactive solid wastes on site and then transport nonhazardous solid wastes off site to either a landfill, storage facility, or recycling facility (SHINE 2013a). For example, scrap metal, batteries, pesticides, mercury-containing equipment and bulbs, used oil, and antifreeze would be collected and stored temporarily and then recycled or recovered at an offsite permitted recycling or recovery facility, as appropriate.

2.7.3 Waste Minimization and Pollution Prevention Program

SHINE's radioactive and nonradioactive waste management program is based on a pollution-prevention and waste-minimization framework. The program includes the following:

- waste minimization and recycling;
- employee training and education on general environmental activities and hazards associated with the facility, operations, and the pollution prevention program; and waste minimization requirements, goals, and accomplishments;
- employee training and education on specific environmental requirements and issues;
- designation of employees responsible for pollution prevention and waste minimization;
- recognition of employees for efforts to improve environmental conditions; and
- requirements for employees to consider pollution prevention and waste minimization in day-to-day activities and engineering (SHINE 2013a, 2013b).

Section 4.9 discusses the impacts associated with waste management activities at the proposed SHINE facility.

Table 2–3. Summary of Major[a] Chemical Inventory and Quantity at the Proposed SHINE Facility

Chemical	Approximate Bounding Inventory (lb)	Chemical Grouping
nitric acid	17,600	Group 4—Acids, Organic/Mineral
sulfuric acid	8,100	Group 4—Acids, Organic/Mineral
calcium hydroxide	4,800	Group 5—Bases
caustic (NaOH)	1,500	Group 5—Bases
n-dodecane	1,600	Group 2—Flammable Liquids
nitrogen	20,000	N/A
Portland cement	20,000	N/A
uranyl sulfate	3,100	N/A

[a] In excess of 1,000 lb.

Source: SHINE 2013a

2.8 Facility Decommissioning

The SHINE facility would be decommissioned upon completion of its useful life. In accordance with 10 CFR Part 50, a licensed production or utilization facility that permanently ceases operations shall submit a decommissioning report. The regulation at 10 CFR 50.33(k) requires that a report indicates how reasonable assurance will be provided that funds will be available to decommission the facility.

SHINE anticipates decommissioning of the facility to begin following a 30-year operating period (SHINE 2014a). SHINE estimates that the decommissioning period would extend for 6 months and would require a peak workforce of approximately 261 workers (SHINE 2014a).

Decommissioning activities would be similar to construction activities, because they would involve heavy equipment to dismantle buildings and remove roadway and parking facilities. Decommissioning could include the removal of all nuclear facilities on site and the reduction of residual radioactivity to a level that permits release of the property for unrestricted use and termination of the license. Decommissioning of the SHINE facility would generate radioactive waste ranging from NRC Class A waste to GTCC waste (see Table 19.2.5–1 in the SHINE Environmental Report [SHINE 2013a]). Estimates of the types and quantity of radioactive waste that would be disposed of during decommissioning are not known at this time and would depend on the effectiveness of the radiological controls implemented during operation of the facility. However, the types of radioactive waste would be consistent with those listed in Table 19.2.5–1 in the SHINE Environmental Report (SHINE 2013a).

SHINE would be required to conduct decommissioning activities in accordance with applicable NRC requirements and any additional Federal, State, and local requirements. For example, any radioactive equipment and materials will be disposed of according to local and Federal laws and regulations. After decommissioning activities are completed, the proposed site could remain industrial or could be converted back to agricultural land or open space.

SHINE estimates that approximately 72 truck deliveries and 191 offsite waste shipments would, on average, be required each month during decommissioning (SHINE 2014a). Demolition and site-grading equipment supporting decommissioning activities are projected to consume a total of approximately 172,000 gal (650,000 L) of diesel fuel over this 6-month period (SHINE 2013b). Table 19.2.5–1 in the SHINE Environmental Report (SHINE 2013a) provides estimates of the type and quantity of radioactive wastes associated with the proposed SHINE facility.

2.9 Related Actions

In February 2011, DOE/NNSA issued a final sitewide EIS at the Y-12 National Security Complex (DOE 2011), which examined the potential impacts of the reasonable alternatives for ongoing and foreseeable future operations at the Y-12 National Security Complex. Included in the sitewide EIS was an evaluation of the mission (including operations and transportation impacts) associated with the supply of LEU for both domestic and foreign customers (e.g., Section 2.1.2, “National Security Programs,” and Section 5.4, “Transportation and Traffic”). DOE/NNSA published a Record of Decision on July 4, 2011, which, among other things, selected the option to continue ongoing operations, including the supply of LEU to foreign and domestic customers. This sitewide EIS and Record of Decision may be viewed as relevant to the SHINE EIS because the Y-12 facility would supply the LEU used at the SHINE facility.

2.10 References

10 CFR Part 20. *Code of Federal Regulations*, Title 10, *Energy*, Part 20, “Standards for protection against radiation.”

10 CFR Part 50. *Code of Federal Regulations*, Title 10, *Energy*, Part 50, “Domestic licensing of production and utilization facilities.”

10 CFR Part 61. *Code of Federal Regulations*, Title 10, *Energy*, Part 61, “Licensing requirements for land disposal of radioactive waste.”

10 CFR Part 71. *Code of Federal Regulations*, Title 10, *Energy*, Part 71, “Packaging and transportation of radioactive material.”

49 CFR Part 172. *Code of Federal Regulations*, Title 49, *Transportation*, Part 172, “Hazardous material table, special provisions, hazardous material communications, emergency response information, training requirement, and security plans.”

49 CFR Part 173. *Code of Federal Regulations*, Title 49, *Transportation*, Part 173, “Shippers—general requirements for shipments and packaging.”

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Resource Conservation and Recovery Act of 1976. 42 U.S.C. §6901 et seq.

[SHINE] SHINE Medical Technologies, Inc. 2013a. *Preliminary Safety Analysis Report (PSAR): Chapter 1, "The Facility," Chapter 2, "Site Characteristics," Chapter 4, "Irradiation Unit and Radioisotope Production Facility Description," Chapter 13, "Accident Analysis," and Chapter 19, "Environmental Review."* Monona, WI: SHINE. March 26, 2013 and May 31, 2013. ADAMS No. ML13172A324.

[SHINE] SHINE Medical Technologies, Inc. 2013b. *SHINE Medical Technologies, Inc. Application for Construction Permit Response to Environmental Requests for Additional Information.* November 19, 2013. ADAMS No. ML13303A887.

[SHINE] SHINE Medical Technologies, Inc. 2014a. *SHINE Medical Technologies, Inc. Application for Construction Permit, Response to Request for Additional Information.* October 15, 2014. ADAMS No. ML14296A189.

[SHINE] SHINE Medical Technologies, Inc. 2014b. "The Mo-99 Advantage." Presented at the U.S. Nuclear Regulatory Commission's Regulatory Information Conference, March 11, 2014, Bethesda, MD. Available at <http://www.nrc.gov/public-involve/conference-symposia/ric/past/2014/docs/abstracts/pieferg-t9-hv.pdf> (accessed 6 November 2014).

[SHINE] SHINE Medical Technologies, Inc. 2015. *SHINE Medical Technologies, Inc. Application for Construction Permit, Response to Request for Additional Information.* February 6, 2015. ADAMS No. ML15043A404.

White House. 2012. *Fact Sheet: Encouraging Reliable Supplies of Molybdenum-99 Produced without Highly Enriched Uranium*. Office of the Press Secretary. June 7, 2012. Available at <http://www.whitehouse.gov/the-press-office/2012/06/07/fact-sheet-encouraging-reliable-supplies-molybdenum-99-produced-without-> (accessed 14 June 2013).

3.0 AFFECTED ENVIRONMENT

The site proposed by SHINE Medical Technologies, Inc. (SHINE), is located in Rock County, Wisconsin, south of the city center of the City of Janesville, Wisconsin. The first section of this chapter describes the location of the proposed SHINE site (proposed site), along with a description of the land use and visual resources, air quality and noise, the geologic environment, water resources, ecological resources, historic and cultural resources, socioeconomics, human health, and transportation at and near the proposed site. Unless specified otherwise, the description of the environment includes the area within a 5-mi (8-km) radius of the proposed site, which is also referred to as the vicinity. This geographic range is in accordance with the Final Interim Staff Guidance Augmenting NUREG–1537, Part 1, “Guidelines for Preparing and Reviewing Applications for the Licensing of Non-Power Reactors: Format and Content,” for Licensing Radioisotope Production Facilities and Aqueous Homogeneous Reactors” (NRC 2012).

The following description of the affected environment is based on the U.S. Nuclear Regulatory Commission (NRC) staff’s independent review of SHINE’s Environmental Report (SHINE 2013a); SHINE’s responses to the NRC staff’s requests for additional information to clarify information in the Environmental Report (SHINE 2013b, 2014, 2015) or for information that did not appear in that report; the NRC staff’s environmental site visit and audit (NRC 2013a); applicable information provided in public scoping comments (NRC 2015); comments and input provided by other Federal, State, tribal, regional, and local agencies; and the NRC staff’s independent research of the environs surrounding the SHINE site.

3.1 Land Use and Visual Resources

This subsection describes the land use and visual resources at the proposed site and in the vicinity of the proposed site. The NRC staff assessed land use and land cover using the National Land Cover Database (USGS 2006). The NRC staff used the U.S. Department of the Interior, Bureau of Land Management (USDOI-BLM), Visual Resource Management System, to rate the visual resources at the proposed site; this system rates the visual appeal and the sensitivity of changes to an area (BLM 1984).

3.1.1 Land Use

3.1.1.1 Site

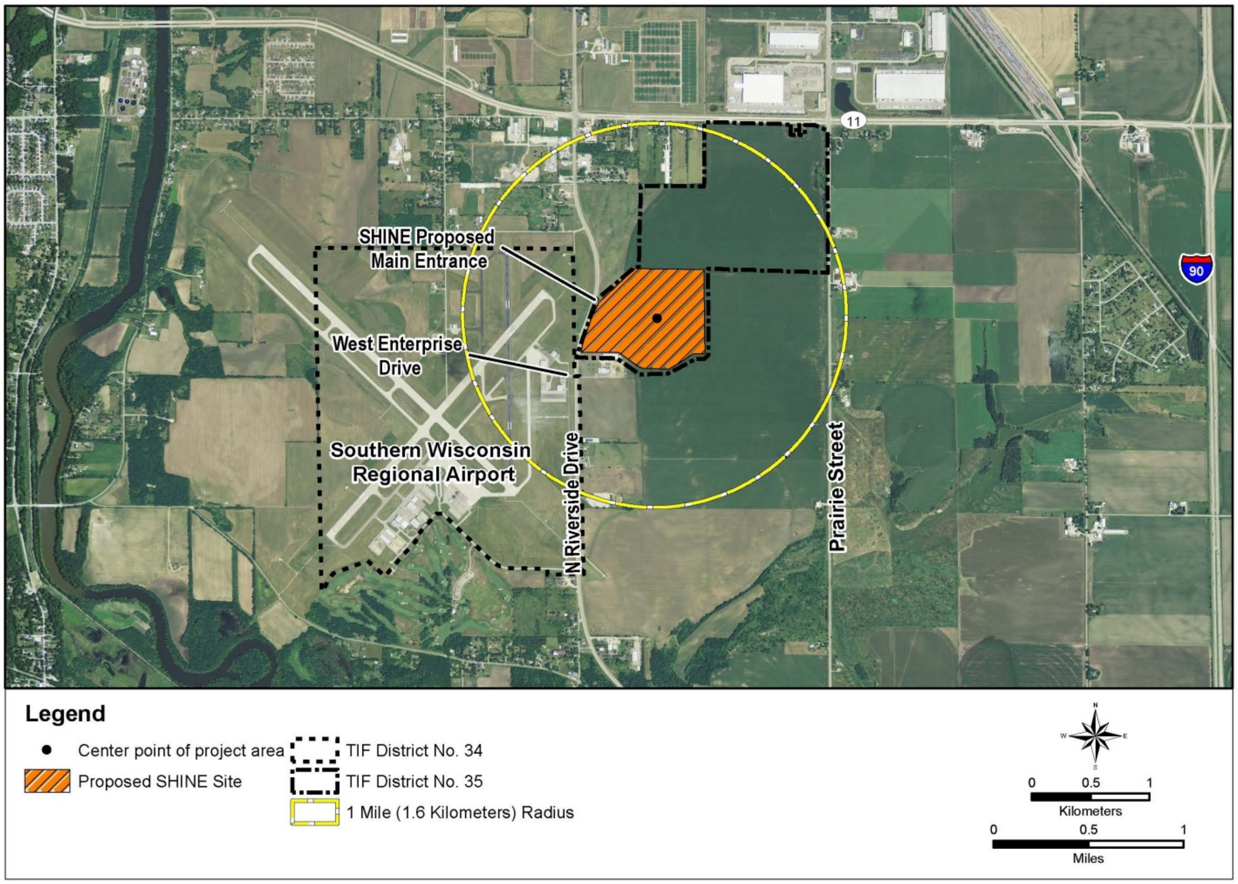
The proposed site includes 91 acres (ac) (37 hectares (ha)) of land located about 4 mi (6 km) south of the city center of the City of Janesville (Figure 3–1). The proposed site is zoned as light industrial (City of Janesville 2012). Based on a review of the National Land Cover Database, 99.8 percent of the proposed site is cultivated agricultural land, and 0.2 percent is developed land or open space (USGS 2006; SHINE 2013a). U.S. Highway 51 borders the western boundary of the proposed site. The Southern Wisconsin Regional Airport is located immediately to the west of U.S. Highway 51. Agricultural land surrounds the remaining portions of the proposed site (SHINE 2013a).

3.1.1.2 Vicinity

Table 3–1 lists the major land uses and land covers within a 5-mi (8-km) radius of the proposed site (USGS 2006). The list includes lands with cultivated crops (50 percent), pastures or hay (12 percent), and low-intensity development (12 percent). Two sand and gravel mining operations and one crushed stone mining operation occur within 5 mi (8 km) of the proposed site (Find the Data 2014).

The city center of Janesville is approximately 4.0 mi (6.4 km) directly north of the proposed site. The northern limits of the City of Beloit, Wisconsin, are about 3.7 mi (6.0 km) south of the proposed site. The City of Janesville and the City of Beloit are major population centers (more than 25,000 residents) within the 5-mi (8-km) vicinity of the proposed site, with 63,480 residents in the City of Janesville and 36,820 residents in the City of Beloit (Rock County 2013).

Figure 3–1. Aerial View of the Proposed SHINE Site



Source: SHINE 2013a

The major transportation corridors in the vicinity include Interstates 39 and 90, U.S. Highway 14, U.S. Highway 51, and State Trunk Highway 11 (Figure 3–2). Chicago and Northwestern Railroad and Chicago, Milwaukee, St. Paul, and Pacific Railroad own the major rail lines or rail systems in Rock County. The only public airport in Rock County is the Southern Wisconsin Regional Airport in the City of Janesville. The airport is directly across U.S. Highway 51 from the proposed site. No major transportation waterways occur within the vicinity of the proposed site.

Table 3–1. Summary of Land Use and Land Cover Within the Proposed SHINE Site and Vicinity

	SHINE Site			Vicinity		
NLCD 2006 Land Cover Class	**ac**	**ha**	**percent**	**ac**	**ha**	**percent**
Open Water				796	322	2
Developed, Open Space	0.18	0.07	0.2	3,043	1,231	6
Developed, Low Intensity				5,858	2,371	12
Developed, Medium Intensity				1,968	796	4
Developed, High Intensity				992	401	2
Barren				43	17	<1
Deciduous Forest				3,298	1,335	7
Evergreen Forest				68	28	<1
Mixed Forest				1	0	<1
Shrub/Scrub				505	204	1
Grassland				1,049	425	2
Pasture/Hay				5,896	2,386	12
Cultivated Crops	91.09	36.86	99.8	25,236	10,213	50
Woody Wetlands				722	292	1
Emergent Herbaceous Wetland				787	318	2
Total	91.27	36.93	100.0	50,262	20,339	100.0

Key: ac = acre, ha = hectare.

Sources: USGS 2006; SHINE 2013a

Figure 3–2. Cities and Major Roadways Within 5 mi (8 km) of the Proposed SHINE Site

Source: SHINE 2013a

3.1.1.3 Special Land Uses

The Wisconsin Department of Natural Resources (WDNR) manages two parcels of land within 5 mi (8 km) of the proposed site. One site is a 112.0-ac (45.3-ha) parcel of land located 1.9 mi (3.0 km) southwest of the proposed site. This site does not have a designated use (WDNR 2013a). Rock River Prairie is a 37.0-ac (15.0-ha) State Natural Area located 3.5 mi (5.6 km) from the proposed site (WDNR 2013a). No military reservations, Federally designated wild and scenic rivers, national parks, national forests, Federally designated coastal zone areas, or Federal lands held in trust for an American Indian tribe occur within 5 mi (8 km) of the proposed site (SHINE 2013a).

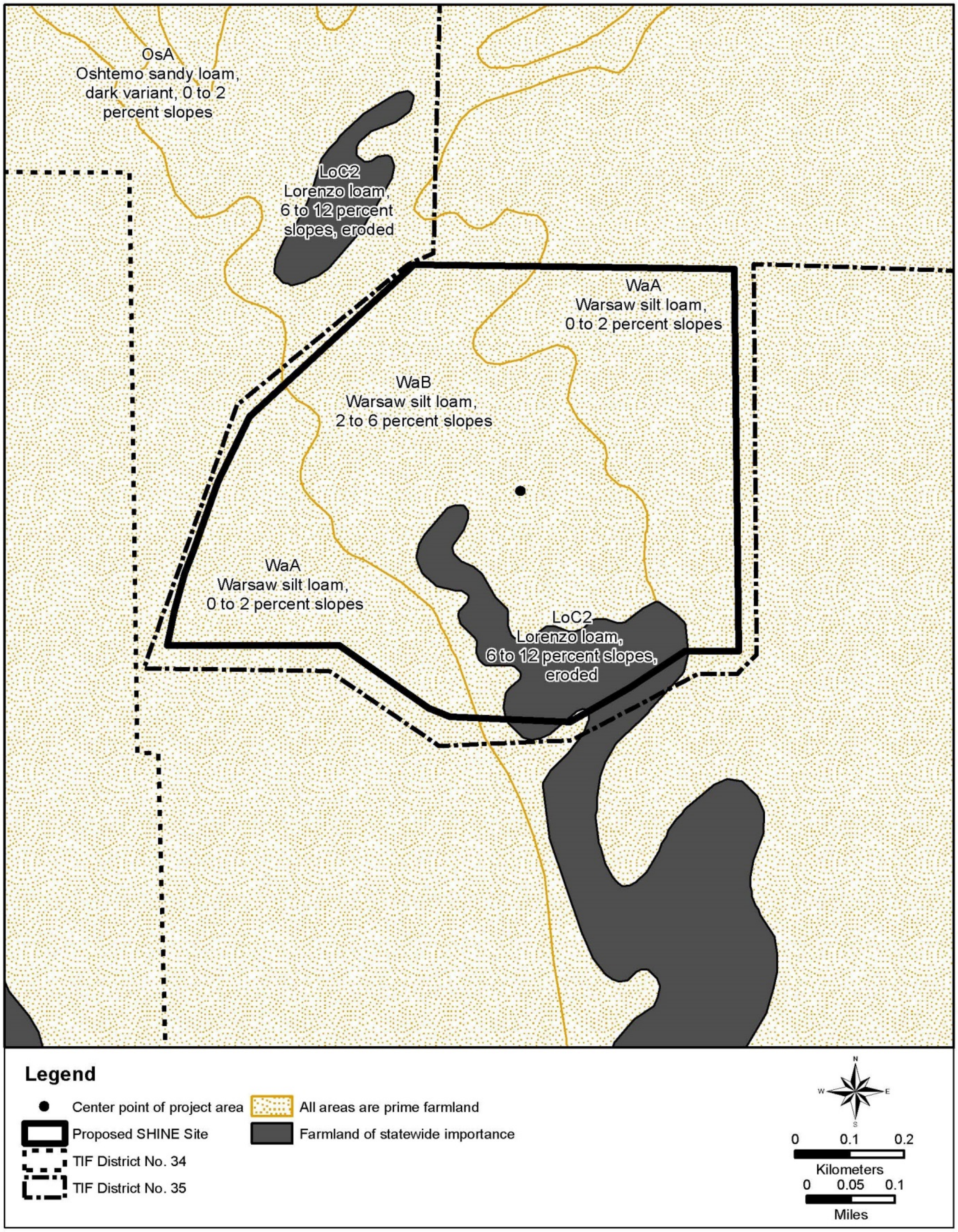
3.1.1.4 Agricultural Resources and Facilities

Prime farmland and farmland of statewide importance are located on the proposed site and in the vicinity (Figure 3–3). Prime farmland is defined in the Farmland Protection Policy Act of 1981 (7 U.S.C. 4201 et seq.) as "land that has the best combination of physical and chemical characteristics for producing food, feed, fiber, forage, oilseed, and other agricultural crops with minimum inputs of fuel, fertilizer, pesticides, and labor, and without intolerable soil erosion, as determined by the Secretary [of Agriculture]." Farmland of statewide importance includes soils, other than those determined as prime farmland, with similar characteristics as prime farmland locally within the State. The U.S. Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS), in cooperation with State and local agencies, defines and delineates the soils to consider as prime farmland and farmland of statewide importance (Title 7 of the *Code of Federal Regulations* (CFR) Part 657). However, otherwise qualifying "farmland" soils do not include those on land already in, or committed to, urban development or water storage, as defined in 7 CFR 658.2.

Warsaw silt loam is the prime farmland soil type in Wisconsin, and Lorenzo loam is the soil type of statewide importance, as further described in Section 3.3. About 41,900 ac (16,900 ha) of land with soils classified as prime farmland or farmland of statewide importance are within 5 mi (8 km) of the proposed site (SHINE 2013a). The NRC staff notes that acres of prime farmland and farmland of statewide importance exceed the number of acres of agricultural land because land with soil types classified as prime farmland or farmland of statewide significance are employed for other purposes, such as development or light industrial uses. Principal agricultural products grown in the vicinity include corn, oats, winter wheat, soybeans, and corn silage (USDA 2013). Based on the average annual production (bushels) per acre harvested in Rock County, the NRC staff estimated the potential relative value of 91 ac (37 ha) of farmland acquired for the proposed site to be about 12,800 bushels (bu) of corn or 4,000 bu of soybeans annually from 2003 through 2012 (Table 3–2).

Other agricultural resources in the vicinity of the proposed site include farms that raise dairy, beef, and other livestock (SHINE 2013a). MacFarlane Pheasants, Inc., which is about 0.9 mi. (1.4 km) north of the proposed site, specializes in raising a variety of game birds, including pheasants and Hungarian partridge (MacFarlane Pheasants 2012).

1 **Figure 3–3. Prime Farmland and Farmland of Statewide Importance**
2 **on the Proposed SHINE Site**



3

4 Source: Modified from SHINE 2013a and NRCS 2013

Table 3–2. Crop Production Estimates for the Proposed SHINE Site and Within Rock County, Wisconsin

	Planted		Harvested		Production	Yield
Year	**ac**	**ha**	**ac**	**ha**	**bu**	**bu/ac**
Corn						
2003	152,000	61,300	141,000	57,000	19,571,000	139
2004	155,000	62,700	141,000	57,000	23,124,000	164
2005	166,000	67,200	150,000	60,700	22,200,000	148
2006	152,000	61,500	141,000	57,000	22,419,000	159
2007	174,000	70,400	165,000	66,800	25,740,000	156
2008	161,000	65,200	152,000	61,500	22,192,000	146
2009	162,000	65,600	153,000	62,000	25,245,000	165
2010	159,000	64,100	142,000	57,500	24,680,000	174
2011	162,000	65,600	157,000	63,600	25,350,000	162
2012	166,000	67,200	146,000	59,100	15,000,000	103
10-year Average Rock County, WI	161,000	65,100	149,000	60,200	22,552,000	152
Site Estimate[a]	91	37	84	34	12,800	152
Soybeans						
2003	101,700	41,200	101,400	41,000	2,535,000	25
2004	87,600	35,500	86,900	35,200	3,737,000	43
2005	88,600	35,900	87,400	35,400	4,020,000	46
2006	89,200	36,100	89,000	36,000	4,539,000	51
2007	71,900	29,100	71,700	29,000	3,370,000	47
2008	81,100	32,800	81,000	32,800	2,957,000	37
2009	80,000	32,400	79,900	32,300	3,875,000	49
2010	86,000	34,800	85,500	34,600	4,822,000	56
2011	80,100	32,400	79,900	32,300	4,272,000	54
2012	82,500	33,400	82,200	33,300	3,087,000	38
10-year Average Rock County, WI	84,900	34,300	84,500	34,200	3,786,000	45
Site Estimate[a]	91	37	91	37	4,000	45

[a] NRC staff extrapolated site production and yield estimates of corn and soybeans based on the size of the site and actual Rock County production and yields.

Note: Estimated values in the table are rounded.

Key: ac = acres, ha = hectares, and bu = bushels.

Source: USDA 2013

3.1.1.5 Land Use Plans

The City of Janesville Comprehensive Plan characterizes current and future land use plans in the city (Vandewalle & Associates 2009). Table 3–3 summarizes the total percentage of land in the 2007 city limits that was classified in each land use category.

The proposed SHINE site is part of a larger development project to create an industrial park in Tax Increment Finance (TIF) District No. 35 (City of Janesville 2012). The City of Janesville created the initial 226-ac (91-ha) parcel of TIF District No. 35 when the city approved the TIF District No. 35 Project Plan in August 2011, after the purchase of an initial parcel of 226 ac (91 ha) in 2004 (City of Janesville 2012). In February 2012, the City of Janesville amended the project plan to expand the district boundary to the southwest by 84 ac (34 ha) to include the proposed SHINE site. When the City of Janesville incorporated the initial TIF District

No. 35 parcel, its zoning was changed from agricultural to M-1 (light industrial) with consideration given to subdividing the larger parcel into 16 lots ranging from 10.99 to 18.86 ac (4.45 to 7.60 ha) (City of Janesville 2011a, 2012). As of January 2014, this land has not been improved or industrially developed and the land cover remains cultivated crops.

Table 3–3. Land Use in the City of Janesville

Land Use Category	Percent
Residential-Single Family Urban	24
Residential-Two-Family/Townhouse	2
Residential-Multifamily	2
Commercial	4
Office	1
Light Industrial	4
Heavy Industrial	4
Community Facilities	11
Parks and Open Space	11
Extraction	2
Vacant	16
Agricultural	0
Surface Water	2
Right-of-Way	17
Total	**100**

Source: Vandewalle & Associates 2009

The City of Janesville's future land use plan for the proposed site and for the land east of U.S. Highway 51 includes developing it for light industrial uses (Vandewalle & Associates 2009; City of Janesville 2012).

3.1.2 Visual Resources

The visual setting of the area that would be affected by the proposed SHINE facility includes agricultural and light industrial viewsheds. The viewshed to the north and east of the proposed site is mainly flat or has slightly rolling cultivated fields (Figure 3–4). The viewshed to the south is similar, with mostly agricultural fields, although two large warehouses account for some light development. The Southern Wisconsin Regional Airport, which includes the airport control tower, runways, and several large warehouses and hangers, dominates a light industrial development landscape in the viewshed to the west.

The proposed site would be within the viewshed of patrons visiting the Southern Wisconsin Regional Airport, which supports about 50,000 flight operations annually (Rock County 2009), and of people visiting Airport Park, located northwest of the proposed site across U.S. Highway 51. Trees and other vegetation that border the residential neighborhoods located north and northwest of the proposed site would obstruct the view of the proposed SHINE facility from these neighborhoods.

The NRC staff rated the visual resources and scenic quality of the existing site using the USDOI-BLM Visual Resource Management System (BLM 1984). The scenic quality classification is the rating of the visual appeal of the land designated for the proposed site. This rating is based on an evaluation of seven key factors—landform, vegetation, water, color, adjacent scenery, scarcity, and cultural modifications. Scenic quality is classified as A, B, or C, with A as the highest quality visual rating. The NRC staff gave the proposed site a C rating, with low scenic quality because of the uniform landform, low vegetation diversity, absence of water, mute colors, cultural modifications to adjacent scenery, commonality within the physiographic province, and lack of notable features.

The NRC staff also analyzed the sensitivity level, which is a measurement of public concern for scenic quality, using six different indicators—types of users, amount of use, public interest, adjacent land uses, special areas, and other factors. The sensitivity level of public concern for scenic quality is assigned as high, moderate, or low. The NRC staff assigned the proposed site a low sensitivity level because it is located in an area with low scenic values, typical users have low sensitivity to changes in the area's visual quality, the amount of viewer use is low, public interest in changes to the visual quality of the proposed site is low, and the location has no special natural and wilderness areas.

Figure 3–4. Visual Setting of the Proposed SHINE Site

View of the Proposed SHINE Site from U.S. Highway 51 Looking Northeast

View of the Proposed SHINE Site from U.S. Highway 51 Looking East

View of the Proposed SHINE Site from Eastern Site Boundary Looking West

Source: SHINE 2013a

3.2 Meteorology, Air Quality, and Noise

The quality of air in a region depends on the types and quantities of pollutants that enter the atmosphere and the meteorological conditions that tend to alter the pollutants. Air pollutant concentrations result from complex interactions between the physical and dynamic properties of the atmosphere, land, and ocean. The local terrain, the presence of large bodies of water, and other surface features may influence meteorological conditions and may subsequently influence air quality. Air pollutant concentrations are sensitive to winds, temperature, humidity, and precipitation. Similarly, the locations and types of noise emitters primarily determine the noise levels in a region. However, meteorological conditions, terrain, and ground-surface types also may influence noise propagation and noise levels at a given location.

This section discusses existing air quality and noise levels near the proposed site and the meteorology and terrain characteristics that may affect them.

3.2.1 Meteorology and Climatology

The proposed site is located in Wisconsin South Central Climate Division 8 near the boundary of the Wisconsin Western Uplands and the Eastern Ridges and Lowlands physiographic provinces (NCDC undated). This region includes some of the State's greatest topographic relief. Climate in this area is characterized by high humidity, warm summers, and snowy winters. Lake Michigan and Lake Superior have a moderating effect on Wisconsin's climate; however, the proposed site is about 60 mi (96 km) west of Lake Michigan, a location that is typically not affected by lake-effect snows.

The nearest National Climatic Data Center (NCDC) station is the Afton Station located about 2.6 mi (4.2 km) from the proposed site. To characterize the region's climate, the NRC staff used climatological data collected at the Afton site. Data from the Afton Station indicate that the annual average precipitation for the past 30 years is about 35.0 in. (88.9 cm), of which 12.6 in. (32.0 cm) or about 36 percent of the total falls in summer. The average annual snowfall is about 35 in. (88.9 cm) (NCDC 2010). The minimum average seasonal temperatures during the past 30 years range from 13.8 °F (-10.0 °C) in winter to 59.3 °F (15.0 °C) in summer, and the maximum average seasonal temperatures range from 30.80 °F (-0.66 °C) in winter to 81.6 °F (27.0 °C) in summer (NCDC 2010). Table 3–4 summarizes the annual and seasonal precipitation and temperature data.

Table 3–4. Annual and Seasonal Precipitation and Temperature Data for the City of Janesville, Wisconsin

Description	Time Period				
	Annual	Winter (Dec.–Feb.)	Spring (Mar.–May)	Summer (June–Aug.)	Fall (Sep.–Nov.)
Average precipitation (in.)	35.2	4.7	9.2	12.6	8.7
Number of days with 0.1-in. precipitation or more	67.8	14.1	18.7	19.6	15.4
Average snowfall (in.)	34.9	28.4	4.7	0.0	1.8
Number of days with 0.1-in. precipitation or more	21.8	17.2	3.2	0.0	1.4
Average temperature (°F)	47.5	22.3	47.1	70.4	49.8
Maximum temperature (°F)	57.8	30.8	57.7	81.6	60.7
Minimum temperature (°F)	37.3	13.8	36.6	59.3	39.0

Note: These are Rock County normals from 1981–2010 for Afton Station 205301.

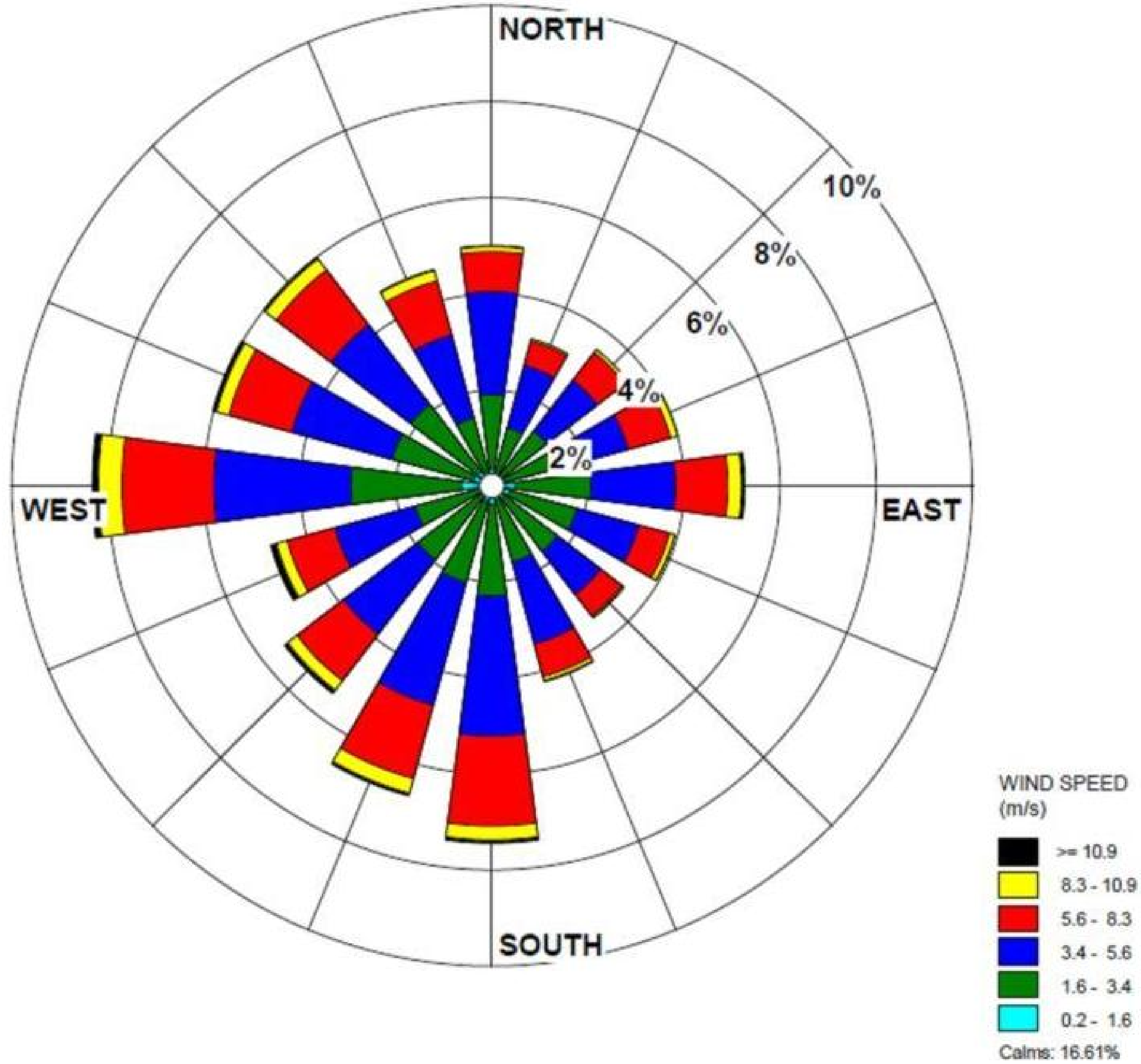
Source: NCDC 2010

Monthly average wind speeds range from 6.6 miles per hour (mph) (10.6 kilometers per hour (kph)) in August to 10.1 mph (16.3 kph) in April. Annual mean wind speed is 8.4 mph (13.5 kph). Prevailing wind directions are from the south-southwest every month except from December through February when prevailing winds are from the northwest (NCDC 2012). The wind rose diagram shown in Figure 3–5 illustrates the frequency of winds blowing from different directions and at different speeds on an annual average basis.

The NCDC records identify the following extreme weather events in Rock County from 1996 to 2013: thunderstorms, lightning, hail, strong winds, funnel clouds, tornadoes, heavy rain, floods, and flash floods (NCDC 2013). Over the 17-year period of record, extreme events occurred on 158 days with deaths or injuries on 6 of those days and property damage on 87 of those days. The strongest tornado in the area, classified as an F2[1] with wind speeds of 113 to 157 mph (181 to 253 kph) occurred in 1998. Six other tornadoes of lesser intensity also occurred in Rock County from 1996 to 2013.

[1] There are five tornado classifications: F0 to F5. F0 tornadoes cause the least damage, and F5 tornadoes are the most dangerous and cause the most damage. Estimated wind speeds for an F2 tornado are 113 to 157 mph (181 to 253 kph) and cause moderate damage.

Figure 3–5. Annual Average Wind Rose as Measured at the Southern Wisconsin Regional Airport



Source: SHINE 2013a based on information from NCDC 2011.

3.2.2 Air Quality

In accordance with the Federal Clean Air Act of 1970, as amended (CAA), EPA established National Primary and Secondary Ambient Air Quality Standards (40 CFR Part 50) for six pollutants (often referred to as criteria pollutants) to protect the environment and public health. These pollutants include ozone, carbon monoxide, nitrogen dioxide, sulfur dioxide, lead, and particulate matter (PM). Particulate matter includes PM less than 10 micrometers (μm) and PM less than 2.5 μm, which are particles with equivalent aerodynamic diameters less than or equal to 10 and 2.5 μm, respectively.

Other air pollutants of concern include greenhouse gases (GHGs), such as carbon dioxide and methane, and hazardous air pollutants (HAPs) as identified in Section 112 of the CAA. The

State of Wisconsin regulates emissions of hazardous air contaminants that include the chemicals on the HAPs list and other chemicals (Wisconsin Administrative Code NR 445, “Control of Hazardous Pollutants”) and has adopted ambient air quality standards within State regulations (Wisconsin Administrative Code NR 404, “Ambient Air Quality”).

National Ambient Air Quality Standards (NAAQS) limit the concentrations of the six criteria pollutants established to protect human health and welfare. Table 3–5 shows the current NAAQS. Areas in which pollutant concentrations exceed these standards are designated nonattainment areas, because air quality levels do not meet the required standards. Attainment areas are areas in which recent monitoring data demonstrate that concentrations are lower than the NAAQS. If monitoring has been insufficient to determine whether an area meets the standards, the area is designated as an unclassifiable area.

The CAA requires development of regulatory plans for nonattainment areas to reduce pollution levels until the area meets the NAAQS within a specified timeframe. State agencies typically complete these plans, which are called State Implementation Plans. After air quality has improved in an area to the point that monitoring data meet the NAAQS, the area is designated as a maintenance area.

Air quality designations are generally made at the county level, but designations may also be made for smaller localized areas. For the purpose of planning and maintaining ambient air quality with respect to the NAAQS, EPA has created Air Quality Control Regions (AQCRs). AQCRs are intrastate or interstate areas that share a common airshed (40 CFR Part 81). The proposed site is in the Rockford, Illinois–Janesville/Beloit, Wisconsin, Interstate (JBWI) AQCR comprising Boone, De Kalb, Ogle, Stephenson, and Winnebago Counties in Illinois and Rock County, Wisconsin (40 CFR 81.71). The proposed SHINE site is located in Rock County, which is designated as an attainment/unclassifiable area for all criteria pollutants (EPA 2013). The nonattainment areas nearest to the proposed site are the following:

(1) McHenry County, Illinois, which is about 19 mi (30 km) south of the proposed site and is part of the Chicago–Naperville, Illinois–Indiana–Wisconsin marginal nonattainment areas for the 8-hour ozone 2008 standard (EPA 2013), and

(2) Kenosha County, Wisconsin, which is about 38 mi (61 km) east of the proposed site and is part of the Chicago–Naperville, Illinois–Indiana–Wisconsin nonattainment area for ozone (EPA 2013).

McHenry County and Waukesha County are also designated maintenance areas for PM less than 2.5 μm and the 8-hour ozone 1997 standard, respectively (EPA 2013). However, these nonattainmment and maintenance areas are not within the JBWI AQCR. The region of influence for purposes of the air quality analysis is defined as Rock County. The General Conformity Rule, established under Section 176(c)(4) of the CAA, ensures that Federal actions conform to State Implementation Plans. The Federal agency must conduct a conformity analysis if the proposed action is in a designated nonattainment or maintenance area with respect to NAAQS and would result in the generation of air emissions that would exceed conformity threshold levels of pollutants (*de minimis* thresholds). Because the proposed SHINE facility would be located in a designated attainment/unclassifiable area, a conformity analysis is not required.

Table 3–5. National Ambient Air Quality Standards

Criteria Pollutant		Primary or Secondary	Averaging Time	Level	Description
Carbon Monoxide (CO)		primary	8 hours	9 ppm	Not to be exceeded more than once per year
			1 hour	35 ppm	
Lead (Pb)		primary and secondary	Rolling 3-month average	0.15 μm^{3}[a]	Not to be exceeded
Nitrogen Dioxide (NO_2)		primary	1 hour	100 ppb	98th percentile, averaged over 3 years
		primary and secondary	Annual	53 ppb[b]	Annual mean
Ozone (O_3)		primary and secondary	8 hours	0.075 ppm[c]	Annual fourth highest daily maximum 8-hour concentration, averaged over 3 years
Particulate Matter (PM)	$PM_{2.5}$	primary	Annual	12 μg/m^3	Annual mean, averaged over 3 years
		secondary	Annual	15 μg/m^3	Annual mean, averaged over 3 years
		primary and secondary	24 hours	35 μg/m^3	98th percentile, averaged over 3 years
	PM_{10}	primary and secondary	24 hours	150 μg/m^3	Not to be exceeded more than once per year on average over 3 years
Sulfur Dioxide (SO_2)		primary	1 hour	75 ppb[d]	99th percentile of 1-hour daily maximum concentrations, averaged over 3 years
		secondary	3 hours	0.5 ppm	Not to be exceeded more than once per year

[a] The final rule was signed on October 15, 2008. The 1978 lead standard (1.5 microgram per cubic meter (μg/m^3) as a quarterly average) remains in effect until 1 year after an area is designated for the 2008 standard, except in areas designated non-attainment for the 1978 standard. The 1978 standard remains in effect until implementation plans to attain or maintain the 2008 standard are approved.

[b] The official level of the annual NO_2 standard is 0.053 parts per million (ppm), equal to 53 parts per billion (ppb), shown here for clearer comparison to the 1-hour standard.

[c] The final rule was signed on March 12, 2008. The 1997 ozone standard (0.08 ppm, annual fourth highest daily maximum 8-hour concentration, averaged over 3 years) and related implementation rules remain in place. In 1997, EPA revoked the 1-hour ozone standard (0.12 ppm, not to be exceeded more than once per year) in all areas, although some areas have continued obligations under that standard (“antibacksliding”). The 1-hour ozone standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm is less than or equal to 1.

[d] The final rule was signed on June 2, 2010. The 1971 annual and 24-hour SO_2 standards were revoked in this rulemaking. However, these standards remain in effect until 1 year after an area is designated for the 2010 standard, except in areas designated as nonattainment for the 1971 standards , where the 1971 standards remain in effect until implementation plans to attain or maintain the 2010 standard are approved.

Source: EPA 2012a

Table 3–6 shows annual emission rates of criteria pollutants, carbon dioxide, and HAPs for the JBWI AQCR and for Rock County. These emission rates include both stationary and mobile sources (vehicular traffic). Section 3.9 presents data and assumptions regarding the amount of vehicular traffic.

Gaseous chemicals that trap heat in the atmosphere are known as greenhouse gases (GHGs). The most common GHGs are carbon dioxide, methane, and nitrous oxide. These pollutants are emitted from natural processes and human activities. As further discussed in Section 3.2.2.1, the GHG Tailoring Rule combines these and other GHGs into a single "pollutant" called carbon dioxide equivalent (CO_{2eq}). Toxic air pollutants, also known as HAPs, are pollutants known or suspected to cause cancer or other serious health effects, such as reproductive effects, birth defects, or adverse environmental effects. Under the CAA, the EPA regulates a list of 187 HAPs. Examples of HAPs include benzene, which is found in gasoline; perchloroethylene, which is emitted from some dry cleaning facilities; and methylene chloride, which many industries use as a solvent and paint stripper.

Table 3–6. Regional Air Emissions Inventory

Description	CO	NO_x	Hydro-carbons	SO_2	PM_{10}	$PM_{2.5}$	CO_2	HAPs
Quantity Emitted (TPY) in JBWI AQCR	122,608	23,781	30,872	1,337	50,268	12,208	4,789,168	11,521
Quantity Emitted (TPY) in Rock County	32,369	6,026	10,848	99	8,877	2,788	1,131,140	2,182

Key: CO = carbon monoxide; NO_x = nitrous oxide; SO_2 = sulfur dioxide; PM_{10} = particulate matter of 10 µm or less; $PM_{2.5}$ = particulate matter 2.5 µm or less; CO_2 = carbon dioxide; HAP = hazardous air pollutants; TPY = tons per year; JBWI = Rockford, Illinois-Janesville-Beloit, Wisconsin, Interstate; and AQCR = air quality control region.

Source: EPA 2014a

EPA promulgated the Regional Haze Rule to improve and protect visibility in national parks and wilderness areas from haze that many diverse sources across a broad region may cause (40 CFR 51.308–51.309). Specifically, 40 CFR Part 81, Subpart D, lists mandatory Class I Federal Areas where visibility is an important value. The Regional Haze Rule requires states to develop State Implementation Plans to reduce visibility impairment at Class I Federal Areas. The nearest currently listed Class I Federal Area for visibility protection is the Seney Wilderness Area in Michigan, which is about 295 mi (475 km) from the proposed site (EPA 2012b). The nearest Class I area to the proposed SHINE facility is Rainbow Lake, Wisconsin, which is located approximately 250 mi (401 km) from the site.[2]

3.2.2.1 Federal New Source Requirements

New facilities that emit air pollutants, such as the proposed site, could be subject to Federal requirements, depending on the location and the type and amount of emitted air pollution. The following discussions summarize these requirements. As described in Section 4.2, emission rates from the proposed site are expected to be below the thresholds triggering any of these requirements. The WDNR has regulatory jurisdiction over construction- and operation-related activities, and SHINE may be required to obtain air permits in accordance with Wisconsin

[2] Rainbow Lake is a Mandatory Federal Class I area in which visibility is not an important air quality-related value.

Administrative Code NR 405, “Prevention of Significant Deterioration”; NR 406, “Construction Permits; and NR 407, “Operation Permits.” As of February 2014, the WDNR was actively working with SHINE to determine which of these permits would be required (WDNR 2014a).

Prevention of Significant Deterioration

Prevention of significant deterioration (PSD) is a Federal permitting program that applies to sources classified as major sources (as defined in 40 CFR 52.21) under the PSD program and located in attainment areas. The purpose of the program is to prevent degradation of air quality in areas where air quality is good. New or modified sources of criteria pollutants that exceed *de minimis* emission rates are subject to the program. The PSD program establishes mandatory Class I areas in which air quality is most pristine and visibility is an important value, such as those near national parks and wilderness areas. For purposes of this air quality analysis, the 250 tons per year (TPY) of any criteria pollutant threshold (40 CFR 52.21) will be considered in determining the significance of air quality impacts for operations.

Title V of the Clean Air Act

Title V of the CAA requires a Federally enforceable operating permit program that applies to large, new, and existing sources of air pollution. Any facility with the potential to emit 100 TPY or more of any criteria pollutant, 10 TPY of any HAP, or 25 TPY of all HAPs combined is required to obtain a valid Title V permit and is considered a major air source. For purposes of this air quality analysis, the 100 TPY of any criteria pollutant threshold for a Title V operation permit will be considered in determining the significance of air quality impacts for operation.

Greenhouse Gas Tailoring Rule

On September 22, 2009, the EPA issued a final rule for mandatory GHG reporting from large GHG emission sources in the United States (74 FR 56260). The purpose of the GHG Tailoring Rule is to collect and use comprehensive and accurate data on carbon dioxide and other GHG emissions to inform future policy decisions. In general, the threshold for reporting is 25,000 metric tons or more carbon dioxide equivalent (CO_{2eq}) emissions per year, excluding mobile-source emissions. CO_{2eq} is a metric used to compare the emissions of GHG based on their global warming potential (GWP). GWP is a measure used to compare how much heat a GHG traps in the atmosphere. GWP is the total energy that a gas absorbs over a period of time compared to carbon dioxide. CO_{2eq} is obtained by multiplying the amount of the GHG by the associated GWP. For example, the GWP of methane is estimated to be 21; therefore, 1 ton of methane emission is equivalent to 21 tons of carbon dioxide emissions.

On May 13, 2010, the EPA issued the GHG Tailoring Rule. This rule set the thresholds for a phase-in approach to regulating GHG emissions under the PSD and Title V permitting programs (75 FR 31514). Beginning on January 2, 2011,[3] operating permits issued to major sources of GHG under the PSD or Title V Federal permit programs must contain provisions requiring the use of best available control technology to limit the emissions of GHGs, if those sources would be subject to PSD or Title V permitting requirements because of their non-GHG pollutant emission potentials and if their estimated GHG emissions are at least 75,000 TPY of CO_{2eq}.

[3] On June 23, 2014, the U.S. Supreme Court issued a decision that EPA may not treat GHGs as an air pollutant for determining whether a source is a major source required to obtain a PSD or Title V permit but could continue to require PSD and Title V permits, which are otherwise required based on emissions of conventional pollutants. In July 2014, the EPA issued a memorandum in response to the Supreme Court’s decision and acknowledged that, although the decision is pending judicial action, the EPA will no longer require PSD or Title V permits for GHG-emitting sources that are not sources subject to PSD or Title V permits based on emissions of conventional pollutants (e.g., nitrogen oxides and, carbon monoxide) (EPA 2014b).

3.2.3 Noise

Noise is often defined as unwanted sound. Sound is created when a source vibrates in air, creating pressure pulses that move through the air or another medium away from the source in waves. When these pressure waves reach a receiver like the human ear, the receiver interprets these waves as sounds. The human ear interprets more forceful vibrations (higher pressures in the sound waves) as louder or more intense sounds.

Sound intensity is measured in logarithmic units called decibels (dB). A dB is the ratio of the measured sound pressure level to a reference level equal to a normal person's threshold of hearing. Because of the way the dB is defined mathematically and because of the way human ears respond to sound intensities, comparing the "noisiness" of two sounds based on their dB values is not straightforward. Most people barely notice a difference of 3 dB or less.

Another characteristic of sound is frequency or pitch. Noise may be composed of many frequencies, but the human ear does not hear very low or very high frequencies as well as it hears frequencies around 1 to 5 kilohertz. To represent noise as closely as possible to the noise levels people experience, sounds are measured using a frequency-weighting scheme known as the A-scale. Sound levels measured on this A-scale are given in units of A-weighted decibels (dBA).

Several different terms are commonly used to describe sounds that vary in intensity over time. The equivalent sound intensity level (L_{eq}) represents the average sound intensity level over a specified interval, often 1 hour. The day-night sound intensity level (L_{DN}) is a single value calculated from an hourly equivalent sound intensity level over a 24-hour period, with the addition of 10 dBA to sound levels from 10 p.m. to 7 a.m. This addition accounts for the greater sensitivity of most people to nighttime noise.

Table 3–7 compares common sound levels and ranks the sounds in terms of their effects on hearing. For example, a whisper is normally 30 dBA and is considered very quiet. An air-conditioning unit located 6.1 m (20.0 ft) away is considered an intrusive noise at 60 dBA. Noise levels can become annoying at 80 dBA and very annoying at 90 dBA. To the human ear, each increase of 10 dBA sounds twice as loud (EPA 1981).

Table 3–7. Sound Levels and Human Response

Noise Level (dBA)	Common Sounds	Effect
10	Just audible	Negligible[(a)]
30	Soft whisper (4.6 m [15 ft])	Very quiet
50	Light automobile traffic (30.5 m [100 ft])	Quiet
60	Air-conditioning unit (6.1 m [20 ft])	Intrusive
70	Noisy restaurant or freeway traffic	Telephone use difficult
80	Alarm clock (0.6 m [2 ft])	Annoying
90	Heavy truck (15.2 m [49.9 ft]) or city traffic	Very annoying hearing damage (8 hours)
100	Garbage truck	Very annoying[(a)]
110	Pile drivers	Strained vocal effort[(a)]
120	Jet takeoff (61 m [200 ft]) or automobile horn (0.9 m [3 ft])	Maximum vocal effort
140	Carrier deck jet operation	Painfully loud

[(a)] This effect is extrapolated.

Key: dBA = decibels A-weighted, and m = meters.

Source: EPA 1981

3.2.3.1 Noise Regulations

There are no regulatory limits on noise levels in the area of the proposed action, but several Federal regulations establish noise guidelines to protect citizens from potential hearing damage and from other adverse physiological, psychological, and social effects associated with noise. Under the Noise Control Act of 1972 (42 U.S.C. 4901 et seq.), the Occupational Safety and Health Administration established workplace standards for noise. The minimum requirement states that constant noise exposure must not exceed 90 dBA over an 8-hr period. The highest allowable sound level to which workers can be exposed is 115 dBA. Exposure to this level must not exceed 15 min within an 8-hr period. If noise levels exceed these standards, employers are required to provide hearing protection equipment that reduces sound levels to acceptable limits (29 CFR 1910.95).

The EPA recommends day-night average sound levels of 55 dBA as guidelines or goals for outdoors in residential areas (EPA 1974). However, these levels are not standards.

The Federal Aviation Administration (FAA) regulates noise levels in the vicinity of airports. FAA regulations regarding airport noise compatibility planning (14 CFR Part 150) define the requirements and procedures for public-use airports, such as the Southern Wisconsin Regional Airport, which is located across the road from the proposed site. The FAA regulation at 14 CFR 150.21 requires a noise exposure map for each airport that identifies incompatible land use and an L_{DN} 65 dBA contour line.

The Federal Highway Administration rules in 23 CFR Part 772 regulate highway traffic and construction noise. The rules identify noise abatement criteria (NAC) that define when noise abatement must be considered in highway projects near different land use areas. For example, the noise abatement criterion for residential land use areas is 67 dBA. Although NAC are not noise limits, they do identify levels most people consider an annoyance.

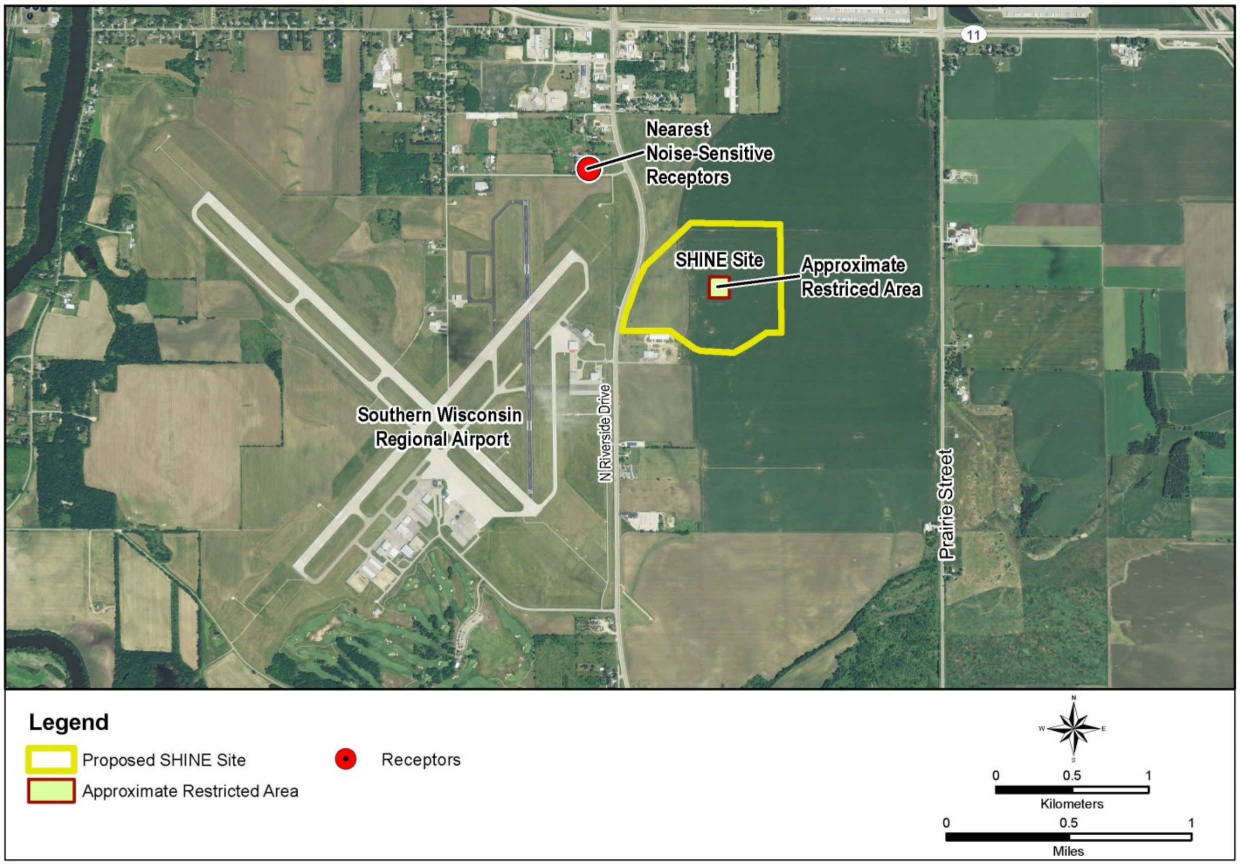
Several Wisconsin laws regulate noise associated with different sources and environments, including certain vehicles (such as snowmobiles, boats, and trucks), occupational settings, airports, highways, and wind farms (State of Wisconsin undated). Wisconsin's implementation of the Federal Highway Administration's highway noise rules is contained in Wisconsin Administrative Code Trans 405, "Siting Noise Barriers."

Rock County ordinances prohibit nuisance noise and require noise prevention in land divisions and other development activities, but the ordinances do not specify numerical noise limits (Rock County undated a).

3.2.3.2 Existing Noise Levels

The region of influence for noise is a 1-mi (1.6-km) radius from the site boundary of the proposed SHINE facility. Existing noise sources near the proposed site include vehicular traffic on U.S. Highway 51 and airplane traffic associated with the Southern Wisconsin Regional Airport. The nearest noise-sensitive receptors are a residence and an adjacent park located on West Knilans Road about 0.5 mi (0.8 km) from the center of the proposed site. Figure 3–6 shows the proposed site, airport, and nearest receptors.

Figure 3–6. Proposed SHINE Facility Map Showing Noise Sources and Receptors



Source: Modified from SHINE 2013a

According to the noise exposure map for the Southern Wisconsin Regional Airport, the nearest noise receptors experience 55–65 dBA L_{DN} noise levels. The proposed site would produce noise levels less than 55 dBA (SHINE 2013b). SHINE's noise modeling for highway traffic noise from U.S. Highway 51 shows that the NAC for residential land uses (67 dBA) is exceeded at distances up to 80 ft (24 m) from the edge of the highway (SHINE 2013b).

3.3 Geologic Environment

3.3.1 Site Geology

The proposed site is located near the boundary of the Wisconsin Western Uplands and the Eastern Ridges and Lowlands physiographic provinces. The till plains section of the Central Lowland physiographic province of the United States encompasses these provinces. This province occupies the middle of the long stable North American continent. Tectonic activity has little effect on this location (USGS 2003; SHINE 2013a, 2013b).

Current site topography is flat to gently rolling. Deposits of glacial outwash and glacial till immediately underlay the site. These unconsolidated materials rest atop a bedrock surface, as further described later in this section (SHINE 2013a).

Site topography slopes gently toward the southwest in the direction of the Rock River, which is located about 2.5 mi (4.0 km) to the west. The change in ground surface elevation across the proposed main facility site is about 7.0 ft (2.1 m) between the southeast and northwest portions of the site. Elevations across the entire site range from about 804 ft (245 m) above mean sea level (MSL) at the southwest corner of the property adjacent to U.S. Highway 51 to 828 ft (252 m) MSL in the northeast corner. A small terraced knoll protrudes into the center of the otherwise gently sloping topography of the proposed site from the northeast (Figure 3–7) (SHINE 2013a, 2013b).

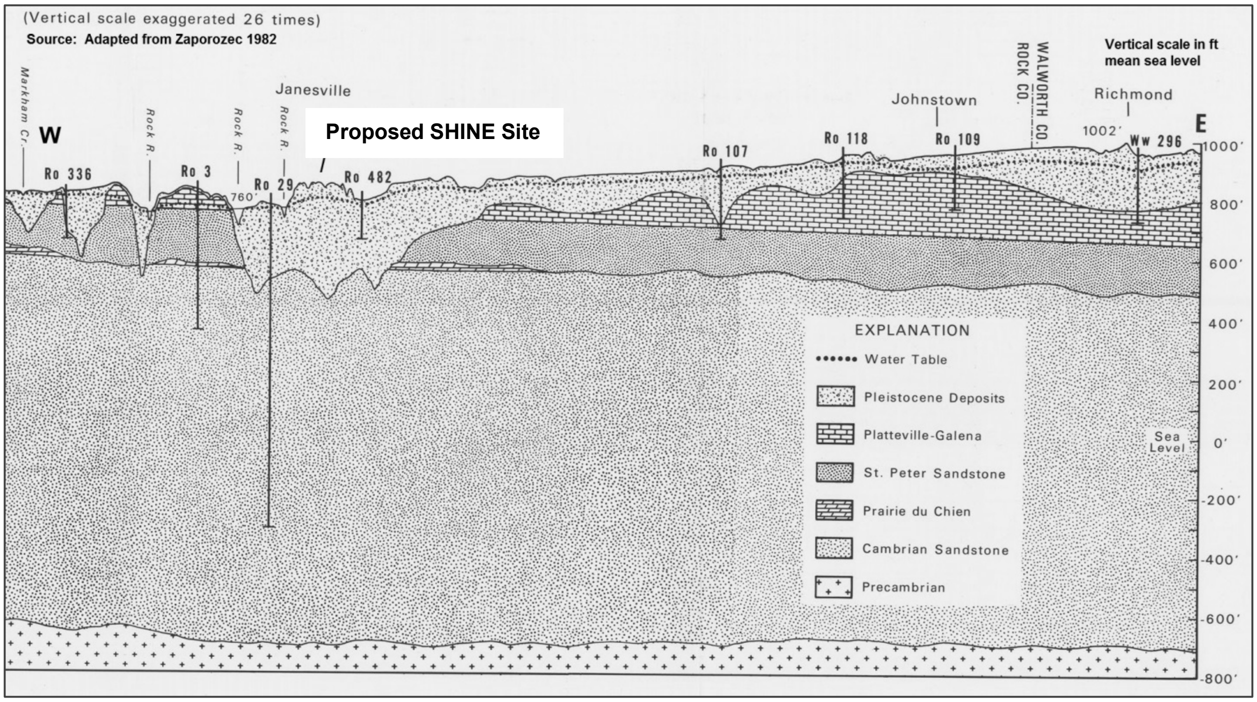
Physical features and the surficial geology at the proposed site and across the southeastern Wisconsin region are the product of successive glacial advances, retreats, and related depositional and erosional processes during the Pleistocene age or “Ice Age” (Fullerton et al. 2003; SHINE 2013a). The Pleistocene age is defined as the period of geologic time that began about 2.6 million years ago and ended about 11,700 years ago (USGS 2010). Both the Illinoian and younger Wisconsin glaciations affected southeastern Wisconsin and parts of Rock County as lobes of ice comprising the massive Laurentide Ice Sheet moved south and southwest out of central Canada and across the region.

Portions of south-central Wisconsin, including southern Rock County and the proposed site, were last glaciated between about 128,000 and 310,000 years ago during the Illinoian Glaciation. At that time, ice covered the eastern half of Wisconsin and extended south into Southern Illinois and east into Indiana and Ohio (Fullerton et al. 2003). The latest glacial advance (the Wisconsin Glaciation) began 100,000 years ago and reached its peak about 30,000 years ago. At its peak, ice reached into Indiana, Illinois, and Iowa and encompassed much of northern and eastern Wisconsin. Although this latest glacial advance did not extend as far south and west as the proposed site, the Jonestown end moraine, which is located about 20 mi (32 km) to the north of the proposed site, marks its terminus. However, by 11,000 years ago, all ice had retreated from the State (SHINE 2013a; Fullerton et al. 2003; WGNHS 2011a).

These glacial movements deposited glacial till, basal moraine, and end moraine. Till is a heterogeneous mixture of materials—clay, silt, sand, granules, pebbles, cobbles, and boulders—that glacial ice directly deposits. Ground moraine is a sheet or layer of till that often forms a gently rolling or undulating plain of low relief. End moraine, a thickened layer of till deposited at the margin of glacial ice, characteristically exists as belts of till or as concentric or overlapping ridges of till (Fullerton et al. 2003). Glacial streams flowing from the edges of the ice deposited sand and gravel outwash (SHINE 2013a; WGNHS 2011b). Alluvial processes, including flowing water, wind, and erosion, have subsequently reworked the deposited materials.

The surficial geology of Rock County consists of the Wisconsin-age Johnstown moraine to the north. This moraine formed at the margins of the Green Bay ice lobe. The remainder of the county contains Illinoian-age ground moraine deposits that southward-flowing glacial outwash stream deposits and lake deposits have dissected in places. The stream valleys now contain late Wisconsin-age and possibly Holocene-age glaciofluvial outwash deposits (SHINE 2013a; Fullerton et al. 2003). The surficial geologic unit at the proposed site is mapped as glaciofluvial outwash composed of sand and gravel. Figure 3–7 is a generalized geologic section that shows the glacial terrain and the surficial and bedrock strata in the vicinity of the proposed site.

Figure 3–7. Geologic Cross-Section of the Proposed SHINE Site and Vicinity



Source: Adapted from Zaporozec 1982

SHINE and its contractors conducted geotechnical investigations at the proposed site. These investigations revealed predominantly coarse, poorly graded (i.e., well-sorted) sandy sediment and soils to a depth of 221 ft (67 m) below ground surface (bgs) with occasional gravel layers (GAI 2012a). Testing of 15 boring samples further revealed that the density of the sand increases with depth and is generally compact. At a depth of 180- to 185-ft (55- to 56-m) bgs, a layer of hard clayey silt was encountered in the three deepest borings with a thickness of 10 to 18 ft (3.0 to 5.5 m). Sand or silty sand underlay this hardened layer to the total borehole depth of 221-ft (67-m) bgs (GAI 2012a).

Based on drilling conducted as part of the site geotechnical investigations, the depth to bedrock is greater than 221-ft (67.4-m) bgs. Glacial action gouged, and then glacial and postglacial sediments filled, the uppermost bedrock surface beneath the proposed site. Figure 3–7 shows the expression of the ancestral Rock River Valley in the dissected bedrock surface.

Beneath the mantle of Pleistocene- and Holocene-age sediments, the uppermost bedrock unit is the Platteville–Galena Formation of Ordovician age, which comprises limestone and dolomite. In descending order, sandstones of the St. Peter Formation and the carbonates of the Prairie du Chien Group, where present, underlay the Platteville–Galena Formation. These eroded units rest upon a thick sequence of Cambrian-age sedimentary rock that consists primarily of sandstone in the upper part. These Cambrian-age rocks are up to 1,000-ft (300-m) thick and extend to Precambrian-age basement rock (SHINE 2013a; WGNHS 2011b).

Sedimentary bedrock underlying the proposed site formed from materials deposited in a shallow marine environment over millions of years in a structural feature known as the Michigan Basin. The proposed site lies on the western margin of the Michigan Basin and on the southeastern edge of another feature—the Wisconsin Arch. The Wisconsin Arch and the Kankakee Arch to the south of the proposed site are northwest- to southeast-striking tectonic features believed to be related to crustal adjustment during and following the development and filling of the Michigan

Basin more than 300 million years ago. This deformation led to the regional faulting and folding of subsurface strata in some areas. Despite this activity, the orientation of sedimentary strata beneath the proposed site indicates little deformation during the last 500 million years (SHINE 2013a).

Still, several geologic faults mapped regionally in association with the Wisconsin and Kankakee Arches are located as close as 2 mi (3 km) to the proposed site. One of the most prominent faults is the Waukesha fault located about 20 mi (32 km) to the east and northeast of the proposed site. This northeast-striking fault runs for up to 133 mi (214 km) in the subsurface. Closer to the proposed site, the Janesville fault (or the Evansville fault) is located about 6 mi (10 km) north of the City of Janesville. This 19-mi-long (31-km-long) east-striking fault exhibits an estimated 70 ft (21 m) of displacement. A smaller unnamed fault of orientation similar to the Janesville fault has been traced for about 1.6 mi (2.6 km). It is located less than 2 mi (3 km) north of the City of Janesville.

None of these faults are expressed at the surface, and no reported evidence exists of Pleistocene or post-Pleistocene activity on any regional faults (SHINE 2013a, 2013b). Further, the NRC staff's review of the USGS's latest release of the Quaternary Fault and Fold Database found no record of Quaternary faults or folds within a 300-mi (480-km) radius of the proposed site (USGS 2012). However, liquefaction features in the Wabash Valley in southern Indiana and Illinois, located about 170 mi (274-km) south of the proposed site, indicate the presence of active faulting in the Holocene and late Pleistocene period (SHINE 2013b; Crone and Wheeler 2000). Therefore, SHINE considered these faults capable because the characteristics in Appendix A to 10 CFR Part 100 are exhibited (SHINE 2013a). Section 3.3.3 further describes the seismic setting, including earthquake risk, at the proposed site.

Geologic resources, encompassing rock and mineral (fuel and nonfuel) resources, in the vicinity of the proposed site, are primarily related to the area's extensive sand and gravel deposits. Rock County features widespread nonmetallic mining, including construction sand and gravel and crushed stone operations (USGS 2013a). Two sand and gravel mining operations and one crushed stone mining operation are within 5 mi (8 km) of the proposed site (Find the Data 2014).

3.3.2 Soils

Based on SHINE's geotechnical investigation (Section 3.3.1), the proposed site generally consists of stratified sand and gravel that underlay well-drained loamy soils (GAI 2012a). The USDA NRCS soil unit mapping identifies the majority of the proposed site (90 percent) as Warsaw silt loam with 2- to 6-percent slopes, and as Warsaw silt loam with 0- to 2-percent slopes (Figure 3–3). These soil mapping units comprise well-drained silt loams and sandy clay loams found on outwash plains and stream terraces that developed from calcareous sand and gravelly outwash. The profiles of these soils grade to a gravelly coarse sand or sand at depths greater than about 36 in. (91 cm). The depth to the water table in these soils is generally 60 to 80 in. (150 to 200 cm), and water rarely ponds on these soils.

The only building site limitation for these soils is that shallow excavations tend to be very unstable because of high sand and gravelly content (NRCS 2013). The soils are further classified as slightly to moderately erodible (NRCS 2013; SHINE 2013a). Given the recent agricultural history of the proposed site, the soils have a well-developed organic soil horizon in the upper 12- to 24-in. (30- to 60-cm) soil profile, which promotes soil tilth while reducing erosion. Section 3.1.1.4 notes that these Warsaw silt loam soils are prime farmland soils when they are not committed to developed uses (NRCS 2013; 7 CFR 657.5(a)).

The remaining south-central portion of the proposed site comprises eroded Lorenzo loam with 6- to 12-percent slopes. These soils are also well drained and grade from a loam in the upper part to a gravelly to very gravelly clay loam below a depth of about 15 in. (38 cm). They occupy outwash plains and knobs that developed from loamy outwash over sandy and gravelly parent materials. Because of slope factors and dense soil horizons, this soil is classified as somewhat to very limited for building site development. This soil unit is also prone to slumping in shallow excavations (NRCS 2013). These soils are farmland of statewide importance when they are not committed to developed uses (Section 3.1.1.4) (7 CFR 657.5(c)).

Borings that SHINE obtained during the geotechnical investigation did not identify the presence of highly plastic clays indicative of expansive or high shrink/swell potential soils (GAI 2012a; SHINE 2013a).

3.3.3 Seismic Setting

Southeastern Wisconsin lies within the central portion of the stable North American craton. Historically, the seismicity of the region encompassing the proposed site is characterized by relatively infrequent small to moderate earthquakes typical of much of the central and eastern United States (SHINE 2013b; USGS 2013b). Across the stable continental region of the United States, most locations can go years without an earthquake strong enough for people to feel.

In the central and eastern United States, people can feel earthquakes over a very wide area. For example, people can feel a magnitude 4.0 earthquake at locations as far as 60 mi (100 km) from its source, and the earthquake can occasionally cause damage near its source. People can usually feel a magnitude 5.5 earthquake as far as 300 mi (500 km) from its source, and the earthquake often causes damage near its epicenter and sometimes as far away as 25 mi (40 km) (USGS 2013b).

The USGS's seismic hazard estimates indicate the proposed site is located within one of the lower earthquake hazard areas in the conterminous United States. Earthquake sources in Southern Illinois are the primary controllers of hazard in the region (Petersen et al. 2011; SHINE 2013a).

Since 1973, six earthquakes within a radius of 200 mi (322 km) of the proposed site have been recorded with a magnitude equal to, or greater than, 2.5. Two of these events occurred in 2013 and one in 2012 at magnitudes of 3.2, 2.6, and 3.0, respectively. The closest earthquake was a magnitude 2.6 earthquake in June 2013, with its epicenter near the City of Campton Hills, Illinois, about 51 mi (82 km) southeast of the proposed site (USGS 2013c). The largest earthquake was a magnitude 4.2 event in June 2004, centered near the City of Ottawa, Illinois, about 80 mi (130 km) south of the proposed site (SHINE 2013b; USGS 2013c, 2013f). This notable earthquake was widely felt across northern Illinois, southern Wisconsin, and western Indiana. Across southeast Wisconsin, it produced shaking in the range of II to III on the Modified Mercalli Intensity (MMI) scale, but no serious damage was reported (USGS 2013d). Although people can feel shaking in this range, this level is unlikely to produce any damage to structures (USGS 2013e).

Historically, larger earthquakes have occurred in adjoining regions with effects felt across southern Wisconsin. The largest of these earthquakes occurred on May 26, 1909, with an estimated magnitude of 5.1. The epicenter of this earthquake was near Aurora, Illinois, about 85 mi (137 km) southeast of the proposed site (SHINE 2013b; USGS 2013d). The earthquake produced MMI VII shaking at its epicenter with many reports of fallen and damaged chimneys. This event is estimated to have produced MMI V shaking across the area of the proposed site (SHINE 2013b; USGS 2013f). MMI V shaking can overturn objects and cause minor damage to personal property (USGS 2013e).

Using USGS national seismic hazard model data, SHINE performed a site-specific analysis to assess the potential maximum earthquake magnitude that may affect the proposed site and its immediate surroundings. SHINE determined that an earthquake with a magnitude of 5.8 can reasonably be regarded as the maximum considered earthquake to occur in the region (i.e., within about 200 mi (322 km) of the proposed site). This earthquake estimate encompasses events producing maximum earthquake response accelerations ranging from 0.119 to 0.206 gravity (i.e., the force of acceleration relative to that of Earth's gravity). This value represents shaking from an earthquake with a 2-percent probability of exceedance in the next 50 years (i.e., an earthquake with a 2,475-year return period). The NRC staff will further evaluate the potential maximum earthquake in the Safety Evaluation Report related to the SHINE construction permit application.

Using the same earthquake return period, SHINE also estimated the probabilistic peak ground acceleration (PGA) for the proposed site reflective of sites with soft rock or very stiff soil. SHINE's calculated PGA was about 0.05 gravity (SHINE 2013b). This calculated PGA is consistent with PGA estimates published in the USGS's 2008 national seismic hazard maps (Petersen et al. 2011). These data indicate a low to very low earthquake shaking hazard at the proposed site (SHINE 2013a, 2013b).

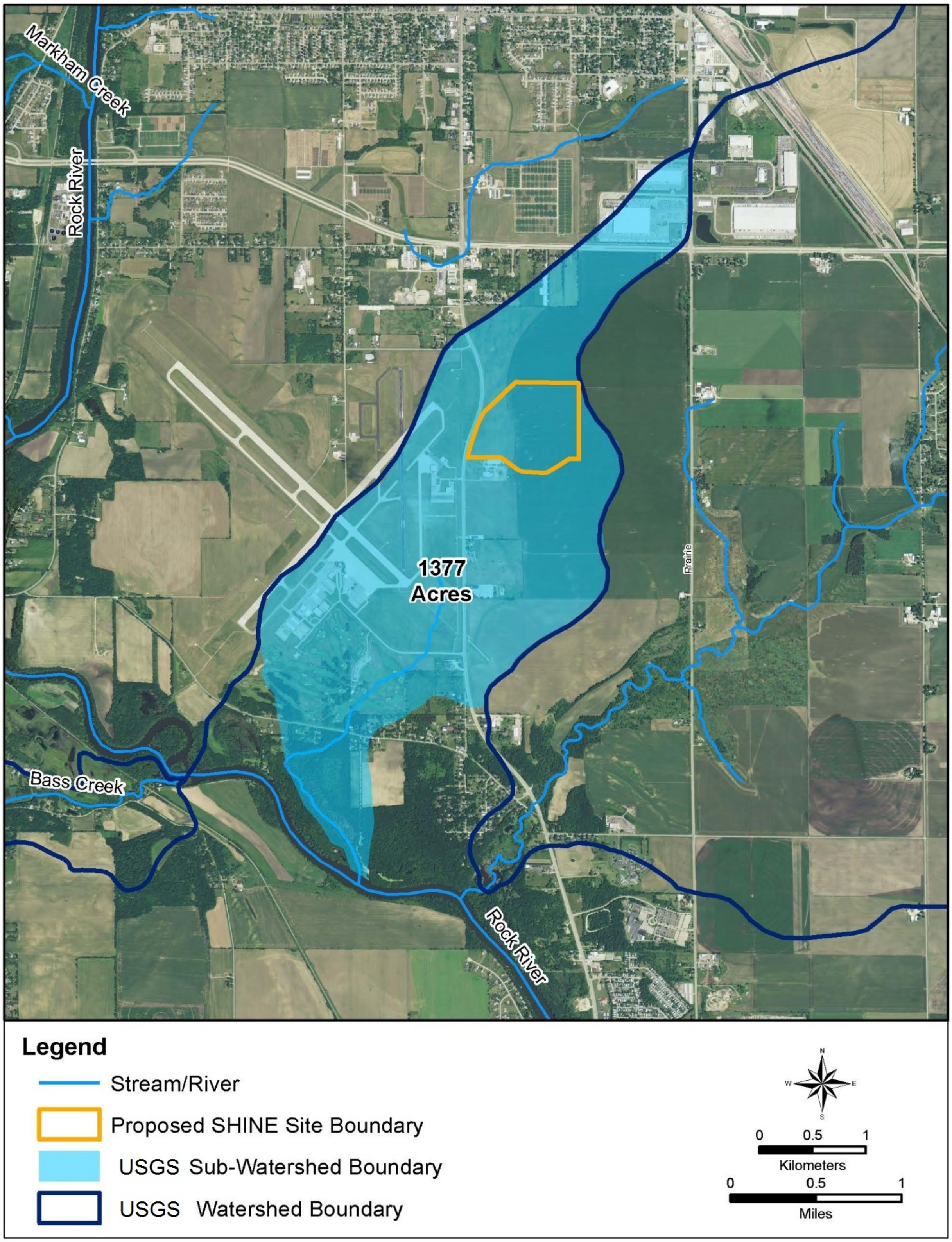
3.4 Water Resources

3.4.1 Surface Water

3.4.1.1 Surface Water Hydrology

The major surface-water feature in the vicinity of the proposed site is the Rock River, located about 1.9 mi (3.1 km) west of the proposed site at its closest point (Figure 3–8). No named tributaries originate on or border the proposed site. However, as shown in Figure 3–8, the headwaters of an unnamed tributary to the Rock River are located about 1.6 mi (2.6 km) southwest of the proposed site and west of U.S. Highway 51.

Figure 3–8. Surface-Water Features in the Vicinity of the Proposed SHINE Site



Source: Adapted from SHINE 2013a

The local watershed that contributes drainage to, and receives drainage from, the proposed site encompasses about 1,377 ac (557 ha) (Figure 3–8). USGS-delineated hydrologic unit (watershed) boundaries are depicted in the figure. U.S. Highway 51 roughly bisects the proposed site and local watershed. Drainage across the proposed site and vicinity is predominantly to the south and southwest across the proposed site toward the unnamed tributary to the Rock River located south of the proposed site.

Culverts under U.S. Highway 51 convey runoff and drainage from the east side ditch to the west side, including two culvert locations (three culvert pipes) adjacent to the proposed site. These include a 30-in. (76-cm) culvert located along the northwest boundary of the proposed site with U.S. Highway 51 and a pair of 24-in. (61-cm) culverts located near the southwest corner of the proposed site and U.S. Highway 51. Drainage across the proposed site toward the unnamed tributary flows through these culverts and then passes through the Southern Wisconsin Regional Airport, through culverts under West Airport Road, through the Glen Erin Golf Course, and through a box culvert under West Happy Hollow Road. Beyond West Happy Hollow Road, the receiving tributary passes through the wooded Rock River floodplain before discharging to Rock River (SHINE 2013a).

Rock River originates in the Horicon Marsh in Dodge County, Wisconsin, where the east, south, and west branches of Rock River join. In Horicon, at the south edge of the marsh, the river flows southerly for about 76 mi (122 km) to Fort Atkinson, which roughly marks the southern end of the Upper Rock River Basin and the beginning of the Lower Rock River Basin. From Fort Atkinson, Rock River flows in a generally southwest direction through Lake Koshkonong and then generally south through Rock County and to the west of the proposed site. Rock River flows across a total of about 62 mi (100 km) in the Lower Rock River Basin before entering Illinois south of the City of Beloit. It ultimately discharges to the Mississippi River downstream of Rock Island, Illinois (Sinclair 1996; Rock County 2009; WDNR 2012a).

Many small dams regulate the flow of Rock River. Originally constructed for hydropower facilities, these low dams do not form deep impoundments. The Indianford Dam, which impounds Lake Koshkonong, is located about 21 mi (34 km) upstream of the point where drainage from the Janesville site enters Rock River through the unnamed tributary. Closer to, and to the north of, the proposed site, the Centerway Dam is located near downtown in the City of Janesville and upstream of the Monterey Dam. The lower Monterey Dam is located about 6.5 mi (10.5 km) upstream of the proposed site drainage confluence and about 2 river miles (RM) (3.2 km) downstream of the Centerway Dam. The first downstream dam on Rock River is the Blackhawk Dam (Beloit Dam), which is located about 8.4 RM (13.5 km) downstream of the proposed site (SHINE 2013a, 2013b).

The nearest USGS gaging station on Rock River is the Afton gage station (Station 05430500). This gage station is located slightly southwest of the proposed site and upstream from the point at which site drainage (through the unnamed tributary) ultimately enters Rock River, as previously described. The mean annual discharge measured at the Afton gage for water years 1914 to 2012 is 2,015 cubic feet per second (cfs) (57 cubic meters per second (m^3/s)). The 90-percent exceedance flow, which is generally indicative of drought conditions, is 499 cfs (14 m^3/s). For water year 2012, the mean discharge was 1,927 cfs (55 m^3/s). The drainage area of Rock River upstream of the Afton gage encompasses 3,340 square miles (mi^2) (8,650 square kilometers (km^2)) (USGS 2013g). No stream flow data are available for the unnamed tributary to Rock River that receives site runoff.

Peak flows and flooding on streams in Rock County typically occur either in late winter or early spring, from March to April, and often in June, as a result of early summer thunderstorms.

Floods on Rock River at Afton also generally occur from March to April with few floods from November to January (SHINE 2013a).

No floodplains are delineated on or near the proposed site (FEMA 2008; SHINE 2013a; Rock County 2009). The flood insurance rate map for the proposed site and vicinity identifies mapped areas as Zone X, the zone for areas outside the 500-year flood elevation. In addition, the proposed site is not located in an area identified as prone to seasonally high water tables or hydric soil conditions (Rock County 2009). However, floodplains are mapped in association with the unnamed tributary to Rock River south of the proposed site (FEMA 2008; Rock County 2009).

Rock River flood levels near the proposed site are well below the lowest ground elevations at the proposed site. Because river flood levels are also sufficiently below the proposed site, the river flood levels have no backwater influence on the unnamed tributary flood-water levels (GAI 2012a; SHINE 2013a).

3.4.1.2 Surface Water Quality and Use

The State of Wisconsin has established water quality standards, numeric criteria, and associated designated use categories for all waters of the State, including wetlands. These standards and use designations are the basis for regulatory, permitting, or funding activities that have an impact on water quality.

The main stem of the Rock River is regulated in accordance with its use for waste assimilation, recreation, fish and aquatic life, irrigation, stock and wildlife watering, and hydropower (Wisconsin Administrative Code NR 104, "Uses and Designated Standards"). Its designated use is for recreation and for fish and aquatic life. Governing water quality standards include limitations on pH, temperature, dissolved oxygen, fecal coliform, and various chemical constituents and toxic substances, in accordance with Wisconsin Administrative Code NR 102, "Water Quality Standards for Wisconsin Surface Waters."

Section 303(d) of the Federal Clean Water Act of 1972, as amended (33 U.S.C. 1313(d)) requires states to identify all "impaired" waters for which effluent limitations and pollution control activities are not sufficient to attain water quality standards. The Section 303(d) list includes those water quality limited segments that require development of total maximum daily loads (TMDLs) to ensure future compliance with water quality standards. TMDLs have been established for several segments of Rock River. Most notably the 12.4-mi (20-km) segment of Rock River, between the City of Janesville's Wastewater Treatment Plant at RM 183.45 and RM 171 at the Illinois State line, is listed as impaired because total suspended solids and total phosphorous contribute to degraded aquatic habitat and low dissolved oxygen, respectively (WDNR 2013b).

The unnamed tributary south of the proposed site (Figure 3–8) discharges to this impaired segment of the river. SHINE collected baseline surface-water quality data for this unnamed tributary from a location where it flows beneath the U.S. Highway 51 bridge near West Happy Hollow Road (SHINE 2013a). The water quality is reflective of the surficial groundwater that provides baseflow to the streams and that indicates some evidence of agricultural runoff based on fecal coliform and nitrate concentrations. The NRC staff visually surveyed this monitoring location during the environmental site audit in July 2013, and it observed that the tributary was a shallow and somewhat braided channel with continuous flow.

In addition to the uses noted earlier in this section, surface-water use in Rock County is primarily limited to use in thermoelectric power generation (Buchwald 2011). Public and community water systems in Rock County use groundwater instead of surface water (Section 3.4.2) (Buchwald 2011; Rock County 2009; SHINE 2013a).

3.4.2 Groundwater

3.4.2.1 Site Description and Hydrogeology

Groundwater beneath the proposed site occurs in unconsolidated and consolidated water-bearing deposits (aquifers). The USGS has broadly classified and grouped the distinct geologic units comprising these aquifers into the surficial aquifer system and the Cambrian-Ordovician aquifer system (Olcott 1992). Neither of these systems contains sole-source aquifers. The geologic units comprising these systems are described in Section 3.3 and are summarized here.

The surficial aquifer system is the most widespread system across Wisconsin and bordering States. Across Rock County, it predominantly comprises Pleistocene-age glacial sediments and younger alluvial sediments that lie atop the bedrock surface (Olcott 1992; SHINE 2013a). At the proposed site, and as shown in Figure 3–7, the local surficial aquifer comprises glacial outwash, a mixture of poorly graded sand and of sand and gravel (GAI 2012b; SHINE 2013a; Zaporozec 1982). The results of geotechnical borings at the proposed site in 2011 (Section 3.3) reveal that sandy sediments extend to a depth of at least 221-ft (67-m) bgs, except for an intervening 10.0- to 18.0-ft-thick (3.0- to 5.5-m-thick) layer of hard clayey silt at a depth of 180- to 185-ft (55- to 56-m) bgs.

As part of the geotechnical and hydrologic/hydrogeologic studies at the Janesville site, SHINE drilled 4 of the 14 boreholes to use as groundwater monitoring wells. The wells were constructed of 2-in. (5-cm) diameter polyvinyl chloride pipe and completed to depths ranging from 60.0 to 71.5 ft (18.0 to 22.0 m). All the borings completed on the proposed site encountered the water table at depths ranging from about 754-ft (230 m) MSL to 766-ft (233 m) MSL, or from about 50- to 65-ft (15- to 20-m) bgs, with about 3 ft (1 m) of seasonal variation (GAI 2012a, 2012b; SHINE 2013a).

Subsequently, SHINE conducted water table and groundwater quality monitoring monthly from October 2011 to September 2012 (SHINE 2013a). SHINE measured water levels and the hydraulic gradient and determined that the direction of groundwater flow beneath the proposed site was southwest (GAI 2012a; SHINE 2013a). The NRC staff found these results consistent with expectations for a surficial aquifer in which the water table is normally a reflection of the overlying topography; the groundwater flow is predominantly in the direction of surface-water drainages that may receive baseflow from groundwater discharge.

To assess the hydraulic conductivity and other characteristics of the surficial aquifer, SHINE selected three of the wells for slug testing. SHINE's analyses yielded an average conductivity (permeability) of 0.0045 ft per second (0.14 cm per second). When modeling the travel time for groundwater that contains any surface seepage, SHINE determined that the average travel time to the Rock River is 77 years, with a standard deviation of 39 years (GAI 2012a).

As a water source, the surficial aquifer in Rock County has demonstrated yields of 5,000 gallons per minute (gpm) (18.9 cubic meters per minute (m^3/min)), with a resulting drawdown of less than 7.0 ft (2.1 m) over a 24-hour period of pumping (Olcott 1968; SHINE 2013a). More typical yields from wells completed in outwash deposits are about 500 gpm (1.9 m^3/min). In contrast, wells completed in glacial till might yield 1 to 10 gpm (0.004 to 0.04 m^3/min) of groundwater to wells. The surficial aquifer is recharged locally from precipitation, with groundwater generally moving downgradient to discharge points (Olcott 1992). The City of Janesville has estimated that the average groundwater recharge rate for Rock County is 6.3 in. per year (16 cm per year) (City of Janesville 2010).

Beneath Rock County, the Platteville-Galena Formations (dolomite), St. Peter Formation (sandstone), Prairie du Chen Group dolomites, and deeper Cambrian sandstone formations represent the Cambrian–Ordovician aquifer system (Section 3.3.1 and Figure 3–7) (Olcott 1992; SHINE 2013a). These units may act as a single aquifer or as independent aquifers, based on the separation of the units by less permeable members (Olcott 1992; SHINE 2013a).

Although the rocks of the Platteville–Galena are considered confining units, particularly where they are overlain by younger sedimentary rocks, they represent a local aquifer in outcrop areas across Wisconsin suitable for domestic water supply (Olcott 1968, 1992). Similarly, the rocks of the St. Peter Formation and Prairie du Chen Group comprise the St. Peter–Prairie du Chien–Jordan Aquifer—also known as the sandstone aquifer in Rock County. In general, recharge to these aquifer strata occurs where the strata outcrop at the surface and also from the overlying glacial sediments (Olcott 1992).

In most areas, the confining units of this aquifer system are leaky and allow vertical downward movement of groundwater within the system (Olcott 1992). In particular, the Prairie du Chien Group and St. Peter Formation outcrop in the major river valleys over much of the western part of Rock County, whereas bedrock east of the Rock River and ridgetops to the west represent the Platteville–Galena (Olcott 1968). On a regional basis, the direction of groundwater flow in the uppermost portion of the Cambrian–Ordovician aquifer system is generally south to southeast toward the Illinois Basin and/or toward regional discharge areas, such as Rock River. The exception is where large pumping centers, such as those in eastern Wisconsin, affect flow (Olcott 1992).

Well yields vary considerably from the individual aquifers that comprise the Cambrian-Ordovician aquifer system (Olcott 1992). However, Olcott (1968) observed that wells completed in the sandstones can yield 1,000 gpm (3.8 m^3/min) or more.

3.4.2.2 Groundwater Quality and Use

Groundwater across Rock County is characterized as good and is suitable for most uses. Its chemical quality is the result of its movement through the surficial sediments and underlying bedrock, which are high in calcium-magnesium carbonate. As a result, the water is primarily of the calcium-magnesium-bicarbonate type in both the surficial and bedrock aquifers.

Groundwater is also very hard because of high concentrations of calcium and magnesium, and it is slightly alkaline (Zaporozec 1982). For the surficial aquifer, the mean concentration of total dissolved solids (TDS) is reported as 351 milligrams per liter (mg/L) with mean TDS concentrations from the Platteville–Galena unit and St. Peter sandstones of 416 and 349 mg/L, respectively (Zaporozec 1982). Groundwater results from onsite monitoring wells revealed TDS concentrations ranging from 340 to 462 mg/L (SHINE 2013a). The State of Wisconsin regulates groundwater quality and administers groundwater protection programs in accordance with Wisconsin Administrative Code NR 140, “Groundwater Quality.”

Rock County obtains nearly all its potable water from groundwater. This includes water for municipal supply and for residential and other private uses, including agricultural and industrial uses (Rock County 2009). The City of Janesville Water Utility uses eight high-capacity wells as its public supply and has established a wellhead protection plan (SHINE 2013a). Four of these are shallow wells that produce from glacial outwash deposits. The wells are completed to depths ranging from 100 to 215 ft (30 to 66 m) with pump capacities ranging from 2,500 to 4,200 gpm (9.5 to 15.9 m^3/min). The remaining three are much deeper wells that withdraw from the sandstone aquifer in the St. Peter Formation. These wells are completed to depths ranging from 1,142 to 1,169 ft (348 to 356 m) deep with pump capacities ranging from 2,400 to 2,600 gpm (9.1 to 9.8 m^3/min) (City of Janesville 2010, 2013b; WDNR 2013c).

The Janesville Water Utility controls high levels of nitrate in some shallow groundwater by blending water from the shallow and deep wells before distribution (City of Janesville 2010, 2013b). The City of Janesville also maintains two covered storage reservoirs with 14 million gallons (53,000 cubic meters (m^3)) of storage capacity. In total, the City of Janesville's groundwater supply system has a capacity of about 32 million gallons per day (mgd) (121,100 cubic meters per day (m^3/d)) and demand is about 10 mgd (37,900 m^3/d) (City of Janesville 2013a). The City of Janesville projects the groundwater demand to increase 50 percent by 2030, with a similar increase countywide (City of Janesville 2010).

The USGS has characterized the hydrogeology of the Rock River Basin, including groundwater flow in the basin, as part of developing a groundwater modeling tool for evaluating the effects of water management programs (Juckem 2009). The groundwater flow model for the Rock River Basin identified 30 high-capacity public wells and 190 irrigation, industrial, and community wells within Rock County. The model does not account for smaller private wells that are responsible for about 20 percent of all the county's groundwater use (City of Janesville 2010).

As part of developing the groundwater flow model, USGS compiled groundwater production data from across the Rock River Basin. Groundwater withdrawals by municipal systems averaged about 84.8 mgd (321,000 m^3/d) for the period from 1997 to 2006, which account for 75 percent of the total groundwater withdrawn from high-capacity wells. The municipal water systems of Janesville (13.2 mgd (50,000 m^3/d)) and Beloit (6.6 mgd (25,000 m^3/d)) were in the top five of such systems, with Madison at the top of the list (32.5 mgd (123,000 m^3/day)). Withdrawals for irrigation and industrial or commercial purposes averaged 27 mgd (102,000 m^3/d) (Juckem 2009). The deeper sandstone aquifers (part of the Cambrian-Ordovician aquifer system) to the east of the Rock River Basin historically have been in a state of overdraft (aquifer drawdown) because of the influence of large, municipal groundwater withdrawals (Avery 2005; Grannemann et al. 2000). However, because of the presence of a hydrogeologic divide and an extensive regional geologic confining unit, groundwater within central and western Rock County is little affected by these influences. The vast majority of groundwater within the county, whether it is within the surficial or Cambrian–Ordovician aquifer systems, cycles and flows within the county and eventually discharges to the Rock River or other streams. It is not lost to, and is not appreciably influenced by, activities in other groundwater basins (Juckem 2009).

The nearest active drinking water well is a private well (State Well No. MF461), which is located about 0.75 mi (1.20 km) northwest of the proposed site. The well has a diameter of 5.0 in. (12.7 cm) and was completed to a depth of 82 ft (25 m) (SHINE 2013a; WDNR 2013d; WDATCP 2013). During the environmental site audit, the NRC staff noted the presence of an additional well just south of the southwestern site boundary (SHINE 2013a). According to the well's completion report, it was drilled in 1974 to service a helicopter port. The well was completed to a depth of 90 ft (27 m) in sand and gravel, with a static water level at 60 ft (18 m) (WDATCP 2013). The well is currently used to supply an indoor sink and to wash down equipment (SHINE 2013b).

3.5 Ecological Resources

3.5.1 Ecoregion

The proposed site is located within the Southeast Glacial Plains ecoregion, which includes 7,725 square miles (mi^2) (20,007 square kilometers (km^2)) in southeastern Wisconsin. This ecoregion primarily consists of glacial till plains and moraines or areas with accumulated soil and rocks left behind from a moving glacier during the Wisconsin Ice Age. The Southeast Glacial Plains has the highest aquatic productivity for plants, insects, other invertebrates, and fish of any ecological landscape in Wisconsin. The main ecological features within the ecoregion include lakes, marshes, fens, sedge meadows, wet prairies, tamarack swamps, and floodplain forests (WDNR 2013e).

The primary undeveloped land cover that provides habitat within the ecoregion includes agricultural cropland (58 percent), followed by wetlands (12 percent) and forests (11 percent). Common forest types include maple-basswood, oak, lowland hardwoods, and conifer swamps. Most forested areas are located in riparian areas along rivers, such as Rock River, or within rugged topography that inhibits agricultural activities. The amount and connectivity of forests and native grasslands have decreased since the 1800s because of agricultural activities and, to some extent, commercial, residential, and other development, thereby leaving few large undisturbed tracts of forest. Wetlands have also declined over time because of hydrologic modifications (e.g., ditching, diking, and tiling), grazing, infestations of invasive plants, and excessive inputs of sediment- and nutrient-laden runoff from croplands (WDNR 2013e).

3.5.2 Site

The proposed site consists of 91 ac (37 ha) of agricultural lands and 0.2 ac (0.1 ha) of developed open space, such as grassy areas. The proposed site has been continuously disturbed from agricultural activities during the past several decades. Because of these agricultural activities, plant communities located on the proposed site are primarily limited to cultivated crops, including corn (*Zea mays*), soybean (*Glycine max*), and winter wheat (*Triticum aestivum*), and to weedy species, including fescue (*Festuca* spp.), green foxtail (*Setaria viridis*), Queen Anne's lace (*Daucus carota*), and common dandelion (*Taraxacum officinale*). Because of the clearing and tilling associated with agricultural activities, the proposed site has no forests, wetlands, grasslands, or prairies. In addition, no water bodies, aquatic habitats, or riparian zones exist within the boundaries of the proposed site (SHINE 2013a).

The proposed site provides habitat for birds, mammals, amphibians, reptiles, and other wildlife tolerant of open or plowed fields and cultivated grasses or other crops. To characterize the types of birds, mammals, reptiles, and amphibians that use the proposed site, SHINE conducted quarterly field reconnaissance survey studies from October 2011 to September 2012 (SHINE 2013a, 2013b).

During each survey, SHINE and its contractors walked through the entire site. SHINE also looked for road kills, tracks, scat, nests, and other lines of evidence to determine what mammals occur on or near the proposed site. SHINE conducted additional birding surveys by driving along the periphery of the proposed site at sunrise, stopping every 0.5 mi (0.8 km), and recording all birds seen or heard during a 3-minute survey period at each stop. SHINE and its contractors conducted birding studies on two separate dates during each of the four seasons. As part of the birding and aquatic surveys, SHINE documented incidental observations of mammals, reptiles, and amphibians.

SHINE and its contractors observed 58 bird species, 9 mammal species, and 7 reptile and amphibian species during the 2011–2012 surveys on and near the proposed site (Table 3–8). Because of the mobility and range of the wildlife described in the table, wildlife observed on agricultural fields near the proposed site also likely use the proposed site as they travel to forage, rest, breed, or seek refuge from predators. The species listed in Table 3–8 are representative of species tolerant of human-altered landscapes, such as agricultural fields. Wildlife that requires trees, native plants, shrubs, or uncultivated grasses would not use the proposed site because of the lack of forested areas, wetlands, and native grasslands.

Table 3–8. Common and Abundant Wildlife Observed on or Near the Proposed Site

Scientific Name	Common Name	On Site	5-mi (8-km) Radius
Birds			
Agelaius phoeniceus	red-winged blackbird	x	x
Branta canadensis	Canadian goose	x	x
Buteo jamaicensis	red-tailed hawk	x	x
Cardinalis	northern cardinal		x
Carduelis tristis	American goldfinch		x
Carpodacus mexicanus	house finch		x
Charadrius vociferus	killdeer	x	x
Corvus brachyrhynchos	American crow	x	x
Eremophila alpestris	horned lark	x	x
Passer domesticus	house sparrow		x
Quiscalus quiscula	common grackle		x
Spizella pusilla	field sparrow	x	x
Sturnus vulgaris	European starling		x
Turdus migratorius	American robin		x
Mammals			
Canis latrans	coyote		x
Didelphis virginiana	opossum		x
Marmota monax	groundhog	x	x
Mephitis	striped skunk		x
Odocoileus virginianus	white tailed deer	x	x
Procyon lotor	raccoon	x	x
Sciurus carolinensis	grey squirrel		x
Spermophilus tridecemlineatus	thirteen-lined ground squirrel		x
Sylvilagus floridanus	eastern cottontail	x	x
Reptiles and Amphibians			
Bufo americanus	American toad		x
Rana catesbiana	bullfrog		x
Rana clanitans	green frog		x
Rana pipiens	northern leopard frog		x
Pseudacris crucifer	spring peeper		x
Chelydra serpentina	common snapping turtle		x
Thamnophis sirtalis	eastern garter snake		x

Source: SHINE 2013a

3.5.3 Habitats in the Vicinity of the Proposed Site

Within a 5-mi (8-km) radius of the proposed site, most of the area (62 percent) is used for agricultural purposes. Vegetation and wildlife within agricultural fields surrounding the proposed site are likely to be similar to those found at the proposed site. The next sections describe other types of habitats—forests, grasslands, wetlands, and aquatic—within a 5-mi (8-km) radius of the proposed site.

3.5.3.1 Forested Habitats

Forests cover 7 percent of the area within a 5-mi (8-km) radius of the proposed site (SHINE 2013a). Typical forests in the vicinity consist of maple-basswood, lowland hardwoods, and oaks (WDNR 2002). Forested habitats primarily occur in riparian areas adjacent to the Rock River and its associated tributaries (SHINE 2013a). Historically, forests covered a larger portion of the area; however, many of the forests have been converted into agricultural fields (WDNR 2013e). Remaining forested tracts, especially in riparian areas, provide important habitat for wildlife and birds. Many neotropical migrating birds use forested riparian habitats along the Rock River for resting, foraging, and providing refuge from predators.

The WDNR (2014b) identified the following two forest communities of special interest within 6 mi (10 km) of the proposed site:

(1) Southern Dry-Mesic Forest. This is an upland forest community that commonly includes white oak (*Quercus alba*), brasswood (*Tilia* spp.), sugar and red maples (*Acer* spp.), white ash (*Fraxinus Americana*), shagbark hickory (*Carya ovate*), and black cherry (*Prunus serotina*). Red oaks (*Q. rubra*) are commonly the most abundant tree species within southern dry-mesic forests.

(2) Southern Mesic Forest. This is an upland forest that commonly includes sugar maples and basswood as the most abundant tree taxa. Other common trees found in southern mesic forests include American beech (*Fagus grandifolia*), walnut (*Juglans* spp.), red oak, red maple, white ash, and slippery elm (*Ulmus rubra*).

3.5.3.2 Grassland Habitats

Grasslands cover about 2 percent of the area within a 5-mi (8-km) radius of the proposed site (SHINE 2013a). Native grasslands include a variety of habitats, including sedge meadows, prairies, and savannas (Sample and Mossman 1997). Before the arrival of European settlers, native grasslands, such as prairies, covered about 50 percent of southern Wisconsin. Agricultural activities converted the majority of native grasslands into cultivated crops. The remaining areas of native grasslands are usually small and disconnected from other patches of native grasslands (Sample and Mossman 1997). These small patches provide lower quality habitat than larger connected tracts of grasslands. Predation, for example, is usually higher along the edge of a patch of prairie than at the center of a large continuous patch of prairie.

The NRC staff notes that cultivated grasses, such as corn and wheat, are sometimes considered grasslands. Because native grasses are relatively rare in the area and native grasses provide a substantially higher quality habitat than cultivated grasses, the NRC staff classified cultivated crops as agricultural lands in this environmental impact statement (EIS).

The WDNR (2014b) identified the following four grassland communities of special interest within 6 mi (10 km) of the proposed site:

(1) Dry Prairie. This is a dry grassland community that usually occurs on steep south- or west-facing slopes or at the summits of river bluffs with sandstone or dolomite bedrock near the surface. Dominant grasses include short- to medium-sized prairie grasses, such as little bluestem (*Schizachyrium scoparium*), side-oats grama (*Bouteloua curtipendula*), hairy grama (*Bouteloua hirsuta*), and prairie dropseed (*Sporobolus heterolepis*).

The Rock River Prairie is about 3 mi (5 km) southwest of the proposed site. The WDNR owns the 37-ac (14-ha) prairie, and the area was designated a State Natural Area in 1999. The prairie supports over 50 native prairie species, including several rare and threatened plants. Typical plant species include pasque flower (*Anemone* *patens*), cream wild indigo (*Baptisia bracteata*), rock sandwort (*Arenaria* spp.), prairie gentian (*Gentiana puberulenta*), little bluestem, and side-oats grama with prairie dropseed (WDNR 2013a).

(2) Dry-Mesic Prairie. This is a rare grassland community that was common in parts of southern Wisconsin. Most dry-mesic prairie has been converted to agricultural lands or forested areas because of the lack of wildfires to control woody vegetation. Dominant grasses include big bluestem (*Andropogon gerardii*) and Indian grass (*Sorghastrum nutans*).

(3) Mesic Prairie. This is an extremely rare grassland community that was historically common. Dominant grasses include the tall grass, big bluestem, little bluestem, Indian grass, needle grass, prairie dropseed, and switch grass (*Panicum virgatum*).

(4) Wet Prairie. This is a variable tall grassland community that may include many wetland-like characteristics. Dominant grasses may include Canada bluejoint grass (*Calamagrostis canadensis*), cordgrass (*Spartina* spp.), marsh wild timothy (*Muhlenbergia glomerata*), lake sedge (*Carex* spp.), water sedge (*Carex aquatilis*), and woolly sedge (*Carex* spp.).

Native grasslands provide an important habitat for wildlife and birds. For example, many birds require grassland habitats for courtship, nesting, foraging, rearing young, roosting, or resting. In Wisconsin, 105 bird species regularly or occasionally use Wisconsin grasslands for at least one of these activities during the breeding season. This represents 45 percent of the 233 confirmed breeding species in the State (Sample and Mossman 1997).

3.5.3.3 Wetlands

Woody wetlands and emergent herbaceous wetlands cover about 3 percent of the area within a 5-mi (8-km) radius of the proposed site (SHINE 2013a). Wetlands provide an important, high-value habitat for both terrestrial and aquatic resources. Migrating birds often use wetland sites for feeding and resting (WDNR 2014c). Areas of open water provide an important nursery ground for many developing amphibians (e.g., frogs and salamanders), reptiles (e.g., turtles), and fish (WDNR 2014c).

3.5.3.4 Aquatic Habitats

As described in Section 3.4, water drains off the proposed site to the south and west toward the Rock River and its tributaries. The closest aquatic resources within this drainage area include an unnamed tributary to the Rock River, which is about 1.6 mi (2.6 km) south of the proposed site, and the Rock River, which is about 1.9 mi (3.1 km) south and west of the proposed site. The unnamed tributary is about 3.0- to 4.0-ft (0.9- to 1.2-m) wide at the ordinary high water mark and has a depth of up to about 1.0 ft (0.3 m) (SHINE 2013a). For a description of the Rock River, see Section 3.4. Aquatic features near the proposed site are part of the Lower Rock River watershed, which drains an area of 1,857 mi^2 (4,810 km^2) (USDA 2007).

SHINE and its contractors conducted fish surveys in the unnamed tributary in October 2011, January 2012, April 2012, and July 2012. Sampling equipment included a seine for fish and a kick net for macroinvertebrates (SHINE 2013a, 2013b). SHINE conducted macroinvertebrate surveys in the unnamed tributary in October 2011 and April 2012 using a kick net (SHINE 2013a, 2013b). In addition, the NRC staff reviewed a fish database compiled by the USGS and the WDNR, which includes the results of various fish surveys in Wisconsin since the 1960s (USGS and WDNR 2014). The NRC staff searched the database to determine fish occurrence data from the Rock River and its tributaries within 5 mi (8 km) of the proposed site.

SHINE observed two species—brook stickleback (*Culaea inconstans*) and green sunfish (*Lepomis cyanellus*) while conducting fish surveys in the unnamed tributary. The low species diversity is likely because of the small size of the unnamed tributary, the intermittent flow of water, and limited survey methods (e.g., seining). During its review of the USGS and WDNR fish database, the NRC staff identified 23 fish species captured from 1980 to 2013 in various surveys in Rock River and its tributaries within 5 mi (8 km) of the proposed site. Table 3–9 summarizes all fish species identified in SHINE's fish surveys and in the USGS and WDNR fish database.

SHINE collected a total of 12 distinct macroinvertebrate taxa in fall 2011 and 9 distinct taxa in spring 2012. The most common taxon was the amphipod *Gammarus*, which comprised 79 percent of the fall collection and 94 percent of the spring collection. All other taxa comprised 5 percent or less of each collection (SHINE 2013a).

Table 3–9. Common Fish Species in the Rock River and Tributaries Within 5 mi (8 km) of the Proposed Site

Scientific Name	Common Name	Rock River and Tributaries[a]	Unnamed Tributary[b]
Aplodinotus grunniens	freshwater drum	x	
Carassius auratus auratus	goldfish	x	
Catostomus commersonii	white sucker	x	
Culaea inconstans	brook stickleback	x	x
Cyprinella spiloptera	spotfin shiner	x	
Cyprinus carpio	common carp	x	
Esox lucius	northern pike	x	
Hypentelium nigricans	northern hogsucker	x	
Ictalurus punctatus	channel catfish	x	
Ictiobus cyprinellus	bigmouth buffalo	x	
Labidesthes sicculus	brook silverside	x	
Lepomis cyanellus	green sunfish		x
Lepomis gibbosus	pumpkinseed	x	
Lepomis macrochirus	bluegill	x	
Micropterus dolomieu	smallmouth bass	x	
Micropterus salmoides	largemouth bass	x	
Moxostoma macrolepidotum	shortnose redhorse	x	
Notropis atherinoides	emerald shiner	x	
Perca flavescens	yellow perch	x	
Percina caprodes	logperch	x	
Pomoxis nigromaculatus	black crappie	x	
Sander canadensis	sauger	x	
Sander vitreus	walleye	x	
Umbra limi	central mudminnow	x	

[a] Occurrence recorded in the USGS and WDNR Fish Mapper Database (USGS and WDNR 2014).

[b] Occurrence observed during SHINE field studies of the unnamed tributary (SHINE 2013a, 2013b).

Source: SHINE 2013a, 2013b; USGS and WDNR 2014

3.5.4 Protected Species and Habitats

The U.S. Fish and Wildlife Service (FWS) and the National Marine Fisheries Service (NMFS) jointly administer the Endangered Species Act of 1973, as amended (ESA) (16 U.S.C. 1531 et seq.). The FWS manages the protection of, and recovery effort for, listed terrestrial and freshwater species, and NMFS manages the protection of and recovery effort for listed marine and anadromous species. In Wisconsin, the WDNR lists species as State-threatened or endangered under Wisconsin's Endangered Species Law (Section 29.604 of Wisconsin Administrative Code, Chapter 29, "Wild Animals and Plants"). This section discusses these species and species protected under the Migratory Bird Treaty Act of 1918, as amended (MBTA) (16 U.S.C. 703 et seq.).

3.5.4.1 Endangered Species Act

Action Area

The implementing regulations for section 7(a)(2) of the ESA define "action area" as all areas affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR 402.02). The action area effectively bounds the analysis of ESA-protected species and habitats because only species that occur within the action area may be affected by the Federal action.

For the purposes of the ESA analysis in this EIS, the NRC staff considers the action area to be to include the lands within the 91-ac (37-ha) proposed site and the adjacent offsite area in which construction of the sewer line would occur. The NRC staff expects all direct and indirect effects of the proposed action to be contained within these areas.

The NRC staff recognizes that while the action area is stationary, Federally listed species can move in and out of the action area. For instance, a flowering plant known to occur near, but outside, of the action area could appear within the action area over time if its seeds are carried into the action area by wind, water, or animals. Thus, in its analysis, the NRC staff considers not only those species known to occur directly within the action area, but those species that may passively or actively move into the action area. The staff then considers whether the life history of each species makes the species likely to move into the action area where it could be affected by the construction, operations, and decommissioning of the SHINE facility.

Overview of Protected Species

Table 3–10 describes the Federally listed species that have the potential to exist within the action area within a 1.0-mi (1.6-km) radius of the proposed site and within a 6-mi (10-km) radius of the proposed site. The NRC staff compiled this table from the FWS's online search (FWS 2014), correspondence from the FWS (2013), and the SHINE environmental report. As described in Section 3.5.2, SHINE conducted ecological surveys in the action area and did not observe any Federally protected species on the proposed site or in nearby adjacent areas (SHINE 2013a). Based on the surveys described in Section 3.5.3, the NRC staff did not identify any Federally listed species that could exist in the action area. The NRC staff did not identify any candidate species or proposed or designated critical habitats within the action area.

In response to the NRC staff's request for endangered and threatened species that the proposed construction and operation could affect, the FWS (2013) stated that no Federally listed, proposed, or candidate species would be expected within the project area. Additionally, no critical habitat is present (FWS 2013). For these reasons, the FWS (2013) concluded that if construction took place at the proposed site, no further action with Wisconsin's FWS Field Office would be necessary under the ESA. Given the available information, the NRC staff concludes that no Federally listed, proposed, or candidate species is unlikely to occur within the action area.

The Rock River does not contain marine or anadromous fish species. Therefore, no Federally listed species or habitats under NMFS's jurisdiction occur within the action area.

3.5.4.2 State-listed Species

Table 3–10 describes the State-listed species that have the potential to exist within a 1.0-mi (1.6-km) radius of the proposed site and within a 6-mi (10-km) radius of the proposed site. The NRC staff compiled this table from the Wisconsin Natural Heritage Program's online database (WDNR 2014d), correspondence from the WDNR (2014a), and the SHINE environmental report (SHINE 2013a). As described in Section 3.5.2, SHINE conducted ecological surveys in the action area and did not observe any State-protected species on the proposed site or in nearby adjacent areas (SHINE 2013a). Based on the surveys described in Section 3.5.3, the NRC staff did not identify any State-listed species that could exist in the action area.

For State-listed species, the WDNR (2014a) stated that the proposed site provides unsuitable habitat for all the State-threatened or -endangered species or for State species of special concern that may exist within a 6-mi (10-km) radius of the proposed site. Because WDNR determined that no State-listed species have the potential to exist within the proposed SHINE site, this EIS does not discuss State-listed species in any further detail.

Table 3–10. Federally and State-Listed Species Within a 6-mi (10-km) Radius of the Proposed SHINE Site

					Potential Occurrence		
Scientific Name	**Common Name**	**Federal Status**[a]	**State Status**[a]	**State Rank**[b]	**Action Area**	**1-mi Radius**	**6-mi Radius**
Fish							
Anguilla rostrata	American eel		SSC	S2			x
Erimystax x-punctatus	gravel chub		E	S1			x
Lythrurus umbratilis	redfin shiner		T	S2			x
Moxostoma valenciennesi	greater redhorse		T	S3			x
Notropis nubilus	Ozark minnow		T	S2			x
Mussels							
Alasmidonta marginata	elktoe		SSC	S3			x
Cyclonaias turberculata	purple wartyback		E	S2			x
Quadrula metanevra	monkey face		T	S2			x
Venustaconcha ellipsiformis	ellipse		T	S3			x
Villosa iris	rainbow shell		E	S1			x
Plants							
Agastache nepetoides	yellow giant hyssop		T	S3			x
Artemisia dracunculus	dragon wormwood		SSC	S2		x	x
Asclepias lanuginosa	woolly milkweed		T	S1			x
Asclepias purpurascens	purple milkweed		E	S3			x
Besseya bullii	kitten tails		T	S3			x
Cacalia tuberosa	prairie Indian-plantain		T	S3			x
Calylophus serrulatus	yellow evening primrose		SSC	S2			x
Camassia scilloides	wild hyacinth		E	S2			x
Cirsium hillii	hill's thistle		T	S3			x
Cypripedium candidum	small white lady's-slipper		T	S3			x
Echinacea pallida	pale purple coneflower		T	S3			x
Euphorbia commutata	wood spurge		SSC	SH			x

Scientific Name	Common Name	Federal Status[(a)]	State Status[(a)]	State Rank[(b)]	Potential Occurrence: Action Area	Potential Occurrence: 1-mi Radius	Potential Occurrence: 6-mi Radius
Hypericum sphaerocarpum	round-fruited St. John's-wort		T	S1,S2			x
Lespedeza leptostachya	prairie bush-clover	T	E	S2			x
Melica nitens	three-flowered melic grass		SSC	S1			x
Myosotis laxa	small forget-me-not		SSC	S2			x
Nothocalais cuspidata	prairie false-dandelion		SSC	S2			x
Nuphar advena	yellow water lily		SSC	S1			x
Penstemon hirsutus	hairy beardtongue		SSC	S1		x	x
Platanus occidentalis	sycamore		SSC	S2			x
Polygala incarnata	pink milkwort		E	S1			x
Polytaenia nuttallii	prairie parsley		T	S2			x
Prenanthes aspera	rough rattlesnake-root		E	S1			x
Ruellia humilis	hairy wild-petunia		E	S2			x
Scutellaria parvula var. parvula	small skullcap		E	S1		x	x
Silene nivea	snowy campion		T	S3		x	x
Thaspium trifoliatum var. flavum	purple meadow-parsnip		SSC	S2			x
Reptiles							
Emydoidea blandingii	blanding's turtle		T	S3, S4			x

[(a)] T = threatened, E = endangered, and SSC = species of special concern.

[(b)] S1 = critically imperiled in Wisconsin because of extreme rarity, S2 = imperiled in Wisconsin because of rarity, S3 = rare or uncommon in Wisconsin, S4 = secure in Wisconsin with many occurrences, and SH = of historical occurrence in Wisconsin.

Sources: SHINE 2013a; WDNR 2014a, 2014d

3.5.4.3 Migratory Bird Treaty Act

The FWS administers the MBTA (16 U.S.C.703–712), which prohibits anyone from taking native migratory birds or their eggs, feathers, or nests. The MBTA definition of a “take” differs from that of the ESA and is defined as “to pursue, hunt, shoot, wound, kill, trap, capture, or collect, or any attempt to carry out these activities” (50 CFR 10.12). Unlike a “take” under the ESA (50 CFR 17.3), a “take” under the MBTA does not include habitat alteration or destruction that results in death or injury to listed species by impairing behavioral patterns, such as breeding, feeding, or sheltering.

The MBTA protects a total of 1,007 migratory bird species (75 FR 9282). Most of the bird species in Wisconsin, except for resident game birds and feral species, are protected under the MBTA (WDNR 2014e). Near the proposed site, migratory birds rely on riparian, forested, grassland, and wetland habitats as important areas for foraging, resting, and avoiding predators and for breeding for some species. Although these habitats exist in the vicinity of the proposed site, none of them exists on the proposed site. For this reason, the proposed site likely provides a low-quality habitat for migratory birds.

3.5.4.4 Magnuson–Stevens Fishery Conservation and Management Act

The National Marine Fisheries Service has not designated any essential fish habitat under the Magnuson–Stevens Fishery Conservation and Management Act, as amended (16 U.S.C. 1801 et seq.), within affected water bodies in the vicinity of the proposed site (NMFS 2014). Because no habitats are designated, no EFH would be affected by the proposed action. Therefore, this section does not discuss species with essential fish habitat.

3.6 Historic and Cultural Resources

This section discusses the cultural background and the known historic and cultural resources at the proposed site in the City of Janesville, Wisconsin, and in the surrounding area, including Rock County and the State of Wisconsin. The discussion is based on a review of the Phase I archaeological survey conducted within the proposed site; a search of the Archaeological Sites Inventory, Architecture and History Inventory, and Burial Sites Inventory; and a review of the Bibliography of Archaeological Reports at the Wisconsin Historical Society (WHS) and other background information for historic and cultural resources within or near the proposed site. Cultural resource reports and site files are available to the public at the WHS in Madison, Wisconsin.

3.6.1 Cultural Background

Human occupation in Wisconsin is generally characterized according to the following chronological sequence (WHS 2013):

(1) Paleo-Indian Period (12,000–10,000 before present (B.P.)),

(2) Archaic Period (10,000–3,000 B.P.),

(3) Woodland Period (3,000–1,100 B.P.),

(4) Mississippian Period (1,100–400 B.P. (ca. A.D. 900–1600)), and

(5) Protohistoric/Historic Period (400 B.P.–present (ca. A.D.1600–present)).

3.6.1.1 Paleo-Indian Period (12,000–10,000 B.P.)

The earliest evidence of people living in Wisconsin dates to the Paleo-Indian Period. Paleo-Indian sites, generally found upland or on river terraces, are characterized by specific types of projectile points (e.g., fluted Clovis and Folsom points) and stone tools, such as gravers, scrapers, or large blades. These artifacts often occur in association with mastodon remains, suggesting a reliance on megafauna (e.g., mammoth, ground sloth, and saber-tooth tiger) for subsistence, along with plants, small game, birds, and amphibians. Social organization consisted of small, highly nomadic bands of hunter-gathers, leaving Paleo-Indian sites with little detailed archaeological information. In southeastern Wisconsin, the Shaefer and Hebior Mammoth sites are examples of the butchering practices of Paleo-Indian tribes and evidence of some of the earliest human occupation in North America (Fagan 2005; Neusius and Gross 2007).

3.6.1.2 Archaic Period (10,000–3,000 B.P.)

The Archaic Period is generally distinguished from the preceding Paleo-Indian Period by changes in the environment, technology, and population. The warmer and dryer part of the Early Archaic Period allowed groups to exploit more diverse resources, and, as a result, their tool kit also became more diversified. Technological changes included the manufacturing of notched projectile points, which were smaller than Paleo-Indian points, likely reflecting a reliance on smaller game (Neusius and Gross 2007). Groups became sedentary when the climate became wetter and warmer as the Archaic Period progressed, and ceremonialism (e.g., mounds and effigies) is evident in the archaeological record during this time. Even though the Archaic Period is one of the longest occupation periods in Wisconsin, few Archaic Period sites are found in the archaeological record.

3.6.1.3 Woodland Period (3,000–1,100 B.P.)

The Woodland Period is marked by an increase in more permanent settlements; changes in burial practices; increased cultivation of plants, such as sunflowers and cucurbits (e.g., squashes, gourds, and melons); and a rise in the manufacture and use of pottery (Fagan 2005). The bow and arrow were also introduced to Wisconsin during this period (WHS 2013). During the Middle Woodland Period, the large and complex Hopewell Culture emerged in the United States, including in southern Wisconsin. This culture is characterized by settlement in villages, increased reliance on intensive horticulture, burial mounds, and long-distance trade networks. These long-distance networks allowed the trade of exotic materials from the Gulf Coast, the Rocky Mountains, Lake Superior, and the Appalachian Mountains to areas far outside their immediate locations (Neusius and Gross 2007).

3.6.1.4 Mississippian Period (1,100–400 B.P. (ca. A.D. 900–1600))

The Mississippian Period is characterized by major changes in settlement, subsistence patterns, and social structure. Large, highly centralized chiefdoms with permanent settlements sites supported by many satellite villages emerged during this period. The platform mound—a new ceremonial earthen mound—appeared in association with these permanent settlements. Platform mounds; burial mounds; and defensive structures, such as moats and palisades, were often constructed in clusters in settlements and were common in the larger river valleys of the Midwest. Mississippian Period subsistence relied heavily on maize agriculture and on hunting and gathering. Long-distance trading increased and craft specialists produced highly specialized lithic and ceramic artifacts, beadwork, and shell pendants (Fagan 2005).

In southern Wisconsin, the emerging Mississippian culture was blended with the receding Woodland culture to produce the Oneota tradition. The Oneota people were organized in permanent villages, produced unique ceramic artifacts, and relied on a mixed subsistence strategy of hunting and gathering even though they cultivated maize. Burial traditions varied from the mounds of the Woodland Period to nonmounded cemeteries near their villages (Neusius and Gross 2007; WHS 2013).

3.6.1.5 Protohistoric/Historic Period (A.D. 1600–present)

The end of the Mississippian Period is characterized by severe social, political, and demographic changes that resulted from indirect and direct contact with Europeans. Before major European advancement in southern Wisconsin, the presence of the Winnebago, Potawatomi, Sac, Fox, and Menominee Tribes was documented in Rock County (Rock County undated b). However, the introduction of European infectious diseases, such as smallpox, yellow fever, typhoid, and influenza, severely decimated these native populations who had no immunity. The spread of these diseases resulted in the widespread abandonment of villages and a concurrent collapse of Native American socioeconomic networks.

The first European exposure to Rock County was likely in the late 1770s from French fur traders (Rock County undated b). As the tribes of southeastern Wisconsin either migrated or were forcibly removed west of the Mississippi, Euro-American settlers moved to Wisconsin to take advantage of the fertile agricultural land. Manufacturing boomed in Rock County in the 1900s, as General Motors (GM), the Parker Pen Company, and other firms began producing tractors; machinery; paper; pens; and refined farm products, such as snack foods. Although manufacturing gained a large market share, agriculture and dairying activities remain an important factor in the regional economy. The area surrounding the proposed site has been traditionally used as agricultural fields, which are located to the north, east, and south of the proposed site. A commercial farm office is also located north of the proposed site (SHINE 2013a).

3.6.2 Historic and Archaeological Resources

Databases that the National Park Service (NPS) maintains show 135 properties listed in the National Register of Historic Places in Rock County, including one property designated as a National Historic Landmark (NPS 2013a, 2013b) under the National Historic Preservation Act (16 U.S.C. 470 et seq.). These historic properties reflect the prehistoric and historic cultural contexts for the proposed site and include prehistoric archaeological sites; historic archaeological sites; and historic buildings, structures, and districts dating from the mid-1700s to the mid-1800s. However, no historic properties are located within the boundaries of the proposed site. The closest property in the National Register of Historic Places list is the John and Martha Hugunin House, which is located about 1.0 mi (1.6 km) northeast of the proposed site and is surrounded by commercial, residential, and agricultural land. The Hugunin House, Italianate in style, is significant for its architectural design and relation to historic farming in the region (NPS 2013a).

SHINE commissioned a Phase I archeological survey at the proposed site and, with its contractors, followed WHS methodologies. SHINE did not identify any archaeological sites or evidence of cultural resources within the survey area. As a result, SHINE did not recommend any further archaeological investigations (Knopf and Krause 2012). SHINE submitted the Phase 1 survey results and report to the WHS for review and comment. The WHS determined that the findings were acceptable (SHINE 2013a).

3.7 Socioeconomics

This section describes socioeconomic factors that have the potential to be directly or indirectly affected from construction, operations, and decommissioning of the proposed SHINE facility. The SHINE facility and the communities that would support it can be described as a dynamic socioeconomic system. The communities provide the people, goods, and services required to construct and operate the proposed SHINE facility. SHINE facility operations, in turn, provide wages and benefits for people and dollar expenditures for goods and services. The measure of a community's ability to support the construction, operations, and decommissioning of the proposed SHINE facility depends on its ability to respond to changing environmental, social, economic, and demographic conditions.

The socioeconomic region of influence is defined by the area in which SHINE operations employees and their families would likely reside, spend their income, and use their benefits—all of which affect the economic condition of the region. For the purposes of analysis and because of the relatively small size of the SHINE operations work force (150 workers), this area includes all of Rock County and the City of Janesville.

3.7.1 Population Growth Rates and Projections

Rock County has 6 cities, 20 towns, and 3 villages (Rock County 2013). In 2012, the total population for Rock County was 160,129. The two most populated cities—the City of Janesville and the City of Beloit—are approximately 13 mi (21 km) apart. The City of Janesville, the county seat for Rock County, has a population of 63,480; the City of Beloit has a population of

36,850. As of 2012, each of the other cities and towns in Rock County had populations of less than 8,000 (Rock County 2013).

The population for Rock County grew steadily from 1970 to 2010, with the largest change of 9.2 percent between 1990 and 2000 (Table 3–11) (USCB 1995, 2000a, 2010a). Based on population projections from the Wisconsin Department of Administration (WDOA), Demographic Services Center, the population within Rock County is projected to continue to increase.

Table 3–11. Resident Population for Rock County (1970–2050)

Year	Rock County	Percent Change
1970	131,970	NA
1980	139,420	5.6
1990	139,510	0.1
2000	152,307	9.2
2010	160,331	5.3
2020	169,130	5.5
2030	179,360	6.0
2040	182,860	2.0
2050	190,847	4.4

Sources: Decennial population data for 1970–2010 (USCB 1995, 2000a, 2010a); projections for 2020–2040 by the WDOA Demographic Services Center (WDOA 2013); 2050 calculated.

3.7.2 Race and Ethnicity

Table 3–12 presents the demographic profiles for the City of Janesville and Rock County (USCB 2010b). In 2010, minorities comprised 11.2 percent of the total population in the City of Janesville. As shown in Table 3–12, the largest minority populations were Hispanic and Latino (of any race) at 5.4 percent followed by Black or African American at 2.5 percent. In Rock County, minorities comprised 15.5 percent of the total population in 2010. The largest minority populations were Hispanic and Latino (of any race) at 7.6 percent followed by Black or African American at 4.8 percent.

Table 3–12. Race and Ethnicity for the City of Janesville and Rock County, Wisconsin, in 2010

	City of Janesville	Rock County
Total Population	63,575	160,331
Race (percent of total population, Not-Hispanic or Latino)		
White	88.8	84.5
Black or African American	2.5	4.8
American Indian and Alaska Native	0.2	0.2
Asian	1.3	1.0
Native Hawaiian and Other Pacific Islander	0.0	0.0
Some other race	0.1	0.1
Two or more races	1.7	1.7

	City of Janesville	Rock County
Ethnicity		
Hispanic or Latino	3,421	12,124
Percent of total population	5.4	7.6
Minority population (including Hispanic or Latino ethnicity)		
Total minority population	7,110	24,805
Percent minority	11.2	15.5

Source: USCB 2010b

3.7.3 Transient Population

Colleges and recreational opportunities attract daily and seasonal visitors who create a demand for temporary housing and services. In 2013, approximately 15,970 students attended colleges and universities within 20 mi (32 km) of the proposed SHINE facility (NCES 2014). According to the 2010 Census, there were 786 seasonal housing units in Rock County.

Migrant farm workers are individuals whose employment requires travel to harvest agricultural crops. These workers may or may not have a permanent residence. Some migrant workers follow the harvesting of crops, particularly fruit, throughout rural areas of the United States. Others may be permanent residents living near Janesville and Beloit and traveling from farm to farm harvesting crops.

Migrant workers may be members of minority or low-income populations. Because migrant workers travel and can spend a significant amount of time in an area without being actual residents, they may be unavailable for counting by Census takers. If uncounted, these minority and low-income workers would be “underrepresented” in the decennial Census population counts.

In the 2002 Census of Agriculture, farm operators were asked for the first time whether they hired migrant workers—defined as a farm worker whose employment required travel—to do work that prevented the migrant workers from returning to their permanent place of residence the same day. The Census is conducted every 5 years and results in a comprehensive compilation of agricultural production data for every county in the Nation.

Information about migrant and temporary farm labor (working less than 150 days) was collected in the 2012 Census of Agriculture. According to the 2012 Census of Agriculture, approximately 1,267 farm workers were hired to work for less than 150 days on 265 farms in Rock County, Wisconsin (USDA 2014). Three farms in Rock County reported hiring migrant workers in the 2012 Census of Agriculture (USDA 2014).

3.7.4 Labor Force, Employment, and Unemployment

This section provides labor force, employment, and unemployment data for the City of Janesville, Rock County, and the State of Wisconsin. It also presents economic data on employment by industry, income, poverty levels, occupations, wages, poverty rates, and housing.

Table 3–13 shows that Rock County had an available labor force in 2012 of 79,255, with an 8.4-percent unemployment rate. The City of Janesville had an available labor force of 32,256, with a 9-percent unemployment rate (WDWD 2010, 2011, 2012). Between 2000 and 2012, unemployment increased in the City of Janesville and in Rock County. One reason for this increase in unemployment in the City of Janesville could be attributed to the GM manufacturing plant. The City of Janesville GM plant employed workers to produce sport utility vehicles and pickup trucks at the end of 2007 (Milwaukee Business Journal 2008). When gas prices rose in the late 2000s, production was shifted to a more fuel-efficient line of cars, causing a decline in the production at the GM plant. The GM plant fully closed in 2009. More than 2,000 hourly and salaried workers were laid off (Leute 2009). In addition to the jobs lost by the GM plant closure, companies in the region that supplied goods and services to the plant laid off approximately 1,200 people (Leute 2009). The unemployment rates in the City of Janesville for 2010 and 2011 reflect the impact of the GM plant closure (Table 3–13). During the same period, the State of Wisconsin as a whole experienced a similar rise in unemployment.

Table 3–13. Labor Force, Employment, and Unemployment Rates in the City of Janesville, Rock County, and the State of Wisconsin

City of Janesville	2000	2010	2011	2012	2000–2012 Percent Change[a]
Labor Force	31,948	32,878	32,091	32,256	1.0
Employed	30,438	29,097	28,850	29,341	-3.6
Unemployed	1,510	3,781	3,241	2,915	93.0
Unemployed Rate	4.7%	11.5%	10.1%	9.0%	91.5
Rock County					
Labor Force	80,895	81,015	78,817	79,255	-2.0
Employed	76,336	71,928	71,321	72,570	-4.9
Unemployed	4,545	9,087	7,496	6,685	47.1
Unemployed Rate	5.6%	11.2%	9.5%	8.4%	50.0
State of Wisconsin					
Labor Force	2,872,104	3,084,557	3,069,021	3,062,636	6.6
Employed	2,734,925	2,823,265	2,837,995	2,850,352	4.2
Unemployed	134,311	261,292	231,026	212,284	58.1
Unemployed Rate	4.7%	8.5%	7.5%	6.9%	46.8

[a] Percent changes are calculated.

Source: USCB 2000a, 2000b, 2000c; WDWD 2010, 2011, 2012

Table 3–14 shows the results of the Bureau of Labor Statistics (BLS) report of employment by industry for Rock County for 2012 (BLS 2013). During 2012, the largest industries for employment in Rock County were trade, transportation, and utilities with a 14,714 employment total or 27.56 percent of employment. The second highest category for employment by industry was education and health services with a 10,288 employment total or 19.27 percent of employment. The employment by industry with the lowest number in 2012 was natural resources and mining, with a 517 employment total or less than 1-percent total of employment.

Table 3–14. Employment by Industry in Rock County for 2012

Industry	Rock County Employment	Percent of Employment
Natural Resources and Mining	517	0.97
Construction	2,719	5.09
Manufacturing	8,991	16.84
Trade, Transportation, and Utilities	14,714	27.56
Information	1,437	2.69
Financial Activities	1,666	3.12
Professional and Business Services	4,994	9.35
Education and Health Services	10,288	19.27
Leisure and Hospitality	6,455	12.09
Other Services	1,607	3.01

Source: BLS 2013

3.7.5 Income and Wages

Table 3–15 compares the median family and per capita income figures for the City of Janesville, Rock County, and the State of Wisconsin (USCB 2011a). According to the USCB 2009–2011 American Community Survey 3-Year Estimates, the City of Janesville had a median family income lower than both Rock County and the State of Wisconsin (USCB 2011a). The City of Janesville had a slightly higher per capita income than that of Rock County, but it was lower than that of the State of Wisconsin. Overall, both Rock County and the City of Janesville had lower median family and per capita income than that of the State of Wisconsin.

Table 3–15. Median Family Income and Per Capita Income for City of Janesville, Rock County, and the State of Wisconsin

Median Family Income	2009–2011
City of Janesville	$57,543
Rock County	$58,679
State of Wisconsin	$63,732
Per Capita Income	**2009–2011**
City of Janesville	$22,924
Rock County	$22,802
State of Wisconsin	$26,212

Source: USCB 2011a

3.7.6 Poverty Rates

Table 3-16 compares families and all people living below the Federal poverty threshold in the City of Janesville, Rock County, and the State of Wisconsin. The poverty levels determined by the USCB in 2011 were $11,484 for individuals and $23,021 for a family of four (USCB 2011b). According to USCB's 2009–2011 American Community Survey 3-Year Estimates, a slightly higher percentage of families and all people living below the poverty level lived in the City of Janesville when compared to Rock County. Both the City of Janesville and Rock County had higher percentages of families and people living below the poverty level than the State of Wisconsin did overall.

Table 3–16. People Living Below U.S. Census Poverty Thresholds for the City of Janesville, Rock County, and State of Wisconsin

Families	**2009–2011**
City of Janesville	11.4%
Rock County	10.7%
State of Wisconsin	8.8%
All People[(a)]	**2009–2011**
City of Janesville	14.8%
Rock County	14.3%
State of Wisconsin	12.9%

[(a)] Census 2010, "All People" category

Sources: USCB 2009–2011a

3.7.7 Housing

Table 3–17 compares the housing units and vacancy rates for the City of Janesville and Rock County (USCB 2009–2011b). According to USCB's 2009–2011 American Community Survey 3-Year Estimates, the City of Janesville had 26,916 total housing units with 1,721 units vacant. Rock County had 68,461 total housing units with 5,478 units vacant. The rental rate was higher than the homeowner vacancy rate in both locations, with Rock County having a slightly higher rental rate at 8.0 percent.

Table 3–17. Housing Unit Characteristics for the City of Janesville and Rock County

City of Janesville	**2009–2011**
Total Number of Housing Units	26,916
Number of Vacant Housing Units	1,721
Homeowner Vacancy Rate	2.0%
Renter Vacancy Rate	6.8%
Rock County	**2009–2011**
Total Number of Housing Units	68,461
Number of Vacant Units	5,478
Homeowner Vacancy Rate	1.9%
Renter Vacancy Rate	8.0%

Sources: USCB 2009–2011b

3.7.8 Local Employers

Table 3–18 ranks the 10 largest private and government employers in the City of Janesville. Three employers have more than 1,000 employees—Mercy Health System, Janesville Public School, and Rock County. These employers provide a variety of products and services, including medical services, public education, local government, wholesale distribution, data processing, manufacturing, and retail sales (Forward Janesville 2014).

Table 3–18. Ten Largest Employers in the City of Janesville (2014)

Employer	Number of Employees	Product/Service
1. Mercy Health System	3,877	Medical services
2. Janesville School District	1,450	Public education
3. County of Rock	1,191	Local government
4. Blackhawk Technical College	762	Technical college
5. Data Dimensions Corporation	724	Business automation processing
6. Grainger	689	Safety equipment distribution
7. Seneca Foods	661	Canning and food processing
8. City of Janesville	572	City government
9. Prent Corporation	550	Custom thermoformer—plastic parts
10. Blain Supply/Blain's Farm & Fleet	540	Wholesale distributors/retail

Sources: Forward Janesville 2014.

Table 3–19 shows that the largest employer in Rock County is Mercy Health System, followed by Beloit Health System with over 1,000 employees each. The largest employer in Rock County that is not located in the City of Janesville is Beloit Health System, Inc. Similar to the City of Janesville, these employers provide a variety of products and services, including medical services, public education, local government, retail, and manufacturing (Rock County Development Alliance 2014).

Table 3–19. Ten Largest Employers in Rock County (2014)

Employer	Number of Employees	Product/Service
1. Mercy Health System	3,877	Medical services
2. Beloit Health System	1,550	Medical services
3. Janesville School District	1,450[a]	Public education
4. County of Rock	1,161	Local government
5. Data Dimensions Corporation	830[a]	Business automation processing
6. Wal-Mart/Sam's Club	804[a]	Retail department store
7. Beloit School District	775[a]	Public education
8. Blackhawk Technical College	701	Technical college
9. Grainger (laboratory safety)	694	Safety equipment distribution
10. Kerry Americas	690	Dehydrated food products

[a] Employs seasonal and part-time workers.

Sources: Rock County Development Alliance 2014

3.7.9 Taxes

Counties, municipalities, and boards of education may impose sales taxes in addition to the State sales tax. Local and State entities in the region of influence impose sales, property, and income taxes. These include the school district, the City of Janesville, Rock County, and the State of Wisconsin. Tax rates can vary by jurisdiction. The retail sales tax rate is 0 percent in the City of Janesville and 0.5 percent in Rock County. The State of Wisconsin has a 4.60-percent to 7.75-percent personal income tax rate, a 5.0-percent sales tax rate, and a 7.9-percent corporate tax rate (City of Janesville undated).

The two school districts in the City of Janesville—Janesville and Milton—receive school district tax levies collected from property taxes in the school district boundaries. The proposed site is in the Janesville School District. In 2011 and 2012, the Janesville School District collected $36,774,828 in school district tax levies. The 2012 and 2013 taxes were $36,077,620 (WDPI 2011–2012, 2012–2013). The City of Janesville's proposed budget for 2013 lists a total estimated assessed value of real and personal property at $3.9 billion. The local tax rate is $7.88 for every $1,000 of property owned (City of Janesville 2013b). The 2012 full property tax value for the City of Janesville was $3,895,706,200 (WDR 2012).

3.7.10 Education

In the 2012–2013 school year, the Janesville School District had 10,327 students in pre-kindergarten (K) through grade 12 (WDPI 2013). The Janesville School District has 12 pre-K to grade 5 elementary schools, 3 grade 6 to 9 middle schools, 2 grade 9 to 12 comprehensive high schools, and 4 charter schools. The Janesville Academy for International Studies, Jackson Elementary School, Lincoln Elementary School, Edison Middle School, and Van Buren Elementary School are the Janesville School District public schools within 2.5 mi (4.0 km) of the proposed site (SHINE 2013b; Janesville School District 2012; WDPI 2013).

The Milton School District, which is also located in the City of Janesville, had 3,388 students in kindergarten (K) through 12th grade for the 2012–2013 school year (WDPI 2013). The Milton School District has four K through grade 3 elementary schools, one elementary school for grades 4 to 6, one middle school for grades 7 to 8, one high school for grades 9 to 12, and one alternative high school.

Rock County has eight public school districts serving K through grade 12 (Rock County 2009). These school districts, with their current total enrollment data for 2013–2014, include Beloit (7,137), Beloit Turner (1,485), Clinton Community (1,188), Edgerton (1,864), Evansville Community (1,719), Janesville (10,408), Milton (3,374), and Parkview (848) (Rock County 2009; WDPI 2013). The total of all enrollments in 2013–2014 for all Rock County school districts is 28,023.

Fourteen private schools are located in Rock County and include 4 private schools in the City of Beloit and 10 private schools in the City of Janesville for K through grade 12 (Private School Review 2013). Three post-secondary schools are located in Rock County. Blackhawk Technical College and University of Wisconsin—Rock County are 2-year technical and community colleges located in the City of Janesville. Beloit College, which offers a 4-year degree, is located in the City of Beloit.

Other educational facilities include the Arrowhead Library System for Rock County, which serves the communities of the City of Beloit (Beloit Public Library), the Village of Clinton (Clinton Public Library), the City of Edgerton (Edgerton Public Library), the City of Evansville (Eager Free Public Library), the City of Janesville (Hedberg Public Library), the City of Milton (Milton Public Library), and the Village of Orfordville (Orfordville Public Library) (Arrowhead Library System 2013).

3.7.11 Tourism, Activity Centers, and Recreation for the City of Janesville and Rock County

Tourism and Activity Centers (Shopping, Business, Agricultural, and Sporting Events)

The City of Janesville has several tourist attractions and activity centers, including the Janesville Performing Arts Center, the Fireside Theater, the 4-H Rock County Fair, a local baseball team, and a local hockey team. The Helen Jeffries Wood Museum Center, Lincoln Tallman House, Milton House Museum, and Angel Museum are all located in or near the City of Janesville. The Janesville Performing Arts Center, Beloit Civic Theatre, Beloit/Janesville Symphony Orchestra, Beloit Fine Arts Incubator, and Beloit International Film Festival all offer access to the arts. The Janesville Shopping Mall is available for local shopping (Janesville Area Convention and Visitors Bureau 2013). Sporting events include a baseball team, the Beloit Snappers; a North American Hockey League, the Janesville Jets; and the semi-pro Ironman Football League.

Public Recreational Facilities

The City of Janesville's Park Place has 2,590 ac (1,048 ha) with 64 improved parks that consist of regional parks, community parks, neighborhood parks, greenbelts, an arboretum, and open spaces. The City of Janesville has 10 mi (16 km) of cross-country ski trails and more than 25 mi (40 km) of paved bike trails. A portion of the statewide Ice Age Trail is located in the City of Janesville (City of Janesville 2011b). No direct trail connections or marked bike routes pass through the proposed site. The City of Janesville also owns two golf courses—the Riverside Golf Course and the Blackhawk Golf Course—and an ice arena (City of Janesville 2011b). The City of Janesville has 34 campgrounds (WDNR undated).

Rock County offers recreational opportunities for biking, hiking, fishing, ice skating, snowmobiling, cross-country skiing, and horseback riding. Several parks, golf courses, and sports facilities are located in Rock County. Rock County parks include Rock River Trail and Roam the Rock. Part of the Wisconsin Ice Age Trail's 1,000-mi (1,600-km) footpath is located in Rock County (Rock County Tourism Council 2012; Ice Age Trail Alliance 2013). In addition, hot air balloon flights are available for balloon rides. Rock River and Lake Koshkonong in Rock County provide recreational opportunities. Rock County has several municipal golf courses, including Blackhawk, Krueger, and Riverside. The county's two ice arenas are the Beloit Sports Arena and the City of Janesville Ice Arena.

Rock County has 15 state-owned natural areas (Table 3–20), including one State park, six wildlife management areas, four fishery management areas, and three areas listed as "other" (WDNR 2013f). Rock County also maintains 226 mi (364 km) of snowmobile trails with the closest located about 2.4 mi (3.9 km) south of the proposed site (SHINE 2013b).

Table 3–20. State-Owned Natural Areas in Rock County

Name	Type of Natural Area
Avon Bottoms Wildlife Area	Wildlife management area
Evansville Wildlife Area	Wildlife management area
Extensive Wildlife Habitat	Wildlife management area
Gift Lands	Other
Ice Age Trail	State park
Lima Marsh-Storrs Lake Wildlife Area	Wildlife management area
Lima Marsh Rough Fish Station	Fishery management area
Miscellaneous Lands	Other
Newville Rough Fish Station	Fishery management area
Statewide All Regulatory Wetland Mitigation Program	Other
Statewide Natural Area	State natural area
Statewide Public Access	Fishery management area
Statewide Wildlife Habitat	Wildlife management area
Streambank Protection Fee Program	Fishery management area
Turtle Creek Wildlife Area	Wildlife management area

Source: WDNR 2013f

3.7.12 Public Services

Medical

The City of Janesville has several medical care facilities, including two hospitals. Mercy Hospital has 240 beds, and St. Mary's Janesville Hospital has 51 beds. The Mercy Health System, Janesville Clinics, has seven homeless shelters and assisted-living care facilities and four nursing homes.

Health care providers in Rock County include the Beloit Health System, Dean Health System, Edgerton Hospital and Health Services, Healthy Communities Cooperative, Mercy Health System, St. Mary's Janesville Hospital, and The Alliance (Rock County Development Alliance 2012).

Emergency Services

Fire/rescue and emergency medical services throughout Rock County are located in the cities of Beloit, Edgerton, Evansville, Janesville, and Milton; the Town of Beloit; and the villages of Clinton, Footville, and Orfordville.

The Emergency Management Agency and the Telecommunications Center are located in the City of Janesville. The Emergency Management Agency coordinates countywide responses and supports local governments during major disasters and emergencies. It also prepares other governmental entities, private business, volunteer organizations, and citizens to respond and recover from major emergencies and disasters. The Telecommunications Center has a 24-hour dispatching service for all Rock County police and law enforcement, fire and rescue, and emergency medical services (Rock County 2014a, 2014b).

Water Treatment

Rock County supplies water to community residents by various water systems and well types—municipal, other than municipal, transient noncommunity, nontransient noncommunity, and private sources of supply water.

The WDNR regulates municipal and industrial operations that discharge wastewater to surface water or groundwater through the Wisconsin Pollutant Discharge Elimination System permit program. Under Section 281.41 of Wisconsin statutes, an owner must obtain WDNR review and approval of municipal and industrial treatment plant construction plans, related monitoring systems, and groundwater monitoring wells (WDNR 2012b).

Rock County manages its wastewater in two ways—with municipal sanitary sewer systems or with onsite waste disposal (septic) systems. Three municipal sanitary sewer systems, located in the City of Beloit, the City of Janesville, and the Town of Beloit, serve more than 10,000 people. The WDNR requires these municipal systems to plan their service capabilities in conformance with the current groundwater quality standards. The many other smaller municipal sanitary sewer systems in Rock County are located in the cities of Edgerton, Evansville, and Milton; Consolidated Koshkonong (Newville area and Indianford); Hanover; and the villages of Clinton, Footville, and Orfordville.

Rock County residents and businesses that do not reside within the boundaries of any of these municipal sanitary sewer system locations treat onsite waste disposal using septic systems. In 2000, the State of Wisconsin adopted a policy allowing conventional (underground) systems and alternative (aboveground) systems. Soil characteristics determine whether conventional or alternative onsite wastewater disposal (septic) systems are used.

Rock County had 13,000 privately operated residential and commercial septic systems in 2009 (Rock County 2009). The septic systems allowed for residential and commercial purposes in

Rock County include conventional, pressure dosing, aerobic treatment unit, at-grade, and mound (i.e., Wisconsin mound wastewater soil treatment system, which is a combination of a, single pass sand filter and dispersal unit).

The conventional system uses a tank with effluent distributed gravitationally that goes to a belowground drain field. A pressure dosing system uses a tank with effluent distributed by a pump through a pressurized pipe system going to a belowground drain field. The aerobic treatment unit uses a tank with effluent distributed by a pump through a pressurized pipe system to either an aboveground or belowground drain field by an aerobic tank where effluent is exposed to air. An at-grade system uses a tank with effluent distributed by a pump through a pressurized pipe system going to a drain field location just below the surface. The mound system uses a tank with effluent distributed by a pump through pressure-fed pipes to an aboveground drain field.

3.8 Human Health

The proposed SHINE facility is a potential source of radiation exposure to onsite workers and offsite members of the public. The Atomic Energy Act of 1954, as amended (42 U.S.C. 2011 et seq.), gives the NRC authority to issue and enforce standards that provide an adequate level of protection for public health and safety and that protect the environment. The NRC staff evaluates the latest radiation protection recommendations from national and international scientific bodies as a basis for its radiation protection standards (10 CFR Part 20). The facilities that the NRC licenses to possess radioactive material must adhere to these radiation protection standards to protect workers and the public against potential health risks from exposure to radioactive material used, generated, and released from the licensed facility. The NRC staff periodically inspects a licensed facility to ensure the facility operates within the NRC requirements. The NRC staff also has enforcement authority to penalize a licensee for a violation of its regulations.

The NRC and the Occupational Safety and Health Administration share responsibility for protecting worker health at nuclear power plants. In September 2013, the NRC and the Occupational Safety and Health Administration updated a Memorandum of Understanding that delineates the general areas of responsibility of each agency, describes how each agency achieves worker protection at facilities licensed by the NRC, and provides guidelines for coordinating activities between the two agencies regarding occupational safety and health (NRC 2013b).

3.8.1 Regulatory Radiological Requirements

A radioisotope production facility using enriched uranium as a fuel must receive a license from the NRC and comply with NRC regulations and conditions specified in the license to operate. A licensee is required to comply with occupational dose limits for adults (10 CFR Part 20, Subpart C) and radiation dose limits for individual members of the public (10 CFR Part 20, Subpart D).

3.8.1.1 Regulatory Requirements for Occupational Exposure

The NRC regulations at 10 CFR 20.1201 establish occupational dose limits. The NRC regulations at 10 CFR 20.1201 specify an annual maximum allowable occupational dose of 5 rem (0.05 sievert) to a radiation worker from exposure to radiation and radioactive material at a licensed facility. The dose limits apply to normal and accident conditions. Under 10 CFR 20.2206, the NRC requires licensees to submit an annual report of their results of individual monitoring for each individual who required monitoring under 10 CFR 20.1502 during that year.

The NRC regulations at 10 CFR 20.2202 and 20.2203 require licensees to submit reports of incidents and occurrences involving personnel radiation exposures that exceed specified doses, radiation levels, and concentrations of radioactive material, respectively. Licensees are required to investigate incidents and occurrences and to take corrective actions as necessary.

3.8.1.2 Regulatory Requirements for Public Exposure

The NRC regulations at 10 CFR 20.1301 specify an annual maximum allowable dose of 100 millirem (1.0 millisievert) to a member of the public from exposure to radiation and radioactive material at a licensed facility. The dose limits apply to normal and accident conditions. In addition, under 10 CFR 20.1101(d), the NRC imposes a 10-millirem (0.01-millisievert) constraint on air emissions of radioactive material released into the environment. This dose constraint, applicable to the proposed SHINE facility, implements 10 CFR 20.1101(b), which requires NRC licensees to use, to the extent practical, procedures and controls based on sound radiation protection principles to achieve doses to members of the public (and facility workers) that are as low as is reasonably achievable.

3.8.1.3 Public Radiological Exposures

The proposed SHINE facility, if approved by the NRC, would be licensed to possess, use, generate, and release radioactive effluents under controlled conditions into the environment during normal operation. SHINE would use radioactive waste management systems to remove radioactivity to maintain the doses to workers and members of the public within the NRC dose limits and to be as low as is reasonably achievable.

Members of the public may be exposed to radioactive material contained in gaseous radioactive effluents released into the atmosphere from the proposed SHINE facility during normal operations. The radioactive materials released under controlled conditions would include krypton-85, iodine-131, xenon-133, and tritium. The NRC would require SHINE to monitor gaseous radioactive effluents to ensure compliance with the NRC requirements. SHINE would not plan to release any liquid radioactive effluents (SHINE 2013a).

The NRC staff evaluates the impact to human health from radioactive material by comparing the estimated dose to a member of the public from the proposed facility, submitted by SHINE in its Environmental Report, against the agency's radiation protection dose limits in 10 CFR Part 20. Dose is calculated based on the amount of time spent in the vicinity of the radioactive effluent or the amount of time the individual's body retains the inhaled or ingested radionuclides (exposure).

Radioactive material released into the environment can expose individuals through the following pathways:

(1) inhaling contaminated air,

(2) standing in a plume of contaminated air,

(3) drinking milk or eating meat from animals that grazed on open pasture on which radioactive material was deposited,

(4) eating vegetables grown near the proposed site that are contaminated with radioactive material releases from the facility, and

(5) being exposed to medical isotopes and low-level radioactive waste shipped off site.

SHINE calculated the dose for the maximally exposed individual (i.e., a hypothetical member of the public potentially subject to maximum exposure) by using site-specific data or conservative (overestimating) assumptions (SHINE 2013a). Because of the low power levels at the proposed facility, the NRC evaluates the potential impacts to human health at a radius of 5 mi (8 km) from the facility (NRC 2012).

3.8.1.4 Occupational Radiological Exposures

SHINE workers who conduct activities involving radioactively contaminated systems or who work in radiation areas can be exposed to radiation. SHINE would monitor its workers in accordance with the NRC's requirements. SHINE expects that most of the occupational radiation dose would result from external radiation exposure rather than from internal exposure resulting from inhaled or ingested radioactive materials. Facility workers are expected to receive radiation exposure while working in the medical isotope production areas of the proposed SHINE facility during the following work activities: handling the product, conducting quality control inspections, packaging the product for transport, maintenance activities, and transporting the product to the end user. Additional exposure would result from handling, storing, packaging, and transporting low-level radioactive waste for disposal (SHINE 2013a).

3.8.2 Chemical Hazards

Chemicals enter the body through the skin, by inhalation, or by ingestion. Chemical exposure produces different effects on the body, depending on the chemical and the amount of exposure. Chemicals can cause cancer, affect reproductive capability, disrupt the endocrine system, and have other health effects. Acute effects from chemical exposure occur immediately (e.g., when somebody inhales or ingests a poisonous substance). Chronic or delayed effects result in symptoms, such as skin rashes, headaches, breathing difficulties, and nausea (NRC 2013c).

At the proposed SHINE facility, chemical effects could result from the routine use of chemicals and hazardous materials during the medical isotope production process. Table 2–4 in Chapter 2 of this EIS contains a list of the chemicals that SHINE plans to use at the facility (SHINE 2013a).

The proposed SHINE facility would release small amounts of nonradioactive laboratory chemicals into the city sewer system as a result of routine facility maintenance activities and performance of analytical procedures. See Section 2.7.2 for a detailed discussion on the use of chemicals at the proposed SHINE facility (SHINE 2013a).

3.8.3 Other Hazards

The proposed SHINE facility is an industrial facility with many of the typical occupational hazards found at other industrial manufacturing or production facilities. Workplace hazards can be grouped into physical hazards (e.g., hazards from slips, trips, and falls from a height and those from transportation, temperature, humidity, and electricity); physical agents (e.g., noise, vibration, and ionizing radiation); chemicals; and psychosocial issues (e.g., work-related stress) (NRC 2013c).

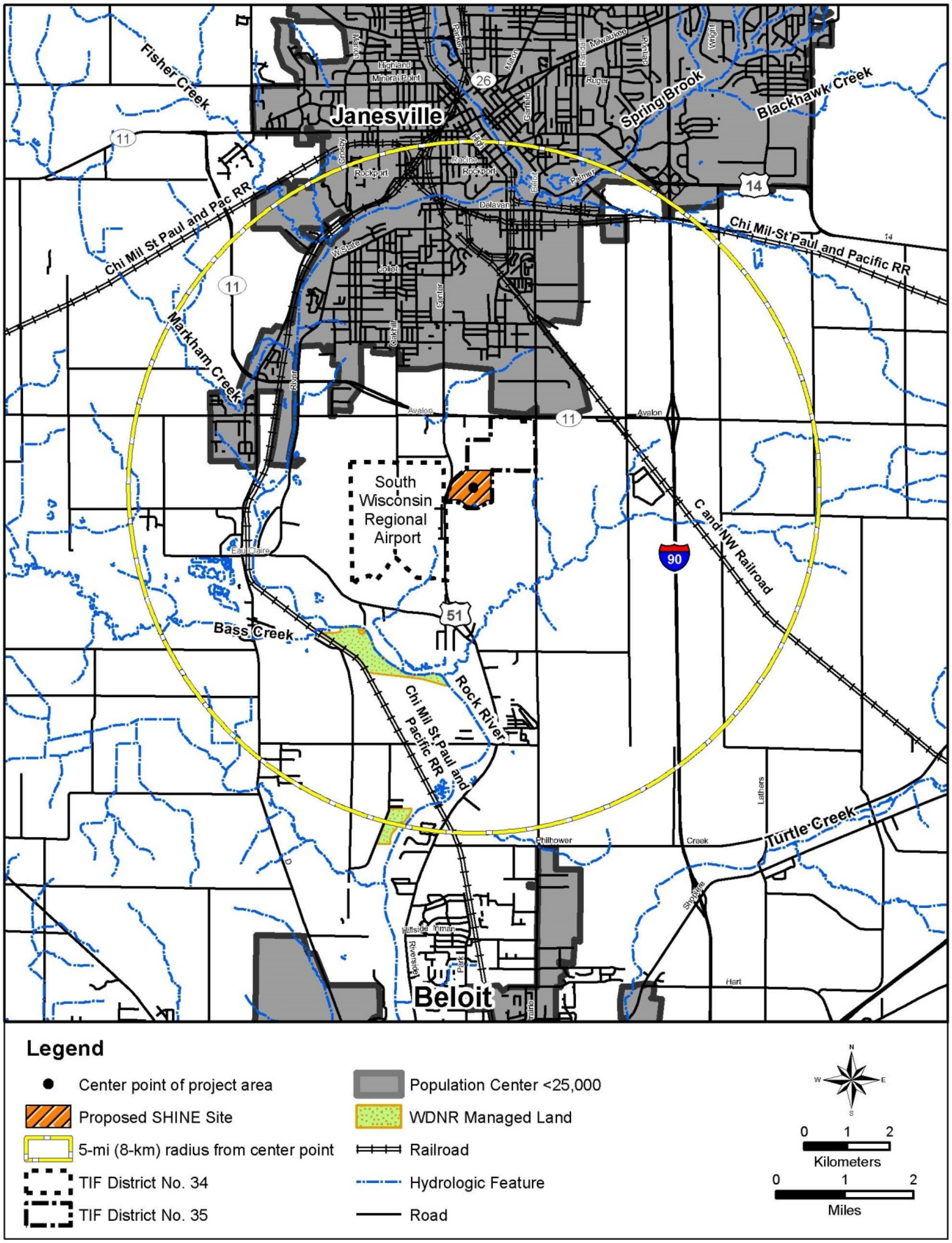
3.9 Transportation Environments

3.9.1 Roads

Figure 3–9 shows major roads and transportation features in the vicinity of the proposed site. The proposed SHINE site lies on the east side of U.S. Highway 51, also known as North

Riverside Drive, directly across from the Southern Wisconsin Regional Airport. U.S. Highway 51 runs north-south, with the City of Janesville to the north and the City of Beloit to the south. The main entrance to the proposed SHINE facility would be on U.S. Highway 51, just north of the intersection with West Enterprise Drive.

1 **Figure 3–9. Existing Transportation Network Near the Proposed SHINE Facility**



2

3 Source: SHINE 2013a

Major highways and roads in the area of the proposed site include the following:

(1) Interstate 39/90 runs generally northwest to southeast and passes about 2.0 mi (3.2 km) to the east of the proposed site. These two designated interstate highways share the same route from approximately the City of Rockford, Illinois, to the City of Portage, Wisconsin.

(2) Interstate 43 runs generally northeast from the City of Beloit, which is located south of the proposed site, to the City of Milwaukee, which is located north of the proposed site.

(3) State Trunk Highway 11 runs east-west to the north of the proposed site and accesses Interstate 39/90.

(4) Town Line Road, a major collector road, runs east-west about 2.7 mi (4.3 km) south of the proposed site. However, this road does not have ramps to or from Interstate 39/90.

(5) U.S. Highway 14 runs generally east-west through the City of Janesville, which is north of the proposed site.

Table 3–21 describes the average daily traffic volumes for these roads and locations. Table 3–22 describes the morning, midday, and evening peak hourly traffic counts for various count locations in the vicinity of the proposed site.

Table 3–21. Average Annual Daily Traffic Counts in the Vicinity of the Proposed Site

Traffic Count Location	Vehicles Per Day
U.S. Highway 51, south of State Trunk Highway 11	9,000
U.S. Highway 51, north of Town Line Road	9,400
State Trunk Highway 11, east of U.S. Highway 51	8,400
State Trunk Highway 11, west of U.S. Highway 51	4,500
State Trunk Highway 11, west of Interstate 39/90	12,400
Interstate 39/90, south of State Trunk Highway 11	45,700
Interstate 39/90, north of State Trunk Highway 11	50,400
Town Line Road, east of U.S. Highway 51	3,400

Source: WDOT 2010a

Table 3–22. Estimated Annual Average Peak and Daily Total Traffic Counts in the Vicinity of the Proposed Site—Number of Vehicles

Count Site No.	Location	Year of Count	A.M. Peak[a]	Midday Peak[b]	P.M. Peak[c]	Daily Total
531345	U.S. Highway 51, north of Happy Hollow Road, Rock Township	2010	667	679	746	8,977
530104	U.S. Highway 51, 1.0 mi south of Southern Wisconsin Regional Airport	2010	693	N/A[d]	802	N/A[d]
531344	State Trunk Highway 11, east of U.S. Highway 51	2010	659	509	703	8,411
531491	State Trunk Highway 11, between River Road and U.S. Highway 51	2010	368	263	382	4,465

Count Site No.	Location	Year of Count	A.M. Peak[(a)]	Midday Peak[(b)]	P.M. Peak[(c)]	Daily Total
530215	U.S. Highway 51, 0.5 mi south of Burbank Avenue, City of Janesville	2010	537	753	401	9,628
531300	Townline Road, between County Highway G and the Interstate 39/90 overpass	2010	58	66	96	1,102

(a) Highest single hourly traffic count for the hours between 00:00 and 09:59.

(b) Highest single hourly traffic count for the hours between 10:00 and 14:59.

(c) Highest single hourly traffic count for the hours between 15:00 and 23:59.

(d) Midday Peak and Daily Total are unavailable because no data were reported for 14:00 to 14:59 hours.

Source: WDOT 2010b

The Beloit-Janesville Express, a route of the Janesville Transit System public transportation network, operates weekdays between the City of Janesville and the City of Beloit via U.S. Highway 51. The stops nearest the proposed site are currently at Kellogg Avenue to the north and at Sunny Lane to the south (City of Janesville 2013c).

3.9.2 Airports

Rock County owns and operates the Southern Wisconsin Regional Airport. It is an air carrier/cargo airport with corporate, general, and cargo aviation but with no scheduled commercial passenger service. The airport has three runways and covers 1,405 ac (569 ha). In 2012, the airport had about 55,000 aircraft operations (i.e., takeoffs and landings combined), three quarters of which were freight operations (Rock County 2009). After Southern Wisconsin Regional Airport, the next closest available airports for proposed SHINE product shipment are Dane County Regional Airport in Madison, Wisconsin, which is about 1 hour from the proposed site, followed by Mitchell International in Milwaukee, Wisconsin, and O’Hare International in Chicago, Illinois, both of which are within 2 hours of the proposed site.

3.9.3 Rail

A Union Pacific rail line runs northwest to southeast about 1.5 mi (2.4 km) to the northeast of the proposed site. This line is not an Amtrak route; it is a freight-only line. The line carries both hazardous and nonhazardous freight. However, this rail line does not provide direct access to the proposed site (Union Pacific Railroad 2013).

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4.0 ENVIRONMENTAL IMPACTS OF CONSTRUCTION, OPERATIONS, AND DECOMMISSIONING

This chapter addresses potential environmental impacts related to the proposed construction, operations, and decommissioning of the SHINE Medical Technologies, Inc. (SHINE), medical radioisotope production facility (SHINE facility). The U.S. Nuclear Regulatory Commission (NRC) standard of significance for impacts uses the Council on Environmental Quality (CEQ) terminology for "significantly" (Title 40 of the *Code of Federal Regulations* (40 CFR) 1508.27). Because the significance and severity of an impact can vary with the setting of the proposed action, both "context" and "intensity," as defined in CEQ regulation 40 CFR 1508.27, were considered. Context is the geographic, biophysical, and social context in which the effects would occur. Intensity is the severity of the impact. Based on this, the NRC established three levels of significance for potential impacts: SMALL, MODERATE, and LARGE. The definitions of these three significance levels, which are presented in the Interim Staff Guidance to NUREG-1537 (NRC 2012), follow:

> SMALL—environmental effects are not detectable or are so minor that they would neither destabilize nor noticeably alter any important attribute of the resource. In 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 this environmental impact statement (EIS), the NRC staff characterized impact levels using the above definitions (NRC 2012). These impacts are grouped and presented according to the resource area. Within each resource area, the NRC staff determined the impacts during each of the three phases: construction, operations, and decommissioning. As describe section 2.2, the NRC staff included the activities and impacts of preoperational activities as part of the construction phase

4.1 Land Use and Visual Resources

4.1.1 Land Use

4.1.1.1 Construction

The proposed SHINE site currently includes 91.1 acres (ac) (36.9 hectares (ha)) of agricultural land and 0.18 ac (0.07 ha) of undeveloped open areas (SHINE 2013a; USGS 2006). Construction of the proposed SHINE facility would permanently disturb and convert 25.67 ac (10.39 ha) of agricultural land and 0.18 ac (0.07 ha) of undeveloped open areas into an industrial area that would include facility buildings, an employee parking lot, facility access roads, a stormwater detention area, and access road drainage ditches (Table 4–1). In addition, 14.54 ac (5.88 ha) of agricultural land would be temporarily converted from agricultural land to a construction parking area and construction material staging or laydown areas. Installation of the water and sewer line would also temporarily affect an additional 0.62 ac (0.25 ha) of offsite agricultural lands immediately adjacent to the northern boundary of the proposed site. Once construction activities are complete, SHINE would restore temporarily affected areas to agricultural fields, cool season grasses, or native prairie (SHINE 2013a). The remaining portion of the site would likely remain as open area or agricultural fields, or it would be converted to cool season grasses or native prairie. The potential conversion of up to 91.1 ac (36.9 ha) of agricultural and cultivated crops would be minor when compared to the 25,236 ac (10,213 ha) of agricultural land remaining within 5 mi (8 km) of the proposed site.

The Farmland Protection Policy Act of 1981 (7 U.S.C. 4201 et seq.) and its implementing regulations requires agencies to make Farmland Protection Policy Act evaluations part of the process under the National Environmental Policy Act of 1969, as amended (NEPA), to reduce the conversion of farmland to nonagricultural uses by Federal projects and programs. Construction of the proposed SHINE facility would convert up to 91.1 ac (36.9 ha) of prime farmland or farmland of statewide significance to industrial use, cool season grasses, or native prairie. However, this is a small percentage of the approximate 41,900 ac (16,900 ha) of prime farmland and farmland of statewide significance within the 5-mi (8-km) region surrounding the proposed site (SHINE 2013a; NRCS 2013). Similarly, the potential relative value of the farmland on the 91.1 ac (36.9 ha) proposed site would be 13,771 bushels (bu) of grain corn or 3,947 bu of soybeans, which is relatively minor when compared to the 10-year production estimate average for Rock County, Wisconsin (22,075,540 bu of grain corn and 3,786,415 bu of soybeans) (USDA 2013). Furthermore, the proposed site is currently zoned light industrial and is part of a larger development project to create an industrial park in Tax Increment Finance (TIF) District No. 35 (City of Janesville 2012). Because the proposed SHINE site has been committed to urban development and zoned light industrial, the proposed site does not have farmland soils subject to the Farmland Protection Policy Act (7 CFR 658.2).

Land-use impacts would be confined to the proposed 91.1 ac (36.9 ha) site and 0.62 ac. (0.25 ha) of offsite agricultural lands immediately adjacent to the northern boundary of the proposed site. Therefore, areas with a special land use or mineral resources (as described in Section 3.1) would not be affected by the proposed construction of the SHINE facility.

Based on the relatively small amount of farmland that would be permanently converted to other land uses, the lack of qualifying important farmland soils within affected areas, the location of the proposed facility within an area zoned for light industrial use, and the lack of special land use or mineral resources on site, land use impacts from construction would be SMALL.

Table 4–1. Acres of Land Required for Construction of the Proposed SHINE Facility

	Permanent Disturbance		Temporary Disturbance		Total Land Cover Within 5 mi (8 km)		
Land Cover Type	ac	ha	ac	ha	ac	ha	Percent
Open Water					796	322	1.6
Developed, Open Space	0.18	0.07			3,043	1,231	6.1
Developed, Low Intensity					5,858	2,371	11.7
Developed, Medium Intensity					1,968	796	3.9
Developed, High Intensity					992	401	2
Barren					43	17	0.1
Deciduous Forest					3,298	1,335	6.6
Evergreen Forest					68	28	0.1
Mixed Forest					1	0	0
Shrub/Scrub					505	204	1
Grassland					1,049	425	2.1
Pasture/Hay					5,896	2,386	11.7

Land Cover Type	Permanent Disturbance		Temporary Disturbance		Total Land Cover Within 5 mi (8 km)		Percent
	ac	ha	ac	ha	ac	ha	
Cultivated Crops	25.67[(a)]	10.39[(a)]	15.16[(a)(b)]	6.13[(a)(b)]	25,236	10,213	50.2
Woody Wetlands					722	292	1.4
Emergent Herbaceous Wetland					787	318	1.6
Total[(c)]	**25.85**	**10.46**	**14.5**	**5.88**	**50,262**	**20,339**	**100**

[(a)] Cultivated crops on the proposed site are located on soils that are prime farmland and farmland of statewide importance.

[(b)] Temporarily disturbed lands include 14.54 ac (5.88 ha) of onsite land and 0.62 ac (0.25 ha) of offsite land.

[(c)] Total may add up to more or less than 100 percent due to rounding.

Source: USGS 2006; SHINE 2013a

4.1.1.2 Operations

Operation of the SHINE facility would not require any new land or require land use changes beyond that required for construction. Therefore, land use impacts during operations would be SMALL.

4.1.1.3 Decommissioning

Decommissioning activities would be similar to construction activities because they would involve heavy equipment to dismantle buildings and remove roadway and parking facilities. Land requirements to perform these activities would be the same or less than those required during construction (SHINE 2014). After decommissioning activities are complete, the proposed site could remain industrial or could be converted back to agricultural land or open space. Given that land requirements would be similar to those described during construction and that, after decommissioning is complete, land would either be industrial, agricultural, or open space, land use impacts during decommissioning would be SMALL.

4.1.2 Visual Resources

4.1.2.1 Construction

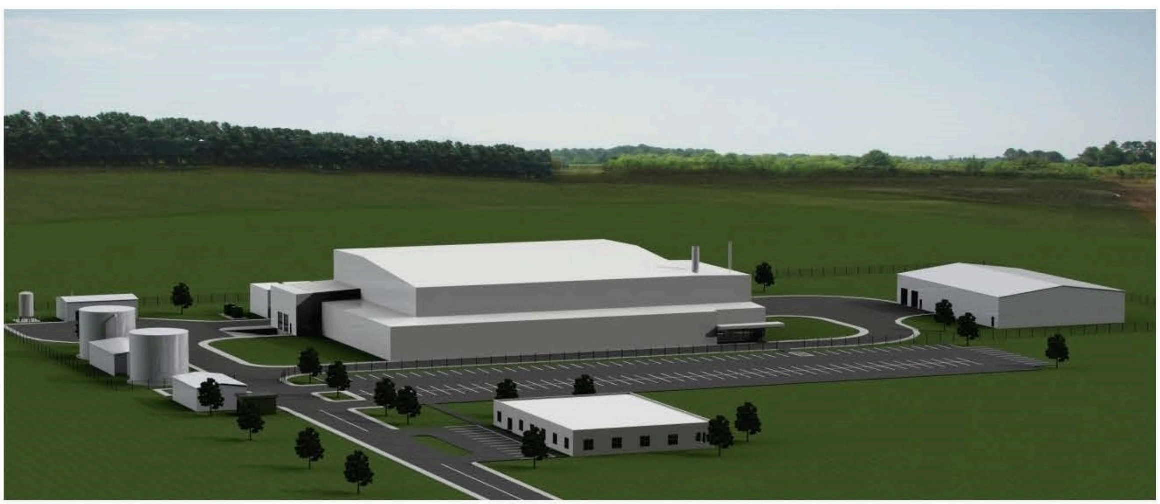
As described in Section 3.1.2, the visual setting of the proposed SHINE facility includes agricultural and light industrial viewsheds. The proposed site is currently used for agricultural purposes, and no existing structures or natural or built barriers, screens, or buffers occur on site. SHINE would build a Production Facility Building that would be approximately 58 ft (18 m) high, 284 ft (87 m) long, and 194 ft (59 m) wide (SHINE 2014). The highest point at the SHINE facility, the exhaust vent on the main building, would be approximately 66 ft (20 m) (SHINE 2014). Figure 4–1 is a conceptual rendering of the proposed SHINE facility based on these dimensions.

The activities associated with construction of the SHINE facility (e.g., excavation, earthmoving, pile driving, and erection) would require large equipment, would significantly alter onsite conditions, and would partially obstruct views of the existing landscape. However, as described in Section 3.1, the NRC staff determined that the proposed site has low scenic quality because of a lack of notable features, uniform landform, low vegetation diversity, an absence of water, mute colors, cultural modifications to adjacent scenery, and a commonality within the physiographic province. The NRC staff also determined that the proposed site has a low sensitivity rating because it is in an area with low scenic values resulting from a low amount of use by viewers, low public interest in changes to the visual quality of the proposed site, a low sensitivity to changes in visual quality by the type of users in the area, and a lack of special natural and wilderness areas. In addition, the viewshed surrounding the proposed site is partially aesthetically altered by light industrial buildings, such as warehouses and an airport. Further, once construction activities are complete, SHINE may vegetate open areas with crops, cool season grasses, or native prairie grasses (SHINE 2013a). Vegetation could partially mitigate impacts to visual resources given that the majority of the surrounding viewshed is cultivated fields or grasses. SHINE would also mitigate impacts by landscaping or planting shrubs along U.S. Highway 51 and bordering access roads (SHINE 2013a). Based on the low scenic quality and light industrial viewshed within the vicinity, construction-related aesthetic impacts would be SMALL.

4.1.2.2 Operations

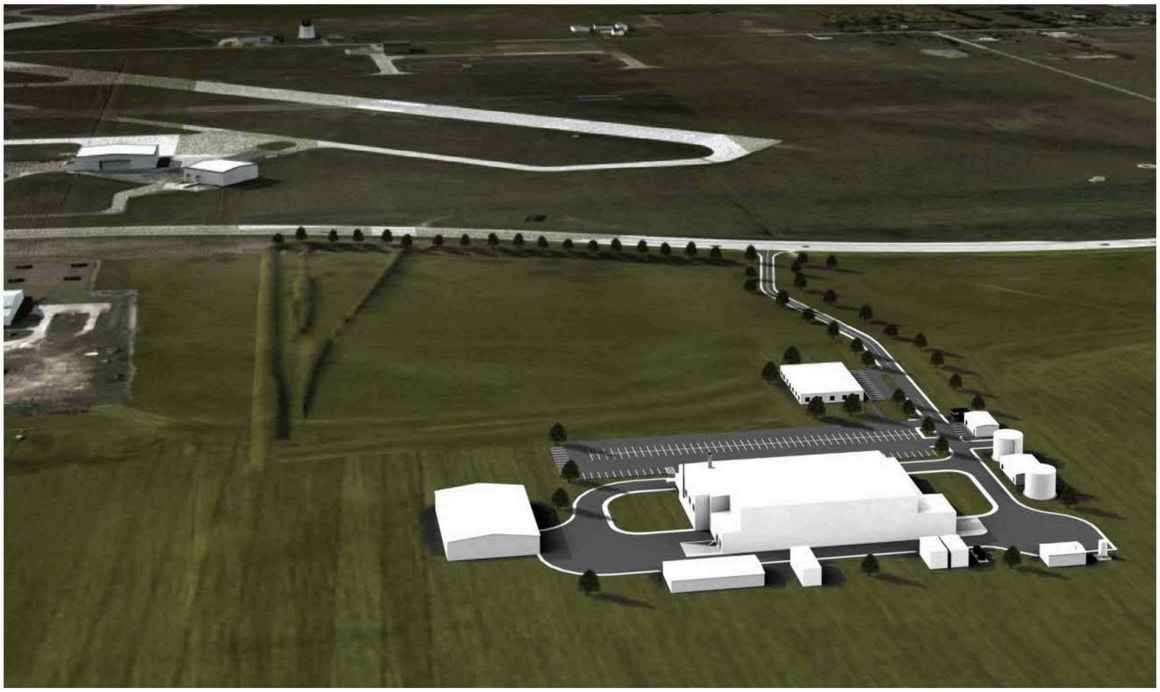
The appearance of the SHINE facility would not change during operation, other than a small steam plume that may be visible coming from the exhaust stack. The steam plume from the exhaust stack is expected to be minimal because opacity associated with the natural gas-fired boiler and heaters tends to be low, as described in Section 4.2.2.1. The plume would be more visible during periods of cold weather, although the size of the plume would still be relatively small. Therefore, visual impacts during operations would be SMALL.

Figure 4–1. Conceptual Rendering of Proposed SHINE Facility



Conceptual View of Proposed SHINE Facility from U.S. Highway 51, Looking Southeast

Figure 4–1. Conceptual Rendering of Proposed SHINE Facility (Continued)



Conceptual View of Proposed SHINE Facility Looking West

Source: SHINE 2014

4.1.2.3 Impacts from Decommissioning

Decommissioning activities would be similar to construction activities because they would involve heavy equipment to dismantle buildings and remove roadway and parking facilities. After SHINE completed decommissioning activities, the proposed site could remain industrial or could be converted back to agricultural land or open space. As the proposed SHINE facility is located in a district zoned for light industrial use and the viewshed surrounding the proposed site is partially aesthetically altered by light industrial buildings, the NRC staff would not expect any changes to the landscape to significantly affect any viewsheds. Therefore, visual impacts during decommissioning would be SMALL.

4.2 Air Quality and Noise

Air and noise emissions would occur during construction, operations, and decommissioning of the proposed SHINE facility. Emission sources, pollutants, and durations would be different for each phase and are discussed below. As discussed in Chapter 3, the region of influence (ROI) for this air quality analysis is Rock County, which is designated as an attainment/unclassifiable area for all criteria pollutants. The ROI for the noise analysis is a 1-mi (1.6-km) radius from the site boundary of the proposed SHINE facility.

4.2.1 Construction

During construction, both air quality and noise levels may be affected near the proposed SHINE facility. Air pollutants would include fugitive dust from earth-moving equipment and other vehicles, exhaust gases from diesel engines, and exhaust gases from worker vehicles as they commute to and from the proposed SHINE facility. Noise would be emitted from diesel engines, backup alarms, and increased traffic as workers commute to and from the proposed SHINE facility and as materials are hauled on and off the construction site. Table 4–2 lists the equipment that would be used during construction. The NRC staff expects actual equipment activity to be lower than what is presented in Table 4–2 because SHINE assumed operation of a majority of the construction equipment throughout the entire construction phase, multiple pieces of the same equipment type and simultaneous use of equipment, and equipment continuously running 5 hours a day during construction (SHINE 2015a). SHINE estimated that a maximum of 451 workers would be needed during construction (SHINE 2014).

Table 4–2. Equipment Used During Construction

Equipment Type	Engine Size (hp)	Total Activity (hours)[(a)]
Asphalt Compactor Cat CB434C	107	521
Asphalt Paver, Barber Greene AP-1000	174	521
Backhoe/Loader Cat 430	105	6,979
Boom Lift JLG 800AJ	65	7,917
Concrete Pump Putzmeister 47Z-Meter[(b)]	300	3,021
Crane (Lattice Boom, Manitowoc 8000-80t)[(b)]	205	1,354
Crane (Picker, Grove RT530E-2 30t)[(b)]	160	5,729
Crane (Picker, Grove RT600E-50t)[(b)]	173	1,146
Dump, Dual axel (15 cy) Mack	350	4,896
Excavator (Large, Cat 345D L)[(b)]	380	521
Excavator (Medium, Cat 321D LCR)[(b)]	148	1,354
Extended Forklift Lull 1044C-54	115	10,104
Fuel Truck, Mack MP6[(b)]	150	1,458
Material Truck 2-1/2t F-650	270	3,229
Mechanic's Truck 2-1/2t F-650	270	2,813
Motor Grader Cat 140M	183	1,563
Pickup Truck F-250	300	19,063
Semi Tracker and Trailer (20 cy) Mack MP8[(b)]	450	7,188
Skidsteer Loader Case SR200	75	8,229
Tracked Dozer Cat D6	150	2,188
Tracked Dozer Cat D7	235	2,708
Tracked Dozer Cat D8[(b)]	310	1,979
Tracked Loader CAT 973C	242	4,479
Vibratory Soil Compactor Cat C874	156	1,458
Water Truck Mack MP6	150	1,146
Portable Air Compressors	50	5,625
Portable Generators	50	6,354
Portable Welders	50	4,688
Walk Behind Compactor	50	2,396

[(a)] Activity represents the total number of hours SHINE would operate equipment during the 18-month construction period. Within each equipment category, several pieces of equipment may be operated simultaneously (SHINE 2015a). Equipment hours are based on construction work schedule, number of hours the equipment is assumed to be used in during the entire18 month construction phase, and equipment utilization factors provided in SHINE 2014, 2015.

[(b)] Equipment anticipated to be utilized during the first 12 months of the construction phase.

Source: SHINE 2014, 2015a

4.2.1.1 Air Quality

During construction, the diesel equipment on site listed in Table 4–2 would generate air emissions. Engine exhausts emit criteria pollutants, and fugitive dust would be generated by earth-moving activities. Employee vehicular traffic would also generate both exhaust and fugitive dust emissions, some of which would occur on site and others would occur off site. However, fugitive dust emissions should be minimal for vehicles when traveling on paved roads off site. Construction-related emissions are summarized in Table 4–3. Additional vehicle-related emissions would be associated with the transportation of shipments and deliveries during construction, as discussed in Section 4.10.1. However, they would be emitted beyond the ROI (SHINE 2014) and would traverse various counties, air quality control regions (AQCRs), and states. Therefore, the air quality analysis focuses on the predominant emission sources during construction, which includes diesel equipment exhaust, worker vehicle commuting, and earth-moving activities.

Table 4–3. Annual Air Emissions During Construction

	Emissions During Construction (tons/yr)						
Source	**CO**	**NO_x**	**Hydro-carbons**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**	**CO_2**
Diesel Equipment Exhaust[(a)]	58	269	2	18	19	19	10,000
Peak Worker Vehicle Exhaust[(a)]	126	9	14	0.3[(d)]	0.06	0.06	4,920
Fugitive Dust[(b)]	-	-	-	-	40	4	-
Total	**183**	**278**	**16**	**18**	**59**	**23**	**14,900**
Percent of Rock County Annual Emissions[(c)]	0.6	5.0	0.1	18	0.7	0.8	1.3

(a) SHINE 2015a

(b) Fugitive dust emissions (as total suspended particles (TSP)) were estimated by SHINE (2014) based on the acres that would be permanently or temporarily disturbed during the construction phase (41.01 ac [16.6 ha]). To calculate particulate matter (PM)$_{10}$ and $PM_{2.5}$, the NRC staff applied the annual construction phase work schedule (50 weeks, 5 days/week, 5 hours/day) and the expected particle-size ratios for PM_{10}/TSP, a ratio of 0.48, and for $PM_{10}/PM_{2.5}$, a ratio of 0.1 (EPA 1984; MRI 2006).

(c) Rock County annual emissions are shown in Table 3–5.

(d) NRC staff applied the emission factors from Cai et al. 2013 to construction worker vehicles-miles provided in SHINE 2014, 2015a to estimate SO_2 emission.

Key: CO = carbon monoxide; NO_x = nitrous oxide; SO_2 = sulfur dioxide; PM_{10} = particulate matter of 10 microns (μm) or less; $PM_{2.5}$ = particulate matter 2.5 μm or less; CO_2 = carbon dioxide

Source: SHINE 2014, 2015a

As shown in Table 4–3, construction-related emissions would be approximately less than 5 percent of countywide emissions for carbon dioxide, carbon monoxide, nitrogen oxides, hydrocarbons, and particulate matter. Sulfur dioxide could result in an increase of up to 18 percent of annual sulfur dioxide emissions for Rock County; however, as explained below, the emissions presented in Table 4–3 are highly conservative. Total greenhouse gas emissions (GHGs) (approximately 15,000 tons of carbon dioxide equivalents (CO_2eq)[4] per year) would be well below the 75,000 TPY of CO_2eq (68,000 metric TPY) threshold for prevention of significant

[4] Carbon dioxide equivalent is a metric used to compare the emissions of GHG based on their global warming potential (GWP). GWP is a measure used to compare how much heat a GHG traps in the atmosphere. GWP is the total energy that a gas absorbs over a period of time, compared to carbon dioxide. Carbon dioxide equivalent is obtained by multiplying the amount of the GHG by the associated GWP. For example, the GWP of methane (CH_4) is estimated to be 21; therefore, 1 ton of methane emission is equivalent to 21 tons of carbon dioxide emissions.

deterioration (PSD) and Title V permits set in the Greenhouse Gas (GHG) Tailoring Rule. As discussed in Section 3.2.2, the nearest currently listed Class I Federal Area for visibility protection is the Seney Wilderness Area in Michigan, about 295 mi (475 km) from the proposed site. EPA recommends that sources located within 62 mi (100 km) of a Class I area be modeled to consider adverse impacts (EPA 1992). Given the distance and estimated emissions from construction, the NRC staff does not anticipate that activities from construction could adversely affect air quality and air quality-related values (e.g., visibility or acid deposition) in the nearest Class I area.

Emissions presented in Table 4–3 should be regarded as bounding conditions for construction activities. The emission estimates presented in Table 4–3 do not account for emission control technologies for diesel engines, best management practices, or mitigative measures that can be implemented during construction-related activities. For instance, SHINE proposes to minimize fugitive dust emissions on site by watering and limiting speeds on unpaved roads, minimizing material handling, stabilizing construction roads and spoil piles, and slope revegetation (SHINE 2013a). Such measures would reduce particulate matter emissions related to land-disturbing activities below those presented in Table 4–3. Furthermore, diesel-related construction equipment emission estimates presented in Table 4–3 are estimated uncontrolled emissions that do not account for control technologies that can be implemented to reduce emissions, such as selective catalytic converters that can reduce emissions (EPA 1996). Estimates are also based on conservative equipment activity values presented in Table 4–2. SHINE plans to implement techniques during construction, where practical, to reduce diesel emissions, such as using ultra-low sulfur diesel fuels (15 parts per million sulfur maximum), deploying new equipment with emission control systems and exhaust filtration devices (diesel oxidation catalyst, diesel particulate matter filters and/or catalytic converters), performing diesel equipment inspections and necessary maintenance to ensure proposed condition of exhaust filtration devices, implementing recommended maintenance procedures, and periodic checks of diesel equipment, and minimizing the idle time of equipment, which would reduce the equipment activity presented in Table 4–2 (SHINE 2013b). Finally, worker commuter emissions assumed a minimum of a 100-mi (160-km) roundtrip commute and a peak number of workers. Because the workforce could travel from all over the 50-mi (80-km) region and not necessarily have a 100-mi roundtrip commute and not all 451 workers would necessarily travel to the site on a daily basis, this projected increase in miles traveled daily for each county is conservative. Furthermore, SHINE will encourage carpooling or other appropriate measures to minimize emissions due to worker vehicles (SHINE 2013). Therefore, the emissions presented in Table 4–3 should be regarded as bounding conditions for construction activities, and, for these reasons, the NRC staff does not expect increased air emissions from construction activities to contribute to concentrations that would exceed National Ambient Air Quality Standards (NAAQS) in Rock County.

SHINE intends to submit an application for a Type A Registration Construction Permit to the Wisconsin Department of Natural Resources (WDNR) (SHINE 2013b). The requirements in the Federal Clean Air Act of 1970, as amended, are implemented within Wisconsin Statutes Chapter 285, “Air Pollution.” WDNR administers its construction permit program under Wisconsin Administrative Code Chapter NR 406. Compliance with the construction permit from WDNR would ensure that the proposed project would meet air pollution standards. SHINE would be required to comply with the requirements and limitations stipulated within the permit.

Given that emissions during construction would be local and temporary (construction phase of 18 months), pollution control measures that would be required in air permits from WDNR, and with Rock County designated as an attainment/unclassifiable area, the NRC staff concludes that air quality impacts during construction would be SMALL.

4.2.1.2 Noise

Noise emissions during construction would occur because of increased traffic volumes on U.S. Highway 51 and because of the use of construction equipment on site. The maximum number of worker vehicles expected on site during construction is 451, all of which would be expected to travel via U.S. Highway 51 during the hours when work starts and stops (SHINE 2013a; SHINE 2014). SHINE modeled highway noise to estimate existing noise levels near U.S. Highway 51 (50 ft [15 m]) away from the road) and used a peak-hour traffic volume of 465 vehicles per hour. If work start and stop times occur during the peak hours modeled, traffic volume would nearly double during some periods during construction. The NRC staff conducted additional noise modeling using the Federal Highway Administration's (FHWA's) Traffic Noise Model (TNM), Version 2.5, which shows adding the proposed SHINE facility construction traffic would increase noise levels near U.S. Highway 51 by less than 3 decibels A-weighted (dBA). Most people are unable to discern noise level differences less than about 3 dBA. Furthermore, posted speed limits and a staggered construction work shift schedule can reduce traffic noise during construction (SHINE 2013a).

The types of equipment that would be used on site during construction are listed in Table 4–2. The noisier equipment from this list was modeled by the NRC staff using the FHWA's Roadway Construction Noise Model, Version 1.1. Modeling results show a maximum noise level of about 53 dBA at the nearest residence to the proposed site (about 0.3 mi (0.5 km) away from the site boundary). This noise level would be well below existing ambient noise levels (about 65 dBA but sometimes greater because of the airport and traffic on U.S. Highway 51) and would not be noticeable by most people.

Given the minor (less than 3 dBA) increase in noise levels caused by additional vehicle traffic and estimated noise levels from construction equipment not exceeding existing ambient noise levels, the NRC staff concludes that offsite noise impacts from construction would be SMALL.

4.2.2 Operations

4.2.2.1 Air Quality

Air emissions from operating the proposed SHINE facility would be predominantly from two sources: (1) radioisotope production and (2) fuel combustion associated with processing and facility heating purposes. Additional emissions would come from vehicular traffic from workers commuting and from transportation of shipments and deliveries during construction. However, shipment-related emissions would be emitted beyond the ROI (SHINE 2014) and would traverse various counties, AQCRs, and states. Therefore, the air quality analysis presented below focuses on emissions from radioisotope production, fuel combustion associated with processing and facility heating purposes, and vehicle worker commuting. The effects on nearby air quality resulting from these emissions would be determined by what and how much is emitted; how and where pollutants are emitted (stack location, size, temperature, and exhaust velocity); and ambient meteorological conditions.

<u>Radioisotope Production</u>

A criteria air pollutant that would be emitted from the radioisotope production process includes nitrogen oxide. SHINE would use nitric acid in target solution vessels (TSVs) and in the thermal denitration process, resulting in the formation and release of nitrogen oxides. SHINE would treat gaseous effluents through the control ventilation systems, which involves two stages of high-efficiency particulate air filters before being vented to the atmosphere through the main stack of the production facility. Total nitrogen oxide emissions from the radioisotope production process would be about 3 TPY (SHINE 2013a).

Fuel Combustion

Diesel and natural gas combustion sources are listed in Table 4–4. Four natural-gas-fired heaters and one boiler would be used to meet heating and hot water requirements for the proposed SHINE facility. Additionally, a diesel generator would be used for emergency power (SHINE 2013a). Emissions from diesel and natural gas combustion sources are summarized in Table 4–5. Estimated fuel combustion-related emissions from the facility during operation, as provided in Table 4–5 are well below the major source threshold of 100 TPY for criteria pollutants requiring a Title V operation permit. GHG emissions (approximately 15,700 TPY of CO_2eq) would be well below the 75,000 TPY of CO_2eq threshold for PSD and Title V permits set in the Greenhouse Gas (GHG) Tailoring Rule. Furthermore, SHINE plans to develop programs, when appropriate, to avoid and control GHG emissions and implement energy efficiency and conservation at the facility (SHINE 2013a). Therefore, the NRC staff anticipates that emissions from combustion-related activities during operation will not be a major source and, therefore, has little potential for significantly affecting air quality or interfering with plans to achieve compliance with the NAAQS.

Table 4–4. Fuel Combustion Sources

		Heat Input Rates (MMBTU/hr)	
Description	**Fuel**	**Maximum**	**Expected Load**
Emergency Generator	Diesel	43.56	NA
Production Building Boiler	Nat. gas	30	23.6
Support Facility Building	Nat. gas	0.42	0.337
Administration Building	Nat. gas	0.29	0.233
Waste Staging and Shipping Building	Nat. gas	0.18	0.142
Diesel Generator Building	Nat. gas	0.072	0.058

Source: SHINE 2013a, 2013b

Table 4–5. Fuel Combustion Emissions During Operations

	Maximum Emissions (ton/yr)					
Description	**CO**	**NO_x**	**PM_{10}[(a)]**	**Hydrocarbons**	**SO_2**	**CO_2**
Emergency Generator[(b)]	0.36	3.52	0.026	0.12	0.01	345
Production Building Boiler[(c)]	10.37	6.22	0.92	0.67	0.08	14,822
Support Facility Building[(c)]	0.067	0.16	0.013	0.01	0.001	208
Administration Building[(c)]	0.05	0.12	0.009	0.007	0.001	143
Waste Staging and Shipping Building[(c)]	0.03	0.07	0.005	0.004	0.001	89
Diesel Generator Building[(c)]	0.01	0.03	0.002	0.002	0.001	36
Total	10.9	10.1	1.00	0.81	0.09	15,642

(a) Particulate emissions from diesel and gas combustion are assumed to be less than 1 μm in diameter. Hence, $PM_{2.5}$ and PM_{10} emissions are the same.

(b) Generator emissions of CO, NO_x, PM, and hydrocarbons were computed using emission factors from the CAT C175-20 Diesel Engine Data Sheet provided by Caterpillar. SO_2 emissions are based on a maximum of 50 parts per million (ppm) sulfur in the fuel. CO_2 emissions were computed using an emission factor from Section 3.4 of AP-42 (EPA 2006).

(c) Emissions from gas-fired heaters and boilers were calculated using emission factors from Section 1.4 of AP-42 (EPA 2006).

Source: SHINE 2013b

SHINE computed air pollutant concentrations near the proposed SHINE facility during operations using the American Meteorological Society/EPA Regulatory Model (AERMOD), Version 123145. Air pollutant concentrations modeled include emissions from the radioisotope production process and heater and boiler combustion during operation (SHINE 2013a). Emissions from the standby diesel generator were not accounted for in the model because its use would be infrequent (SHINE 2013a). SHINE used surface and upper air meteorological data from Madison, Wisconsin (Station 14837), for the years 2006 to 2010. Modeled air pollutant concentrations (maximum predicted impact) for each pollutant resulting from operation (production process and heater and boiler combustion) were added to ambient background concentrations and compared with NAAQS. SHINE's modeling results are shown in Table 4–6.

Table 4–6. SHINE Air Dispersion Modeling Results

Pollutant	Averaging Period	Maximum Predicted Impact ($\mu g/m^3$)[a]	Year	Total Concentration ($\mu g/m^3$)[b]	NAAQS ($\mu g/m^3$)
CO	1-hr	26.45	2009	1,389	40,000[c]
	8-hr	12.16	2007	1,203	10,000[c]
NO_2	1-hr	61.57	2007	117	188
	Annual	1.722	5-yr	26	100
SO_2	1-hr	0.2266	2009	13	196
	3-hr	0.1238	2010	43	1,310
	24-hr	0.0584	2008	-	NA[d]
	Annual	0.0062	5-yr	-	NA
PM_{10}	24-hr	0.7318	2008	48	150
	Annual	0.0786	5-yr	-	NA
$PM_{2.5}$	24-hr	0.75	5-yr	29	35
	Annual	0.09	5-yr	10	12

[a] Values represent the highest predicted impacts for each pollutant and averaging time.

[b] Total concentrations provided are the maximum predicted impact plus background concentrations.

[c] The value shown is approximate. The NAAQS is expressed in units of ppm or parts per billion.

[d] NA = Not applicable. No current NAAQS applies to this averaging time.

Source: SHINE 2013b; EPA 2012a.

As can be seen from Table 4–6, total concentrations (maximum predicted impact plus background concentration) for each pollutant do not exceed the NAAQS. In other words, the additional emissions resulting from operation did not result in NAAQS thresholds being exceeded. Therefore, the NRC staff concludes that violations of NAAQS are not expected as a result of increased air emissions from operation of SHINE. Additionally, the maximum impacts include consideration of building downwash effects. Therefore, these values are conservative and bounding. Visibility modeling was not performed for this project because of the low emission rates and resulting pollutant concentrations. No visible plume other than steam is expected from SHINE stacks during normal operation. The nearest currently listed Class I Federal Area for visibility protection is the Seney Wilderness Area in Michigan, about 295 mi (475 km) from the proposed site. EPA recommends that sources located within 62 mi (100 km) of a Class I area be modeled to consider adverse impacts (EPA 1992). Given the distance and estimated emissions from operation, the NRC staff does not anticipate that activities from operation could adversely affect air quality and air quality-related values (e.g., visibility or acid deposition) in the nearest Class I area.

SHINE would control emissions of nitrogen oxide from the natural-gas-fired boiler using low nitrogen oxide burners and emissions from gas-fired heaters using combustion controls and properly designed and tuned burners (SHINE 2013a). The generator would be required to meet applicable New Source Performance Standards (40 CFR Part 60, Subpart IIII) and National Emission Standards for Hazardous Pollutants (40 CFR Part 63, Subpart ZZZZ). Emissions from radioisotope production and fuel combustion sources would be emitted through stacks. Terrain near the proposed SHINE facility is relatively flat and, therefore, should not affect dispersion of pollutants. SHINE intends to submit an application for a Type A Registration Operation Permit to WDNR for stationary equipment (e.g., emergency generator) (SHINE 2013b). The operating permit from WDNR would set limits and establish monitoring, recordkeeping, and reporting requirements with which SHINE would be required to comply.

Additional emissions would result from workforce vehicles. Approximately 150 passenger vehicles would enter and leave the proposed SHINE facility on a daily basis (SHINE 2013b, 2014). Vehicular emissions would occur wherever the vehicles are driven, both on and off the proposed SHINE facility. Employee vehicle emissions during operation are summarized in Table 4–7. Additional vehicle-related emissions would be associated with the transportation of waste shipments, as discussed in Section 4.10.2, during operation. However, these emissions would be emitted beyond the ROI because they are expected to be shipped to a facility in Clive, Utah (SHINE 2014) and would therefore traverse various counties, AQCRs, and states. Minimal air emissions resulting from waste shipments would be emitted within Rock County.

Table 4–7. Vehicle Emissions During Operation

	Emissions During Operation (TPY)						
Activity	**CO**	**NO_x**	**Hydro-carbons**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**	**CO_2**
Worker Commuting Exhaust	42	3	5	0.1[a]	0.02	0.02	1,600

[a] NRC staff applied the emission factors from Cai et al. 2013 to worker vehicles-miles provided in SHINE 2014, 2015a to estimate SO_2 emission.

Source: SHINE 2014, 2015a

When estimated emissions from vehicles (Table 4–7) are added to the estimated emissions from radioisotope production and fuel combustion emissions (Table 4–5), total emissions are below the major source threshold of 100 TPY for criteria pollutants that would require a Title V permit and are below 250 TPY, which is the threshold for triggering PSD requirements (as discussed in Section 3.2.2). Furthermore, total GHGs (approximately 17,300 TPY of CO_2eq) are below the 75,000 TPY of CO_2eq threshold for PSD and Title V permits set in the Greenhouse Gas (GHG) Tailoring Rule. Therefore, the NRC staff anticipates that emissions from related activities during operation has little potential for significantly affecting air quality or interfering with plans to achieve compliance with the NAAQS.

Given that modeled air emissions from operation do not exceed NAAQS, that estimated emissions from operation-related activities are below the 100-TPY major source threshold, that Rock County is designated attainment/unclassifiable status and given the provisions that would be established in the air permit, the impact of the proposed SHINE facility on air quality during operation is expected to be SMALL.

4.2.2.2 Noise

Noise emissions during operation would occur because of increased traffic volumes on U.S. Highway 51. Noise from operating equipment would be contained inside buildings and would not be audible outside the proposed SHINE buildings at the site.

The number of worker vehicles expected during operation is 150 (SHINE 2013a, 2014). Adding this traffic volume to the TNM modeling completed for existing traffic levels would increase noise levels near U.S. Highway 51 by about 1 dBA. Most people are unable to discern noise level differences less than about 3 dBA.

The Southern Wisconsin Regional Airport currently operates approximately 105 flights per day, 38,400 flights per year (FAA 2014). Flight operations may increase because of the demand to transport materials to and from the proposed SHINE facility. Up to 468 medical shipments would occur each year associated with the proposed action with most being transported by air (SHINE 2013a). However, these increases are not anticipated to cause an appreciable increase in noise above the current operations.

Given that noise emissions from operating equipment are not expected to be audible beyond the building facility, that additional noise emissions caused by worker vehicles are minor (1 dBA), and that noise emissions from shipments are not anticipated to increase noise levels from current airport operations, the NRC staff concludes that offsite noise impacts during operation would be SMALL.

4.2.3 Decommissioning

Decommissioning activities would be similar to construction activities. The decommissioning activities would include, for example, vehicular traffic, earth-moving equipment, demolition of structures, and dismantlement and decontamination of systems over a period of 6 months (SHINE 2013a). Table 4–8 lists the equipment that would be used during the decommissioning phase. The NRC staff expects actual equipment activity to be lower than what is presented in Table 4–8 because SHINE assumed operation of the construction equipment throughout the entire decommissioning phase, multiple pieces of the same equipment type and simultaneous use of equipment, and equipment continuously running 5 hours a day during decommissioning (SHINE 2015a). SHINE estimated that a maximum of 261 workers would be on the proposed SHINE site at one time during decommissioning (SHINE 2013a, 2014).

Table 4–8. Diesel Equipment Used During Decommissioning

Equipment Type	Engine Size (hp)	Total Activity (hr)[(a)]
Backhoe/Loader Cat 430	105	3.542
Boom Lift JLG 800AJ	65	3,958
Crane (Lattice Boom, Manitowoc 8000–80t)	205	729
Crane (Picker, Grove RT530E-2 30t)	160	2,917
Crane (Picker, Grove RT600E- 50t)	173	625
Dump, Dual axel (15 cy) Mack	350	2,500
Excavator (Large, Cat 345D L)	380	313
Excavator (Medium, Cat 321D LCR)	148	729
Extended Forklift Lull 1044C-54	115	5,104
Fuel Truck, Mack MP6	150	729
Material Truck 2-1/2t F-650	270	1,667
Mechanic's Truck 2-1/2t F-650	270	1,458
Motor Grader Cat 140M	183	833
Pickup Truck F-250	300	9.583

Equipment Type	Engine Size (hp)	Total Activity (hr)[(a)]
Semi Tracker and Trailer (20 cy) Mack MP8	450	3,646
Skidsteer Loader Case SR200	75	4,167
Tracked Dozer Cat D6	150	1,146
Tracked Dozer Cat D7	235	1,354
Tracked Dozer Cat D8	310	1,042
Tracked Loader CAT 973C	242	2,292
Vibratory Soil Compactor Cat C874	156	729
Water Truck Mack MP6	150	625
Portable Air Compressors	50	2,813
Portable Generators	50	3,229
Portable Welders	50	2,396
Walk Behind Compactor	50	1,250

(a) Activity represents the total number of hours SHINE would operate equipment during the 6-month decommissioning period. Within each equipment category, several pieces of equipment may be operated simultaneously (SHINE 2015a). Equipment hours are based on decommissioning work schedule, number of hours the equipment is assumed to be used in 6 months, and equipment utilization factors provided in SHINE 2014, 2015a.

Source: SHINE 2013a, 2014, 2015a

4.2.3.1 Air Quality

During decommissioning, the diesel equipment on the proposed SHINE site would be a source of air emissions (Table 4–8). Engine exhausts emit criteria pollutants, and fugitive dust would be generated by earth-moving activities. Vehicular traffic would also generate both exhaust and fugitive dust emissions, some of which would occur on site and some off site. Emissions are summarized in Table 4–9. Additional vehicle-related emissions would be associated with the transportation of waste shipments, as discussed in Section 4.10.3 during decommissioning. However, these emissions would be emitted beyond the ROI because they are expected to be shipped to a facility in Clive, Utah (SHINE 2014) and would therefore traverse various counties, AQCRs, and states. Minimal air emissions resulting from waste shipments would be emitted within Rock County.

Table 4–9. Air Emissions During Decommissioning

Source	Emissions During Decommissioning (tons/yr)						
	CO	NO_x	Hydro-carbons	SO_2	PM_{10}	$PM_{2.5}$	CO_2
Diesel Equipment Exhaust[(a)]	37	170	14	11	12	12	6,400
Peak Worker Commuting Exhaust[(a)]	73	5	8	0.1[(d)]	3	3	2,900
Fugitive Dust[(b)]					7	0.7	
Total	110	175	22	11	22	16	9,300
Percent of Rock County Annual Emissions[(c)]	0.3	3.0	0.2	11	0.2	0.5	0.8

(a) SHINE 2014

(b) Fugitive dust emissions (as TSP) were estimated by SHINE 2014 based on the acres that would be permanently or temporarily disturbed during construction (25 ac). To calculate PM_{10} and $PM_{2.5}$, the NRC staff applied the decommissioning phase work schedule (25 weeks, 5 days/week, and 5 hours/day) and the expected particle size ratios for PM_{10}/TSP, a ratio of 0.48, and $PM_{10}/PM_{2.5}$, a ratio of 0.1 (EPA 1984; MRI 2006).

(c) Rock County annual emissions are shown in Table 3–5.

(d) NRC staff applied emission factors from Cai et al. 2013 to worker vehicles-miles provided in SHINE 2014, 2015a to estimate SO_2 emission.

Source: SHINE 2014, 2015a

As shown in Table 4–9, emissions during decommissioning would be less than 3 percent of total countywide emissions of pollutants, with the exception of sulfur dioxide. Sulfur dioxide could result in an increase of up to 11 percent of annual sulfur dioxide emissions for Rock County. The NRC staff expects SHINE emissions to be low enough that resulting air quality concentrations should not cause NAAQS to be exceeded. Similarly, total GHGs (approximately 9,330 tons of CO_2eq per year) would be well below the 75,000 TPY of CO_2eq threshold for PSD and Title V permits set in the GHG Tailoring Rule.

The emission estimates presented in Table 4–9 did not account for emission control technologies for diesel engines or mitigative measures that can be implemented during construction activities. For instance, SHINE proposes to minimize fugitive dust emissions by watering disturbed areas and unpaved roads and by limiting speeds on unpaved site roads (SHINE 2013a). Such measures should reduce dust emissions below those presented in Table 4–9 and should prevent fugitive dust from adversely affecting highway or airport traffic. Emissions are estimated based on equipment activity presented in Table 4–8, which are bounding and conservative. Actual emissions are expected to be lower depending on the exact use of equipment. Additionally, estimated diesel-related equipment emissions are for uncontrolled emissions that do not consider emission control technologies. SHINE plans to implement techniques during decommissioning, where practical, to reduce diesel equipment emissions, such as using ultra-low sulfur diesel fuels (15 parts per million sulfur maximum), deploying new equipment with emission control systems and exhaust filtration devices (diesel oxidation catalyst, diesel particulate matter filters and/or catalytic converters), performing diesel equipment inspections and necessary maintenance to ensure proposed condition of exhaust filtration devices, implementing recommended maintenance procedures, and periodic checks of diesel equipment, and minimizing the idle time of equipment, which would reduce the equipment activity presented in Table 4–9 (SHINE 2013b). Furthermore, worker commuter emissions assumed a minimum 100-mi (161-km) roundtrip commute. Because the workforce could travel from all over the 50-mi (80-km) region and not necessarily have a 100-mi (161-km) roundtrip commute, this projected increase in miles traveled daily for each county is conservative. Therefore, emissions in Table 4–9 are bounding and conservative.

Given that air emissions during decommissioning would be local and temporary (decommissioning phase of 6 months) and that Rock County is designated as an attainment/unclassifiable area, the NRC staff concludes that the air quality impact associated with the decommissioning phase would be SMALL.

4.2.3.2 Noise

Noise emissions during decommissioning would be similar to those generated during construction. Increased noise levels would occur from increased traffic volumes on U.S. Highway 51 and from the use of construction equipment on site.

A maximum of 261 worker vehicles could be on site during decommissioning (SHINE 2014). For purposes of analysis, the NRC staff assumed that all of these vehicles would travel on U.S. Highway 51 near the proposed SHINE facility during the hours when work starts and stops. Adding these to the TNM, as completed for the other phases, shows increased noise levels near U.S. Highway 51 of less than 2 dBA. Most people are unable to discern noise level differences less than about 3 dBA.

The types of equipment that would be used on site during decommissioning are listed in Table 4–8; they are similar to those used during construction. Application of the Roadway Construction Noise Model by the NRC staff indicates that decommissioning activities would result in a maximum noise level of about 53 dBA at the nearest residence to the proposed site (about 0.3 mi (0.5 km) away from the site boundary). During the day, this noise level would be well below existing ambient noise levels (about 65 dBA but sometimes greater because of the airport and traffic on U.S. Highway 51) and would not be noticeable by most people.

Given the minor (2-dBA) increase in noise levels caused by additional vehicle traffic and given that estimated noise levels from decommissioning activities would be bounded by existing ambient noise levels, the NRC staff concludes that offsite noise impacts from decommissioning would be SMALL.

4.3 Geologic Environment

4.3.1 Construction

Construction of the proposed SHINE facility is expected to disturb approximately 41 ac (16.6 ha) of land, as detailed in Section 4.1.1.1. The property has been in active agricultural use and would likely be left fallow before the start of construction. Construction of the radiologically controlled area (RCA) of the facility would require excavation to a depth of 39 ft (12 m). Utility routings and other foundation slabs and footings would require excavation to a depth of about 5 ft (1.5 m). As the depth to bedrock is greater than 221 ft (67 m) and likely greater than 300 ft (91 m), no blasting would be required for site preparation and facility construction. Site soils may be prone to slumping in excavations (Section 3.3.2) because of textural characteristics; therefore, bracing may be required.

Mineral and other geologic resources would be required to support the construction effort, including approximately 7,600 yd^3 (5,800 m^3) of granular road base (e.g., typically crushed aggregate (sand and gravel) as a base material); 2,200 yd^3 (1,680 m^3) of asphalt pavement material; and 8,500 yd^3 of gravel surfacing (6,500 m^3) (SHINE 2013a). These resources would be procured from local and/or regional commercial vendors. As noted in Section 3.3.1, construction aggregate is widely available throughout Rock County and the greater southeastern Wisconsin region.

SHINE estimated that 27,700 yd^3 (21,180 m^3) of concrete would also be used for facility construction and would be obtained from offsite commercial vendors (SHINE 2013a). Consequently, no onsite concrete batch plant would be required (SHINE 2014). The mineral products that comprise concrete (i.e., Portland cement, sand, gravel, and other additives) are widely available in the region or are not otherwise limited in commercial availability.

Additionally, an estimated 74,000 yd^3 (56,600 m^3) of backfill would be required for emplacement around structures, along with the use of 10,000 yd^3 (7,650 m^3) of topsoil for miscellaneous earthwork and final surface preparation (SHINE 2013a). The backfill material would be reworked from onsite material and prepared as necessary to meet structural requirements, and the topsoil would likewise be derived from onsite soils that are temporarily stockpiled during site preparation and excavation work for later use. Construction materials are further detailed in Table 2–1, and construction activities are described in Section 2.2.

Although site grading, surface compaction, excavation work, and construction-related vehicle traffic would expose site soils and sediments to wind and water erosion, adherence to standard best management practices (BMPs) for soil erosion and sediment control during facility construction would serve to minimize soil erosion and loss. Such BMPs would include the use of gravel aprons, sediment traps, sediment fencing, check dams and staked hay bales, mulching and geotextile matting, and rapid reseeding. The impacts would also be contained within the immediate project site and would be temporary in nature. SHINE has indicated that soil erosion and sediment control for ground-disturbing activities would meet or exceed the applicable regulatory requirements under the Federal Clean Water Act of 1972, as amended (33 U.S.C. 1251 et seq.), National Pollutant Discharge Elimination System (NPDES) regulations, and applicable Wisconsin regulations (SHINE 2013a). EPA has delegated NPDES permit authority to Wisconsin for stormwater dischargers associated with construction and industrial activity. The WDNR administers its permit program under the Wisconsin Administrative Code (NR 151 and NR 216). Specifically, SHINE would be required to obtain and comply with the provisions of a General Permit to Discharge Construction Site Storm Water Runoff (Wisconsin Pollutant Discharge Elimination System (WPDES) Permit No. WI-S067831-4) (WDNR 2013a). The permit would require SHINE to develop and implement a site-specific construction site erosion control plan, including specific BMPs or pollution control measures to reduce the discharge of pollutants in stormwater runoff, and a stormwater management plan (for postconstruction stormwater management). The permit also specifies that the permittee should minimize soil compaction and preserve topsoil.

Construction of the proposed SHINE facility would consume geologic resources and have the potential to increase soil erosion. However, given that the geologic resources are widely available within the region and that erosion would be managed with the implementation of BMPs, the NRC staff concludes that the impacts on the geologic environment from the construction of the proposed SHINE facility would be SMALL.

4.3.2 Operations

During facility operations, previously disturbed areas would not be subject to long-term soil erosion. Areas disturbed during construction would be within the footprint of the completed facility or overlain by other impervious surfaces, such as roadways and parking lots. Land temporarily disturbed during construction within the site boundary and lying outside the facility footprint would be revegetated. SHINE proposes to use native vegetation in the landscaping design (SHINE 2013a). As currently proposed, implementation of a stormwater management plan for the facility site would entail the use of vegetated drainage swales to control runoff, which would be effective in reducing surface erosion and sediment transport. All production activities would be conducted within enclosed buildings, and vehicle traffic would be confined to paved surfaces (e.g., roads and parking areas) that service the facility. As a result, incremental impacts on geology and soils would be negligible during operations.

The NRC staff does not expect site geologic conditions to affect the operation of the SHINE facility. The proposed site is located in a region with a low seismic hazard, as described in Section 3.3.3. The proposed facility would be sited, designed, and constructed in accordance with all applicable building codes, which provide for the evaluation of site geologic and soil conditions, including potential seismic hazards. Therefore, the NRC staff concludes that the operational impacts associated with the geologic environment at the proposed site would be SMALL.

4.3.3 Decommissioning

Compacted site soils and underlying sediments would be disturbed by facility demolition work. The impacts on site geology and soils would be similar in scope to those described for construction. Site clearing to restore the proposed site to a reusable condition would be subject to the requirements of the Wisconsin General Permit (WPDES Permit No. WI-S067831-4) (WDNR 2013a).

Before beginning to dismantle onsite structures, waste materials and contaminated media would be removed from the facilities, packaged, and properly disposed of as discussed in Section 4.9. Thus, these materials would not pose a contamination threat to site soils or underlying groundwater. Soils and other media would be sampled to determine the presence of any contamination and associated waste management requirements. All activities would be conducted in accordance with a decommissioning plan approved by the NRC, as described in Section 2.8.

Consequently, the NRC staff concludes that impacts on the geologic environment from facility decommissioning would be SMALL.

4.4 Water Resources

4.4.1 Surface Water

4.4.1.1 Construction

No natural surface-water features occur on the proposed site, and there would be no direct impact from facility construction on natural surface-water drainages. The closest surface-water feature to the proposed construction location is an unnamed tributary to Rock River located approximately 1 mi (1.6 km) southeast of the proposed site (SHINE 2013a). During construction, however, stormwater runoff from construction areas could potentially affect downstream surface-water quality if not properly managed. As described in Section 4.3.1, appropriate soil erosion and sediment control BMPs would be employed to minimize the transport of suspended sediment and other pollutants. SHINE would be required to conduct construction activities in accordance with the Wisconsin General Permit (WPDES Permit No. WI-S067831-4). SHINE would be required to prepare a site-specific plan that details stormwater pollution prevention measures. In accordance with this permit, these measures would be required to include proper management of all construction materials and chemicals to prevent them from being exposed to, and conveyed by, stormwater to waters of the State. The permit would explicitly require the development of spill prevention and response procedures, such as measures to avoid and respond to spills and leaks of fuels and other materials from construction equipment and activities.

In accordance with common construction practices, the NRC staff expects that portable restroom facilities, serviced by a commercial vendor, would be used during site construction. As a result, there would be no sanitary wastewater discharges during construction. Section 4.9 describes the waste management impacts.

No surface water or onsite groundwater would be diverted or withdrawn to support facility construction (SHINE 2013a). SHINE proposes to obtain water for construction and operations from the City of Janesville Water Utility, which uses groundwater as its supply source. Section 4.4.2.1 presents an NRC analysis of groundwater use impacts.

The proposed site is not located in an area susceptible to flooding or in a delineated floodplain, as discussed in Section 3.4.1.

No natural surface-water features occur on the proposed site, no surface water would be diverted or withdrawn to support facility construction, and SHINE must prepare a site-specific plan that details stormwater pollution prevention measures; therefore, the NRC staff concludes that the impacts on surface-water hydrology, quality, and use from the construction of the proposed SHINE facility would be SMALL.

4.4.1.2 Operations

During operations, there would be no direct impact on surface-water features and no direct discharge of industrial wastewater to surface water. Stormwater would be collected and discharged from the facility property in compliance with applicable State and local permit provisions and ordinances. The Wisconsin General Permit (WPDES Permit No. WI-S067831-4), as described for construction, specifically requires the development of a stormwater management plan with appropriate BMPs to address runoff from buildings and other impervious surfaces. Temporary stormwater management controls, such as rip-rap-lined culverts and ditches, would first be stabilized and otherwise integrated with permanent stormwater management structural controls to provide long-term stormwater velocity attenuation, runoff, and sediment transport reduction and to prevent channel scouring (SHINE 2013a).

The design, construction, and subsequent operations of the proposed SHINE facility incorporate features and structural controls to manage stormwater runoff and associated hydrologic impacts during operations. For example, the site plan for the proposed facility (Figure 2–3) minimizes impervious surfaces and infiltration and uses a system of diversion ditches and vegetated drainage swales to manage stormwater runon and runoff, instead of a traditional detention or retention pond. Specifically, the SHINE facility would be surrounded by an exterior stormwater runon diversion berm with an interior and exterior ditch system. The exterior ditch would direct stormwater and farm-field runoff to flow spreaders, which direct the excess water to the surrounding fields. The interior ditch directs excess water to the vegetated stormwater basin and swale located in the southwest corner of the facility site. Collected stormwater would then discharge from the west end of the swale through an outfall structure to the existing drainage ditch along U.S. Highway 51 with drainage ultimately flowing to the unnamed tributary to Rock River (Figures 2–3 and 3–8). This stormwater system would be designed to address the 1-year, 2-year, and 24-hour storm events per State regulations and the 10-year and 100-year events, as required by the City of Janesville (SHINE 2013a). As discussed in Section 3.3.2, the natural soils at the proposed site are well drained and not prone to water ponding.

No discharge of stormwater associated with industrial activity (i.e., where stormwater can come into contact with stockpiles, raw materials, or process areas) would occur. Nevertheless, in accordance with the provisions of the Wisconsin General Permit (WPDES Permit No. WI-S067831-4), stormwater discharges from the SHINE site would have to comply with the wasteload allocation established for downstream receiving waters. As described in Section 3.4.1, the segment of Rock River that would ultimately receive drainage from the SHINE facility site is impaired for total suspended solids and total phosphorous.

The proposed SHINE facility is designed to have no discharge of liquid wastes from the RCA (SHINE 2013a). Sections 2.7 and 4.9 discuss the treatment and handling of waste from the RCA. Furthermore, there would be no direct discharge of industrial or process wastewater to surface waters to support SHINE facility operations. Wastewater from the SHINE facility would be conveyed to the City of Janesville Wastewater Treatment Plant (WTP) through a 10-in. (25-cm) sanitary sewer line extended to the proposed site (SHINE 2013a).

Facility wastewater would normally consist of sanitary wastewater and boiler blowdown from the facility's heated water system for building heating. In total, this wastewater would be discharged at an average rate of 5,850 gallons per day (gpd) (22,145 liters per day (Lpd)), or about 0.006 million gallons per day (mgd) (23 cubic meters (m^3)/day). About once a year, an additional 10,000 gal (37,850 L) of cooling water would be flushed from the closed-loop chilled water system to the sanitary sewer. This water would contain residual water treatment chemicals added to control biological growth and scale buildup and corrosion from the chilled water system (SHINE 2013b). Small quantities of maintenance and laboratory chemicals also would be discharged periodically to the facility's sanitary sewer drains. However, administrative controls would be in place to ensure that such waste streams meet the acceptance requirements of the City of Janesville WTP before they are released (SHINE 2013a, 2013b). All wastewater conveyed to the City of Janesville WTP would also have to meet influent acceptance requirements for industrial users and, specifically, the prohibitions and maximum daily limits specified by the City's Wastewater Facilities and Sewer Ordinance (City of Janesville 2013; SHINE 2013b).

Overall, the volume of this nonhazardous wastewater is very small compared to the capacity of the City of Janesville WTP. The WTP, according to City of Janesville officials, has a treatment capacity of 19.1 mgd (72,290 m^3/day) with an average peak treatment flow of 14.5 mgd (54,900 m^3/day) (NRC 2014).

Finally, as much as 30,000 gal (113,600 L) of fuel oil may be stored on site in an underground storage tank to supply the facility's standby generator. This volume of oil storage requires the development and implementation of a Spill Prevention, Control, and Countermeasure (SPCC) Plan, in accordance with 40 CFR Part 112 and applicable State requirements. The SPCC Plan details requirements for oil-spill prevention, preparedness, and response to prevent oil discharges to land and surface waters (SHINE 2013a).

Given that SHINE would not divert or withdraw surface water to support facility operations, that a site-specific plan that details stormwater pollution prevention measures must be prepared, and that SHINE would be required to develop and implement an SPCC Plan, the NRC staff concludes that the impacts on surface-water hydrology, quality, and use from the operation of the proposed SHINE facility would be SMALL.

4.4.1.3 Decommissioning

No natural surface-water features occur on the proposed site, and there would be no direct impacts on surface-water resources as a consequence of facility decommissioning activities. No surface water would be used during decommissioning.

As previously noted in Section 4.3.3, during decommissioning, waste materials and contaminated media would be removed from the facility and packaged for proper disposal. Building demolition and related ground-disturbing activity, including the removal of the facility site's stormwater management structures, would be subject to the requirements of WPDES

Permit No. WI-S067831-4) (WDNR 2013a). BMPs, including the use of structural controls, such as sediment fencing and sediment basins, and the use of mulching, geotextile matting, and rapid reseeding of disturbed areas, would be used to prevent soil erosion and loss and downstream water-quality impacts. Soils and other media would be sampled to determine the presence of any contamination and associated waste management requirements. Thus, any such materials would not pose a contamination threat to offsite surface water or groundwater.

The Wisconsin General Permit requires the development of spill prevention and response procedures, such as measures to avoid and respond to spills and leaks of fuels and other materials from equipment that would be used during building demolition and site restoration. Therefore, appropriate waste handling and stormwater pollution prevention practices and spill prevention and response procedures would be observed during decommissioning to ensure that no materials or contaminants are released to soils or exposed to stormwater.

Given that no natural surface-water features occur on the proposed site, that there would be no diversion or withdrawal of surface water during decommissioning, and that SHINE would be required to prepare a site-specific plan that details stormwater pollution prevention and spill prevention and response measures, the NRC staff concludes that the impacts on surface-water resources from facility decommissioning would be SMALL.

4.4.2 Groundwater

4.4.2.1 Construction

Groundwater dewatering is not expected to be required during construction. The deepest proposed excavation for facility construction is 39 ft (12 m) (SHINE 2013a). As described in Section 3.4.2, site studies have shown the depth to groundwater to range from 50 to 65 ft (15 to 20 m) below ground surface. Further, SHINE did not identify any perched aquifers (i.e., water-bearing zones confined to locations above the site water table) or seasonally high water table conditions during site geotechnical and hydrogeologic studies (SHINE 2013a). Therefore, the NRC staff determined that facility construction would be unlikely to affect groundwater conditions beneath the proposed site.

No groundwater supply wells would be drilled on the proposed site (SHINE 2013a). The NRC staff expects that the four monitoring wells completed as part of site characterization and geotechnical studies would be maintained as environmental monitoring wells.

SHINE would not use groundwater from onsite sources during construction. Instead, SHINE would obtain water from the City of Janesville Water Utility as needed for construction. Water would be required during construction for such uses as dust control and soil compaction (Table 4–10). Some potable water would also be required to meet the drinking and sanitary needs of the construction workforce during the projected 18-month construction period. Water would also be consumed for concrete production and would likely be required for other miscellaneous uses, such as washing down equipment and work areas. The City of Janesville plans to construct a new, 16-in. (41-cm) water distribution line along the northern boundary of the site property. This distribution line would serve the properties in the vicinity of the SHINE site as well as the proposed facility (SHINE 2013a).

SHINE would use water trucks for dust mitigation and suppression during construction, which would require 10,000 gal (37,850 L) of water per day for the first 3 months of construction (SHINE 2013a). SHINE estimated total water needs for concrete mixing to be 700,000 gal (2.65 million L) (SHINE 2013a). The peak demand to meet the personal needs of the construction workforce (including preoperational testing) is estimated to be 13,530 gpd

(51,233 Lpd) (SHINE 2013b, 2014). Further, the NRC staff estimates that other miscellaneous uses would increase total water requirements by about 10 percent.

Table 4–10. Water Requirements for SHINE Facility—Construction

Requirement	Quantity (gal)[(a)]	Quantity (L)[(a)]
Dust Control/Soil Compaction	600,000	2,271,000
Concrete Production	700,000	2,650,000
Potable and Sanitary Uses	4,871,000	18,439,000
Washing and Miscellaneous Uses	487,000	1,843,000
Total Demand[(a)]	6,658,000	25,203,000

[(a)] Values are total requirements for the period of construction and assume 20 workdays per month for 12 months, except for potable and sanitary uses, which include an additional 6 months of preoperational testing and commissioning. Conversions are rounded.

Note: To convert gallons (gal) to liters, multiply by 3.7854. To convert gal to cubic meters (m^3), divide by 264.2.

Source: Based on values derived or scaled from SHINE 2013b, 2014

During the course of construction and before the establishment of permanent utility connections with the newly constructed facility, the NRC staff expects that water would be trucked to the point of use at the work site or conveyed through a nearby, temporary water tap from the City of Janesville Water Utility. While water would be consumed to produce concrete, no onsite batch plant is proposed. Instead, ready-mix concrete would be delivered to the proposed site, supplied by commercial vendors. These commercial suppliers would likely be in Rock County, but SHINE could use water from purveyors other than the City of Janesville Water Utility. Moreover, in accordance with common construction practices, the NRC staff expects that portable restroom facilities, serviced by a commercial vendor, would also be used during site construction. This measure would reduce the quantity of projected water required for potable and sanitary uses by the construction workforce.

The total estimated water demand for construction is approximately 6.66 million gal (25.2 million L), or a daily demand during the 18-month construction period averaging about 0.012 mgd (45 m^3/day) (Table 4–10). The NRC staff considers these values to be conservative (i.e., bounding) with respect to the total water needs required for construction, based on the above assumptions. As described in Section 3.4.2, groundwater is the source of water supply for the City of Janesville Water Utility. The utility has a system capacity of approximately 32 mgd (121,100 m^3/day), with current demand of approximately 10 mgd (37,900 m^3/day) (City of Janesville 2013). Even if all required construction water is supplied by the City of Janesville Water Utility, the estimated demand would be a very small percentage (less than 1 percent) of both the utility system's total capacity and average, available excess capacity.

Given that SHINE would not use groundwater from onsite sources during construction and that the estimated water demand would be less than 1 percent of the City of Janesville Water Utility system's total capacity and average available excess capacity, the NRC staff concludes that the impacts on groundwater hydrology, quality, and use from construction of the proposed SHINE facility would be SMALL.

4.4.2.2 Operations

The NRC staff expects that routine facility operation would not have any impact on local groundwater hydrology because of the depth of groundwater and provisions for proper design and construction of the facility site's stormwater management and drainage system. SHINE has stated that all equipment and material storage areas would comply with appropriate regulations requiring secondary containment of stored liquids and materials to prevent their release where such materials could contaminate site soils or stormwater runoff, or infiltrate to contaminate groundwater (SHINE 2013a). As described in Section 4.4.1.1, SHINE would develop and implement an SPCC Plan for oil spill prevention, preparedness, and response. Furthermore, SHINE would not use onsite groundwater nor discharge liquid effluents to the subsurface (SHINE 2013a). Because of the nature of the facility, with all process and material storage areas located indoors, the risk to groundwater and other environmental media is low.

Water would be required for potable and sanitary uses, fire protection, heating and cooling system makeup, and makeup for the radioisotope production process. This water would be supplied by the City of Janesville Water Utility (SHINE 2013a). These water needs are summarized in Table 4–11.

Table 4–11. Water Requirements for SHINE Facility—Operations

Requirement	Quantity (gpd)[(a)]	Quantity (Lpd)[(a)]
Potable and Sanitary	3,270	12,380
Facility Heating Water System	2,580	9,770
Radioisotope Production Process	223[(b)]	844[(b)]
Total Daily Demand	6,073	23,005

(a) Values are average daily demand, assuming 5.5 days of water usage per week. Conversions are rounded.

(b) Consumptive water use is water that is not returned to a water resource system after it is used.

Note: To convert gallons per day (gpd) to liters per day (Lpd), multiply by 3.7854. To convert gal to cubic meters (m^3), divide by 264.2.

Source: SHINE 2013a, 2013b

Potable water demand is 3,270 gpd (12,380 Lpd), and blowdown and makeup to the facility heating water system is 2,580 gpd (9,770 Lpd). Water initially would be needed to provide makeup supply to the chilled water and facility heating water system, as well as for fire protection. The largest automatic fire suppression system demand in the event of a fire is 390 gpm (1,476 Lpm). The automatic fire suppression demand would be supplied by a fire water tank (SHINE 2013a).

The majority of the makeup water to the radioisotope production process would pass through a demineralizer system to control the water's chemistry. As reflected in Table 4–11, water use in the radioisotope production process is consumptive in nature, and water would either be lost to the atmosphere as vapor or incorporated into packaged waste streams from the process (SHINE 2013b).

Total water use is projected to be 6,073 gpd (22,990 Lpd), or 0.006 mgd (23 m^3/day) during operations. This water requirement is a very small percentage (less than 0.03 percent) of the available capacity of the City of Janesville Water Utility (see Section 4.4.2.1) and could easily be supplied by the extension of the proposed 16-in. (41-cm) water distribution line to the facility site.

Given that SHINE would not use groundwater from onsite sources, and the estimated water demand would be a very small percent (less than 0.03 percent) of the City of Janesville Water Utility's total capacity, the NRC staff concludes that the impacts on groundwater hydrology, quality, and use from the operation of the proposed SHINE facility would be SMALL.

4.4.2.3 Decommissioning

The potential decommissioning impacts on and associated mitigation measures for groundwater are similar to those described in Section 4.4.1.3 for surface water. In summary, demolition and site-restoration activities would be conducted in accordance with the Wisconsin General Permit and with appropriate BMPs. Further, waste handling and pollution prevention practices and spill prevention and response procedures would be observed during decommissioning, so that no materials or contaminants are released to soils or exposed to stormwater, where they could contaminate underlying groundwater. SHINE would be required to conduct necessary surveys of the soils and subsurface to comply with the NRC's radiological criteria for license termination in 10 CFR Part 20, Subpart E. The NRC staff also expects that soils and other media would be sampled to ensure that no nonradiological contamination is present. Given the depth to the water table, the NRC staff concludes that any spills of fuels or other petroleum products during facility demolition, or inadvertent release of contaminated materials, would be contained and remediated before any such material could reach the groundwater.

Small quantities of water may be required for dust control and soil compaction in association with site-restoration activities. As the source of water supply in Rock County is groundwater, it would be expected that water would be trucked to the point of use or conveyed from a temporary connection from the onsite water line as decommissioning activities progress. The volume of water required would likely to be less than that required during facility construction. No onsite groundwater would be used to support decommissioning (SHINE 2013a). The NRC staff anticipates that portable restroom facilities, serviced by a commercial vendor, would be used during site decommissioning to meet the needs of decommissioning personnel. Thus, there would be no onsite discharge of sanitary waste streams.

Therefore, based on the stated considerations, the NRC staff concludes that impacts on groundwater resources from facility decommissioning would be SMALL.

4.5 Ecological Resources

4.5.1 Construction

As described in Section 4.1, construction of the proposed SHINE facility would permanently convert 25.67 ac (10.39 ha) of agricultural land and 0.18 ac (0.07 ha) of developed or open areas into an industrial area (Table 4–1) (SHINE 2013a). In addition, 15.16 ac. (6.14 ha) of agricultural land would be temporarily converted from agricultural land to a construction parking area, construction material staging or laydown area, or construction laydown areas to install a water and sewer line (SHINE 2013a). Once construction activities are complete, SHINE would restore the areas to agricultural fields, cool season grasses, or native prairie (SHINE 2013a). Directly affected vegetation would be limited to cultivated crops and weedy species, both of which are abundant within the region and provide relatively low-quality habitat for birds and wildlife in comparison to forests, grasslands, and wetland habitats. In addition to a loss of habitat, noise from construction activities could disturb birds and wildlife. In response to such disturbances and loss of habitat, birds and wildlife could move out of the immediate area and find adequate, similar habitat (e.g., agricultural fields) within the vicinity.

During construction, bird collisions with construction equipment and the new facility could result in increased mortality caused by the presence of tall structures and artificial night lighting. SHINE would use tall cranes to build the facility, which, when built, would be at a height of 58 ft (18 m) (SHINE 2013a). In addition, the exhaust vent would be at a maximum height of 66 ft (20 m) (SHINE 2013a). Migratory songbirds would be most likely to collide with artificially lighted structures or cranes because of their propensity to migrate at night, their low flight altitudes, and their tendency to be trapped and disoriented by artificial light (Ogden 1996; NRC 2013a). SHINE (2013a) stated that, during construction at night, BMPs, such as light source shielding and appropriate directional lighting, would be used to mitigate impacts associated with artificial nighttime illumination. The NRC staff reviewed bird collisions with plant structures at nuclear power plants and determined that collision rates were negligible sources of bird mortality with plants that have cooling towers 100 ft (30 m) in height. The SHINE facility and construction equipment would be similar or smaller in size and height than an operating nuclear power plant; therefore, the impacts from bird collisions at the SHINE site would be bounded by the conclusions the NRC staff reached in its review of bird collisions at operating nuclear power plants.

Construction of the SHINE facility is not expected to result in any direct impacts to aquatic resources, such as habitat loss, because no aquatic resources occur on site. As described in Section 3.4, water drains off the proposed site to the south and west towards the Rock River and its tributaries. Runoff from the proposed site could affect offsite aquatic resources by increasing turbidity or introducing various chemicals or other pollutants. However, impacts to the Rock River and its tributaries are expected to be minimal because of the distance to the nearest tributary and Rock River, appropriate soil erosion and sediment control BMPs would be employed to minimize the transport of suspended sediment and other pollutants, and SHINE would be required to develop a site-specific program to prevent pollution from stormwater runoff (see Section 4.3).

Given that construction would not permanently or temporarily affect any high-quality habitats, such as grasslands, forests, or wetlands; permanently and temporarily affected habitats (agricultural fields) are abundant within the region; mortality from bird collisions is expected to be negligible; and no aquatic features or Federally or State-listed species occur on the SHINE site, the NRC staff concludes that impacts to ecological resources during construction would be SMALL.

4.5.2 Operations

During operations, impacts to ecological resources could result from bird collisions, herbicide applications for landscape maintenance activities, elevated noise levels, and increased turbidity or introduction of pollutants from site runoff. As described above, mortality from bird collisions is expected to be negligible, given that the tallest structure would be a stack no higher than 66 ft (20 m). Disturbance from daily activities, herbicide applications, or elevated noise levels are likely to have minimal impacts on wildlife and plant species, given that the species identified at the proposed site are generally tolerant of human disturbances because the land has been actively farmed for the past several decades. In response to any disturbances, birds and wildlife could move out of the immediate area and find adequate, similar habitat (agricultural fields) within the vicinity. In addition, SHINE would apply herbicides according to an integrated pest management plan, which would include applicable BMPs or related permit requirements.

Operation of the SHINE facility is not expected to result in any direct impacts to aquatic resources, because no aquatic resources occur on site and wastewater would be conveyed to the City of Janesville WTP through a 10-in. (25-cm) sanitary sewer line extended to the proposed site (SHINE 2013a). Indirect impacts during operations could include runoff that may contain sediments, contaminants from road and parking surfaces, or herbicides. However, as described in Section 4.3, impacts to aquatic resources are expected to be minimal because of the distance to the nearest tributary and the Rock River, a vegetated onsite detention swale would minimize stormwater runoff, and SHINE would be required to develop a site-specific program to prevent pollution from stormwater runoff.

Given that mortality from bird collisions is expected to be negligible, habitat disturbances during operations would be minimal, any disturbed wildlife could find similar habitat in the vicinity, and no aquatic features or Federally or State-listed species occur on the proposed site, the NRC staff concludes that impacts to ecological resources during operations would be SMALL.

4.5.3 Decommissioning

Decommissioning activities would have impacts that are similar to the impacts that would occur during construction of the proposed facility. For example, SHINE would use construction equipment to dismantle large buildings, which could result in disturbances to wildlife and birds and potential runoff to nearby waterbodies. In addition, some land on the proposed site could be used as staging areas for the equipment and to conduct certain dismantling activities. As described above, if noise or other activities disturb birds or wildlife, similar habitat is available in nearby offsite areas. No surface water would be used during decommissioning and impacts from runoff would be minimal, based on the distance to the nearest tributary and the Rock River, and because BMPs would be required in SHINE's stormwater permit. Therefore, impacts during decommissioning are expected to be SMALL.

4.5.4 Federally Protected Species

Section 3.5 describes the special status species and habitats that have the potential to be affected by the proposed action. The discussion of species and habitats protected under the Endangered Species Act of 1973 (16 U.S.C. 1531 et seq., herein referred to as ESA), includes a description of the action area as defined by the ESA section 7 regulations at 50 CFR 402.02. The action area encompasses all areas that would be directly or indirectly affected by the proposed construction, operations, and decommissioning of the SHINE facility.

Appendix D contains information on the NRC staff's section 7 consultation with the U.S. Fish and Wildlife Service (FWS) for the proposed action. The NRC did not consult with the National Marine Fisheries Service (NMFS) as part of the construction permit review because (as described in Sections 3.5) no species or habitats under NMFS's jurisdiction occur within the action area.

In Section 3.5, the NRC staff concludes that no Federally listed species are likely to occur in the action area. The NRC staff also concludes that no candidate species, or proposed or designated critical habitat occur in the action area. Thus, the NRC staff concludes that the proposed action would have no effect on Federally listed species or habitats under FWS's jurisdiction.

As discussed in Section 3.5, no species or habitats under NMFS's jurisdiction occur within the action area. Thus, the NRC staff concludes that the proposed action would have no effect on Federally listed species or habitats under NMFS's jurisdiction.

As discussed in Section 3.5, NMFS has not designated essential fish habitat (EFH) pursuant to the Magnuson–Stevens Fishery Conservation and Management Act, as amended (16 U.S.C. 1801 et seq.; herein referred to as MSA) in the Rock River. Thus, the NRC staff concludes that the proposed action would have no effect on EFH.

4.6 Historic and Cultural Resources

4.6.1 Historic and Cultural Resources

This section provides the NRC's assessment of the potential effects from the proposed undertaking on historic and cultural resources under 40 CFR 1508.8. Additionally, the National Historic Preservation Act of 1966, as amended (NHPA), requires Federal agencies to consider the effects of their undertakings on historic properties, and construction, operations, and decommissioning of the SHINE Radioisotope Production Facility is an undertaking that could potentially affect historic properties. Historic properties are defined as resources eligible for listing in the National Register of Historic Places (NRHP). The criteria for eligibility are listed in 36 CFR 60.4 and include (1) association with significant events in history, (2) association with the lives of persons significant in the past, (3) embodiment of distinctive characteristics of type, period, or construction, and (4) sites or places that have yielded, or are likely to yield, important information. Regulations issued by the Advisory Council on Historic Preservation (ACHP) in 36 CFR Part 800 outline the historic preservation review process (Section 106 of the NHPA).

4.6.2 Proposed Action

In accordance with the provisions of the NHPA, the NRC is required to make a reasonable effort to identify historic properties included in, or eligible for, inclusion in the NRHP in the Area of Potential Effect (APE). The APE for this undertaking is the 91-ac (37-ha) proposed site and its immediate environs that may be affected by construction-, operation-, and decommissioning-related land-disturbing activities. The APE may extend beyond the immediate environs in those instances where construction and postconstruction land-disturbing operations may potentially have an effect on known or proposed historic sites. This determination is made irrespective of ownership or control of the lands of interest.

If historic properties are present within the APE, the NRC is required to contact the State Historic Preservation Office (SHPO), assess the potential impact, and resolve any possible adverse effects of the undertaking on historic properties. In addition, the NRC is required to notify the SHPO if historic properties would not be affected by the undertaking or if no historic properties are present. The SHPO is part of the Wisconsin Historical Society (WHS) in the State of Wisconsin.

4.6.3 Consultation

In accordance with 36 CFR 800.8(c), on July 1, 2013, the NRC initiated consultations on the proposed action by writing to the ACHP and WHS (NRC 2013b, 2013c). On July 31, 2013, the NRC staff visited the WHS in Madison, Wisconsin, to perform a cultural resource review of the proposed site. The NRC staff queried the Archaeological Sites Inventory and Architectural History Inventory, Burial Sites Inventory, and the Bibliography of Archaeological Reports at the WHS. No known historic or cultural resources or historic properties were found at the proposed project site (NRC 2013d). The closest historic property to the proposed site is the John and Martha Hugunin House, located approximately 1 mi (1.6 km) to the northeast.

The NRC staff also initiated consultation with the following 13 Federally recognized tribes on July 1, 2013 (see Appendix D for a copy of these letters) (NRC 2013e):

- Citizen Potawatomi Nation,
- Flandreau Santee Sioux Tribe of South Dakota,
- Forest County Potawatomi Community,

- Hannahville Indian Community,
- Ho-Chunk Nation of Wisconsin,
- Lower Sioux Indian Community,
- Prairie Band of Potawatomi Nation,
- Prairie Island Indian Community,
- Santee Sioux Nation,
- Sisseton-Wahpeton Oyate of the Lake Traverse Reservation,
- Spirit Lake Tribe,
- Upper Sioux Community, and
- Winnebago Tribe of Nebraska.

In its letters, the NRC provided information about the proposed action, defined the APE, and indicated that the NHPA review would be integrated with the NEPA process, according to 36 CFR 800.8. The NRC staff invited participation in the identification and possible decisions concerning any historic properties and also invited participation in the scoping process.

The NRC staff received scoping comments from one tribe, the Forest County Potawatomi, in July 2013. The Tribe indicated that the proposed SHINE project occurs within Potawatomi ancestral land and expressed concern for any impacts to historic and cultural properties within the APE (Cook 2013). Attempts to contact representatives of the Forest County Potawatomi to discuss the undertaking are ongoing. The last attempt to contact the Forest County Potawatomi was in March 2014.

4.6.4 Impact Analysis

4.6.4.1 Construction

Of the 91 ac (37 ha) comprising the APE, construction would permanently convert approximately 26 ac (10 ha) of agricultural land and open space to industrial facilities and temporarily would disturb 15 ac (6 ha) of agricultural fields, as described in Section 4.1.1. SHINE intends to make connections to the main sewage, commercial natural gas, underground electrical distribution, and municipal water lines but would not construct additional pipelines for the facility (SHINE 2013b).

Because there are no known historic properties under 36 CFR 800.4(d)(1) or historic and cultural resources located within the APE, impacts to these resources are not likely during construction. Construction of the proposed SHINE facility would have little or no visual or aesthetic impact because potential visual impacts during construction would be temporary. The proposed SHINE facility is a low-profile build, and the nearest NRHP site is approximately 1 mi (1.6 km) away and is surrounded by other residential and commercial properties. However, previously unidentified cultural resources could be inadvertently discovered during land-disturbing activities associated with construction. In anticipation of this possibility, SHINE has developed a sitewide cultural resource management plan (CRMP) to manage and protect as-yet unidentified cultural resources. The WHS has reviewed and concurred on the CRMP (SHINE 2013b). According to the CRMP, if cultural resources or materials are discovered during construction; the activity would be immediately halted; the area would be protected; the SHINE Environment, Health, and Safety (ES&H) Manager would be notified; and consultation with the WHS might be initiated. Consultation may require additional investigation and preservation plans, which would be developed by the SHINE ES&H Manager. All investigation and preservation plans would be approved by SHINE management and in consultation with the WHS. Work that uncovered potential cultural resources would not recommence without SHINE management approval. If actual or suspected human remains are unearthed during construction, construction activities would halt immediately, and the area would be protected. The procedures for uncatalogued burial sites found in Wisconsin Statute 157.70 would be followed, and local law enforcement would be contacted (SHINE 2013b). Additionally, SHINE would educate its employees and contractors engaged in the construction of the proposed site in a capacity that disturbs the ground or that could result in the discovery of cultural resources on requirements of the CRMP. Actions for the special case of the discovery of human remains would be discussed in the training CRMP.

Based on (1) no known NRHP-eligible historic properties or historic and cultural resources on the proposed SHINE facility site, (2) tribal input, (3) SHINE's CRMP procedures, and (4) cultural resource assessment and consultations performed by the NRC staff, construction of the SHINE facility would have no impact on known historic and cultural resources. However, given the possibility of an inadvertent discovery of previously unidentified cultural resources caused by land disturbance during construction, the overall impact would be SMALL.

4.6.4.2 Operations

Because there are no known historic properties under 36 CFR 800.4(d)(1) or historic and cultural resources located within the proposed SHINE facility site, impacts to these resources are not likely during operations. Operation of the proposed SHINE facility would have little or no visual or aesthetic impact on historic properties in its immediate vicinity because it is a low-profile build, and the nearest NRHP site is over 1 mi (1.6 km) away and is surrounded by other residential and commercial properties. However, normal maintenance and operation of the proposed facility could result in the inadvertent discovery of previously undiscovered cultural resources. SHINE would continue to follow the procedures specified in its CRMP to manage and protect any such cultural resources for the entire period of facility operation (SHINE 2013b).

Based on (1) no known NRHP-eligible historic properties or historic and cultural resources on the proposed SHINE facility site, (2) tribal input, (3) SHINE's commitment to follow CRMP procedures throughout the period of facility operation, and (4) cultural resource assessment and consultations performed by the NRC staff, operation of the proposed SHINE facility would have no impact on known historic and cultural resources. However, given the possibility of an inadvertent discovery of previously unidentified cultural resources occurring as a result of normal maintenance and operational activities, the overall impact would be SMALL.

4.6.4.3 Decommissioning

Because there are no known historic properties under 36 CFR 800.4(d)(1) or historic and cultural resources located within the proposed SHINE facility site, impacts to these resources would not be expected during decommissioning. However, similar to construction, previously unidentified cultural resources could be inadvertently discovered during land-moving activities associated with decommissioning. Activities during decommissioning would involve the use of heavy equipment and land-disturbing activities to dismantle buildings and remove roadway and parking facilities within the APE. Land use for the APE after decommissioning is undetermined at this time, but it may be returned to agricultural lands or open space (SHINE 2013a). SHINE would continue to follow the procedures specified in its CRMP to manage and protect previously unidentified cultural resources for the entire period of facility decommissioning (SHINE 2013b).

Based on (1) no known NRHP-eligible historic properties or historic and cultural resources on the proposed SHINE facility site, (2) tribal input, (3) SHINE's commitment to follow CRMP procedures throughout the period of facility decommissioning, and (4) cultural resource assessment and consultations performed by the NRC staff, decommissioning of the proposed SHINE facility would have no impact on known historic and cultural resources. However, given the possibility of an inadvertent discovery of previously unidentified cultural resources caused by land disturbance during decommissioning, the overall impact would be SMALL.

4.7 Socioeconomic Impacts

The SHINE medical radioisotope production facility and the people and communities surrounding it can be described as a dynamic socioeconomic system. The facility needs people, goods, and services from the communities to operate, and the communities, in turn, provide the people, goods, and services to run the facility. Facility employees residing in the community receive income from the 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 facility. 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 facility that stores, generates, or uses nuclear materials depends on its ability to respond to changing socioeconomic conditions.

The analysis presented in this section considers four socioeconomic impact areas:

(1) employment;

(2) housing, recreation, and tourism;

(3) tax revenue; and

(4) community services and education.

For the purposes of this analysis, the ROI is Rock County, Wisconsin, and the City of Janesville.

4.7.1 Construction

4.7.1.1 *Employment*

An estimated 451 workers would be needed to construct the proposed SHINE facility during peak construction (SHINE 2014). Table 4–12 compares construction worker occupations with available labor in the ROI by occupation, as reported by the U.S. Department of Labor (DOL), Bureau of Labor Statistics (BLS), in May 2012. Based on this information, a number of construction workers (56 percent) currently reside within the ROI with shortages in most labor categories. The remaining labor needed from outside the ROI would be expected to commute from adjacent counties and communities. In addition, Blackhawk Technical College, located in the City of Janesville, offers several technical diplomas to students, which could provide an additional labor resource. However, the total number of jobs generated during construction would represent less than 2 percent of the available labor force reported for both the City of Janesville and Rock County in 2012 (Table 3–13); therefore, employment impacts would be SMALL.

4.7.1.2 Housing, Recreation, and Tourism

SHINE estimates 451 workers would be needed during peak construction (SHINE 2014). The percentage of construction workers needed represents less than 1 percent of Rock County's total population of approximately 160,000 (USCB 2010). As discussed in Section 4.7.1.1, the majority of construction workers already reside within the ROI. Any additional construction workers likely would commute from other nearby counties and would not likely relocate to the ROI. This would result in little, if any, increased demand for temporary housing, recreation, and tourism. Any construction workers from outside of the immediate commuting area relocating to the ROI would find available housing in the City of Janesville and Rock County. Because few, if any, construction workers would relocate to the ROI, housing, recreation, and tourism impacts would be SMALL.

4.7.1.3 Tax Revenues

The estimated total construction costs expected to be spent in the local community would be approximately $20 to $30 million for labor, electrical equipment, cabling, and concrete, spread over the construction period (SHINE 2013b). As most of the plant equipment is highly specialized, very little of it would be purchased and taxed locally (SHINE 2013a, 2013b). SHINE intends to enter into a TIF agreement with the City of Janesville during the first 10 years of the proposed project, covering the entirety of the construction period. The TIF agreement would allow SHINE to make payments in lieu of taxes to the City of Janesville. SHINE's estimated payments would total $600,000 per year and would be used to offset the infrastructure expenses for the proposed SHINE facility (SHINE 2013a). SHINE would also pay property taxes estimated to be $35,000 per year, based on the assessed property before improvements during this 10-year period (SHINE 2013a). As the proposed SHINE facility would be located in the Janesville School District, schools within the district would receive additional property tax revenue. In addition, there would be an increase in sales tax revenues within the ROI, generated when nonspecialized supplies would be purchased during construction or from workers paying for commercial services within the ROI. However, the total amount of taxes collected within the ROI during the period of construction would be relatively small in comparison to the established tax base of the City of Janesville and Rock County, even if the entire $635,000 were applied to one taxing jurisdiction; in 2012, the City of Janesville's tax revenue was approximately $35.4 million, whereas Rock County's was $71.5 million (WDOR 2014). Therefore, the tax revenue impacts during construction would be SMALL.

Table 4–12. Comparison of SHINE Work Force Estimates by Occupation with Employment by Occupation in ROI

Occupation	SHINE Peak Workers[(a)]	Available Labor Force in ROI[(b)]	Additional Labor Needed from Outside ROI[(c)]
Construction			
Boilermaker	26	5	21
Carpenter	48	72	0
Electrician	59	38	21
Ironworker	54	10	44
Laborer[(d)]	75	68	7
Equipment Operator/Eng.[(e)]	28	26	2
Plumber/Pipefitter[(f)]	75	14	61
Sheet Metal Worker	32	16	16
Construction Supervisor[(g)]	22	32	0
Other	32	6	26
Total	451	287	198
Operation			
Operation Support[(h)]	40	34	6
Productions/Operations	37	11	26
Tech Support[(i)]	40	259	0

Occupation	SHINE Peak Workers[a]	Available Labor Force in ROI[b]	Additional Labor Needed from Outside ROI[c]
Other	33	3	30
Total	150	307	62
Decommissioning			
Carpenter	20	72	0
Ironworker	20	4	16
Laborer[d]	100	68	32
Equipment Operator/Eng.[e]	20	20	0
Plumber/Pipefitter[f]	30	14	16
Radiation Technicians	30	6	24
Other	41	0	41
Total	261	184	129

[a] Peak month estimated need of labor categories for which need is greater than or equal to 20.

[b] Estimated available construction and decommissioning labor force based on 20 percent of BLS-estimated work force in Rock County. Available operational labor force based on 10 percent of BLS-estimated labor force.

[c] Additional labor determined by subtracting available labor estimates from SHINE peak worker estimates.

[d] Laborer is listed as a Construction Laborer.

[e] Equipment Operator/Eng. is listed as Operating Engineers and Other Construction Equipment Operators.

[f] Plumber/Pipefitter is listed as Plumbers, Pipefitters, and Steamfitters.

[g] Construction Supervisor is listed as First-Line Supervisors of Construction Trades and Extraction Workers.

[h] Operation Support is listed as First-Line Supervisors of Production and Operating Workers.

[i] Tech Support is listed as Industrial Machinery Mechanics.

Source: SHINE 2013a, 2014; BLS 2012

4.7.1.4 Community Services and Education

There would be little or no increase in population in the ROI during construction because most of the construction workers already reside in the ROI. These workers would continue to use existing community services and educational facilities. These community services should also be able to handle any temporary increases in demand for services from the small number of additional workers during construction. Therefore, the impact of this increased demand on community services and education during construction would be SMALL.

4.7.1.5 Summary of Construction Impacts

The availability of construction workers and housing within the ROI and the short duration of construction (18 months) would minimize any socioeconomic impacts within the ROI. The creation of 451 jobs would help maintain construction employment and generate property and sales tax revenue, but any changes would be minimal. Therefore, the overall socioeconomic impact from the construction of the proposed SHINE facility would be SMALL.

4.7.2 Operations

4.7.2.1 Employment

Approximately 150 jobs would be added to the local economy during SHINE facility operations (SHINE 2013a, 2014). In Table 4–12, SHINE facility operations worker occupations were compared with available labor in the ROI by occupation, as reported by the BLS in May 2012. Based on this information, some specialized workers would be recruited from outside the ROI.

The total number of jobs generated during SHINE facility operation represents less than 1 percent of the available labor force in Janesville and Rock County in 2012 (Table 3–13), therefore, employment impacts would be SMALL.

4.7.2.2 Housing, Recreation, and Tourism

SHINE estimates that 150 workers would be needed during operations (SHINE 2013a). The percentage of operation workers needed represents less than 1 percent of Rock County's total population of approximately 160,000 in 2010 (USCB 2010). As shown in Table 4–12, Janesville has occupational labor available to perform most of the operational tasks. Additionally, Blackhawk Technical College, located in Janesville, offers several technical diplomas to students who could provide additional labor. However, some specialized workers would likely relocate to the ROI to support SHINE facility operations. Because of the long-term nature of SHINE facility operations, workers relocating to the ROI would likely purchase or rent permanent housing. Any operations workers moving to the ROI would find available housing in Janesville and Rock County. Because few, if any, operations workers would relocate to the ROI, housing, recreation, and tourism impacts would be SMALL.

4.7.2.3 Tax Revenues

As discussed in Section 4.7.1.3, SHINE intends to enter into a TIF agreement with Janesville, allowing SHINE to make payments in lieu of taxes during the first 10 years of the project. The payments are estimated to total $600,000 per year and would be used to offset the infrastructure expenses for the proposed SHINE facility. SHINE also would pay property taxes estimated to be $35,000 per year based on the assessed property before improvements during this 10-year period. Additionally, when the 10-year TIF agreement with Janesville expires, SHINE expects to pay annual property taxes of approximately $660,000 during the remaining period of operation of the proposed SHINE facility (SHINE 2013a). As the proposed SHINE facility would be located in the Janesville School District, schools within the district would receive additional property tax revenue. In addition, there would be an increase in sales tax and property tax revenues within the ROI, generated by SHINE facility operations workers in the ROI. However, the total amount of taxes collected within the ROI during operations would be relatively small in comparison to the established tax base of Janesville and Rock County, even if the entire $660,000 tax payment were applied to one taxing jurisdiction; in 2012, Janesville's tax revenue was approximately $35.4 million, whereas Rock County's was $71.5 million (WDOR 2014). Therefore, tax revenue impacts during operations would be SMALL.

4.7.2.4 Community Services and Education

As discussed in Section 4.7.2.2, there would be little or no increase in population during SHINE facility operations because most of the operations workers would already reside within the ROI. These workers would continue to use existing community services and educational facilities. These community services should be able to handle any increase in demand for services from the small number of new operations workers and their families. Therefore, the impact of this increased demand on community services and education during SHINE facility operations would be SMALL.

4.7.2.5 Summary of Operation Impacts

The availability of operations workers and housing within the ROI and the small number of specialty workers relocating from outside of the ROI, would minimize any socioeconomic impacts. The creation of 150 jobs would help maintain existing employment and generate property and sales tax revenue, but any changes would be minimal. Therefore, the overall socioeconomic impact from the operation of the proposed SHINE facility would be SMALL.

4.7.3 Decommissioning

4.7.3.1 Employment

An estimated 261 workers would be needed to decommission the SHINE facility during peak activity (SHINE 2013a). In Table 4–12, decommissioning worker occupations were compared with Janesville employment by occupation, as reported by the BLS in May 2012. Based on this information, a number of workers currently reside within the ROI. In addition, some operations workers may be kept on to support decommissioning. Some specialized workers may have to be recruited from outside the ROI. The total number of jobs generated during decommissioning would represent less than 1 percent of the available labor force reported for both Janesville and Rock County in 2012 (Table 3–13); therefore, employment impacts would be SMALL.

4.7.3.2 Housing, Recreation, and Tourism

SHINE estimated that decommissioning would require a maximum of 261 workers (SHINE 2013a). However, as previously discussed, some operations workers may be kept on to support decommissioning, thereby reducing the need for new hires. As demonstrated in Table 4–12, Janesville and Rock County have workers available to support decommissioning. In addition, Blackhawk Technical College, located in Janesville, offers several technical diplomas to students who would provide additional labor, if needed, and some specialized labor may be needed from outside the ROI. Any additional decommissioning workers would likely commute from other nearby counties and would not likely relocate to the ROI. This factor would result in little, if any, increased demand for temporary housing, recreation, and tourism. Any decommissioning workers from outside the immediate commuting area relocating to the ROI would find available housing in Janesville and Rock County. Because few, if any, decommissioning workers would relocate to the ROI, housing, recreation, and tourism impacts would be SMALL.

4.7.3.3 Tax Revenues

SHINE would continue to pay property taxes during decommissioning. The assessed property taxes that would be collected after the completion of the proposed SHINE facility would be based on the property tax rates at the time. Revenue loss would directly affect Rock County and other local taxing districts and communities closest to, and most reliant on, the facility's tax revenue. However, the loss in tax revenue should be small in comparison to the established tax base of Janesville and Rock County. Therefore, tax revenue impacts during decommissioning would be SMALL.

4.7.3.4 Community Services and Education

Any temporary increase in population during decommissioning would be small relative to the projected population of Janesville and Rock County. Community services currently available in Janesville and Rock County should be able to handle any temporary increases in demand for services during decommissioning. Therefore, the impact of this potential increased demand on community services and education during decommissioning would be SMALL.

4.7.3.5 Summary of Decommissioning Impacts

The availability of decommissioning workers and housing within the ROI and the short duration of decommissioning (6 months) would minimize any socioeconomic impacts within the ROI. Decommissioning activities would temporarily stimulate the local economy with purchasing activity and tax contributions, and SHINE would continue to pay property taxes during decommissioning. Therefore, the overall socioeconomic impact from decommissioning the proposed SHINE facility would be SMALL.

4.8 Human Health

This section provides the NRC's assessment of the potential radiological and nonradiological effects from the proposed SHINE facility. Radioactive and nonradioactive materials would routinely be used at the proposed SHINE facility. The NRC and State of Wisconsin regulations would control the use and discharge of these materials to protect facility workers and members of the public.

Radiological exposures from the proposed SHINE facility would include offsite doses to members of the public and onsite doses to facility workers. The NRC has the authority to issue, inspect, and enforce radiation protection standards that provide an adequate level of protection for workers, members of the public, and the environment. The NRC has multiple layers of radiation safety standards to ensure that radioactive material is adequately controlled. The NRC's radiation safety requirements appear in 10 CFR Part 20. Specifically, 10 CFR 20.1301(a) limits the annual dose to members of the public from a licensed facility, such as that proposed by SHINE, to 100 millirem (mrem) (0.1 millisievert (mSv)). In addition, 10 CFR 20.1101(d) imposes a constraint of 10 mrem (0.1 mSv) on air emissions to ensure that the dose to members of the public is as low as is reasonably achievable (ALARA).

Nonradiological exposures from the proposed SHINE facility to workers and members of the public would be regulated by the State of Wisconsin in accordance with the Wisconsin Administrative Code (SHINE 2013b).

4.8.1 Construction

4.8.1.1 Radiological

During construction and pre-operational testing of the facility and equipment commissioning, SHINE would have radioactive material onsite (SHINE 2015a). The possession and use of the radioactive material would require SHINE to obtain an NRC license (e.g., 10 CFR Part 30) before receiving the radioactive material. To obtain a license, the NRC staff would conduct a thorough independent review of SHINE's application for the radioactive material to ensure the material is used in accordance with NRC regulations and there is adequate protection of the workers and the public. The radioactive material brought onsite would not be used for any radioisotope production-related activities. SHINE does not expect any radioactive waste to be generated during construction or pre-operational testing of the facility (SHINE 2015a). Access controls for the construction site would ensure that only authorized personnel would be at the site (SHINE 2013a). Assuming the NRC staff determines SHINE has adequate controls in place to ensure that the dose to workers and the public is within the dose limits specified in 10 CFR Part 20, the NRC staff concludes that the impacts to workers and the public would be SMALL.

4.8.1.2 Nonradiological

Members of the public would not have access to the construction site. As discussed in Section 4.2 of this document, the NRC expects air pollutants from worker vehicles and fossil-fueled equipment (e.g., excavation and earth-moving equipment and electric generators), but the impact to the public would be SMALL because the effects would not be noticeable.

Construction workers would encounter potential hazards typical of any industrial construction site. As discussed in Section 3.8, workplace hazards can be grouped into physical hazards (e.g., slips and trips; falls from height; and those related to transportation, temperature, humidity, and electricity); physical agents (e.g., noise and vibration); petrochemicals; and psychosocial issues (e.g., work-related stress). SHINE would employ normal construction safety practices contained in Occupational Safety and Health Administration (OSHA) regulations, such as safety training, safety equipment, and supervision of the work force to promote worker safety and reduce the likelihood of worker injury during construction (SHINE 2013a). However, construction accidents could occur. Over the projected 12-month period when construction activities would occur, the average number of workers at the site would be 248 with a peak of 421 (SHINE 2013a). The NRC staff notes that this 12-month period does not include the 6-month preoperational period because preoperational activities would not including building and other activities that are applicable for construction accidents. The NRC staff used data from BLS for nonfatal workplace injuries and illnesses to calculate the potential number of reportable cases at the proposed SHINE construction site based on the average number of workers. The DOL data for 2012 showed that nearly 3.0 million nonfatal workplace injuries and illnesses were reported by private industry employers, resulting in an incidence rate of 3.4 cases per 100 equivalent full-time workers (DOL 2013). Conservatively assuming an average number of 248 workers during the construction period, the NRC staff estimates that there would be 8.4 recordable cases during the 12 months of construction. With the use of normal construction safety practices at the proposed SHINE construction site, the NRC staff concludes that the average number of recordable cases would be consistent with the DOL data.

During construction, SHINE would store nonradioactive chemical sources on site in liquid; gaseous; and solid forms, including fuels, oils, and solvents necessary for site preparation and construction. SHINE does not plan to use any products or processes that emit hazardous air pollutants (SHINE 2013a). Toxic chemicals stored or used at the construction site would be limited to be within the threshold amounts listed in the Wisconsin Administrative Code (SHINE 2013b).

Given that access to the site would be restricted, that SHINE would implement normal construction safety practices contained in OSHA regulations, and that toxic chemicals stored or used at the construction site would be limited to be within the threshold amounts listed in the Wisconsin Administrative Code, the NRC staff concludes that impacts to human health during construction would be SMALL.

4.8.2 Operations

4.8.2.1 Radiological

As part of normal operation of the proposed SHINE facility, radioactive material (e.g., nuclear fuel, radioisotopes, and radioactive waste) would be used, produced, handled, stored, released as gaseous effluents into the environment, and transported off site for use in medical procedures or as waste products for disposal (SHINE 2013a, 2013b).

As discussed in Section 2.7 of this document, radioactive gaseous effluents containing krypton, xenon, iodine, and tritium would be released into the environment. The NRC staff expects radioactive gaseous effluents to be the only contributor to a radiation dose to members of the public because no radioactive liquid effluents would be released (Section 2.7). Radioactive liquid wastes would be solidified and shipped off site for disposal. SHINE designed the buildings containing radioactive material with shielding to minimize direct radiation outside the facility. Given this shielding, SHINE projected negligible direct radiation at the site boundary (SHINE 2013a, 2013b).

SHINE estimates that the maximum dose to a member of the public from radioactive gaseous effluents in the offsite environment would be approximately 9.0 mrem (0.9 mSv) (SHINE 2015b). This dose is well below the annual dose limit of 100 mrem (1.0 mSv) in 10 CFR 20.1301(a)(1) and is below the ALARA requirements in 10 CFR 20.1101(d) that impose a constraint of 10 mrem (0.1 mSv) on the annual dose from radioactive gaseous effluents.

SHINE plans to maintain radiation exposure to facility workers to within the occupational dose limits in 10 CFR 20.1201. As discussed in Section 2.7 of this document, radiation exposure within the proposed facility would be minimized using shielding, shielded hot cells, shielded transport containers, access control to radiation areas, ventilation, filters, training, protective clothing, and administrative controls. In addition, SHINE would operate the proposed facility in accordance with all applicable Federal and State of Wisconsin regulatory requirements (SHINE 2013a).

As described above, the maximum dose to a member of the public would be within the annual dose limits of 100 mrem (1.0 mSv) in 10 CFR 20.1301 (SHINE 2013a). Further, the NRC staff is conducting a thorough independent review of the potential dose to the public from operation of the SHINE facility. This independent evaluation will be documented in the NRC staff's Safety Evaluation Report (SER). If the NRC staff determines in its SER that the maximum dose to workers and the public is within the dose limits in 10 CFR Part 20, the NRC staff concludes that the impacts from potential radiological exposures would be SMALL. In addition, the design of the facility incorporates measures to minimize radiation exposure to workers and members of the public by limiting the release of radioactive gaseous effluents, and that SHINE would operate the proposed facility in accordance with all applicable Federal and State of Wisconsin regulatory requirements.

4.8.2.2 Nonradiological

The proposed SHINE facility would be designed with engineering controls (e.g., shields, double-valves, ventilation system, glove boxes, fume hoods, safety switches, and safe-storage facilities) to minimize the exposure of workers to chemicals (SHINE 2013a, 2013b).

SHINE would have a Chemical Hygiene Plan to minimize chemical exposure to its workforce. The Chemical Hygiene Plan would incorporate mechanisms for maintaining a safe working environment and would be based on OSHA requirements, industry standards, and the experience of the managerial staff. General areas within the proposed facility and laboratory spaces would be kept clean and orderly. SHINE would store hazardous material (e.g., acids, bases, oxidizers, gases, and pyrophoric metals) in appropriate safety containers and cabinets (SHINE 2013a).

SHINE would designate a Chemical Hygiene Officer, whose main responsibilities would be to oversee the effective implementation of the Chemical Hygiene Plan. The Chemical Hygiene Officer would coordinate with the Radiation Safety Officer because some chemicals would be used in the radiological areas of the proposed facility. Coordination would help ensure the effectiveness of the overall safety culture at the proposed SHINE facility. In addition to supervision and oversight of facility operations, SHINE would implement an extensive training program that would emphasize workplace safety (SHINE 2013a).

In addition to supervision and training, the Chemical Hygiene Plan would describe requirements for protective equipment commensurate with the hazards. These requirements would range from a description of appropriate clothing for workers (e.g., no shorts or open-toed shoes in the facility or the laboratory) to protective equipment (e.g., gloves, safety glasses, and laboratory coats). For more potentially hazardous operations, such as target solution preparation, which involves the handling of acids, workers would be required to use face shields, aprons, and heavy nitrile gloves (SHINE 2013a).

As discussed in Sections 2.7, 4.2, and 4.4, nonradioactive pollutants may be present in wastewater and air emissions released into the environment during normal operations. Solid nonradioactive wastes would also be generated. After initial use, SHINE expects the majority of chemicals to be either reused, released into the environment, or shipped off site as waste (SHINE 2013a).

Given that SHINE would manage and minimize worker hazards by complying with OSHA and State of Wisconsin regulations and by using multiple planned features (e.g., facility design, Chemical Hygiene Plan, supervision, training, and protective equipment), the NRC staff concludes that impacts to workers and members of the public during routine facility operations would be SMALL.

4.8.3 Decommissioning

4.8.3.1 Radiological

The majority of the impacts associated with facility operations would cease with shutdown of the medical radioisotope production process; however, some impacts would remain unchanged, whereas others would continue at reduced or altered levels. Ancillary systems that were used solely to support radioisotope production would cease operations completely; however, because of residual radioactivity in the systems, impacts from their physical presence could continue as long as they remain at the facility (SHINE 2013a).

Terminating the medical radioisotope production operations would result in the cessation of actions necessary to maintain the TSV system, neutron generator, and processing vessels in an operable status. In addition, SHINE expects a reduction in the workforce directly supporting the radioisotope production operations. Termination of the medical radioisotope production operations does not automatically mean that immediate decontamination and dismantlement of the facility would occur.

After permanent cessation of operations, the equipment used for radioisotope production and associated processing equipment would be made inoperable and maintained in a safe condition (SHINE 2013a). SHINE would store the uranium fuel and other radioactive materials in a safe condition until packaged and transported to a disposal facility. Facility workers would continue to receive radiation exposure during work activities relating to the cleanup, movement, storage, and disposal of radioactive material. The radiological controls discussed in Section 3.8 of this document would be used to maintain radiation dose to levels that are ALARA. With the termination of radioisotope production, radioactive gaseous effluents released into the environment from operations would effectively stop. However, low levels of residual radioactive material that remain in the radioactive waste treatment systems may be released as effluents into the environment during the decommissioning process or sent to a low-level waste disposal facility.

During decommissioning activities, workers and members of the public would continue to be exposed to negligible or low levels of radioactive material within the facility and from radioactive gaseous effluents resulting from decommissioning activities involving the dismantlement and decontamination of equipment and systems and the handling, packaging, and transportation of radioactive waste to a disposal facility. The NRC's radiation protection standards and dose limits for workers and members of the public during decommissioning are the same as those for the operating facility.

The NRC would terminate the license if the decommissioning were performed in accordance with the facility's approved decommissioning plan and if the termination radiation survey and associated documentation demonstrated that the facility and site were suitable for release in accordance with the criteria in 10 CFR Part 20, Subpart E.

Based on the expected reduced levels of radioactive material in the facility and the radiological controls expected to be used to ensure compliance with radiation protection standards, the NRC staff concludes that the impacts to workers and members of the public from the decommissioning of the proposed SHINE facility and site would be SMALL.

4.8.3.2 Nonradiological

Nonradiological health impacts on the public and workers from decommissioning and demolition activities would be similar to construction activities. Decommissioning and demolition activities would involve the use of heavy construction and demolition equipment and the transport of new and waste materials and personnel to and from the site. The public and workers could be exposed to dust and vehicle exhaust and noise. Workers could also experience occupational injuries. Nonradiological hazards would also be associated with emissions, discharges, and waste from processes within the facility and from accidental spills and releases. SHINE would manage nonradioactive wastes generated by decommissioning the SHINE facility, including solid wastes, liquid wastes, discharges, and air emissions, in accordance with applicable Federal, State, and local laws and regulations and with applicable permit requirements discussed in Section 2.7. As discussed in Section 4.2 of this document, the NRC staff determined that air pollutants from worker vehicles and fossil-fueled equipment (e.g., demolition, excavation, and earth-moving equipment and electric generators) would have a SMALL impact on air quality. In addition, SHINE's access controls would help ensure that only authorized personnel would come on site. Given that SHINE would prohibit members of the public from accessing the site during decommissioning and that SHINE would manage nonradioactive wastes generated by decommissioning the SHINE facility in accordance with applicable Federal, State, and local laws and regulations and with applicable permit requirements, the NRC staff expects decommissioning activities to result in minimal human health impact to members of the public.

Decommissioning and demolition workers would encounter potential hazards typical of any industrial construction and demolition site. As discussed in Section 3.8, workplace hazards can be grouped into physical hazards (e.g., slips and trips; falls from height; and those related to transportation, temperature, humidity, and electricity); physical agents (e.g., noise and vibration); chemicals; and psychosocial issues (e.g., work-related stress). SHINE would implement normal construction safety practices contained in OSHA regulations, such as safety training, safety equipment, and supervision of the work force, to promote worker safety and reduce the likelihood of worker injury during decommissioning. However, decommissioning accidents could occur. Over the projected 12-month decommissioning period, SHINE estimated a peak of 261 workers at the site (SHINE 2013a). The NRC staff used data from the DOL BLS for nonfatal workplace injuries and illnesses to calculate the potential number of reportable cases at the proposed SHINE construction site based on the average number of workers. The DOL data for 2012 show that private industry employers reported nearly 3.0 million nonfatal workplace injuries and illnesses, resulting in an incidence rate of 3.4 cases per 100 equivalent full-time workers (DOL 2013). Conservatively assuming the peak number of 261 workers during the decommissioning period, the NRC staff estimates that there would be 8.9 recordable cases of nonfatal workplace injuries and illnesses during the 12-month decommissioning period. The NRC staff expects that SHINE would use the best available practices, such as proper planning, workplace design, and engineering controls, supplemented by the use of personal protective equipment and administrative controls, to protect workers. With the use of normal construction safety practices at the proposed SHINE decommissioning site, the NRC staff concludes that the average number of recordable cases during decommissioning would be consistent with the DOL data.

During decommissioning, nonradioactive chemical sources would be stored or used on site in liquid; gaseous; and solid forms, including fuels, oils, and solvents. SHINE does not plan to use any products or processes that emit hazardous air pollutants. Toxic chemicals stored or used at the construction site would be limited to be within the threshold amounts listed in the Wisconsin Administrative Code (SHINE 2013a, 2013b).

Given that access to the site would be restricted, that SHINE would implement normal safety practices contained in OSHA regulations, and that toxic chemicals stored or used at the construction site would be limited to be within the threshold amounts listed in the Wisconsin Administrative Code, the NRC staff concludes that impacts to human health during decommissioning would be SMALL.

4.9 Waste Management

4.9.1 Radioactive Waste

As described in Section 2.7, operation of the proposed SHINE facility would include the temporary storage and generation of radioactive waste.

NRC regulations require that radioactive material within the facility and radioactive effluents released into the environment meet radiation protection dose-based limits specified in 10 CFR Part 20. NRC regulations also require occupational and public exposure to radioactive material be ALARA, as required by 10 CFR 20.1101(b). In addition, the State of Wisconsin is an NRC Agreement State and has its own set of radiation protection regulations with authority to regulate certain radioactive byproduct materials. Wisconsin's rules on radiation protection are contained in the State of Wisconsin Administrative Code DHS 157. Radiation protection standards help to ensure the safety of facility workers and members of the public from operation of the radioisotope production facility.

SHINE would implement waste management systems to control, handle, process, store, and transport the types and quantities of radioactive waste expected to be generated by the medical radioisotope production process. For example, SHINE would use radioactive waste management systems, shielding, procedures, protective clothing, and training to control and process radioactive wastes within and outside the facility to ensure public and occupational safety (SHINE 2013a, 2013b). As discussed in Section 2.7.1, the radioactive liquid and gaseous wastes would be processed (i.e., temporary storage to allow for radioactive decay) to reduce the levels of radioactive material in the waste. SHINE would solidify some liquid wastes before disposal on site. For example, it would solidify evaporator bottoms and spent ion-exchange column media from the target solution cleanup system. Waste from proprietary processes may be solidified in a hot cell using Portland cement before shipment and disposal (SHINE 2013a).

After SHINE treats, solidifies, and packages liquid radioactive waste, it would be temporarily stored on site only long enough for radioactive decay before offsite disposal shipment and for efficient frequency of disposal shipments (SHINE 2013a). Class A waste could accumulate up to 1 year. No liquid radioactive effluents would be released into the environment.

SHINE would use high-efficiency particulate filters and carbon bed filters to treat gaseous radioactive effluents to reduce their radioactivity before they are released through a vent stack in the Production Facility Building (SHINE 2013a). SHINE expects the gaseous radioactive effluents released into the environment to contain measurable quantities of noble gases (i.e., xenon and krypton), radioactive iodine, and tritium (see Section 2.7). The vent stack would have a radiation monitor that would continuously monitor the gaseous effluents to ensure that the effluents are within design parameters and regulatory limits. SHINE would be able to collect samples of the gaseous effluent in the vent stack to perform a detailed analysis of the specific types, concentrations, and quantities of the radionuclides in the gaseous effluents (SHINE 2013a).

The proposed SHINE facility design would incorporate features to minimize radioactive contamination of the facility and radioactive effluent releases into the environment. The design would use engineered features, such as shielding, berms, sumps, and drain collection systems with leak detection; ventilation systems with filters; hot cells; glove boxes; shielded transport containers; and protective coatings on floors and walls. Other protection measures for the facility workers include the following: training, protective clothing and equipment, and procedures. Additionally, administrative measures would be used to minimize the movement of contaminated materials out of the facility's RCA and to limit the introduction of unnecessary materials into the RCA that may become contaminated and require disposal as low-level waste (SHINE 2013a, 2013b).

The waste management systems and engineering designs features would help ensure that the dose to facility workers and members of the public are within the NRC's dose limits and are reduced to levels that are ALARA in accordance with NRC regulations. Further, SHINE would implement procedures to ensure proper operation of the waste systems. Therefore, the NRC staff determined that the waste management systems would be expected to ensure that the radioactive wastes generated at the proposed SHINE facility would be managed in accordance with the regulatory requirements of the NRC, the U.S. Department of Transportation (DOT), and the State of Wisconsin.

A provision of the American Medical Isotopes Production Act of 2012 (42 U.S.C. 2065(c)(3)(A)(ii)) states that DOE would take title to, and be responsible for, the final disposition of radioactive waste created by the irradiation, processing, or purification of uranium leased from DOE if it determines that the producer (e.g., SHINE) does not have access to a disposal path. For example, if a disposal pathway for greater than Class C waste does not exist, DOE will be responsible for its safe storage and disposal.

Based on SHINE's proposed waste management systems; engineered designs features to minimize radioactive contamination; and because SHINE would operate within the NRC's, DOT's, and State of Wisconsin's radiation protection requirements, the NRC staff concludes that radioactive waste is expected to be managed in accordance with applicable Federal and State regulatory requirements. Therefore, the NRC staff concludes that impacts would be SMALL during construction, operations, and decommissioning.

4.9.2 Nonradioactive Waste

As discussed in Section 2.7, SHINE would acquire, use, and store solid and liquid nonradioactive waste.

Resource Conservation and Recovery Act (RCRA) waste regulations govern the disposal of solid and hazardous waste. RCRA, Subtitle C, establishes a system for controlling hazardous waste, and RCRA, Subtitle D, encourages states to develop comprehensive plans to manage nonhazardous solid waste and mandates minimum technological standards for municipal solid waste landfills. In the State of Wisconsin, EPA has delegated the primary responsibility for implementing RCRA regulations to the State of Wisconsin. For example, Wisconsin Administrative Code NR 460 addresses the identification; generation; minimization; transportation; and final treatment, storage, or disposal of hazardous and nonhazardous waste.

SHINE would implement waste management systems to control, handle, process, store, and transport nonradioactive waste generated during construction, operations, and decommissioning (SHINE 2013a). As described in Section 2.7, SHINE's nonradioactive waste management program is based on a pollution prevention and waste minimization framework. The design of the SHINE facility would also incorporate features to minimize the release of fuel, chemicals, or other nonradioactive materials into the environment (SHINE 2013b). Additionally, during operations, SHINE would contain chemicals within closed systems, use the chemicals in controlled processes, and treat chemicals through filters and scrubbers (SHINE 2013a, 2013b). (See Section 4.9.2 for additional discussion on nonradioactive gaseous effluents.) The NRC staff expects that the waste management systems would ensure that the nonradioactive wastes generated at the proposed SHINE facility would be managed in accordance with the regulatory requirements of DOT and the State of Wisconsin.

Nonhazardous waste would be temporarily stored on site before being transported to a local disposal or recycling facility (SHINE 2013a). The NRC staff determined that adequate storage capacity occurs within the facility to accommodate the waste generated and stored between shipments to offsite disposal facilities.

Based on SHINE's proposed waste management systems, processes to minimize chemical contamination, and because SHINE would operate within DOT and the State of Wisconsin's nonradiological requirements, the NRC staff concludes that nonradioactive waste is expected to be managed in accordance with applicable regulatory requirements. Therefore, the NRC staff concludes that impacts would be SMALL during construction, operations, and decommissioning.

4.10 Transportation

4.10.1 Construction

Construction of the proposed SHINE facility would require an average of 420 deliveries per month (14 deliveries per day) and 9 offsite waste shipments per month using heavy vehicles (dump trucks, delivery trucks) (SHINE 2013a, 2014). Peak worker traffic volume during construction would add an estimated 451 vehicles (pickup trucks and cars) per day (SHINE 2013a, 2014). The NRC staff assumed that, with a total of 465 vehicles per day, each having an arrival and departure trip, and with some vehicles making return trips during the day (e.g., off site for lunch), vehicle counts immediately adjacent to the proposed SHINE facility may increase by approximately 1,000 trips per day.

Although offsite sources of construction materials, including concrete, have not been specified and routes for delivery of these materials have not been designated, SHINE plans to ensure that delivery routes would avoid residential and sensitive areas (SHINE 2013b). SHINE and the common carrier trucks would be required to adhere to the applicable regulatory packaging and transportation requirements for radioactive material in NRC regulations (10 CFR Parts 20, 40, and 71), the State of Wisconsin Administrative Code Chapter 326, "Transportation," and DOT requirements (49 CFR Parts 172 and 173) (SHINE 2013a). These regulations help ensure public health and safety on roadways.

Table 3–14 indicates that U.S. Highway 51 experiences approximately 9,000 vehicles per day adjacent to the proposed SHINE facility. Although available traffic counts do not distinguish between types of vehicles currently traveling this route, the addition of up to 465 vehicles per day (or approximately 1,000 trips per day) from construction activities at the proposed SHINE facility would result in an increased traffic volume on U.S. Highway 51 of approximately 11 percent, and the percentage of heavy vehicles on this route would also increase.

SHINE's traffic analysis indicated that construction-related traffic would contribute to minor delays during peak-hour traffic at intersections along U.S. Highway 51 in the vicinity of proposed SHINE facility, but not to a degree that would require modifications to the transportation infrastructure (SHINE 2013a). Because traffic to and from the proposed SHINE facility would use both U.S. Highway 51 northbound and southbound routes, the site access point at U.S. Highway 51 would experience the greatest impact on current traffic with impacts decreasing further from the proposed SHINE facility. During construction, SHINE plans to use a staggered work shift schedule to reduce the hourly traffic flow onto U.S. Highway 51 and to schedule truck deliveries early in the day to help reduce traffic congestion (SHINE 2013b).

Based on the overall increase in average daily traffic flow and construction-related truck traffic, the NRC staff concludes that traffic impacts in the immediate vicinity of the proposed SHINE facility would be noticeable, but not destabilizing. These impacts likely would be temporary and of short duration, and would abate as construction activities wind down. Therefore, the impact on transportation infrastructure during the construction phase would be MODERATE.

4.10.2 Operations

During operations at the proposed SHINE facility, an estimated maximum of 150 worker vehicles per day would access the site over three work shifts (SHINE 2013a, 2014). In its environmental report (ER), SHINE assumed that 75 percent of site-related traffic would come from and go to the north, and 25 percent would come from and go to the south (SHINE 2013a). The NRC staff estimated that each vehicle would make separate trips to and from the proposed SHINE facility, plus a number of trips to and from the proposed SHINE facility during the midshift, resulting in approximately 325 additional worker vehicle trips daily.

In addition to operations employees commuting to the proposed SHINE facility, SHINE estimates traffic to and from the proposed facility would also include the following:

(1) an average of 36 truck deliveries per month to the proposed SHINE facility, which would include both radioactive and nonradioactive materials (SHINE 2013a, 2015a);

(2) an average of 39 outbound medical isotope product shipments per month through the Southern Wisconsin Regional Airport (SHINE 2015a);

(3) an average of 25.6 radioactive waste shipments per year (SHINE 2015a); and

(4) an average of one shipment per month of nonradioactive domestic and industrial waste (SHINE 2013a, 2015a).

SHINE's preferred method of product shipments would be to transport products by truck from the proposed SHINE facility to the Southern Wisconsin Regional Airport, approximately 0.5 mi (0.8 km) away, for air transport to customers. These shipments would result in an estimated 1 percent increase in flight operations at the airport. In the event that the Southern Wisconsin Regional Airport is unavailable, product shipments would be transported by truck to the nearest secondary airport (SHINE 2013a).

SHINE's traffic analysis indicates that a "slight degradation of service" (i.e., traffic delays) would occur at the intersection of westbound State Trunk Highway 11 onto southbound U.S. Highway 51 during the morning peak hour (SHINE 2013a). This impact could be mitigated by optimizing the signal timing for this turning movement, which would improve the level of service to its existing level (SHINE 2013a). The NRC staff expects the overall daily traffic flow in the immediate vicinity of the proposed SHINE facility to increase slightly during the operation phase, but it would not be appreciable when compared with the average daily and annual traffic flow of roads in the immediate vicinity of the proposed SHINE facility, as discussed in Section 3.9.1.

As described above and in Section 2.7, SHINE would transport radioactive waste from the proposed SHINE site to an offsite storage, treatment, or disposal facility. A common carrier truck would transport the waste. SHINE and the common carrier trucks would be required to adhere to the applicable regulatory packaging and transportation requirements for radioactive material in NRC regulations (10 CFR Parts 20, 40, and 71), the State of Wisconsin Administrative Code Chapter 326, "Transportation"), and DOT requirements (49 CFR Parts 172 and 173) (SHINE 2013a). These regulations help ensure public health and safety on roadways.

Because of the relatively small increase in traffic as compared to the average daily and annual traffic flows near the proposed SHINE site and because SHINE and common carrier trucks would be required to adhere to the applicable NRC, DOT, and State of Wisconsin regulatory packaging and transportation requirements for radioactive material, impacts on transportation would generally be SMALL. However, because the additional traffic attributable to SHINE worker vehicles would result in morning peak-hour traffic delays sufficient to reduce the existing level of service (traffic flow) at a key intersection near the SHINE facility, impacts could temporarily be MODERATE. Therefore, the NRC staff concludes that the impact on transportation infrastructure during operations would range from SMALL to MODERATE.

4.10.3 Decommissioning

Decommissioning of the proposed SHINE facility would require an average of 72 truck deliveries and 191 offsite waste shipments per month (a total of approximately 9 heavy-vehicle shipments per day) (SHINE 2013a, 2014). Peak worker traffic volume during decommissioning would add an estimated 261 vehicles per day (SHINE 2013a, 2014). Therefore, the NRC staff estimates that there could be an increase of approximately 580 trips a day on local roads during the decommissioning phase, thereby increasing the average daily traffic on roads in the immediate vicinity of the proposed SHINE facility from traffic during the operation phase. SHINE assumed that traffic in support of decommissioning, including employee commutes, would be similar to the initial construction phase with the following three exceptions:

(1) Production equipment brought to the proposed SHINE facility as clean material and later contaminated from operations would be packaged and transported as radioactive waste. Thus, the ratio of radioactive to nonradioactive shipments would likely be greater than those in the construction phase. As described above, SHINE and common carrier trucks would be required to adhere to the applicable NRC, DOT, and State of Wisconsin regulatory packaging and transportation requirements for radioactive material.

(2) Facility upgrades and expansions that would be implemented during the operational life of the proposed SHINE facility and not accounted for under initial construction would add to the ultimate decommissioning waste volume.

(3) Size reduction of facilities and process components during decommissioning, such as the compacting of pre-assembled filter plenums and air ducts to minimize waste packaging void space, could reduce the overall volume of both contaminated and noncontaminated wastes generated and shipped for disposal under decommissioning.

SHINE could use a staggered work shift schedule, similar to construction, to reduce the hourly traffic flow onto U.S. Highway 51 and to schedule truck deliveries early in the day to help reduce traffic congestion (SHINE 2013b). However, the change in average daily traffic flows in the immediate vicinity of the proposed SHINE facility and the increase in commuter, truck delivery, and waste traffic directly related to decommissioning could noticeably affect local commuting patterns. Because traffic to and from the proposed SHINE facility would use both

U.S. Highway 51 northbound and southbound routes, the site access point at U.S. Highway 51 would experience the greatest impact to current traffic with impacts decreasing further from the proposed SHINE facility.

Based on the overall increase in average daily traffic flow and decommissioning-related truck traffic, the NRC staff concludes that traffic impacts in the immediate vicinity of the proposed SHINE facility would be noticeable, but not destabilizing. These impacts likely would be temporary and of short duration, and would abate as decommissioning activities wind down. Therefore, the impact on transportation infrastructure during the decommissioning phase would be MODERATE.

4.11 Accidents

This section discusses the environmental impacts associated with potential radiological and hazardous chemical accidents that might occur at the proposed SHINE facility. The information contained in this section comes from the SHINE ER (SHINE 2013a). In addition to this EIS, the NRC staff will perform an independent verification of the potential accident scenarios and associated consequences at the proposed SHINE facility in its SER. The SER is part of the regulatory process used by the NRC to decide whether to issue a construction permit and operating license for the proposed SHINE facility.

The term "accident," as used in this section, refers to any off-normal event that releases radioactive or hazardous chemicals into the environment that may affect facility workers and members of the public. The accidents described in this section are associated with the medical radioisotope production process.

Potential initiating events and credible operational accidents for the proposed SHINE facility constitute the design-basis accidents (DBAs). For example, SHINE considered a small aircraft collision as a credible DBA scenario. The maximum hypothetical accident (MHA) goes beyond the credible DBA scenarios and represents the bounding case accident (SHINE 2013a). This EIS uses the impacts from the MHA as the basis for the significance determination of the environmental impact from potential accidents at the proposed SHINE facility.

SHINE classified accidents into two categories: those that are nuclear or involve radiation and those related to handling and storage of hazardous chemicals. The list below includes potential hazards associated with the operation of the proposed SHINE facility (SHINE 2013a).

(1) Nuclear or Radioactive Material. The types of accidents involving nuclear or radioactive material include the following:

- criticality accidents associated with handling and storage of fissile source material;
- criticality accidents associated with fissile solution mixing and TSV or dump tank operation; and
- radiation doses exceeding regulatory limits to facility workers accidents from the following:
  - irradiated fissile solution and fission/decay (dissolved and gaseous),
  - accelerator/moderator neutron production, and
  - radioactive waste handling and storage (SHINE 2013a).

(2) Hazardous Chemicals. The types of accidents involving hazardous chemicals include explosion or fire accidents associated with radiolytic gas generation, collection, or recombination and include the following:

- hazardous chemical vessel or tank failure accidents caused by natural catastrophic events that result in leaks or spills,
- hazardous chemical reactivity (heat or pressure) accidents in a vessel or tank exceeding the equipment design that result in a leak or spill, and
- human-error accidents occurring during hazardous chemical handling that result in a spill inside or outside the buildings (SHINE 2013a).

4.11.1 Maximum Hypothetical Accident

This section discusses the potential offsite radiological consequences of the MHA and controls to prevent or mitigate the potential consequences. The results of the analysis are compared to the NRC public dose limits in 10 CFR 20.1301. The MHA is a conservative evaluation and represents the bounding consequences for potential DBAs at the proposed SHINE facility.

The MHA is an event that could result in radiological consequences exceeding those of any credible accident. It is a bounding calculation on the radiological consequences of postulated DBAs at the proposed SHINE facility.

The MHA is based on events unique to the design of the proposed SHINE facility that hypothetically could release radioactive materials into the environment. The proposed SHINE facility would have two major operation facilities involving radioactive and hazardous chemical materials: the irradiation facility and the radioisotope production facility (Chapter 2) (SHINE 2013a). Under normal operating conditions, processes in both of these areas would be of generally low energy (i.e., subcritical and low-heat generation). SHINE designed the facility to withstand credible external events, such as tornadoes and earthquakes, without causing an accident (SHINE 2013a). An internal accident that releases the largest hypothetical quantity of radioactive material would be the initiating event that results in the maximum bounding radiological consequence or MHA (SHINE 2013a).

The irradiation facility and radioisotope production facility are designed to function as two physically separated, independent areas within the facility. Although the irradiation facility and radioisotope production facility have interconnected processes and systems, they are physically separated by concrete walls. Additional safety features include shielding, redundant isolation valves, ventilation systems, and penetration seals that reduce the likelihood that an accident in one area would affect the other area (SHINE 2013a).

The SHINE irradiation and radioisotope production facilities are designed to withstand external events, such as tornadoes, maximum expected seismic events, and manmade external events. SHINE states that scenarios involving multiple irradiation units are not credible because there is no initiating event that could produce a breach of more than one irradiation unit (SHINE 2013a).

SHINE states that one credible MHA initiating event, a rupture or leakage of the TSV, or TSV dump tank, would affect only one irradiation unit cell. This event would result in a complete release of the target solution and fission product inventory into one irradiation unit cell. Under a worse-case condition, this MHA assumes that the 5.5-day irradiation cycle has just been completed and that decay time has not begun. By design, this event would be confined to the interior of the irradiation unit cell. The calculated radionuclide inventory released from the TSV to the irradiation unit cell would represent the bounding source term for any postulated accident in the irradiation facility (SHINE 2013a).

SHINE states that the radiation effects of this MHA would be mitigated by several controlling mechanisms, including confinement provided by the irradiation unit cell's exterior walls; confinement by the RCA ventilation system; radiation monitoring; shielding of the pipe penetrations; and the collection of gas, vapor, or particulates by the TSV off-gas system (SHINE 2013a).

Another potential MHA initiating event scenario evaluated by SHINE is a release of the radioactive material inventory held in the noble gas removal system storage tanks when they are at their maximum storage level. By design, this event would be confined to the noble gas storage tank room, located in the radioisotope production facility. The calculated radionuclide inventory released from the noble gas removal system storage tanks represents the bounding source term for any other postulated MHA in the radioisotope production facility. The radiation effects of this MHA in the radioisotope production facility would be mitigated by the walls in the noble gas removal system room, collection by the ventilation system, and collection by the RCA ventilation system (SHINE 2013a).

SHINE's evaluation of the radioactive material inventory for these two potential MHAs is based on a set of initial conditions that maximize the potential source terms and bound DBA scenarios (SHINE 2013a).

SHINE calculated the potential dose to an offsite member of the public for the potential MHAs as follows:

(1) A rupture or leakage of the TSV or TSV dump tank scenario would result in a total effective dose equivalent of 16.5 mrem (0.16 mSv) at the site boundary and 2.30 mrem (0.023 mSv) at the nearest residence.

(2) A release of the inventory stored in the noble gas removal system storage tanks would result in a total effective dose equivalent of 82.0 mrem (0.82 mSv) at the site boundary and 11.5 mrem (0.11 mSv) at the nearest residence (SHINE 2015a).

SHINE has proposed to provide safety-related structures, systems, and components (as defined in the SHINE Preliminary Safety Analysis Report) that would prevent the initiation of accidents or mitigate their consequences (SHINE 2013a). These safety-related structures, systems, and components include the systems described above (i.e., the irradiation unit cell confinement, radiation monitoring system, ventilation system, pipe penetration shields, TSV off-gas system, noble gas removal system walls, RCA ventilation system, secure chemical containers, and other safety-related structures, systems, and components). The NRC staff is conducting a thorough independent review of these safety-related structures, systems, and components, which it will document in its SER. The NRC staff will determine whether the safety-related structures, systems, and components will be designed, implemented, and maintained to ensure that they are available and reliable to perform their preventive or mitigative functions when needed so that the likelihood of serious consequences is small. If the staff determines, in its SER, that SHINE has met all of the NRC regulatory requirements described above, the likelihood of accidents would be reliably controlled.

The calculated doses for the MHA at the proposed SHINE facility would be within the annual dose limits of 100 mrem (1.0 mSv) in 10 CFR 20.1301 to a member of the public (SHINE 2013a). Further, the NRC staff is conducting a thorough independent review of the potential dose to the public from the MHA. This independent evaluation will be documented in the NRC staff's SER. If the NRC staff determines in its SER that the hypothetical accident dose is within the dose limits in 10 CFR 20.1301, the NRC staff concludes that the impacts from potential radiological accidents would be SMALL.

4.11.2 Hazardous Chemical Accidents

In its ER, SHINE evaluated the consequence of hazardous chemical releases from its proposed facility using dispersion models and/or computer codes that are consistent with methodologies contained in the Nuclear Fuel Cycle Facility Accident Analysis Handbook (NUREG/CR-6410) (NRC 1998). SHINE used a combination of ALOHA (Areal Locations of Hazardous Atmospheres) code (EPA/NOAA 2013) and EPIcode (Homann Associates, Inc., 2007) computer programs to model chemical releases and to determine the chemical concentration (SHINE 2013a). These codes are widely used to support accident analysis and emergency response evaluations by Government agencies, such as EPA and U.S. Department of Energy (DOE). SHINE verified and validated both codes for modeling chemical hazards at the proposed SHINE facility. ALOHA is only able to model about half of the chemicals that would be used at the proposed SHINE facility; therefore, SHINE used the EPIcode to model other chemical dose calculations. SHINE stated that both computer codes give comparable results for the hazardous chemicals they have in common and both implement release and dispersion models that are consistent with the guidance in NUREG/CR-6410. For validation, SHINE used ALOHA to check some of the output values from the EPIcode (SHINE 2013a).

In its analysis, SHINE assumed the release of all chemical materials and did not take a reduction credit for the deposition of chemicals within the facility or during transport to the site boundary or the nearest population location. All dispersion calculations were made assuming stable meteorological conditions and a 1-m-per-second (m/s) wind speed. The chemical concentrations reported in Table 4-13 are in units of parts per million (ppm) and milligram per cubic meter (mg/m^3). These meteorological conditions are typically seen about 15 percent of the time at the Janesville site (SHINE 2013a). Ambient temperature was assumed to be 75 °F (24 °C), the deposition velocity was assumed to be 1 m/s, and a receptor height of 1.5 m (4.9 ft) was used to simulate the height of an individual. Concentrations produced by the model runs are for plume centerline values. Chemical releases were conservatively modeled at ground level and in the centerline of the plume (SHINE 2013a).

SHINE determined the chemical concentrations for nonpropriety hazardous chemicals in the proposed facility inventory. The concentrations were calculated for the maximum offsite individual (MOI) at the site boundary and the nearest residence, 402 m (1319 ft) and 788 m (2585 ft), respectively. In its ER, SHINE summarizes the results of the source term and calculated concentrations for the nonpropriety chemicals that would be used at the proposed facility. The NRC staff provides this information in Table 4–13. The material at risk (MAR) category represents the inventory of hazardous material that is available for release from the postulated accident scenario. The MAR for most of the chemicals represents the amount of material in storage. In some cases, the MAR represents the total facility inventory. For other chemicals, a reduction factor has been applied to account for the total inventory that is not available for release because the material is being stored in secure containers. SHINE selected the chemicals for evaluation based on the combination of anticipated bounding facility inventory amounts and toxicity characteristics. As its acceptance criteria, SHINE used the criteria in NUREG/CR-6410, which correspond to Protective Action Criteria (PAC) (DOE 2012a) and which are explained later in this section. The PAC values correspond to Acute Exposure Guideline Levels (AEGLs) in EPA guidance (EPA 2012b), Emergency Response Planning Guidelines (ERPG) (AIHA 2012), or Temporary Emergency Exposure Limits (TEEL) (DOE 2008) values for the chemicals (SHINE 2013a).

Table 4–13. SHINE Hazardous Chemical Source Terms and Concentrations

Hazardous Chemical/ Release Mechanism	MAR (lb)	Source Term[a] (lb)	PAC-1	PAC-2	PAC-3	Site Boundary (402 m) Concentration	Nearest Residence (788 m) Concentration
Nitric Acid (Evaporating liquid)	6,229	6,229	0.53 ppm	24 ppm	92 ppm	3.0 ppm	0.4 ppm
Sulfuric Acid (Evaporating liquid)	7,770	7,770	0.20 mg/m^3	8.7 mg/m^3	160 mg/m^3	4.7x10^{-7} mg/m^3	6.3x10^{-8} mg/m^3
Calcium Hydroxide (Dispersed solid)	3,182	3.182	15 mg/m^3	240 mg/m^3	1,500 mg/m^3	0.16 mg/m^3	0.020 mg/m^3
Caustic Soda (Dispersed solid)	1,488	1.488	0.5 mg/m^3	5 mg/m^3	50 mg/m^3	0.073 mg/m^3	0.010 mg/m^3
Ammonium Hydroxide (Dispersed solid)	59	0.059	61 ppm	330 ppm	2,300 ppm	2.0x10^{-3} ppm	2.6x10^{-4} ppm
Dodecane (Evaporating liquid)	1,033	1,033	0.0028 ppm	0.031 ppm	7.9 ppm	4.4x10^{-3} ppm	5.9x10^{-4} ppm
Potassium Permanganate (Dispersed solid)	66	0.066	8.6 mg/m^3	14 mg/m^3	78 mg/m^3	3.3x10^{-3} mg/m^3	4.2x10^{-4} mg/m^3
Tributyl Phosphate (Dispersed solid)	333	0.333	0.6 mg/m^3	3.5 mg/m^3	125 mg/m^3	1.5x10^{-3} mg/m^3	2.0x10^{-4} mg/m^3
Uranyl Nitrate (Dispersed solid—likely in solution)	480	0.480	0.99 mg/m^3	5.5 mg/m^3	33 mg/m^3	0.024 mg/m^3	3.1x10^{-3} mg/m^3

[a] The source term value has been reduced from the inventory value based on a reduction factor to account for the amount of material available for release into the environment.

Source: SHINE 2013a

Emergency exposure limits are essential components of planning for the uncontrolled release of hazardous chemicals. These limits, combined with estimates of exposure, provide the information necessary to identify and evaluate accidents for the purpose of taking appropriate protective actions. During an emergency response to an uncontrolled release, these limits may be used to evaluate the severity of the event, to identify potential outcomes, and to decide what protective actions should be taken. In anticipation of an uncontrolled release, these limits may also be used to estimate the consequences of an uncontrolled release and to plan emergency responses (DOE 2008).

SHINE's analysis indicates that the chemical dose or concentration for the MOI and the nearest residence for the worst-case analysis is below the PAC-2 and PAC-3 levels (equivalent to ERPG-2 and ERPG-3) for all the listed hazardous chemicals. These concentrations are conservatively calculated (i.e., they overestimate the potential consequences of the hazardous chemical release) and are based on the conservative assumption that the liquid hazardous chemicals would be instantaneously released and evaporating within 1 hour. If an accident were to occur, SHINE states that this amount of fluid evaporation would take longer than 1 hour, which would have the effect of reducing the hazardous chemical concentrations at the site boundary and to the nearest resident (SHINE 2013a).

PAC (AEGLs and ERPGs) are defined below.

The AEGLs represent threshold exposure limits for the general public and are applicable to emergency exposures ranging from 10 minutes to 8 hours. Three levels—AEGL-1, AEGL-2, and AEGL-3—are used for each of five exposures periods (10 minutes, 30 minutes, 1 hour, 4 hours, and 8 hours) and are distinguished by varying degrees of severity of toxic effects. DOE guidance that SHINE followed states that the 1-hour AEGL values should be used to assess the potential impacts associated with the accidental release of hazardous chemicals. The three AEGLs are defined as follows:

(1) AEGL-1 is the airborne concentration (expressed in ppm or milligrams per cubic meter (mg/m^3)) of a substance above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort; irritation; or certain asymptomatic, nonsensory effects. However, these effects are not disabling and are transient and reversible upon cessation of exposure.

(2) AEGL-2 is the airborne concentration (expressed as ppm or mg/m^3) of a substance above which it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting, and adverse health effects or an impaired ability to escape.

(3) AEGL-3 is the airborne concentration (expressed as ppm or mg/m^3) of a substance above which it is predicted that the general population, including susceptible individuals, could experience life-threatening adverse health effects or death.

The three ERPGs are defined as follows:

(1) ERPG-1 is the maximum concentration in air below which it is believed nearly all individuals could be exposed for up to 1 hour without experiencing other than mild transient adverse health effects or perceiving a clearly defined objectionable odor.

(2) ERPG-2 is the maximum concentration in air below which it is believed nearly all individuals could be exposed for up to 1 hour without experiencing or developing irreversible or other serious health effects or symptoms that could impair their abilities to take protective action.

(3) ERPG-3 is the maximum concentration in air below which it is believed nearly all individuals could be exposed for up to 1 hour without experiencing or developing life-threatening health effects.

SHINE's analysis shows that, for the hazardous chemicals listed in Table 4–13, the concentrations to the MOI and the nearest residence would be below the PAC-1, PAC-2, and PAC-3 levels (equivalent to ERPG-1, ERPG-2, and ERPG-3), except for nitric acid, which exceeds the PAC-1 level for the MOI. For nitric acid, the MOI could be exposed to a concentration above the PAC-1 level (equivalent to ERPG-1) but below the PAC-2 level (equivalent to ERPG-2). ERPG-1 is the maximum concentration in air below which it is believed nearly all individuals could be exposed for up to 1 hour without experiencing other than mild transient adverse health effects or perceiving a clearly defined objectionable odor. Exposure below the PAC-2 level (equivalent to ERPG-2) would not likely result in experiencing or developing irreversible or other serious health effects of symptoms that could impair an individual's ability to take protection action (i.e., seek shelter or evacuate to a location further away from the proposed SHINE facility).

The NRC staff concludes that the impacts to the MOI from the potential uncontrolled release of hazardous chemicals under accident conditions from the proposed SHINE facility may include mild transient adverse health effects but would not include serious irreversible health effects. Further, the NRC staff is conducting a thorough independent review of the health impacts to the public from a chemical accident. The NRC will document the independent evaluation in its SER. If the NRC staff determines in the SER that the hypothetical accident dose is within the dose limits in 10 CFR 70.61 and if SHINE meets all the performance requirements in 10 CFR 70.61, the NRC staff concludes that the impacts from potential chemical accidents would be SMALL.

4.12 Environmental Justice

This section describes the potential human health and environmental effects from the construction, operations, and decommissioning of the proposed SHINE facility on minority and low-income populations living near the proposed site. The NRC strives to identify and consider environmental justice issues in agency licensing and regulatory actions primarily by fulfilling its NEPA responsibilities for these actions.

Under Executive Order (EO) 12898 (59 FR 7629), Federal agencies are responsible for identifying and addressing, as appropriate, potential disproportionately high and adverse human health and environmental impacts on minority and low-income populations. In 2004, the Commission issued a Policy Statement on the Treatment of Environmental Justice Matters in NRC Regulatory and Licensing Actions (69 FR 52040), which states that "[t]he Commission is committed to the general goals set forth in EO 12898, and strives to meet those goals as part of its NEPA review process."

The CEQ provides the following definitions to consider when conducting environmental justice reviews within the framework of NEPA in *Environmental Justice: Guidance under the National Environmental Policy Act* (CEQ 1997):

> **Disproportionately High and Adverse Human Health Effects.** Adverse health effects are measured in risks and rates that could result in latent cancer fatalities, as well as other fatal or nonfatal adverse impacts on human health. Adverse health effects may include bodily impairment, infirmity, illness, or death. 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 (as employed by NEPA) and appreciably exceeds the risk or exposure rate for the general population or for another appropriate comparison group.
>
> **Disproportionately High and Adverse Environmental Effects.** A disproportionately high environmental impact that is significant (as employed by NEPA) refers to an impact or risk of an impact on the natural or physical environment in a low-income or minority community that appreciably exceeds the environmental impact on the larger community. Such effects may include ecological, cultural, human health, economic, or social impacts. An adverse environmental impact is an impact that is determined to be both harmful and significant (as employed by NEPA). In assessing cultural and aesthetic environmental impacts, impacts that uniquely affect geographically dislocated or dispersed minority or low-income populations or American Indian tribes are considered.

The environmental justice analysis assesses the potential for disproportionately high and adverse human health or environmental effects on minority populations and low-income populations that could result from the construction, operations, and decommissioning of the

SHINE facility. In assessing the impacts, the following definitions of minority individuals and populations and low-income population were used (CEQ 1997):

> **Minority individuals**. Individuals who identify themselves as members of the following population groups: Hispanic or Latino, American Indian or Alaska Native, Asian, Black or African American, Native Hawaiian or Other Pacific Islander, or two or more races—meaning individuals who identified themselves on a Census form as being a member of two or more races (e.g., Hispanic and Asian).
>
> **Minority populations**. Minority populations are identified when the minority population of an affected area exceeds 50 percent or the minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis.
>
> **Low-income population.** Low-income populations in an affected area are identified with the annual statistical poverty thresholds from the [U.S.] Census Bureau's Current Population Reports, Series P60, on Income and Poverty.

<u>Methodology for Assessing Environmental Justice Impacts</u>

The NRC normally addresses environmental justice issues and concerns by first identifying potentially affected minority and low-income populations and then determining whether there would be any potential human health or environmental effects and whether these effects may be disproportionately high and adverse. Adverse health effects are measured in terms of the risk and rate of fatal or nonfatal adverse impacts on human health. 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 risks of impacts on the natural or physical environment in a minority or low-income community that are significant and that appreciably exceed the environmental impact on the larger community. Such effects may include biological, cultural, economic, or social impacts.

Consistent with the Commission's Policy Statement (69 FR 52040), affected populations are defined as minority and low-income populations who reside within a 5-mi (8-km) radius of the proposed SHINE facility site. Data on minority and low-income populations are usually collected and analyzed at the Census tract or Census block group level.

The U.S. Census Bureau (USCB) compiles demographic information at the Census tract and block group levels in small geographic areas. A Census tract is a small area that is a statistical subdivision of a county or statistically equivalent entity. A block group is a statistical subdivision of a Census tract. A Census block is the smallest geographic entity for which the USCB collects and tabulates data.

Minority population data were available for Census block groups within a 5-mi (8-km) radius around the proposed site. Low-income population data were only available at the Census tract level because of the limited availability of poverty data at the block group level. To protect confidentiality, USCB does not publish information about small geographic areas if the population size is too small. The NRC staff used race and ethnicity and poverty Census data to identify the location of minority and low-income populations near the proposed site. If the Census tract and block group boundaries crossed the 5-mi (8-km) radius boundary, the entire Census tract or Census block group data were used. Geographic information system software was used to create the maps.

Minority Population

According to the 2010 Census, approximately 12 percent of the City of Janesville population (which includes more than one Census tract and block group) identified themselves as minority. In Rock County, approximately 15 percent of the population identified themselves as minority (UCSB 2014a).

Within the 5-mi (8-km) radius of the proposed SHINE facility and the existing industrial park, 12.5 percent of the population identified themselves as minority individuals (Table 4–14) (UCSB 2014a). The largest minority group was Hispanic or Latino (of any race) at 6 percent, followed by Black or African American at 3 percent (USCB 2014a).

Figure 4–2 shows minority population block groups within a 5-mi (8-km) radius of the proposed SHINE facility site. Census block groups were considered minority population block groups if the percentage of the minority population within any block group exceeded 12.5 percent. Eleven of the 25 Census block groups were found to have meaningfully greater minority populations. The proposed SHINE facility site is located in Census Tract 14, Block Group 3, with a minority population of 17.6 percent. This block group is considered a minority population block group because it has a greater percentage of minority people than that in the 5-mi (8-km) radius.

Figure 4–2. Minority Populations Within 5 mi (8 km) of the Proposed SHINE Site in Janesville

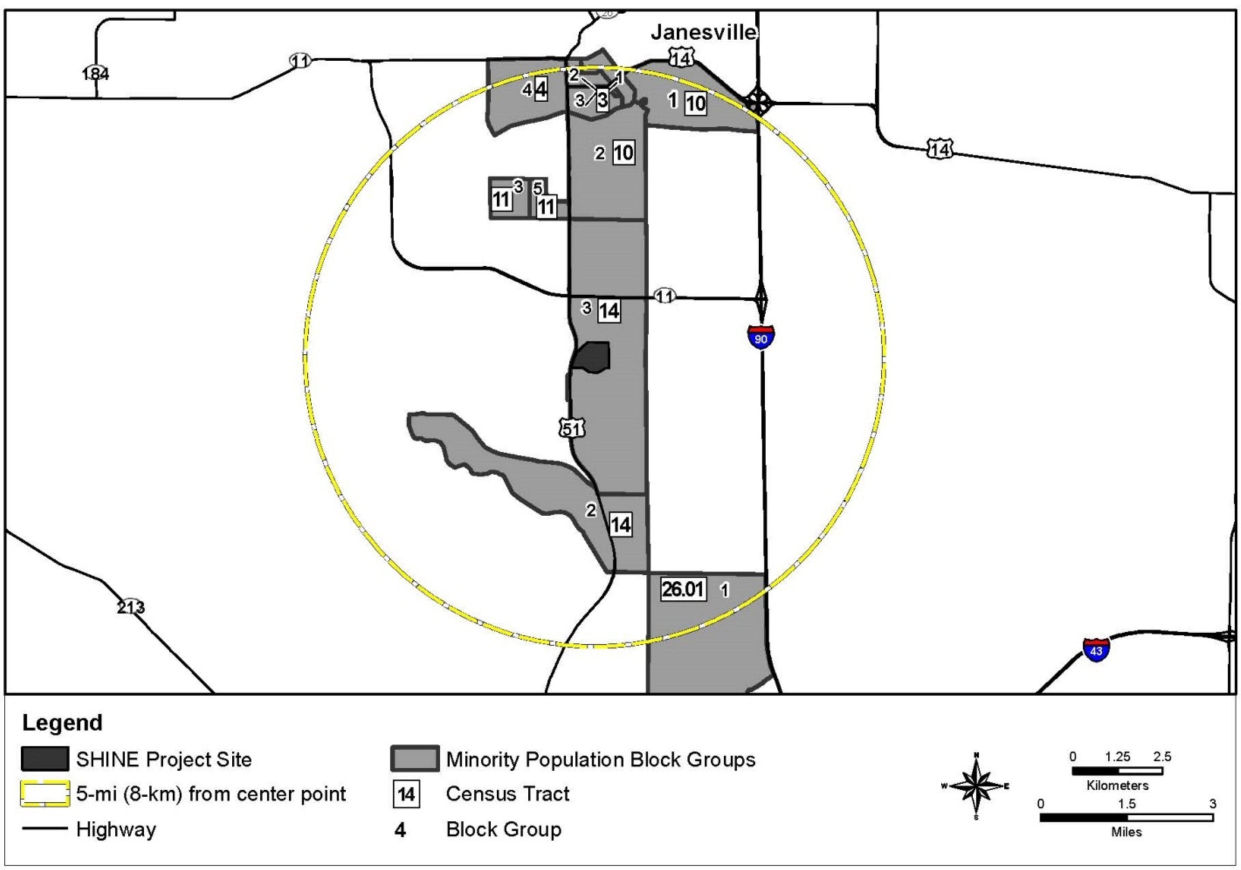


Table 4–14. Minority Populations Within 5 mi (8 km) of the Proposed SHINE Site in Janesville

Census Tract	Block Group	Total Population[(a)]	Percent Minority	Total Minority Population[(a)]	Hispanic or Latino	Black or African American	American Indian or Alaska Native	Asian	Native Hawaiian and Other Pacific Islander	Two or More Races
2	3	1,206	12.4	150	74	31	5	13	0	27
3	1	863	23.8	205	100	65	3	14	0	23
3	2	1,079	30.2	326	147	82	7	54	0	36
3	3	763	19.7	150	45	32	3	55	0	15
4	4	1,060	21.4	227	153	19	4	31	0	20
10	1	1,534	12.6	193	100	41	10	16	0	26
10	2	1,745	14.9	260	196	28	5	11	0	20
11	1	1,610	7.1	115	48	28	2	17	0	20
11	2	779	9.1	71	30	10	1	12	1	17
11	3	1,128	19.9	225	107	78	1	9	0	30
11	4	1,021	6.5	66	30	9	3	6	0	18
11	5	941	16.7	157	108	26	2	11	0	10
12.01	2	1,515	4.8	72	39	17	1	4	0	11
12.01	3	2,728	4.9	135	48	11	11	22	1	42
13.02	3	972	7.7	75	26	33	0	9	0	7
13.02	4	609	2.6	16	7	3	0	0	0	6
14	1	574	4.7	27	6	6	3	7	0	5
14	2	1,287	15.5	200	136	49	3	1	0	11
14	3	1,224	17.6	215	133	38	4	20	3	17
14	4	2,725	7.4	203	112	42	6	15	0	28
22	2	1,186	6.2	73	24	13	7	5	0	24
24	1	1,641	10.0	164	53	60	1	29	0	21
24	2	1,168	10.1	118	59	38	2	10	0	9
26.01	1	1,637	28.2	461	180	230	1	19	0	31
26.02	1	1,648	11.0	182	74	65	1	28	0	14

(a) Total population includes all minority and nonminority groups.

Source: USCB 2010 Census Summary File 1, Table P9, Hispanic or Latino or Not Hispanic or Latino by Race

<u>Low-Income Population</u>

According to 2006–2010 American Community Survey estimates, an average of 10.7 percent of families and 14.3 percent of all people residing in Rock County were identified as living below the Federal poverty threshold. In addition, the City of Janesville had an average of 11.4 percent of families and 14.8 percent of all people identified as living below the Federal poverty level. The 2010 Federal poverty threshold was $22,314 for a family of four (USCB 2014b).

Table 4–15 lists low-income population Census tracts within a 5-mi (8-km) radius of the proposed SHINE facility site; 13.5 percent of the total population within that radius was identified as living below the Federal poverty level (USCB 2014b).

Census tracts were considered low-income population Census tracts if the percentage of individuals living below the Federal poverty threshold exceeded 13.5 percent. Figure 4–3 shows low-income population Census tracts within a 5-mi (8-km) radius of the proposed SHINE facility site. Four of the 11 Census tracts were found to have meaningfully greater low-income populations. These Census tracts are concentrated north of the proposed SHINE facility site near the City of Janesville. The existing industrial park and proposed SHINE facility site are located in Census Tract 14 with an estimated 11.2 percent of its population living below the poverty level (USCB 2014b).

Figure 4–3. Low-Income Populations Within 5 mi (8 km) of the Proposed SHINE Facility in Janesville

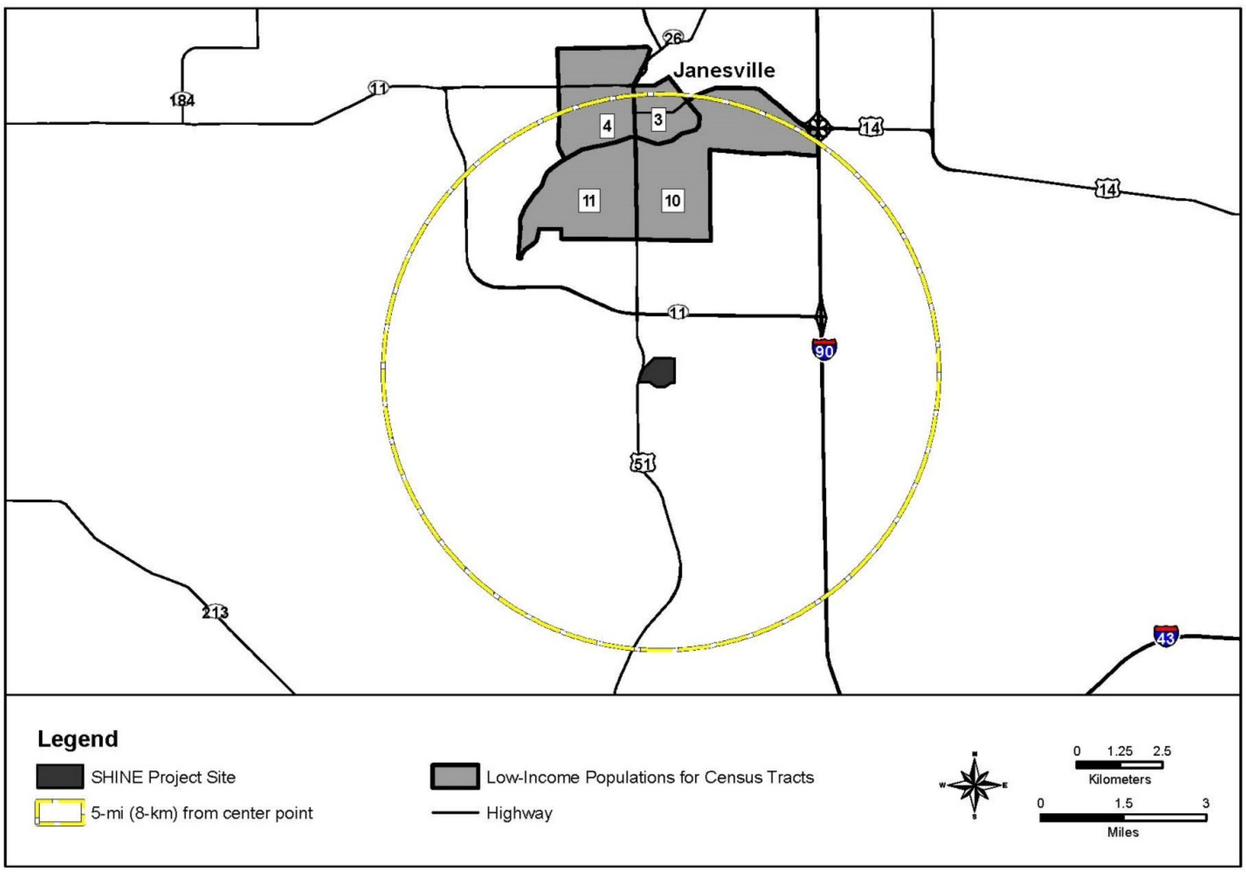


Table 4–15. Low-Income Populations Within 5 mi (8 km) of the Proposed SHINE Facility in Janesville

Census Tract	Census Tract Total Populations	Number of People Below Poverty Level for Census Tract	Percentage Below Poverty Level for All People (Estimated)
3	2,955	1,489	50.4
4	3,207	824	25.7
10	3,022	453	15.0
11	5,625	793	14.1
12.01	5,378	231	4.3
13.02	7,178	516	7.2
14	5,917	662	11.2
22	2,521	274	10.9
24	3,678	305	8.3
26.01	5,808	679	11.7
26.02	3,599	388	10.8

Sources: USCB 2006–2010 American Community Survey 5-Year Estimates, Table DP03 Selected Economic Characteristics; USCB 2006–2010 American Community Survey 5-Year Estimates, Table B01003 Total Population (USCB 2014b)

Impact Analysis

As previously discussed, the environmental justice impact analysis evaluates the potential for disproportionately high and adverse human health and environmental effects on minority and low-income populations from the construction, operations, and decommissioning of the proposed SHINE facility. Some of these potential effects have been described in the other resource areas discussed in this EIS. Chapter 4 presents the assessment of environmental and human health impacts for each environmental resource area.

In the impact analysis, the NRC first identified all potential human health and environmental effects and then determined the significance of the impact and whether or not minority or low-income populations would experience disproportionately high and adverse effects. The NRC then considered whether the radiological or other health effects were significant or above generally accepted norms, whether the risk or rate of hazard was significant and appreciably in excess of the general population, and whether the radiological or other health effects would occur in populations affected by cumulative or multiple adverse exposures from environmental hazards. The NRC determined whether the following human health and environmental effects have the potential to disproportionately affect minority and low-income populations living near the proposed SHINE facility site:

(1) radiological human health impacts (Sections 4.8.1.1, 4.8.2.1, and 4.8.3.1);

(2) nonradiological human health impacts (Sections 4.8.1.2, 4.8.2.2, and 4.8.3.2);

(3) noise impacts (Section 4.2.2.2); and

(4) traffic impacts (Section 4.10.2).

The NRC also considered whether there would be an impact on the natural or physical environment that significantly and adversely affects a particular group, whether there would be any significant adverse impacts on a group that appreciably exceed or (are) likely to appreciably exceed those on the general population, and whether environment effects would occur in populations affected by cumulative or multiple adverse exposures from an environmental hazard.

Construction

Potential impacts to minority and low-income populations would mostly consist of environmental effects during construction (e.g., noise, dust, traffic, employment, and housing impacts). Noise and dust impacts during construction would be short term and primarily limited to onsite activities (Section 4.2). Minority and low-income populations residing along site access roads would be directly affected by increased commuter vehicle and truck traffic. However, because of the temporary nature of construction, these effects are not likely to be high and adverse and would be contained within a limited time period during certain hours of the day. Increased demand for temporary housing during construction could cause rental housing costs to rise, disproportionately affecting low-income populations who rely on inexpensive housing. However, given the small number of construction workers and the likelihood that most of them would already reside within the ROI (Rock County), workers would likely commute to the construction site, thereby reducing the need for rental housing.

Operations

Potential impacts to minority and low-income populations during SHINE facility operations would mostly consist of radiological and nonradiological human health and environmental (e.g., noise and traffic) effects. Everyone living near the existing industrial park and proposed SHINE facility site would be exposed to the same potential operational effects, and any impacts would depend on the magnitude of the change from current environmental conditions.

As discussed in Section 4.8.2.1 of this EIS, the level of potential radiological doses to the public from SHINE facility operations would be well below the annual dose limit and well within the NRC and applicable Federal, State, and local regulatory limits. As a result, minority or low-income populations and the general population living near the proposed SHINE facility site would not be adversely affected by radiation exposure during facility operations. Permitted nonradiological air emissions are also expected to be within regulatory standards (Section 4.2.2.1).

As discussed in the Section 4.2.2.2 of this EIS, noise emissions during SHINE facility operations would occur because of increased commuter traffic on U.S. Highway 51. Noise from operating equipment would be contained inside buildings and would not be audible outside the proposed SHINE facility buildings at the site. However, additional noise emissions caused by worker vehicles would be minor (1 dBA), and noise emissions from shipments are not anticipated to increase noise levels beyond current airport operations across the street.

Minority and low-income populations residing along site access roads would be directly affected by increased commuter vehicle and truck traffic during facility operations. However, as discussed in Section 4.10.2 of this EIS, the only appreciable impact would be a “slight degradation of service” (i.e., traffic delays) at the intersection of westbound SH 11 onto southbound U.S. Highway 51 during the morning peak hour (SHINE 2013a). The overall daily traffic flow in the immediate vicinity of the proposed SHINE facility would increase slightly during facility operations but would not be of an appreciable nature when compared with the average daily and annual traffic flow of roads in the immediate vicinity of the proposed SHINE facility as discussed in Section 3.9.1.

Therefore, offsite noise and traffic impacts caused by the proposed SHINE facility operations would be SMALL for both these resource areas. Based on this information, neither minority nor low-income populations, nor the general population living near the proposed SHINE facility site, would be adversely affected by noise and traffic during facility operations.

Decommissioning

Similar to construction impacts, potential impacts to minority and low-income populations would mostly consist of environmental and socioeconomic effects during decommissioning (e.g., noise, dust, traffic, employment, and housing impacts). Noise and dust impacts during the decommissioning of the proposed SHINE facility would be short term and primarily limited to onsite activities (Section 4.2). Minority and low-income populations residing along site access roads would be directly affected by increased commuter vehicle and truck traffic and noise and dust during decommissioning. However, because of the temporary nature of decommissioning, these effects are not likely to be high and adverse and would be contained within a limited time period during certain hours of the day. Increased demand for rental housing during decommissioning could cause rental costs to rise, disproportionately affecting low-income populations who rely on inexpensive housing. However, given the small number of decommissioning workers and the likelihood that most of them would already reside within the ROI, workers would likely commute to the site, thereby reducing the need for rental housing.

In addition, the environmental impacts from decommissioning the proposed SHINE facility would be SMALL for all resource areas. There is no evidence that impacts from decommissioning would be disproportionately high and adverse on minority or low-income populations.

Subsistence and Special Conditions

The special pathway receptors analysis is an important part of the environmental justice analysis because consumption patterns may reflect the traditional or cultural practices of minority and low-income populations in the area, such as migrant workers or Native Americans.

Section 4–4 of EO 12898 directs Federal agencies, whenever practical and appropriate, to collect, maintain, and analyze information on the consumption patterns of populations that rely principally on fish or wildlife for subsistence and to communicate the risks of these consumption patterns to the public. In this EIS, the NRC considered whether there were any means for minority or low-income populations to be disproportionately affected by examining impacts to American Indians, Hispanics, migrant workers, and others with traditional lifestyle special pathway receptors. Based on the air- and water-quality discussions and the discussion of human health effects in this EIS, the NRC finds it unlikely that there would be any disproportionately high and adverse human health impacts in special pathway receptor populations in the region as a result of subsistence consumption of water, local food, fish, and wildlife. Thus, the operation of the SHINE facility would not have disproportionately high and adverse human health and environmental effects on these populations.

Summary

Minority and low-income populations residing along site access roads or near the proposed site could be affected by noise and dust and increased commuter and vehicle traffic during construction, operations, and decommissioning. However, during construction and decommissioning, these impacts would be short term and primarily limited to onsite activities. Facility operations would not adversely affect minority and low-income populations living near the proposed SHINE facility site. The level of potential radiological doses to the public from SHINE facility operations would be well below the annual dose limit and well within the NRC and applicable Federal, State, and local regulatory limits. Permitted air emissions are expected to remain within regulatory standards. As a result, minority and low-income populations residing near the proposed SHINE facility and the existing industrial park would not experience disproportionately high and adverse human health and environmental effects from the proposed action.

4.13 Cumulative Impacts

The NRC staff considered potential cumulative impacts in the environmental analysis of the construction, operations, and decommissioning of the potential SHINE facility. Cumulative impacts may result when the environmental effects associated with the proposed action are overlaid or added to temporary or permanent effects associated with other past, present, and reasonably foreseeable actions. Cumulative impacts can result from individually minor, but collectively significant, actions taking place over a period of time. An impact that may be SMALL by itself could result in a MODERATE or LARGE cumulative 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.

For the purposes of this cumulative analysis, past actions are those before the receipt of the SHINE application. Present actions are those related to the resources at the time of construction of the SHINE facility, and future actions are those that are reasonably foreseeable through the end of operation and decommissioning. The geographic area over which past, present, and reasonably foreseeable actions would occur depends on the type of action considered and is described below for each resource area.

To evaluate cumulative impacts, the incremental impacts of the proposed action, as described in Sections 4.1 to 4.12, are combined with other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such actions. The NRC staff used the information provided in the ER; responses to requests for additional information; information from other Federal, State, and local agencies; scoping comments; and information gathered during the visits to the potential SHINE facility site to identify other past, present, and reasonably foreseeable actions.

Table 4–16 identifies recent past, present, and reasonably foreseeable future actions within the geographic extent of analysis. To be considered in the cumulative analysis, the NRC staff determined whether the project would occur within the noted geographic areas of interest and within the noted timeframes, whether it was reasonably foreseeable, and whether there would be potential overlapping effects with the proposed project. For past actions, consideration within the cumulative impacts assessment is resource- and project-specific. In general, the effects of past actions are included in the description of the affected environment in Chapter 3, which serves as the baseline for the cumulative impacts analysis. However, past actions that continue to have an overlapping effect on a resource potentially affected by the proposed action are considered in the cumulative analysis.

Table 4–16. Past, Present, and Reasonably Foreseeable Projects and Other Actions Retained for the Cumulative Impacts Analysis

Project Name	Summary of Project	Location	Status
Energy Projects			
Alliant Energy Generation Facility	Existing power generation facility	3.2 mi (5.1 km) south of site	Existing operating facility, stack visible in site viewshed (WDNR 2013b)
Industrial Parks and Manufacturing Facilities			
NorthStar Medical Radioisotopes	Medical radioisotope facility	7.7 mi (12 km) south of site	Construction began in 2014 (NorthStar 2014)

Project Name	Summary of Project	Location	Status
TIF District No. 35	Two parcels zoned for industrial use as a TIF district	The first parcel is just north of the site. The second parcel includes the site.	Approved by City of Janesville (City of Janesville 2012); no proposed projects other than SHINE (NRC 2013f)
TIF District No. 34	Area that encompasses the Southern Wisconsin Regional Airport	1.0 mi (1.6 km) southwest of site	Approved by City of Janesville (City of Janesville 2009); no proposed projects other than SHINE (NRC 2013f)
United Ethanol	Facility upgrades at an ethanol production plant	11 mi (18 km) northeast of site	Existing operation with new construction permitted to start in 2014 (WDNR 2014)
Medical Facilities			
Mercy Clinic South	Medical services facility	1.8 mi (2.9 km) north of site	Operational (Mercy Health System 2014a)
Mercy Hospital	Medical services facility	4.4 mi (7.1 km) north of site	Operational (Mercy Health System 2014b)
Other Projects/Actions			
Southern Wisconsin Regional Airport	Public airport	1.0 mi (1.6 km) southwest of site	Operational; ongoing improvements through 2015 (SWRA 2012)
Glen Erin Golf Course	7,000-yd public golf course	1.6 mi (2.6 km) southwest of site	Operational (Wisconsin Golf Courses 2013)

4.13.1 Land Use and Visual Resources

This section addresses the direct and indirect effects of the construction, operations, and decommissioning of the proposed SHINE facility on land use and visual resources when added to the aggregate effects of other past, present, and reasonably foreseeable future actions. The description of the affected environment in Section 3.1 serves as baseline conditions for the land use and visual resources cumulative impact assessment. The incremental impacts from construction, operations, and decommissioning of the proposed SHINE facility on land use and visual resources would be SMALL, as described in Section 4.1.

4.13.1.1 Land Use Resources

The projects and activities described in Table 4–16 would result in minimal changes to existing land uses because new construction would occur either within or adjacent to existing facilities or within areas currently zoned for industrial use. For example, in 2012, the City of Janesville approved a new industrial park within TIF District No. 35 (City of Janesville 2012). The proposed SHINE facility is part of this larger development project. Although TIF District No. 35 has been zoned for light industrial use and is “shovel ready” for future development, there are no proposed industrial or commercial projects besides SHINE within TIF District No. 35 or in its immediate vicinity (NRC 2013f).

Future urbanization and global climate change could contribute to additional decreases in agricultural lands, forests, grasslands, and wetlands. Urbanization in the vicinity of the proposed site would alter important attributes of land use. Urbanization would reduce natural vegetation and agricultural fields, resulting in an overall decline in the extent and connectivity of wetlands, forests, grasslands, and wildlife habitat. Global climate change could reduce crop yields and livestock productivity (USGCRP 2014), which may change portions of agricultural land uses. However, existing parks, reserves, and managed areas would help preserve wetlands and forested areas. In addition, zoning laws and comprehensive land use plans would help ensure a proper balance of development (Rock County 2009).

Under the Farmland Protection Policy Act of 1981 (7 U.S.C. 4201 et seq.) and its implementing regulations, the presence of important farmland soils (7 CFR 657.5), including prime farmland, was included in the cumulative impacts analysis. Development projects listed in Table 4–16 would incrementally and cumulatively add to the loss of important farmland soils, including prime farmland soils, in the region surrounding the proposed site and across Rock County. With respect to the build-outs of TIF District Nos. 34 and 35, the City of Janesville has committed the districts to developed nonfarming uses. Otherwise qualifying farm lands in or already committed to urban development; lands acquired for a project on or before August 4, 1984; and lands acquired or used by a Federal agency for national defense purposes are exempt from Farmland Protection Policy Act provisions (7 CFR 658.2 and 658.3). Because the proposed TIF Districts Nos. 34 and 35 have been committed to development, the sites do not have qualifying important farmland soils subject to the Farmland Protection Policy Act.

Given that reasonably foreseeable new construction activities would occur within or adjacent to existing facilities or within areas zoned for industrial use, cumulative land use impacts would be SMALL.

4.13.1.2 Visual Resources

The projects and activities described in Table 4–16 would result in minimal changes to the existing viewshed because most new construction would occur either within or adjacent to existing facilities or within areas that are currently zoned for industrial use. Furthermore, the viewshed within the vicinity of the proposed site is agricultural, light industrial, or residential. Within nondeveloped areas, where a new structure would change qualities of the existing landscape, the viewshed is generally of low scenic quality because of a lack of notable features, uniform landform, low vegetation diversity, an absence of water, and mute colors.

Given that reasonably foreseeable new construction activities would occur within or adjacent to existing facilities or within areas zoned for industrial use and of low scenic quality, cumulative visual impacts would be SMALL.

4.13.2 Air Quality and Noise

This section addresses the direct and indirect effects of the construction, operations, and decommissioning of the proposed SHINE facility on air quality and noise when added to the aggregate effects of other past, present, and reasonably foreseeable future actions. The description of the affected environment in Section 3.2 provides baseline conditions for the assessment of cumulative impacts on air quality and noise. The incremental impacts from construction, operations, and decommissioning of the proposed SHINE facility on air quality and noise would be SMALL, as described in Section 4.2.

4.13.2.1 Air Quality

As described in Section 3.2.2, the ROI considered for the air quality analysis of the proposed SHINE facility is defined as Rock County. The ROI considered in the cumulative air quality analysis is also Rock County because air quality designations for criteria air pollutants are generally made at the county level. The incremental impact on air quality from construction, operations, and decommissioning activities from the proposed SHINE facility would be SMALL.

Present-day activities in Rock County that could potentially result in cumulative impacts include 12 major sources of air emissions identified on EPA's Enforcement and Compliance History

Online (ECHO) air data search tool (EPA 2014). Minor sources of air emissions are also present in Rock County; however, a minor source classification typically indicates that the facility has little to no potential for significantly affecting air quality or interfering with plans to achieve compliance with NAAQS (EPA 2014). Classification as a major source requires a permit that will include provisions on how much and what is allowed to be emitted. Because major sources must meet permitting requirements, this minimizes cumulative impacts on air quality.

Additional activities near the proposed SHINE facility that could potentially result in cumulative impacts on air quality include other present-day construction activities, seasonal agricultural activities, and future projects within the county (Table 4–17); however, as noted in Table 4–17, the impacts are minimal because of low emissions and the distance from the proposed SHINE facility. Cumulative impacts to air quality could occur if project schedules overlap. For example, operation of the proposed SHINE facility and the planned NorthStar Medical Radioisotopes facility approximately 7.7 mi (12 km) south could overlap. However, both projects must meet the permitting and licensing requirements, which would minimize cumulative impacts.

Climate change can affect air quality as a result of changes in meteorological conditions. The formation, transport, dispersion, and deposition of air pollutants depend, in part, on weather conditions (IPCC 2007). Air pollutant concentrations are sensitive to winds, temperature, humidity, and precipitation (EPA 2009a). Ozone levels have been found to be particularly sensitive to climate change influences (IPCC 2007; EPA 2009b). Ozone is formed, in part, as a result of the chemical reaction of nitrogen oxides and volatile organic compounds (VOCs) in the presence of heat and sunlight. Sunshine, high temperatures, and air stagnation are favorable meteorological conditions leading to higher levels of ozone (IPCC 2007; EPA 2009b). Climate model simulations (from 2021 to 2050 relative to the reference period (1971 to 1999)) indicate an increase in the annual mean temperature in the midwestern region from 2.5 to 3.5 °F (NOAA 2013). The predicted increase in temperature during this time period occurs for all seasons with the largest increase occurring in the summer months (June, July, and August). Although surface temperatures are expected to increase in the midwestern region, ozone levels would not necessarily increase because ozone formation also depends on the relative amount of nitrogen oxides and VOC precursors available (NASA 2004). The combination of higher temperatures, stagnant air masses, sunlight, and emissions of precursors may make it difficult to meet ozone NAAQSs (USGCRP 2014). However, states must continue to comply with the Clean Air Act and must ensure that air quality standards are met.

Overall, the potential cumulative air quality impact associated with SHINE operations in conjunction with other reasonably foreseeable projects is considered SMALL, primarily because any of the projects with overlapping impacts with the proposed SHINE facility would have low-emission rates and sufficient distance between the two facilities.

Table 4–17. Cumulative Air Emission Effects Summary During SHINE Operation

Project Name	Emissions (Annual)	Impacts
TIF District No. 35	Section 4.2	There are no reasonably foreseeable projects other than SHINE (NRC 2013f), which the NRC staff determined to have SMALL impacts on air quality in Section 4.2.
Alliant Energy	15 tons of NO_x (WDNR 2013b)	Operation would overlap with all phases of the SHINE project, but the cumulative impact is considered minimal because of the low-emission rate.

Project Name	Emissions (Annual)	Impacts
NorthStar Medical Radioisotopes	6.5 tons of CO 8.7 tons of NO_x 0.3 tons of PM_{10} 0.7 tons of VOC 0.01 tons of SO_2 40,000 tons of CO_2 (DOE 2012b)	Operation is expected to overlap with SHINE, but the cumulative impact is considered minimal because of the low-emission rates and the distance between facilities.
United Ethanol	13 tons of CO 52 tons of NO_x 56 tons of PM_{10} 7.2 tons of hydrocarbons 0.2 tons of SO_2 39,000 tons of CO_2 (WDNR 2013b)	Operation is expected to overlap with SHINE, but the cumulative impact is considered minimal because of the low-emission rates and the distance between facilities.

4.13.2.2 Noise

The ROI considered for noise is a 1-mi (1.6-km) radius from the site boundary of the proposed SHINE facility. Noise levels attenuate rapidly with distance. When distance is doubled from a point source, noise levels decrease by 6 dBA (MPCA 2014). Generally, a 3-dBA change over existing noise levels is considered to be a “just noticeable” difference, and a 10-dBA increase is subjectively perceived as a doubling in loudness and almost always causes an adverse community response (NWCC 2002).

Potential cumulative noise impacts could occur during the construction or decommissioning phases in conjunction with other reasonably foreseeable activities occurring within a few hundred feet of the proposed SHINE facility. Primarily, these activities would be transportation-related noise from aircraft traffic at the Southern Wisconsin Regional Airport and from traffic on U.S. Highway 51. Occasional noise from farming equipment on nearby agricultural fields also may coincide with the proposed SHINE construction noise. In addition, noise from a future industrial development in the TIF District No. 35 area could occur simultaneously with the proposed SHINE construction or decommissioning operations.

The Southern Wisconsin Regional Airport currently operates approximately 105 flights per day. Flight operations may increase because of the demand to transport materials to and from the proposed SHINE facility and the planned NorthStar Medical Radioisotopes facility. Up to 468 medical shipments associated with the proposed action would occur each year with most being air transported (SHINE 2013a). However, these increases are not anticipated to cause an appreciable increase in noise above the current operations. As a result, the cumulative noise impacts would be SMALL.

4.13.3 Geologic Environment

This section addresses the direct and indirect effects of the construction, operations, and decommissioning of the proposed SHINE facility on the geologic environment when added to the aggregate effects of other past, present, and reasonably foreseeable future actions. The cumulative impacts on the geologic environment primarily relate to land disturbance, the potential for soil erosion and loss, and the projected consumption of geologic resources. The description of the affected environment in Sections 3.3.1 and 3.3.2 (Site Geology and Soils, respectively) serves as the baseline for the cumulative impact assessment of the geologic environment. The geographic area of analysis for evaluation of cumulative impacts on soil resources includes the 5-mi (8-km) vicinity surrounding the proposed site. For geologic resources, the extent of the geologic area of analysis has been expanded to all of Rock County to encompass potential commercial sources of rock and mineral resources to support construction activities at the proposed site and vicinity. Because the aspects of land disturbance and conversion are addressed separately in Section 4.13.1.1, the cumulative impacts analysis here will focus on soil loss, including the loss of prime farmland soils and other important farmland soils, and the consumption of geologic resources.

The incremental impacts from construction, operations, and decommissioning of the proposed SHINE facility on the geologic environment, including geologic and soil resources, would be SMALL, as described in Section 4.3.

Soil Resources

New construction projects identified in Table 4–16 within the immediate 5-mi (8-km) radius would result in the conversion and loss of soils, including important farmland soils, caused by land use conversion and soil erosion. However, in accordance with State and local requirements, development activities would be subject to BMPs for soil erosion and sediment control, which would serve to minimize soil erosion and loss. Some topsoil removed by ground-disturbing activities would likely be reclaimed for use at the proposed site of disturbance or reused elsewhere. Following the completion of construction activities, continued soil loss would be minimal as the remaining soils would lie beneath impervious surfaces or would have been revegetated. Although developed land areas could be reclaimed and sufficiently restored to support certain agricultural and nondevelopment uses at some point in the future, such lands and associated soils would not be restorable to prime or other important farmland status.

Based on the foregoing, cumulative impacts on soil resources would be SMALL.

Geologic Resources

New facility construction and expansion (Table 4–16) would specifically require the use and consumption of geologic resources, including rock and mineral assets, such as ore and aggregate materials (e.g., sand and gravel). Construction of the proposed SHINE facility at the Janesville site would use many of the same materials, including concrete, gravel, and sand (Section 3.4.1) required for the other identified projects. As noted in Section 3.3.1, construction aggregate is widely available throughout Rock County and the greater southeastern Wisconsin region. Likewise, products derived from geologic materials, including concrete and asphaltic materials used in construction, are widely available on a regional basis. It is not likely that the geologic resource requirements to construct the proposed SHINE facility or the resource requirements of other identified projects are of such a scale as to affect regional sources and supplies of the identified resources. In addition, there are no developed geologic assets (mines or quarries) at or near the proposed SHINE facility site that would be rendered inaccessible for future use as a result of the proposed projects. In total, cumulative impacts on geologic resources would be SMALL.

4.13.4 Water Resources

This section addresses the direct and indirect effects of the construction, operations, and decommissioning of the proposed SHINE facility on water resources when added to the aggregate effects of other past, present, and reasonably foreseeable future actions. The cumulative impacts on surface-water resources include issues concerning water use, water quality, and potential climate change and specifically include issues related to water withdrawal, effluent discharges, accidental spills and releases, and stormwater drainage and runoff. The description of the affected environment in Sections 3.4.1 and 3.4.2 (Surface Water Resources and Groundwater Resources, respectively) serves as a baseline for the cumulative impact assessment of water resources. The geographic area of analysis for evaluating cumulative impacts on the geologic environment includes the 91-ac (37-ha) area within the site boundary and the 5-mi (8-km) region surrounding the proposed SHINE facility. For surface-water resources, the extent of the geologic area of analysis has been expanded to include the Lower Rock River Basin within Rock County and downstream of the proposed site. For groundwater resources, the area considered encompasses the local groundwater basin in which groundwater is recharged and flows to discharge and those aquifers from which groundwater is withdrawn through wells. Specifically, the cumulative impacts analysis focuses on those projects and activities, when combined with the proposed action, that would (1) withdraw water from, or discharge wastewater to, the segment of Rock River downstream of the proposed site or (2) would use groundwater or could otherwise affect the same aquifers that would supply water to the proposed site.

The incremental impacts from construction, operations, and decommissioning of the proposed SHINE facility on surface-water and groundwater resources would be SMALL, as described in Sections 4.4.1 and 4.4.2, respectively.

The proposed SHINE facility site and adjoining areas at the center of the geographic area of analysis for the analysis of cumulative impacts are encompassed by the local watershed that contributes drainage to Rock River, as described in Section 3.4.1 (Figure 3–8). The State has established water-quality standards and numeric criteria for Rock River. The main stem of Rock River is regulated in accordance with established uses for waste assimilation, recreation, fish and aquatic life, irrigation, stock and wildlife watering, and hydropower, as further described in Section 3.4.1. Rock River is not a major source for water supply. The source of water for the municipal water supply and for individual property owners in Rock County is groundwater. Likewise, the extensive surficial aquifer system and portions of the underlying bedrock aquifers in Rock County provide base flow to Rock River.

As a result of climate change, shifts in the timing, intensity, and distribution of precipitation would be likely to result in changes in surface-water runoff affecting water availability across the Midwest. The Midwest may continue to experience an increase in annual precipitation, with much of the increase attributable to an increase in the frequency of heavy rainfall. Runoff and streamflow at a regional scale for the midwestern region indicate no clear trend during the last half century. However, annual runoff and river flow are projected to increase in the upper Midwest, and soil moisture increased in most seasons in the upper and eastern Midwest between 1998 and 2010 (despite an increase in average temperature) (USGCRP 2014).

Climate change impacts on groundwater availability depend on basin geology, frequency and intensity of high rainfall periods, recharge, soil moisture, and interactions between groundwater and surface water. Precipitation and evapotranspiration are key drivers in aquifer recharge (USGCRP 2014).

<u>Surface-Water and Groundwater Resources</u>

No surface water would be used for the construction, operations, or decommissioning of the proposed SHINE facility; therefore, there would be no incremental contribution to cumulative effects of surface-water use.

Existing water quality within the main stem of Rock River and throughout the Lower Rock River Basin is the result of historic land use changes and current land uses (e.g., urban, agricultural, and mining) and its associated development activities. As discussed in Section 3.4.1, the Federal Clean Water Act requires states to identify all waters for which effluent limitations and pollution control activities are not sufficient to attain water-quality standards in such waters and establish total maximum daily loads (TMDLs) to ensure future compliance with water-quality standards. EPA delegated the authority for issuing NPDES permits in the State of Wisconsin to the WDNR. Because of total suspended solids and total phosphorous, the 12.4-mi (20-km) segment of Rock River between the Janesville WTP and the Illinois State line is listed as impaired, and TMDLs have been established. It is this segment that receives drainage from the proposed SHINE facility site and its local watershed.

As noted in Section 4.13.1.1 and listed in Table 4–16, the proposed SHINE facility is part of a larger development, TIF District No. 35. Development projects disturbing greater than 1 ac (0.4 ha) of land have to obtain and comply with the provisions of WPDES Permit No. WI-S067831-4. As discussed in Sections 4.3.1 and 4.4.1, the permit requires the development and implementation of a site-specific construction site erosion control plan, including specific BMPs, and a stormwater management plan (for postconstruction stormwater management). Permits issued to all new stormwater and industrial wastewater dischargers would include provisions to comply with the wasteload allocation established for downstream receiving waters. Beyond the activities listed in Table 4–16, future industrial development or major expansion projects also would be subject to NPDES permitting requirements within the ROI and Lower Rock River Basin.

The proposed SHINE facility is not expected to require either a permit to authorize the discharge of stormwater associated with industrial activity to support operations or an NPDES individual permit for industrial (process) wastewater discharges to surface water. Further, there are few large industrial wastewater dischargers with NPDES permits immediately upstream or downstream of the local watershed encompassing the SHINE facility site. The closure of the General Motors assembly plant in Janesville eliminated one such industrial wastewater point source to Rock River.

As part of the build-out of TIF District No. 35, the resulting growth district will be served by the extension of public infrastructure by the City of Janesville, including public water and sanitary sewer service. These utility systems would also provide for sanitary sewer service and a potable water supply to the proposed SHINE facility. Operation of the SHINE facility would produce an estimated 5,850 gpd (22,145 Lpd), or about 0.006 mgd (23 m^3/day) of sanitary and some industrial wastewater (Section 4.4.1.2). No radiological effluent would be discharged. All wastewater conveyed to the City of Janesville WTP also would have to meet influent acceptance requirements for industrial users. Such acceptance standards and any necessary pretreatment requirements are imposed, in part, so that the WTP can comply with the WPDES permit effluent limitations imposed on its discharges to Rock River and on waste load allocations (TMDLs) established by the WDNR. The WTP has a treatment capacity of 19.1 mgd (72,290 m^3/day) with an average peak treatment flow of 14.5 mgd (54,900 m^3/day). Thus, the incremental contribution of influent from the proposed SHINE facility is a very small percentage (i.e., 0.13 percent) of the available treatment capacity and would not affect the WTP's ability to provide for the treatment of other current or reasonably foreseeable residential, commercial, and industrial dischargers to the WTP. Wastewater generated by the proposed SHINE facility and conveyed to the City of Janesville WTP would contribute very little to the facility's treatment burden with negligible impacts on receiving water quality. Therefore, the cumulative impacts on surface-water use and quality would be SMALL.

<u>Groundwater Resources</u>

Groundwater is the source of water supply for municipal water suppliers and individual users in Rock County. The City of Janesville Water Utility provides water service to connected customers within the city's developed areas and growth boundaries. Section 3.4.2 provides a detailed discussion of the City of Janesville Water Utility capacity wells, groundwater basin, and aquifer system. As noted previously, water service would be extended to the proposed SHINE facility site and other properties within TIF District No. 35.

In total, the City of Janesville's groundwater supply system has a capacity of approximately 32 mgd (121,100 m^3/d) and the current demand is approximately 10 mgd (37,900 m^3/d) (City of Janesville 2013). The city's groundwater production (pumpage) peaked in 2000, averaging 13.9 mgd (52,600 m^3/d). However, overall groundwater demand within the City of Janesville is projected to increase by 50 percent by 2030 with a similar increase countywide. Although the City of Janesville Water Utility has enjoyed stable water levels, other municipalities in the basin have seen declines. Consequently, the city has developed a water conservation plan in anticipation of future growth (City of Janesville 2010).

Operation of the SHINE facility is estimated to require a total of about 6,073 gpd (22,990 Lpd), or 0.006 mgd (23 m^3/day), of water. This incremental water requirement is a very small percentage of the available groundwater supply capacity (0.03 percent) of the City of Janesville Water Utility. This additional demand, combined with current and forecast demands and considering the potential for climate-change-related impacts, would not be expected to affect the utility's ability to provide adequate water supplies and would not be likely to affect regional groundwater conditions. Taken together, the cumulative impacts on groundwater resources would be SMALL.

4.13.5 Ecological Resources

This section addresses the direct and indirect effects of the construction, operations, and decommissioning of the proposed SHINE facility on ecological resources when added to the aggregate effects of other past, present, and reasonably foreseeable future actions. The description of the affected environment in Section 3.5 serves as a baseline for the ecological cumulative impact assessment. The geographic area of analysis for evaluating cumulative impacts on ecological resources includes the Rock River watershed in the vicinity of the proposed site. The incremental impacts from construction, operations, and decommissioning of the proposed SHINE facility would be SMALL, as described in Section 4.5.

Before European settlement, the main land cover types within the Rock River watershed included prairies, forests, and wetlands (WDNR 2002; USDA 2007). Since that time, these habitats have been greatly reduced, by at least 50 to 80 percent and converted into agricultural fields, industrial uses, and residential and commercial areas, as described in Section 3.5. The remaining tracts of grasslands, forests, and wetlands tend to be relatively small and isolated, which provides lower quality habitats than large tracts of habitat because of the different biological and physical characteristics along the edge of a habitat patch (WDNR 2013c).

Environmental management practices over the past few decades have slightly increased the quality and extent of terrestrial and aquatic habitats. For example, the amount of forested habitats has increased because of changes in land management and forestry laws. Water quality in streams has increased primarily because of more effective treatment at WTPs (WDNR 2002).

Current threats to terrestrial and aquatic habitats include increased soil, nutrients, and other pollutants washing into streams and lakes from urban and agricultural stormwater runoff, continued conversion and fragmentation of wildlife habitat from development, and the introduction of invasive species (WDNR 2002, 2013c). These activities will likely decrease the overall availability and quality of forested, grassland, and wetland habitats. Species with threatened, endangered, or declining populations are likely to be more sensitive to declines in habitat availability and quality and the introduction of invasive species.

New development projects identified in Table 4–16 are likely to have minimal impacts on ecological resources because all the projects are sited within areas that are currently agricultural land, open space, or developed. These types of land covers provide low-quality habitats for wildlife, birds, and aquatic resources.

State parks and wildlife refuges located near the proposed site provide valuable habitat to native wildlife and migratory birds. As agricultural activities, development, and urbanization increase habitat conversion and fragmentation, these protected areas will become ecologically more important because they provide continuous areas of minimally disturbed habitat.

Climate change in the midwestern United States is likely to include an increase in the annual mean temperature combined with an increase in the frequency, duration, and intensity of droughts (USGCRP 2014). As the climate changes, ecological resources will either need to be able to tolerate the new physical conditions, such as less water availability, or to shift their population range to new areas with a more suitable climate. Some species may be more prone to changes in climate. For example, migratory birds that travel long distances may not be able to pick up on environmental clues that a warmer, earlier spring is occurring in the United States, while the birds are still overwintering in the tropics. Fraser et al. (2013) found that songbirds overwintering in the Amazon did not leave their winter sites earlier, even when spring sites in the eastern United States experienced a warmer spring. As a result, the song birds missed periods of “peak food” availability. Climate changes could also favor nonnative invasive species and promote population increases of insect pests and plant pathogens, which may be more tolerant to a wider range of climate conditions (USGCRP 2014). Physiological stressors associated with climate change may also exacerbate the effects of existing stresses in the natural environment, such as those caused by habitat fragmentation, invasive species, nitrogen deposition and runoff from agriculture, and air emissions.

Section 4.5 of this EIS concludes that the impact from the proposed facility construction, operations, and decommissioning would not noticeably alter the terrestrial and aquatic environment and, thus, would be SMALL. However, as environmental stressors, such as runoff from agricultural fields and urban areas and climate change, continue over the proposed construction, operational, and decommissioning periods, certain attributes of the terrestrial and aquatic environment (such as habitat quality) are likely to noticeably change. The staff does not expect these impacts to destabilize any important attributes of the terrestrial and aquatic environment because such impacts will cause gradual change, which should allow the terrestrial and aquatic environment to appropriately adapt. The staff concludes that the cumulative impacts of the proposed construction, operations, and decommissioning of the SHINE facility plus other past, present, and reasonably foreseeable future projects or actions would result in MODERATE impacts to terrestrial and aquatic resources.

4.13.6 Historic and Cultural Resources

This section addresses the direct and indirect contributory effects from the construction, operations, and decommissioning of the proposed SHINE facility when added to the aggregate effects of other past, present, and reasonably foreseeable future actions on historic and cultural resources. The geographic area considered in this analysis is the APE associated with the proposed SHINE facility, the Janesville site, and its immediate vicinity. As discussed in Section 4.6, the impacts to historic and cultural resources from the construction, operations, and decommissioning of the SHINE facility would be SMALL.

The archaeological record for the region indicates prehistoric and historic occupation; the APE and its immediate environs appear to have been traditionally used as agricultural fields from the protohistoric period onward. Historic land development and prolonged agricultural use of the

APE resulted in impacts on, and the loss of, cultural resources in the APE and its immediate vicinity. As described in Section 3.6.2, no known historic or cultural resources or historic properties are present within the APE, and the closest historic property is approximately 1 mi (1.6 km) to the northeast of the proposed site. However, there remains the possibility for inadvertent discovery of historic and cultural resources within the APE. Direct impacts would occur if newly discovered historic and cultural resources were to be physically removed or disturbed. Indirect visual (viewshed) impacts could occur from new construction within the APE. The only foreseeable project within the APE is the SHINE facility and the potential discovery of historic and cultural resources on the proposed site. Should they be discovered, any cultural resources would be managed using SHINE's BMPs (e.g., cultural resource management procedures and training) (SHINE 2013b). Therefore, the cumulative impact of the proposed SHINE facility, combined with other past, present, and reasonable foreseeable future activities on historic and cultural resources, would be SMALL.

4.13.7 Socioeconomics

This section addresses the direct and indirect contributory effects from the construction, operations, and decommissioning of the proposed SHINE facility when added to the effects from other past, present, and reasonably foreseeable future actions on current socioeconomic conditions within the ROI. The description of the affected environment in Section 3.7 serves as a baseline for the cumulative socioeconomic impact assessment. The geographic area of analysis is the ROI, Rock County. Section 4.7 found that socioeconomic impacts from the construction, operations, and decommissioning of the proposed SHINE facility would be SMALL.

Table 4–16 identifies past, present, and reasonably foreseeable future actions within the ROI that could contribute to cumulative socioeconomic impacts. Relevant "other actions" that are considered in this cumulative impacts analysis are future construction within TIF District No. 35 (including utility lines for the proposed SHINE facility) and the construction and operation of the NorthStar Medical Radioisotopes facility.

The proposed SHINE facility is located in TIF District No. 35, an area on the south side of Janesville designated for light industrial use. TIF District No. 35 is large enough for the construction and operation of several industries. To date, SHINE is the only light industry that has expressed an interest in TIF District No. 35 (NRC 2013f).

The NorthStar Medical Radioisotopes facility being constructed in Beloit, Wisconsin, 13 mi (21 km) to the south of Janesville would likely compete for some of the same skilled labor as the proposed SHINE facility. In the *Environmental Assessment for NorthStar Medical Technologies LLC Commercial Domestic Production of the Medical Isotope Molybdenum-99*, an estimated 150 operations workers would be needed (DOE 2012b). However, this demand for skilled labor would not create a shortage because Rock County has sufficient skilled labor to meet the needs for both facilities (Table 3–7). Construction and operation of the NorthStar Medical Radioisotopes facility could cause an increase in population, employment, and tax revenue and an increased demand for public services in the ROI. However, this increase is likely to be small because most of the construction and operations workers would likely already reside within the ROI. The overall contributory socioeconomic effect of this action would be small. Therefore, the contributory effects from the construction, operations, and decommissioning of the proposed SHINE facility, when added to the operation of the NorthStar Medical Radioisotopes facilities, would be SMALL.

4.13.8 Human Health

The geographic region of interest for the evaluation of cumulative effects on human health is that within a 5-mi (8-km) radius of the proposed SHINE facility. Within this ROI, there are no nuclear power plants that would contribute to radioactive or nonradioactive exposure.

As discussed in Section 4.8.2, the NRC reviewed the information provided by SHINE regarding the proposed radiological and nonradiological safety programs that would be implemented to protect the workers and members of the public from operations at the proposed SHINE facility. In Section 4.8.2, the NRC staff concluded that the impacts from operations at the proposed SHINE facility would be SMALL. For this evaluation of cumulative impacts, the NRC staff considers the impacts in the ROI associated with the operations of other facilities using radioactive and nonradioactive material in the recent past, present, and reasonably foreseeable future.

This assessment evaluates the potential cumulative impacts from the proposed SHINE facility, the proposed NorthStar Medical Radioisotopes facility, and two medical facilities located in Janesville, Wisconsin: the Mercy Clinic South and the Mercy Hospital. Mercy Clinic South provides imaging services to patients. Mercy Hospital provides medical services to patients that include imaging services, radiation oncology, and nuclear medicine (SHINE 2013). A third medical facility within the ROI, First Choice Women's Health Center, does not use radioactive material and is not considered in this evaluation. The SHINE and NorthStar Medical Radioisotopes facilities are proposed future actions, whereas the hospital and clinic are operating.

In its environmental assessment for the proposed NorthStar Medical Radioisotopes facility, DOE stated that no radioactive emissions are expected during operation. DOE stated that the design of the proposed NorthStar facility is expected to control radioactive and nonradioactive effluent releases to negligible amounts and are not expected to violate Federal or State criteria applicable to facility workers or members of the public. Additionally, liquid waste generated during operations at the proposed NorthStar Medical Radioisotopes facility would be collected, temporarily stored on site, and sent off site for treatment and disposal in accordance with the Federal and State of Wisconsin regulations (SHINE 2013a; DOE 2012b). DOE also stated that operations at the proposed NorthStar Medical Radioisotopes production facility would be conducted in accordance with State of Wisconsin regulatory limits (DOE 2012b). Further, the proposed NorthStar Medical Radioisotopes facility would be approximately 7.7 mi. (12. km) from the SHINE facility, which would minimize the potential cumulative radiological exposure because there would be sufficient distance between the two facilities. Given that the expected radiological and nonradiological impacts from each facility would be limited, the NRC staff does not expect that the combined operation of these facilities would result in a cumulative impact to the workers or members of the public in excess of NRC or State of Wisconsin regulatory limits.

Mercy Clinic South and Mercy Hospital in Rock County, Wisconsin, provide imaging services to patients that include radiation oncology and nuclear medicine. Both facilities are within 5 mi (8 km) of the proposed SHINE facility. Mercy Clinic South is approximately 1.6 mi (2.6 km) away, and Mercy Hospital is approximately 4.4 mi (7.1 km) away. SHINE (2013a) determined that radiological exposure to members of the public outside these facilities is negligible. Based on the low levels of radiation exposures from these medical facilities and the proposed SHINE facility, and factoring in the distance between the medical facilities and the proposed SHINE site, the NRC staff does not expect the cumulative impacts to workers at the SHINE facility or members of the public would be in excess of NRC or State of Wisconsin regulatory limits.

As discussed in Section 4.8.2.2 of this EIS, the NRC staff concluded that the nonradiological impacts from the proposed SHINE facility to workers and members of the public would be SMALL. Given that the nonradiological impacts from the facilities listed in Table 4–16 would be within regulatory limits of the State of Wisconsin and the distance between the facilities and the proposed SHINE facility, the NRC staff concludes that the cumulative impact to workers and members of the public would be SMALL.

The NRC staff is currently conducting a thorough independent safety evaluation to verify that the radiological exposure to the members of the public would be below regulatory limits set in 10 CFR Part 20. If the NRC staff concludes that the cumulative dose to workers and the public would be below the regulatory limits set in 10 CFR Part 20, the NRC staff concludes that the cumulative radiological impacts would be SMALL.

4.13.9 Waste Management

The geographic region of interest for the evaluation of cumulative impacts from the disposal of radioactive and nonradioactive waste is that area within a 5-mi (8-km) radius of the proposed SHINE facility. Table 4–16 lists the facilities considered within this ROI. There are no nuclear power plants that would contribute to radioactive or nonradioactive exposure. There are two medical facilities: Mercy Clinic South and Mercy Hospital.

In Section 4.9, the NRC staff reviewed SHINE's radioactive and nonradioactive management programs for the safe handling and disposal of its waste. Based on information provided by SHINE in its ER, the NRC staff found that the expected design features and management programs (i.e., temporary storage, packaging, transportation, and disposal) would adequately control radioactive and nonradioactive waste. Therefore, the NRC staff concluded that the impacts would be SMALL.

This evaluation considers the cumulative impacts within the ROI associated with the operations of other facilities using radioactive and nonradioactive material in the recent past, present, and reasonably foreseeable future.

This cumulative impact assessment is based on the proposed SHINE facility and the facilities listed in Table 4–16, including the proposed NorthStar Medical Radioisotopes facility and two medical facilities located in Janesville, Wisconsin: the Mercy Clinic South and the Mercy Hospital. The proposed SHINE and NorthStar Medical Radioisotopes facilities are proposed future actions, whereas the two medical facilities are operating. Radioactive and nonradioactive waste are and would be generated as part of the operation of many of the facilities listed in Table 4–16. The waste from these facilities, in some cases, are and would likely go to the same waste disposal sites.

For radioactive waste, two facilities are available for the disposal of low-level waste from the proposed SHINE facility and the medical facilities: EnergySolutions in Clive, Utah, and Waste Control Specialists in Andrews County, Texas. EnergySolutions is authorized to dispose of only Class A low-level waste, whereas WCS is authorized to dispose of Class A, B, and C low-level waste (SHINE 2013a).

In the event that SHINE loses access to a low-level waste disposal facility, the NRC staff expects that any low-level waste would have to be stored either within the facility or in a new storage facility constructed either on site or at an offsite location. The storage of low-level waste would continue until a low-level waste disposal facility is available. Low-level waste, regardless of its location, must be stored in accordance with Federal and State requirements to ensure the safety of workers and members of the public. As discussed in Section 4.9, multiple physical barriers (i.e., shielded walls, hot cells, shielded storage containers, protective equipment, and ventilation systems) and administrative controls (i.e., procedures and training) would be used to limit the impacts to workers and members of the public from radioactive material in the proposed SHINE facility. The NRC staff expects that similar facility design and management programs would be used to ensure safety during the temporary storage of low-level waste at NorthStar and the medical facilities.

A provision of the American Medical Isotopes Production Act of 2012 (42 U.S.C. 2065(c)(3)(A)(ii)) states that DOE would take title to, and be responsible for, the final disposition of radioactive waste created by the irradiation, processing, or purification of uranium leased from DOE if it determines that the producer (e.g., SHINE or NorthStar Medical Radioisotopes facilities) does not have access to a disposal path. For example, if a disposal pathway for greater than Class C waste does not exist, DOE will be responsible for its safe storage and disposal.

As discussed in Section 4.4, nonradioactive wastewater from the proposed SHINE facility would be sent to the Janesville municipal sanitary system. The NRC staff expects that most of the facilities listed in Table 4–16 would also send their wastewater to the Janesville municipal sanitary system. The WTP has a treatment capacity of 19.1 mgd (72,290 m^3/day), with an average peak treatment flow of 14.5 mgd (54,900 m^3/day). The average daily treatment and discharge flow includes the operating Mercy Clinic South and Mercy Hospital (SHINE 2013b). Sanitary sewer and wastewater treatment for the proposed NorthStar Medical Radioisotopes facility would be provided by the City of Beloit (DOE 2012b). Based on the capacity of the Janesville municipal sanitary system, the NRC staff concludes that there would be adequate capacity to process wastewater from the proposed facility, in addition to existing and reasonably foreseeable residential, medical, and commercial facilities.

Solid nonradioactive waste, such as general office trash and industrial waste generated during the operation, maintenance, and day-to-day office operations of the proposed facility, would be handled by the City of Janesville’s sanitation department (SHINE 2013b). Rock County has a State-licensed landfill (License No. 3939) authorized to receive the following materials: asbestos, contaminated soil, demolition, garbage, noncombustible material, refuse, and shredder fluff (WDNR 2013d).

The NRC staff reviewed information on solid-waste management on the WDNR and EPA Web sites; no known capacity constraints exist for the disposal of such waste either within Wisconsin or the Nation as a whole (WDNR 2013d; EPA 2013).

As discussed in Sections 2.7 and 4.9 of this document, SHINE would have waste management systems and programs to control, handle, process, store, and transport the types and quantities of nonradioactive waste expected to be generated by the medical radioisotope production process. The waste management systems and programs are expected to ensure that the radioactive wastes generated at the proposed SHINE facility would be managed in accordance with the regulatory requirements of the NRC, DOT, and the State of Wisconsin. The NRC staff expects that nonradioactive waste generated by the facilities listed in Table 4–16 will be managed in accordance with the State of Wisconsin requirements.

Based on the information on waste disposal in Wisconsin and the United States, the NRC staff concludes that there would be adequate disposal space on a State and national level for radioactive and nonradioactive waste from multiple current and reasonably foreseeable sources and that the waste would be handled and disposed of in accordance with Federal, State, and local requirements. Therefore, the NRC staff concludes that the cumulative impacts would be SMALL.

4.13.10 Transportation

This section addresses the direct and indirect contributory effects from the construction, operations, and decommissioning of the proposed SHINE facility when added to the effects from other past, present, and reasonably foreseeable future actions on transportation infrastructure. The geographic area of analysis for evaluation of cumulative impacts on transportation is primarily the same as that used in Section 4.10 and includes the 91 ac (37 ha) within the site boundary and the 5-mi (8-km) region surrounding the proposed SHINE facility. However, the roads for routes that could be used for delivery of medical isotopes (if air transport is not possible) or disposal of wastes were also considered. Transportation infrastructure includes roadways, rail lines, airports, and traffic control devices. As discussed in Section 4.10, the traffic impacts would be MODERATE during construction and decommissioning and SMALL to MODERATE during operations.

Construction projects in Table 4–16 could produce an increase in vehicle traffic on roads within the 5-mi (8-km) radius of the proposed SHINE site. For example, the NorthStar medical radioisotope project would involve the construction of a facility and would add additional employees commuting on roads near the SHINE site. In addition, new construction projects could occur within TIF Districts Nos. 34 and 35, although the NRC staff did not identify any specific additional construction projects within TIF Districts Nos. 34 and 35 (NRC 2013f). Depending on the number of workers required and on whether construction projects near the SHINE site were occurring at the same time as the SHINE facility construction or operations, traffic impacts on access roads would increase. Most existing roads would be sufficient to handle the construction project transportation activities, and alternative routes could be used to minimize transportation impacts. In some cases, however, a noticeable increase in traffic could occur, especially if construction timeframes overlapped and construction workers and vehicles used the same roads. Traffic from facilities, such as the Southern Wisconsin Regional Airport, Glen Erin Golf Course, Mercy Clinic, Mercy Hospital, and Alliant Energy Generation Facility, would likely have a noticeable impact on transportation, given that the facilities are currently operating and that a need for additional transportation infrastructure has not occurred. Therefore, depending on whether other construction projects overlapped with the SHINE project or on whether increased vehicular activity from workers or residents on roads near the proposed SHINE site had a noticeable impact on traffic volumes, the cumulative effect of transportation-related traffic impacts during SHINE facility construction, operations, and decommissioning would be SMALL to MODERATE.

4.13.11 Environmental Justice

The environmental justice cumulative impact analysis evaluates the potential contributory human health and environmental effects from the construction, operations, and decommissioning of the proposed SHINE facility when added to the effects from other past, present, and reasonably foreseeable future actions on minority and low-income populations and whether these effects might be disproportionately high and adverse. Minority and low-income populations are subsets of the general public residing near the Janesville site in the existing industrial park, and everyone would be exposed to the same environmental effects generated by the construction, operations, and decommissioning of the SHINE facility.

The geographic area of analysis is the 5-mi (8-km) region surrounding the proposed SHINE facility at the Janesville site. As discussed in Section 4.12, the proposed SHINE facility site and industrial park are located in a minority population block group because it has a greater percentage of minority people than the 5-mi (8-km) radius. Minority and low-income populations residing along site access roads could be disproportionately affected by noise and dust and increased commuter and vehicle traffic during construction, operations, and decommissioning. However, during construction and decommissioning, these would be short term and primarily limited to onsite activities. Facility operations at the Janesville site would not have high and adverse human health and environmental effects on minority and low-income populations. As a result, minority and low-income populations residing near the proposed SHINE facility and the existing industrial park would not experience disproportionately high and adverse human health and environmental effects from the proposed action.

Table 4–16 identifies past, present, and reasonably foreseeable future actions within the geographic area of analysis that could contribute cumulative human health and environmental effects. Potential impacts to minority and low-income populations from other past, present, and reasonably foreseeable future actions would mostly consist of environmental effects caused by construction and operations of new commercial and industrial developments (e.g., noise, dust, traffic, employment, and housing impacts). However, noise and dust impacts during construction would be short term and primarily limited to onsite activities. Minority and low-income populations residing along site access roads would be directly affected by commuter vehicle and truck traffic. However, these effects are not likely to be high and adverse and would be contained within a limited time period during certain hours of the day. Increased demand for temporary housing during construction could cause rental housing costs to rise, disproportionately affecting low-income populations who rely on inexpensive housing. However, given the availability of workers and the likelihood of workers commuting to the construction site, the need for rental housing would be reduced.

Operational emissions from commercial or industrial facilities could disproportionately affect minority and low-income populations living near the new commercial and industrial facility. However, everyone would be exposed to the same potential contributory effects, and any impacts would depend on the magnitude of the change in current environmental conditions. Permitted air emissions from all commercial and industrial facilities, including the contributory effects from the proposed SHINE facility, would be expected to remain within regulatory standards.

Based on this information and the analysis of human health and other environmental impacts presented in this EIS, the contributory effects of constructing, operating, and decommissioning the SHINE facility are not likely to create high and adverse cumulative human health and environmental effects on minority and low-income populations living near the Janesville site.

4.13.12 Summary

Table 4–18 summarizes the cumulative impacts in all resource areas. Cumulative impacts would range from SMALL to MODERATE depending on the resource area. Specifically, these cumulative impacts would be SMALL for all resource area components other than ecological resources and transportation.

Table 4–18. Cumulative Impacts on Environmental Resources, Including the Impacts of the Proposed Project

Resource Category	Cumulative Impact Level	Description of Impacts
Land Use and Visual Resources		
Land Use	SMALL	New construction activities would occur within or adjacent to existing facilities or within areas zoned for industrial use.
Visual Resources	SMALL	New construction activities would occur within or adjacent to existing facilities or within areas zoned for industrial use and of low scenic quality.
Air Quality and Noise		
Air Quality	SMALL	Other sources of air emissions in Rock County are too small or are located too far away to have any significant cumulative effects.
Noise	SMALL	Noise levels associated with the proposed SHINE facility would be localized and restricted to within a few hundred feet of the proposed SHINE facility.
Geologic Environment	SMALL	Important farmland soils would be lost but would primarily occur in areas committed to development. Consumption of rock and mineral resources would not affect regional availability of the materials.
Water Resources	SMALL	Projected water use and wastewater generation would be within the capabilities of the affected utility systems to provide adequate service.
Ecological Resources	MODERATE	As climate change and runoff from agricultural fields and urban areas continue over the proposed construction and operational period, certain attributes of the terrestrial and aquatic environment (such as habitat quality) are likely to noticeably change. No impacts are expect to destabilize any important attributes of the terrestrial and aquatic environment because changes will be gradual, thus allowing the terrestrial and aquatic environment to appropriately adapt.

Resource Category	Cumulative Impact Level	Description of Impacts
Socioeconomics	SMALL	Most of the construction and operations workers already reside within the ROI. Therefore, the cumulative effects from the construction and operation of the proposed SHINE facility in TIF District No. 35, combined with the construction and operation of the NorthStar Medical Radioisotopes facility in the ROI, would result in little, if any, change in population or increased demand for housing and public services. The combined effect would create minimal socioeconomic impacts.
Historic and Cultural Resources	SMALL	No ground-disturbing activities would occur within the APE besides the proposed SHINE facility. BMPs would be employed in case of any future inadvertent discoveries of historic and cultural resources on SHINE property.
Human Health	SMALL	Radiological doses and nonradiological exposures would be within NRC and the State of Wisconsin’s limits.
Waste Management	SMALL	Adequate radioactive and nonradioactive disposal space occurs on a state and national level and waste would be handled and disposed of in accordance with Federal, State, and local requirements.
Transportation	SMALL TO MODERATE	Commercial development within the ROI has not resulted in the need for additional transportation infrastructure improvements. Current infrastructure is sufficient to handle the projected growth in TIF Districts Nos. 34 and 35, but traffic monitoring as development progresses would identify potential problem areas and could point to traffic control improvements that could alleviate episodic or peak traffic congestion. Cumulative transportation impacts would be MODERATE during construction and decommissioning and SMALL during SHINE facility operations.
Environmental Justice	– –	Cumulative human health and environmental effects on minority and low-income populations are not expected to be disproportionately high and adverse.

4.14 References

7 CFR Part 657. *Code of Federal Regulations*, Title 7, *Agriculture*, Part 657, "Important farmlands inventory."

7 CFR Part 658. *Code of Federal Regulations*, Title 7, *Agriculture*, Part 658, "Farmland and protection policy act."

10 CFR Part 20. *Code of Federal Regulations*, Title 10, *Energy*, Part 20, "Standards for protection against radiation."

10 CFR Part 30. *Code of Federal Regulations*, Title 10, *Energy*, Part 30, "Rules of general applicability to domestic licensing of byproduct material."

10 CFR Part 40. *Code of Federal Regulations*, Title 10, *Energy*, Part 40, "Domestic licensing of source material."

10 CFR Part 70. *Code of Federal Regulations*, Title 10, *Energy*, Part 70, "Domestic licensing of special nuclear material."

10 CFR Part 71. *Code of Federal Regulations*, Title 10, *Energy*, Part 71, "Packaging and transportation of radioactive material."

36 CFR Part 60. *Code of Federal Regulations*, Title 36, *Parks, Forests, and Public Property*, Part 60, "National Register of Historic Places."

36 CFR Part 800. *Code of Federal Regulations*, Title 36, *Parks, Forests, and Public Property*, Part 800, "Protection of historic properties."

40 CFR Part 60. *Code of Federal Regulations*, Title 40, *Protection of Environment*, Part 60, "Standards of performance for new stationary sources."

40 CFR Part 63. *Code of Federal Regulations*, Title 40, *Protection of Environment*, Part 63, "National emission standards for hazardous air pollutants for source categories."

40 CFR Part 112. *Code of Federal Regulations*, Title 40, *Protection of Environment*, Part 112, "Oil pollution prevention."

40 CFR Part 1508. Code of Federal Regulations, Title 40, *Protection of Environment*, Part 1508, "Terminology and index."

49 CFR Part 172. *Code of Federal Regulations*, Title 49, *Transportation*, Part 172, "Hazardous materials table, special provisions, hazardous materials communications, emergency response information, training requirements, and security plans."

49 CFR Part 173. *Code of Federal Regulations*, Title 49, *Transportation*, Part 173, "Shippers—general requirements for shipments and packaging."

59 FR 7629. Executive Order No. 12898. "Federal actions to address environmental justice in minority populations and low-income populations." *Federal Register* 59(32):7629–7634. February 16, 1994.

69 FR 52040. U.S. Nuclear Regulatory Commission. "Policy statement on the treatment of environmental justice matters in NRC regulatory and licensing actions." *Federal Register* 69(163):52040–52048. August 24, 2004.

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5.0 ALTERNATIVES

This chapter describes alternatives to granting a construction permit for the proposed SHINE Medical Technologies, Inc. (SHINE), medical radioisotope production facility (SHINE facility) and the environmental impacts of those alternatives. The need to compare the proposed action with alternatives arises from the requirement in Section 102(2)(C)(iii) of the National Environmental Policy Act of 1969 (NEPA), as amended (42 U.S.C. 4321 et seq.). NEPA states that an environmental impact statement (EIS) shall include an analysis of alternatives to the proposed action. The U.S. Nuclear Regulatory Commission (NRC) implements this requirement through regulations in Title 10 of the *Code of Federal Regulations* (10 CFR) Part 51 and its Interim Staff Guidance in NUREG–1537 (NRC 2012), which state that the EIS will include an analysis that considers and weighs 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.

The NRC standard of significance for impacts uses the Council on Environmental Quality (CEQ) terminology for "significantly" (40 CFR 1508.27). Since the significance and severity of an impact can vary with the setting of the proposed action, the NRC considered both "context" and "intensity," as defined in the CEQ regulations in 40 CFR 1508.27. Context is the geographic, biophysical, and social context in which the effects would occur. Intensity is the severity of the impact. Based on this, the NRC established three levels of significance for potential impacts: SMALL, MODERATE, and LARGE. For this EIS, the NRC staff characterized impact levels for each resource area using the following three definitions of significance levels, which are presented in the Interim Staff Guidance to NUREG–1537:

> SMALL—environmental effects are not detectable or are so minor that they would neither destabilize nor noticeably alter any important attribute of the resource. In 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.

In this EIS, the NRC staff analyzed four alternatives to the proposed action. In Section 5.1, the NRC staff analyzed the no-action alternative or the environmental consequences if the NRC denies the construction permit. In Section 5.2, the NRC staff examined the environmental consequences if the SHINE facility were constructed and operated at an alternative location. Based on an in-depth site selection process, the NRC staff examined in depth two alternative sites, Chippewa Falls and Stevens Point. Section 5.3 examines the environmental impacts of constructing and operating a medical radioisotope production facility at the proposed SHINE site but using alternative technology. Section 5.4 describes the benefits and costs of the various alternatives.

5.1 No-Action Alternative

Under the no-action alternative, the NRC would deny the construction permit, and the SHINE facility would not be constructed. The no-action alternative does not involve the determination of whether radioisotopes are needed or should be generated. The decision to produce radioisotopes is at the discretion of applicants (NRC 2012).

Under the no-action alternative, no changes would occur to the proposed SHINE site in Janesville, Wisconsin. The site would remain zoned for industrial use. Therefore, impacts on all resource areas would be SMALL.

The no-action alternative is the only alternative considered by the NRC that does not satisfy the purpose and need for this EIS, because this alternative does not satisfy the need for a U.S. supply of molybdenum-99. Assuming that the need for a U.S. supplier of molybdenum-99 continues to exist, another private company would likely construct and operate a medical radioisotope production facility.

5.2 Alternative Sites

The NRC staff considered the environmental impacts of locating the proposed SHINE facility at alternative sites. SHINE identified and selected reasonable alternative sites, using the alternative site-selection process described below, in Section 5.2.1 (SHINE 2013a). Unless indicated otherwise, the following discussion is a summary of information presented in SHINE's Environmental Report (ER) (SHINE 2013a).

5.2.1 Description of Alternative Site-Selection Process

SHINE's site-selection process assessed a variety of economic and environmental factors to determine reasonable regions, states, and, ultimately, sites to construct and operate the proposed SHINE facility. SHINE determined that proximity and access to customers was one of the most important factors in determining site location, because molybdenum-99 decays or disappears at a rate of about 1 percent per hour after production. To identify a potential region that is central to the locations of its customers, SHINE first identified the locations of their three most likely customers: Nordion Inc. in Ottawa, Ontario, Canada; Covidien Ltd. in St. Louis, Missouri; and Lantheus Medical Imaging Inc. in Billerica, Massachusetts. SHINE determined that locating the facility in the midwestern U.S. region provides proximity to these three customers, as well as to potential future customers, which could include hospitals and radiopharmacies throughout the country. The Midwestern States considered by SHINE included Minnesota, Iowa, Missouri, Illinois, Wisconsin, Indiana, Ohio, and Michigan. SHINE also considered Louisiana because of potential financial incentives.

SHINE evaluated potential Midwestern States based on their proximity to available and potential customers, financial incentives, and seismic considerations. To initially evaluate seismic concerns on a regional level, SHINE reviewed major fault-line seismic conditions within the midwestern region and determined that Michigan, Wisconsin, and Louisiana do not have any major fault lines. To better understand potential financial incentives, SHINE contacted economic development offices in Wisconsin, Minnesota, Ohio, Michigan, and Louisiana. Ohio and Michigan were eliminated from further consideration because neither of the economic development offices in these States responded to SHINE's request. Wisconsin offered what SHINE considered to be a superior financial incentives package. Wisconsin is also the most centrally located State to SHINE's three prospective customers and is the home State of several project partners, including the University of Wisconsin in Madison, Morgridge Institute for Research, and Phoenix Nuclear Labs. Based on these factors, SHINE eliminated Minnesota and Louisiana from further consideration. Therefore, based on communication with economic development offices, a review of major fault lines, and the location of potential customers, SHINE determined that Wisconsin was the preferred State within the region.

Within the State of Wisconsin, SHINE identified four locations that met certain basic geographic and infrastructure requirements for the proposed facility. Specifically, based on the relatively fast decay rate of molybdenum-99, SHINE required that sites met two fundamental criteria: (1) build-to-suit land available for development with proximity and access to an interstate highway, and (2) an airport within approximately 10 minutes of the proposed facility location, capable of handling radioisotope distribution aircraft. Based on these criteria, SHINE identified four cities for further consideration: Madison, Chippewa Falls, Janesville, and Stevens Point.

Of these four cities, three city councils offered financial incentive packages to SHINE: Chippewa Falls, Janesville, and Stevens Point. No incentive package was offered for Madison and, therefore, SHINE eliminated this city from further consideration.

For the remaining three cities, SHINE staff determined an approximate parcel size appropriate for the facility and requested that the city councils or other local government entities identify a potential site that met the size requirements and prepare an incentive proposal detailing the advantages of the site.

SHINE developed a set of 11 criteria to score the three potential sites and to ultimately identify the site with the best economic advantage and fewest potential environmental impacts. SHINE scored each site using the following criteria:

- local government and community support,
- financial incentives,
- distance to the site boundary,
- access to a skilled workforce,
- proximity to potential future customers,
- proximity to an airport,
- proximity to an interstate highway,
- anticipated depth to the groundwater table,
- seismic characteristics,
- presence of endangered resources and wetlands, and
- presence of historic and archaeological resources.

Local Government and Community Support

SHINE determined that a supportive local government and a supportive local community are important factors in its facility site-selection process, because this support would be essential to complete the proposed construction and operations. SHINE weighted this factor (along with the financial incentives below) more heavily than the other nine factors in the scoring process because of the level of importance SHINE felt these factors would contribute to the successful construction and operation of the proposed facility. SHINE assigned these two factors a maximum score of 10. When evaluating this criterion, SHINE found that all three local governments showed an interest in the project, and it assigned all three sites a score of 10 out of 10.

Financial Incentives

SHINE determined that the financial incentive offered by each local government is an important factor in the site-selection process, because this support would be key to successfully completing the proposed construction and operating the facility. As with local government and community support, SHINE assigned this factor a possible 10 out of 10. During its evaluation, SHINE determined that all three communities provided competitive financial incentives; however, the cities of Janesville and Stevens Point provided slightly larger incentive packages than the city of Chippewa Falls. SHINE assigned the Janesville and Stevens Point sites a score of 9 out of 10 and the Chippewa Falls site a slightly lower score (8 out of 10).

Distance to the Site Boundary

SHINE assessed the distance from the facility to the site boundary, because a greater distance would lower the likelihood of a potential adverse impact on the public. The Janesville site had the furthest distance to the site boundary, approximately 1,000 ft (305 m) in all directions. The Stevens Point site was similar, with a minimum distance to the boundary just under 1,000 ft (305 m) in all directions. The Chippewa Falls site had a considerably smaller distance to the site boundary in some directions because of the site’s smaller, oblong shape. Based on this information, SHINE assigned the Janesville and Stevens Point sites a score of 5 out of 5 and the Chippewa Falls site a slightly lower score of 4 out of 5.

Access to a Skilled Workforce

SHINE determined that proximity to large cities, as well as cooperation with local universities or technical colleges, was indicative of the accessibility to a skilled workforce. Proximity to large cities provides access to a diverse workforce, while relationships with local universities provide access to skilled training for the workforce. SHINE assigned the Janesville site the highest score (4 out of 5), because of its proximity to Madison, Milwaukee, and Chicago. Janesville is close to Blackhawk Technical College, which would offer future training for SHINE’s workforce, if the facility were located at the Janesville site. The Chippewa Falls site ranked evenly with the Stevens Point site, and SHINE assigned both sites a score of 3 out of 5. Chippewa Falls is approximately 100 mi (161 km) from Minneapolis–St. Paul, but none of the local schools offer any workforce training options, while Stevens Point is more remote than the other two sites but is in close proximity to the University of Wisconsin—Stevens Point, which would offer training to SHINE’s workforce if the Stevens Point site were selected.

Proximity to Potential Customers

As described earlier in this section, SHINE determined that, because molybdenum-99 decays or diminishes at a rate of about 1 percent per hour after production, proximity to potential customers is a site-selection factor. Based on the locations of its three prospective customers (in Ottawa, Missouri, and Massachusetts) in comparison to the locations of the three potential sites, SHINE determined that radioisotopes shipped from the Janesville location have the shortest overall distance for air travel to each of SHINE's potential customers. SHINE assigned the Janesville site the highest score for this category (5 out of 5), followed by the Stevens Point site (4 out of 5) and then the Chippewa Falls site (3 out of 5).

Proximity to Airport

SHINE determined that the closer the potential site is to the airport, the quicker its product would be delivered to the customer, and it analyzed this distance as a site-selection factor. The Janesville site is directly across the highway from the Southern Wisconsin Regional Airport, with a distance of less than 0.5 mi (0.8 km). The Stevens Point site is approximately 4 mi (6 km) from the Stevens Point Municipal Airport. The Chippewa Falls site is approximately 10 mi (16 km) from the Chippewa Valley Regional Airport.

During instances of local airport closures, radioisotopes would need to be transported by truck to the nearest secondary airport. The Janesville site is approximately 1 hour from Dane County Regional Airport in Madison and within 2 hours of both O’Hare International Airport in Chicago and Mitchell International Airport in Milwaukee. The Chippewa Falls site is within 2 hours of the Minneapolis–St. Paul International Airport. The Stevens Point site is more than 2 hours from all of these airports. Based on proximity to local and major airports, SHINE assigned the Janesville site a score of 5 out of 5, while the Stevens Point and Chippewa Falls sites received lower scores (3 out of 5).

Proximity to an Interstate Highway

If the local airport closes, SHINE determined that transporting radioisotopes by truck either to the closest secondary airport or directly to the customer would be necessary. To minimize travel time, SHINE made proximity to an interstate highway a site-selection factor. The Janesville site is approximately 3 mi (4.8 km) from Interstate 39. The Stevens Point site is less than 2 mi (3.2 km) from Interstate 39, and the Chippewa Falls site is approximately 18 mi (29 km) from Interstate 94. SHINE assigned the Stevens Point site the highest score in this category (5 out of 5), followed by the Janesville site (4 out of 5) and then the Chippewa Falls site (3 out of 5).

Anticipated Depth to Groundwater

SHINE made depth to groundwater a site-selection factor, because greater depth to groundwater would minimize facility impacts from spills, given that potential groundwater contamination from a leak or spill of oil or chemicals is less likely with further depth to the water table. Based on boreholes and wells drilled on site, SHINE determined that groundwater at the Janesville site was located 55 to 65 ft (17 to 20 m) below grade. Using records from onsite boreholes, SHINE determined groundwater to be approximately 50 ft. (15.2 m) below grade at the Chippewa Falls site. Using similar methods as at the Chippewa Falls site, SHINE determined that groundwater at the Stevens Point site was located 8.0 to 11.0 ft (2.4 to 3.4 m) below grade. SHINE assigned the Janesville site the highest points for this category (5 out of 5), followed by the Chippewa Falls site (4 out of 5) and then the Stevens Point site (2 out of 5).

Seismic Characteristics

SHINE evaluated the seismic characteristics at each proposed site by reviewing the seismicity of the site area (based on peak ground accelerations) and historic records of seismic activity in the site area. SHINE found that the Janesville site is slightly more likely than the other two sites to experience a very weak shaking event. However, SHINE also noted that both the Chippewa Falls and Stevens Point sites are located on glacial sands and may have higher amplification factors than at the Janesville site. SHINE also conducted a geotechnical investigation of the Janesville site that indicated that glacial deposits occur at the Janesville site, as well. Based on this information, SHINE assigned all three sites a score of 3 out of 5.

Presence of Protected Species

To score each of the three sites based on the presence of endangered resources and wetlands, SHINE requested information from the U.S. Fish and Wildlife Service (FWS) and the Wisconsin Department of Natural Resources (WDNR) regarding the potential occurrence of Federally or State-listed species at the three sites. Because the Janesville site is an active agricultural field far from any wetlands, water, or buffer areas, WDNR and FWS determined it was an unsuitable habitat for listed species. Both the Chippewa Falls and the Stevens Point site contain forested areas, which the FWS noted is a potential habitat for migratory birds. WDNR also recommended that the small wetland community on the eastern edge of the Chippewa Falls site be protected as much as possible to avoid affecting any potential rare or declining species. FWS identified a portion of the Stevens Point site as having a high potential for the Karner blue butterfly (*Lycaeides melissa samuelis*), a Federally listed endangered species in Wisconsin.

Based on the input from WDNR and FWS, SHINE assigned the Janesville site the highest score in this category (5 out of 5), and assigned the Stevens Point and Chippewa Falls sites a 2 out of 5, based on the potential habitats for protected species.

Presence of Historic and Archaeological Resources

To evaluate the presence of historic and archaeological resources, SHINE reviewed the National Register of Historic Places (NRHP), as well as the Wisconsin Historic Preservation Database. This search did not identify significant archaeological sites or other cultural resources on or near any of the proposed or alternative sites. As described in Chapter 3, SHINE completed a Phase I archaeological survey of the Janesville site. The survey did not identify any precontact or historic Euro-American archaeological sites. Based on this information, SHINE assigned all three sites a 5 out of 5.

Summary

SHINE assigned each site a score of either 1 to 10 or 1 to 5, based on the criteria discussed above. These scores are summarized in Table 5–1.

Table 5–1. Proposed SHINE Site-Selection Scoring Criteria

	(Max Score)	Janesville	Stevens Point	Chippewa Falls
Local Government and Community Support	(10)	10	10	10
Financial Incentives	(10)	9	9	8
Minimum Distance to Site Boundary	(5)	5	5	4
Access to a Skilled Workforce	(5)	4	3	3
Proximity to Potential Future Customers	(5)	5	4	3
Proximity to Airport	(5)	5	3	3
Proximity to Interstate Highway	(5)	4	5	3
Anticipated Depth to Groundwater Table	(5)	5	2	4
Seismic Characteristics	(5)	3	3	3
Presence of Endangered Resources and Wetlands	(5)	5	2	2
Presence of Historic and Archaeological Resources	(5)	5	5	5
Total	65	60	51	48

Source: SHINE 2013a

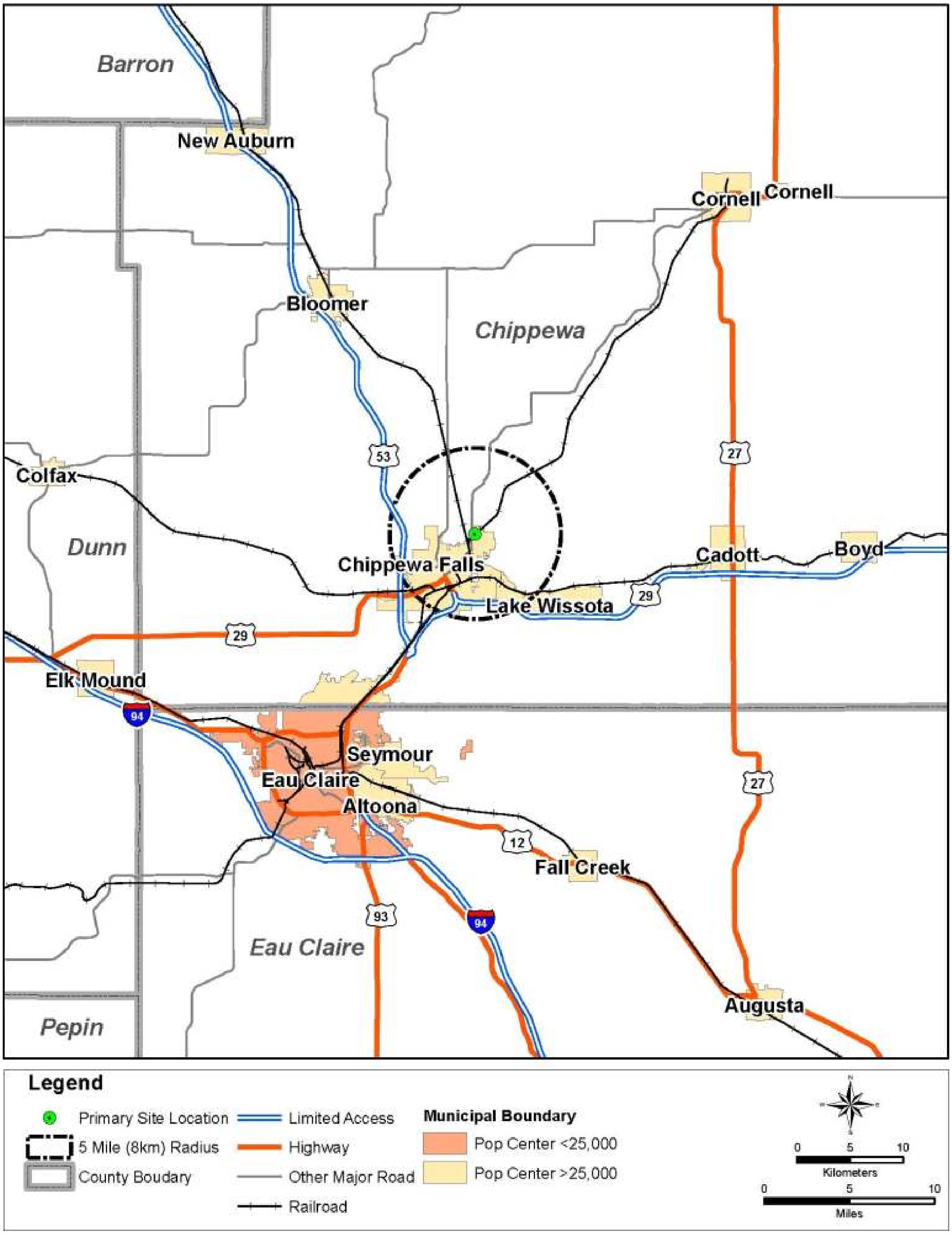
Based on these scores, SHINE selected the Janesville site, with a total score of 60 out of 65, as the proposed location for the SHINE facility. SHINE determined that the Chippewa Falls site (48 out of 65) and the Stevens Point site (51 out of 65) were reasonable alternatives to the Janesville site.

The NRC staff evaluated the site-selection methodology described above and concluded that the process for selecting and evaluating alternative sites, including the proposed site in Janesville, Wisconsin, is reasonable and consistent with guidelines presented in NUREG-1537 and the associated Interim Staff Guidance (NRC 2012). The NRC staff evaluated the environmental impact of the two alternative sites, Chippewa Falls and Stevens Point, in the following sections.

5.2.2 Chippewa Falls Site

The NRC staff evaluated the Chippewa Falls site as a reasonable alternative site. The City of Chippewa Falls is in Chippewa County in northwestern Wisconsin, approximately 13.4 mi (21.6 km) north of Eau Claire, Wisconsin (Figure 5–1). Specifically, the site is located in the Wissota Lake Business Park near the northern edge of the corporate boundaries of the City of Chippewa Falls in Chippewa County, Wisconsin. The site is bordered to the west by Commerce Parkway, to the north by County Highway S, to the east by State Highway 178, and to the south by forested and open land (Figure 5–2). The site is relatively flat with a gentle slope to the southwest. Cropland, including corn and soybeans, comprises the majority of the site. No residences or other buildings are located on site.

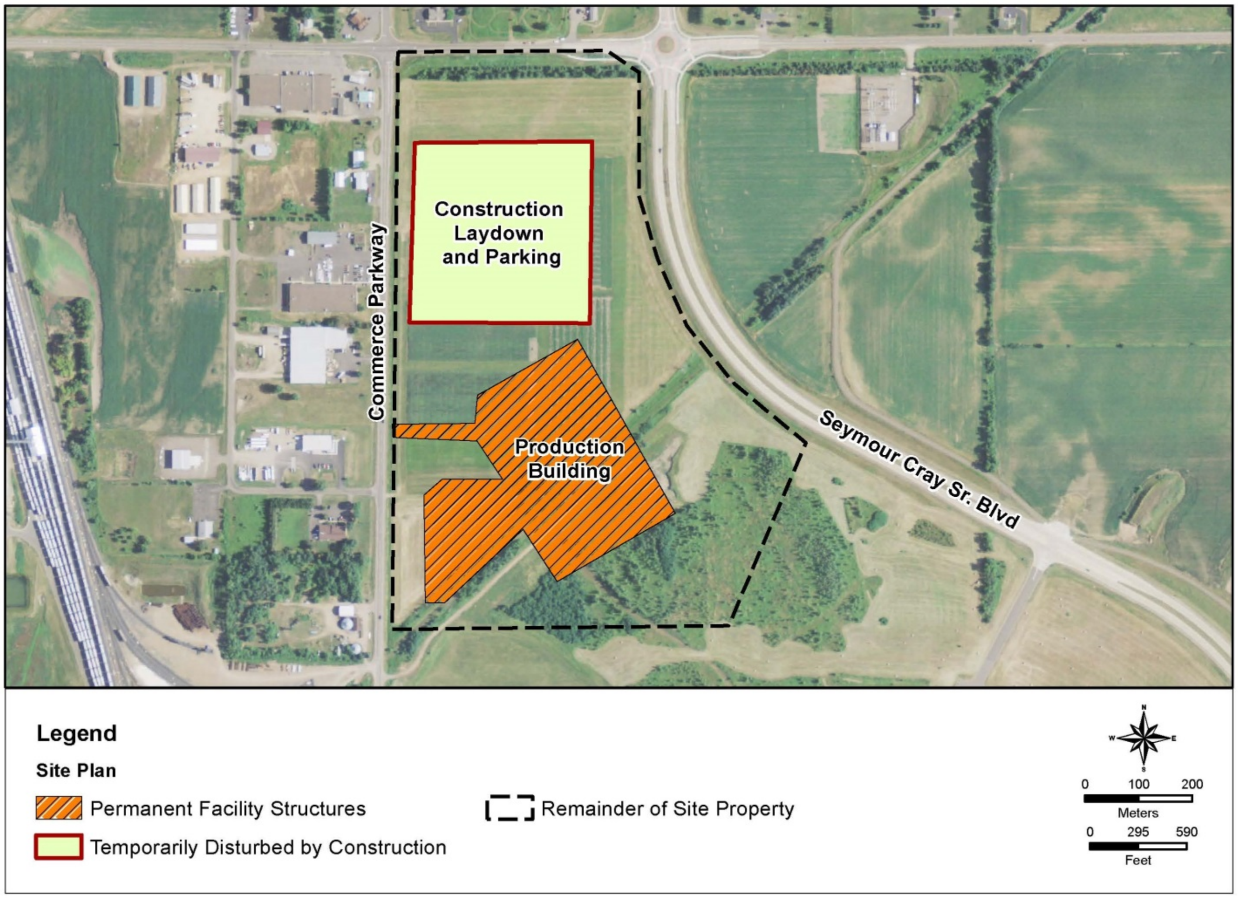
1 **Figure 5–1. Population Centers and Transportation**
2 **Features in Chippewa County, Wisconsin**



3

4 Source: SHINE 2013a

Figure 5–2. Chippewa Falls Site



Source: SHINE 2013a

5.2.2.1 Land Use and Visual Resources

<u>Land Use</u>

The Chippewa Falls site includes 76 acres (ac) (31 hectares (ha)) of land within the northern portion of the City of Chippewa Falls (Figure 5–2). The site is currently zoned for light industrial use and is part of the Wissota Lake Business Park (City of Chippewa Falls 1999; WEDC 2014a). Based on a review of the National Land Cover Database, the Chippewa Falls site is composed of 66.5 ac (26.9 ha) of cultivated agricultural land, 9.1 ac (3.7 ha) of developed land, and 0.8 ac (0.3 ha) of deciduous forest (Table 5–2) (USGS 2006; SHINE 2013a). State Highway 178 borders the western boundary of the site. Warehouses and other buildings are located immediately to the west of State Highway 178. Agricultural fields surround the remaining portions of the Chippewa Falls site (SHINE 2013a).

An abandoned railroad right-of-way runs diagonally through the southern portion of the site. Some of the land south of this right-of-way has been graded for use for the Wissota Lake Business Park. No residences, other structures, special land uses, or mineral resources are located within the Chippewa Falls site boundaries.

The entire site is composed of prime farmland soils where otherwise not committed to developed uses (NRCS 2013a; 7 CFR 657.5). Prime farmland is defined in the Farmland Protection Policy Act of 1981 (7 U.S.C. 4201 et seq.) as “land that has the best combination of physical and chemical characteristics for producing food, feed, fiber, forage, oilseed, and other agricultural crops with minimum inputs of fuel, fertilizer, pesticides, and labor, and without intolerable soil erosion, as determined by the Secretary [of Agriculture].” The U.S. Department of Agriculture, Natural Resources Conservation Service (NRCS), in cooperation with State and local agencies, defines and delineates the soils to consider as prime farmland and farmland of statewide importance (7 CFR Part 657). However, otherwise qualifying “farmland” soils do not include those on land already in or committed to urban development or water storage, as defined in 7 CFR 658.2.

Table 5–2. Potential Land Use and Natural Habitat Impacts at the Chippewa Falls Site

Land Use Category	Permanently Disturbed	Temporarily Disturbed	Total On Site	Total Within 5-mi (8-km) Radius	Percentage Within 5-mi (8-km) Radius
Developed Land	2.6 ac (1.0 ha)	0.01 ac (0.004 ha)	9.1 ac (3.7 ha)	8,966 ac (3,629 ha)	18
Cultivated Crops	14.9 ac (6.0 ha)	13.7 ac (5.5 ha)	66.5 ac (26.9 ha)	19,133 ac (7,743 ha)	38
Pasture/Hay	-	-	-	3,237 ac (1,310 ha)	6
Grassland/ Herbaceous	-	-	-	896 ac (362 ha)	2
Shrub/Scrub	-	-	-	569 ac (230 ha)	1
Deciduous Forest	0.5 ac[(a)] (0.2 ha)		0.8 ac (0.3 ha)	7,301 ac (2,955 ha)	15
Evergreen Forest	-	-	-	1,116 ac (452 ha)	2
Mixed Forest	-	-	-	496 ac (201 ha)	1
Woody Wetlands	-	-	-	1,269 ac (514 ha)	3
Emergent, Herbaceous Wetlands	-	-	-	733 ac (297 ha)	1
Open Water	-	-	-	6,549 ac (2,650 ha)	13
Totals	17.9 ac (7.3 ha)	13.7 ac (5.5 ha)	76.4 ac (30.9 ha)	50,2645 ac (20,342 ha)	100

Notes: The footprint of the facility would permanently convert 0.5 ac (0.2 ha). In addition, up to 0.3 ac (0.1 ha) could also be cleared to comply with security requirements or other measures.

Source: USGS 2006, SHINE 2013a

Construction

Construction at the Chippewa Falls site would permanently disturb and convert 14.9 ac (6.0 ha) of agricultural land, 2.6 ac (1.0 ha) of developed land, and 0.5 ac (0.2 ha) of deciduous forest into an industrial area (Table 5–2). If SHINE needed to clear additional portions of the site to comply with security requirements or other measures, the total amount of affected forested areas could be up to 0.8 ac (0.3 ha) (SHINE 2013a). In addition, 13.7 ac (5.5 ha) of agricultural land would be temporarily converted from agricultural land to a construction parking area and construction material staging or laydown areas. Once construction activities are complete, SHINE would likely restore temporarily affected areas to agricultural fields, cool season grasses, or native prairie (SHINE 2013a). The remaining portion of the site would likely remain as open area, forested areas, or agricultural fields, or would be converted to cool season grasses or native prairie. The potential conversion of up to 66.5 ac (26.9 ha) currently used for agricultural and cultivated crops to other uses would be minor when compared to the 19,133 ac (7,743 ha) of agricultural land remaining within 5 mi (8 km) of the site. Similarly, the conversion of up to 0.8 ac (0.3 ha) of deciduous forest to industrial facilities would be minor when compared to the 7,301 ac (2,955 ha) of deciduous forest remaining within 5 mi (8 km) of the Chippewa Falls site.

The Farmland Protection Policy Act and its implementing regulations require agencies to make Farmland Protection Policy Act evaluations part of the NEPA process to reduce the conversion of farmland to nonagricultural uses by Federal projects and programs. Construction of the proposed SHINE facility at the Chippewa Falls site would permanently convert 14.9 ac (6.0 ha) and temporarily convert 13.7 ac (5.5 ha) of prime farmland soils to industrial use. However, this is a small percentage of the prime farmland within the region surrounding the Chippewa Falls site. Furthermore, the Chippewa Falls site is currently zoned for light industrial uses and is part of a larger development project to create the Wissota Lake Business Park (City of Chippewa Falls 1999; WEDC 2014a). Because the Chippewa Falls site has been committed to urban development and zoned for light industrial use, the Chippewa Falls site does not have qualifying important farmland soils subject to the Act.

Impacts on land use from construction would be SMALL, based on the relatively small amount of farmland and deciduous forest that would be permanently converted to other uses, the lack of qualifying prime farmland soils within affected areas, and the location of the proposed facility within an area zoned for light industrial use, as well as the fact that no effects were expected on special land use or mineral resources.

Operations

Operation of the SHINE facility would not require any new land or require land use changes beyond those required for construction. Therefore, impacts on land use during operations would be SMALL.

Decommissioning

Decommissioning activities would be similar to construction activities, as they would involve heavy equipment to dismantle buildings and remove roadway and parking facilities. Land requirements to perform these activities would be similar to those required during construction. After decommissioning activities are complete, the Chippewa Falls site could remain industrial or be reconverted to agricultural land or open space. Given that land requirements would be similar to those described during construction and that, after decommissioning is complete, the land would be industrial, agricultural, or open space, the NRC staff determined that the impacts on land use during decommissioning would be SMALL.

<u>Visual Resources</u>

The visual setting of the area that would be affected by the proposed SHINE facility at the Chippewa Falls site includes agricultural, forested, and light industrial viewsheds. The viewshed to the north, south, and east of the Chippewa Falls site is mainly flat or has slightly rolling cultivated fields. In addition, trees are visible in many directions. The viewshed to the west is a light industrial landscape, with a few warehouses and other buildings adjacent to the proposed site.

Construction

The activities associated with constructing the proposed SHINE facility (e.g., excavation, earthmoving, pile driving, and erecting the facility) would require large pieces of construction equipment, significantly altering the appearance and partially obstructing views of the existing landscape. However, the Chippewa Falls site has low scenic quality caused by a lack of notable features, uniform landform, low vegetation diversity, an absence of water, mute colors, cultural modifications to adjacent scenery, and a commonality within the physiographic province. The Chippewa Falls site also has a low-to-moderate sensitivity rating, as it is in an area with low scenic values and a lack of special natural and wilderness areas. However, several potentially sensitive viewing areas exist within 1.0 mi (1.6 km) of the Chippewa Falls site, including the following: more than 100 residences, a hospital, nursing home, child daycare facility, adult daycare facility, several medical clinics, and two colleges. Nonetheless, trees and existing buildings would block the view from most of these locations, which would result in a partial view of the Chippewa Falls site during construction. In addition, the viewshed surrounding the Chippewa Falls site is partially aesthetically altered by light industrial buildings, such as warehouses and other buildings, and agricultural fields. Based on the low scenic quality and light industrial viewshed in the vicinity of the Chippewa Falls site, construction-related aesthetic impacts would be SMALL during construction.

Operations

After the facility is constructed, the appearance of the SHINE facility at the Chippewa Falls site would not change during operations, other than a small steam plume that may be visible coming from the exhaust stack. The steam plume from the exhaust stack is expected to be minimal, because opacity associated with the natural-gas-fired boiler and heaters tends to be low, as described in Section 4.2.2.1. The steam plume would be more visible during periods of cold weather, although the size of the steam plume would still be relatively small. Therefore, visual impacts during operations would be SMALL.

Decommissioning

Decommissioning activities would be similar to construction activities, as they would involve heavy equipment to dismantle buildings and remove roadway and parking facilities. After SHINE completed decommissioning activities, the Chippewa Falls site could remain industrial, or be reconverted to agricultural land or open space. As the facility would be located in a district zoned for light industrial use and the viewshed surrounding the Chippewa Falls site is partially aesthetically altered by light industrial buildings, the NRC staff would not expect any changes to the landscape during decommissioning to significantly affect any viewsheds. Therefore, visual impacts during decommissioning would be SMALL.

5.2.2.2 Air Quality and Noise

<u>Air Quality</u>

The climate in Chippewa Falls is similar to that in Janesville, which was described in Section 3.2. According to National Climatic Data Center (NCDC) records for the years 1981 to 2010 (NCDC 2010a), the annual average temperature near Chippewa Falls was 44.8 °F (7.1 °C) , annual snowfall is about 47 in. (119 cm) and average annual precipitation (rain) is 31 in. (78.8 cm). July is the warmest month of the year and January, the coldest. The NCDC records identify the following extreme weather events in Chippewa County from 1996 to 2013: thunderstorms (88 events), lightning (8 events), hail (76 events), tornadoes (2 events), heavy rain (23 events), and floods (2 events) (NCDC 2014a).

The Chippewa Falls site is located in Chippewa County and is part of the Southeast Minnesota-La Crosse (Wisconsin) Interstate Air Quality Control Region (40 CFR 81.66). Chippewa County is designated as an attainment area for sulfur dioxide and an attainment/unclassifiable area for carbon monoxide, ozone, nitrogen dioxide, lead, and particulate matter (40 CFR 81.350). Therefore, criteria pollutant concentrations in the county are lower than the National Ambient Air Quality Standards (NAAQS) or there is insufficient data to determine if the NAAQS are met. The region of influence (ROI) for the air quality analysis discussed below is Chippewa County, because air quality designations are made at the county level. The nearest currently listed Class I Federal Area for visibility protection is the Boundary Waters Canoe Area Wilderness in Minnesota, about 208 mi (334 km) from the site (EPA 2014).[5]

Construction

Sources of air pollutant emissions during construction of the Chippewa Falls site would include fugitive dust from earth-moving equipment and other vehicles, criteria pollutants from diesel engines, and exhaust gases from worker vehicles as they commute to and from the Chippewa Falls construction site. Air emissions would be similar to those calculated for the proposed SHINE facility in Janesville (Section 4.2), since construction activities and the number and type of sources would be similar (e.g., worker vehicles, diesel equipment, equipment activity, fuel combustion). Air emissions would include nitrogen oxides, sulfur oxides, particulate matter, carbon monoxide, and carbon dioxide, as provided in Table 4–3. Construction air emissions would be temporary and localized. Chippewa County, as discussed above, is designated an attainment/unclassifiable area and, therefore, air quality is generally good. Based on the estimated air emissions presented in Section 4.2, the NRC staff does not expect emissions from a facility at the Chippewa Falls site to contribute to concentrations in the air that would exceed NAAQS or that would deteriorate Chippewa County’s attainment/unclassifiable designation. Furthermore, SHINE would be required to comply with the requirements and limitations stipulated in the WDNR Type A Registration Construction Permit.

Given the temporary nature of construction activities (18 months), the air quality designation of Chippewa County, and the pollution control measures that would be required in air permits from WDNR, the NRC staff concludes that air quality impacts during construction would be SMALL.

Operations

Sources of air emissions from operating the facility would be from radioisotope production, fuel combustion associated with processing and facility heating, and vehicular traffic from workers commuting and from monthly truck shipments in and out of the facility. Air pollutants from these sources would include nitrogen oxides (from radioisotope production, fuel combustion, vehicular traffic), sulfur dioxide (from fuel combustion and vehicular traffic), particulate matter (from fuel combustion and vehicular traffic), carbon dioxide (from fuel combustion and vehicular traffic), and carbon monoxide (from fuel combustion and vehicular traffic). Air emissions would be similar to those calculated for the proposed SHINE facility in Janesville (Section 4.2), since operation activities and the number and type of sources would be similar (worker vehicles, fuel combustion associated with processing and facility heating, and the production process). Chippewa County, as discussed above, is designated an attainment/unclassifiable area and, therefore, air quality is generally good. Based on the estimated air emissions presented in Section 4.2, the NRC staff does not expect emissions from a facility at the Chippewa Falls site to contribute to concentrations in the air that would exceed NAAQS or that would deteriorate

[5] Rainbow Lake in Wisconsin is the nearest Class 1 area (about 117 miles (188 km) from the Chippewa Falls site); however, in 1980, Rainbow Lake was excluded for purposes of visibility protection as a Class I area.

Chippewa County's attainment/unclassifiable designation. Furthermore, SHINE would be required to comply with the requirements and limitations stipulated within the Type A Registration Operation Permit from WDNR.

Given that NAAQS are not expected to be exceeded, that the Chippewa County air quality is good, and that pollution control measures would be required in air permits from WDNR, the NRC staff concludes that air quality impacts during operation would be SMALL.

Decommissioning

Decommissioning activities would be similar to construction activities in type and duration. Sources of air emissions would be diesel equipment, vehicle worker emissions, and fugitive dust from earth-moving activities. Air emissions would be similar to those calculated for the proposed SHINE facility in Janesville (Section 4.2), because decommissioning activities and sources would be similar (e.g., worker vehicles, diesel equipment, equipment activity, fuel combustion). Air emissions would include nitrogen oxides, sulfur oxides, particulate matter, carbon monoxide, and carbon dioxide, as provided in Table 4–10. Air emissions from decommissioning would be temporary and localized. Chippewa County, as discussed above, is designated an attainment/unclassifiable area and, therefore, air quality is generally good. Based on the estimated air emissions presented in Section 4.2, the NRC staff does not expect emissions from decommissioning at the Chippewa Falls site to contribute to concentrations in the air that would exceed NAAQS or that would deteriorate Chippewa County's attainment/unclassifiable designation.

Given that NAAQS are not expected to be exceeded and the Chippewa County air quality is good, the NRC staff concludes that air quality impacts during decommissioning would be SMALL.

<u>Noise</u>

The ROI considered for noise is a 1-mi (1.6-km) radius from the site boundary of the proposed SHINE facility. There are a number of noise-sensitive receptors within a 1-mi (1.6-km) radius from the Chippewa Falls site, and the closest noise-sensitive receptors are residences located approximately 2,112 ft (644 m) from the production building and approximately 530 feet (162 m) from the site boundary. As discussed above, the Chippewa Falls site is bordered to the west by Commerce Parkway, to the north by County Highway S, and to the east by State Highway 178. Existing noise sources near the proposed site include vehicular traffic on these roads. The NRC staff did not identify available noise surveys of the Chippewa Falls site and surrounding area. As discussed in Section 5.2.2.1 above, the Chippewa Falls site and surrounding area are cultivated agricultural land. Background noise levels are approximately 45 decibels on the A-weighted scale (dBA) in agricultural cropland areas (EPA 1978).

Construction

Noise sources during construction of the Chippewa Falls site would include construction equipment on site and increased traffic volumes. The maximum number of worker vehicles expected on site during construction is 451. The Chippewa Falls site is bordered to the west by Commerce Parkway, to the north by County Highway S, and to the east by State Highway 178, and site access would be from Commerce Parkway. While workers would be able to access the site using a combination of routes (Section 5.2.2.10), it is reasonable to assume that Commerce Parkway, County Highway S, and State Highway 178 will experience an increase in traffic volumes. As discussed in Section 5.2.2.10, peak traffic on these roads averages around 400 vehicles per hour, similar to Highway 51 near the Janesville site. The NRC staff estimates that an increase in vehicular traffic caused by 451 peak construction workers will increase noise levels no more than 3 dBA near these roads in the vicinity of the Chippewa Falls site. A 3-dBA change over existing noise levels is considered to be a “just noticeable” difference, while a 10-dBA increase is subjectively perceived as a doubling in loudness and almost always causes an adverse community response (NWCC 2002).

The types of equipment that would be used on site during construction are listed in Table 4–2. Blasting and pile driving would not be required for excavation or installation of foundations (SHINE 2013a). The closest noise-sensitive receptors are residences located approximately 2,112 ft (644 m) from the center of the site and approximately 530 ft (162m) from the site boundary. The NRC staff estimates noise levels of 64 dBA at the residence nearest to the Chippewa Falls site. Background noise levels are assumed to be around 45 dBA. The increase in noise levels could be noticeable to residents.

Given the closeness of the nearest resident to the Chippewa Falls site and the noise levels from construction activities, the NRC staff estimates that noise impacts would be SMALL to MODERATE.

Operations

Noise sources during operation of the Chippewa Falls site would be traffic from worker vehicles. Noise from operating equipment would be contained inside buildings and is not expected to be audible outside the proposed SHINE building facility. The number of worker vehicles expected during operation is 150 (SHINE 2013a). Commerce Parkway, County Highway S, and State Highway 178 in the vicinity of the Chippewa Fall site will experience an increase in traffic volumes. The NRC staff does not expect that noise levels will increase beyond 1 dBA near these roads in the vicinity of the Chippewa Falls site and should not be noticeable. For this reason, the NRC staff concludes that noise impacts from facility operations would be SMALL.

Decommissioning

Noise sources during decommissioning of the facility would include construction equipment on site and increased traffic volumes, similar to construction activities. The maximum number of worker vehicles expected on site during decommissioning is 261. Commerce Parkway, County Highway S, and State Highway 178 in the vicinity of the Chippewa Fall site will experience an increase in traffic volumes. The NRC staff does not expect that noise levels will increase beyond 2 dBA near these roads in the vicinity of the Chippewa Falls site and should not be noticeable.

The types of equipment that would be used on site during decommissioning are listed in Table 4–9. The closest noise-sensitive receptors are residences located approximately 2,112 ft (644 m) from the production building and approximately 530 ft (162 m) from the site boundary. The NRC staff estimates noise levels of about 64 dBA at the nearest residence to the Chippewa Falls site. Background noise levels are assumed to be around 45 dBA.

Given the closeness of the nearest resident to the Chippewa Falls site and the noise levels from decommissioning activities, the NRC staff estimates that noise impacts would be SMALL to MODERATE.

5.2.2.3 Geologic Environment

The Chippewa Falls site is located within the Wisconsin Central Plain physiographic province. This province is situated near the boundary between the Superior Upland and Central Lowland physiographic provinces of the United States (USGS 2003; SHINE 2013a). The site location is near a dividing line between areas affected by the younger Wisconsin glaciations that ended about 11,700 years ago and older glaciations of the Illinoian age (WGNHS 2011). These events are further discussed in Section 3.3.1.

The topography of the site is relatively flat, with an average elevation of approximately 930 ft (283 m) mean sea level. During the NRC environmental site audit, evidence of earthwork and stockpiles of topsoil were observed in the central portion of the site. Geologic map coverage indicates that the site is located on a glacial outwash plain (Copper Falls outwash plain) formed by meltwater associated with the Chippewa ice lobe between approximately 26,000 and 9,500 years ago, during the latter part of the Wisconsin glaciation. The meltwater deposited sediment characterized as brown to pale brown sand, gravelly sand, and sandy gravel with developed soil profiles of 3.2- to 3.9-ft (1- to 1.2-m) thick. Depth to the uppermost bedrock surface is estimated to range from 49- to 98-ft (15- to 30-m) below ground surface (bgs) (Syverson 2007). Bedrock in the vicinity of the site is mapped mainly as Cambrian age sandstones and locally (in the Chippewa Falls area), as Precambrian granitic intrusive rocks (Mudrey et al. 1982; WGNHS 2005).

A single geotechnical boring was completed in the north-central portion of the proposed site (AET 2011, SHINE 2013b). At this location, the boring encountered fill extending to a depth of approximately 3.5 ft (1.1 m) and underlain by a buried soil horizon (sandy silt) approximately 1.5-ft (0.45-m) thick. Below 5 ft (1.5 m), coarse sediments composed of poorly graded sands and gravels were found. A static water table elevation of 50-ft (15-m) bgs is inferred from the boring log. The boring was terminated in dense sandy gravel at 82-ft (25-m) bgs without encountering bedrock (AET 2011).

Sand is being mined in several locations around Chippewa County (where the Chippewa Falls site is located) for use in hydraulic fracturing associated with natural gas production (SHINE 2013a; WGNHS 2014). Construction sand and gravel is also a commodity in the county (USGS 2013a), as are peat, glacial clay, and crushed Precambrian igneous or metamorphic rocks (Chippewa County 2010).

Soil unit mapping by NRCS identifies natural soils across the site as consisting of Sattre loam, 0- to 3-percent slopes. This soil mapping unit is composed of well-drained loams and fine sandy loams and is found on outwash plains and stream terraces that developed from loamy glacial drift atop gravelly outwash. The profiles of these soils grade to a gravelly coarse sand or sand at depths greater than about 34 in. (86 cm). The depth to the water table in these soils is generally greater than 80 in. (200 cm) and they are not prone to ponding. The only building site limitation these soils have is that excavations tend to be very unstable because of the coarse sandy texture of subsoils and gravelly content. These soils are all prime farmland soils, where otherwise not committed to developed uses (NRCS 2013a; 7 CFR 657.5).

As further described in Section 3.3.3, the State of Wisconsin lays within the central portion of the stable North American craton. Regional seismicity is characterized by relatively infrequent, small-to-moderate earthquakes that are typical of much of the central and eastern United States (USGS 2013b). Similar to the Janesville site, seismic hazard estimates prepared by the U.S. Geological Service (USGS) indicate that the site is located within one of the lowest earthquake hazard areas in the conterminous United States (Petersen et al. 2011).

Within a radius of 200 mi (322 km) of the Chippewa Falls site, only 2 earthquakes with a magnitude equal to or greater than 2.5 have been recorded since 1973. These events occurred in January 1988 and February 1994. The closest was a magnitude 3.6 earthquake with an epicenter approximately 140 mi (225 km) north of the site in the Upper Peninsula of Michigan (USGS 2013c).

<u>Construction</u>

Ground-disturbing activities associated with facility construction would have impacts on geologic and soil resources similar to those discussed for the Janesville site (Section 4.3.1). Earthwork requirements and the ease of excavation would be very similar, as soils and surficial strata are comparable for the two sites. The depth to bedrock is not a concern for excavation work for the below-grade portions of the facility. As at the Janesville site, shallow excavations could be prone to slumping, caused by the texture of the soils. The potential for soil erosion and loss would be similar to that at the Janesville site. However, as described in Section 4.3.1, adherence to standard best management practices (BMPs) for soil erosion and sediment control and compliance with the provisions of the Wisconsin General Permit to Discharge Construction Site Storm Water Runoff (Wisconsin Pollutant Discharge Elimination System (WPDES) Permit No. WI-S067831-4) would serve to minimize soil erosion and loss.

Site work and the creation of an impervious surface would result in the irretrievable loss of prime farmland soils equal to the acreage disturbed and converted to an impervious surface. Given that the potential for soil erosion and loss is minimal and that SHINE would be required to comply with the provisions of the Wisconsin General Permit (WPDES Permit No. WI-S067831-4), the NRC staff finds that the impacts on the geologic environment from the construction of the proposed SHINE facility at the Chippewa Falls site would be SMALL.

<u>Operations</u>

There would be no additional impact on geology and soils from facility operations at the Chippewa Falls site. Land temporarily disturbed during construction within the site boundary and lying outside the facility footprint would be revegetated. Regardless of the site location, the proposed SHINE facility would be sited, designed, and constructed in accordance with all applicable building codes, which provide for the evaluation of site geologic and soil conditions, including potential seismic hazards.

Therefore, the NRC staff finds that the operational impacts associated with the geologic environment at the Chippewa Falls site would be SMALL.

<u>Decommissioning</u>

Facility demolition and other ground-disturbing activities associated with decommissioning would have impacts on soils and sediments similar to those described for construction. As site activities would be conducted in accordance with applicable local, State, and other Federal regulations and permits, the NRC staff finds that the impacts on the geologic environment from facility decommissioning at the Chippewa Falls site would be SMALL.

5.2.2.4 Water Resources

<u>Surface Water</u>

No streams or other surface-water bodies exist within the boundaries of the Chippewa Falls site (SHINE 2013a). The major surface-water feature in the vicinity of the site is Lake Wissota, an impoundment of the Chippewa River, located about 0.8 mi (1.3 km) east of the site. From the downstream end of the lake, the Chippewa River flows to the west immediately south of the site before taking a more southerly course toward Eau Claire (SHINE 2013a). Drainage from the site would be expected to travel south and southeast toward the Chippewa River.

The Chippewa River is one of the largest rivers in Wisconsin. Within the subbasin in which the Chippewa Falls site is located, the river flows for 103 mi (166 km), extending from the Holcombe Dam in northern Chippewa and southern Rusk counties to the Mississippi River. This river section includes five flowages created by dams owned and operated by Northern States Power Company for hydropower generation and some 69 mi (111 km) of free-flowing river. The largest of these flowages (Lake Wissota) comprises 6,212 ac (2,500 ha) (WDNR 2013a).

The nearest USGS gaging station on the Chippewa River is just southwest of the site in Chippewa Falls (Station 05365500). The mean annual discharge measured at the USGS gage for water years 1888 to 2012 is 4,974 cubic ft per second (cfs) (140.5 cubic m per second (m^3/s)). The 90-percent exceedance flow, indicative of drought conditions, is 1,320 cfs (37.3 m^3/s). For water year 2012, the mean discharge was 3,619 cfs (102 m^3/s). The drainage area of the river upstream of the station encompasses 5,560 mi^2 (14,630 km^2) (USGS 2012a).

No floodplains have been delineated on or near the site or within the Lake Wissota Business Park (Chippewa County 2010; SHINE 2013a; WEDC 2014a), and no tributaries to the Chippewa River originate on or near the site that could present backwater flooding concerns.

The State of Wisconsin has established water-quality standards and numeric criteria and associated designated-use categories for all waters of the State, as previously described in Section 3.4.1, and in accordance with the Wisconsin Administrative Code (NR 102 and NR 104). Section 303(d) of the Federal Clean Water Act (CWA) requires states to identify "impaired" waters for which effluent limitations and pollution control activities are not sufficient to attain water-quality standards in such waters. The Chippewa River at Lake Wissota has a designated use for fish and aquatic life and is identified as impaired because of contaminated fish stemming from polychlorinated biphenyls and, historically, mercury (WDNR 2013a).

In Chippewa County, surface water is used for self-supplied industrial and commercial uses and with minor use for irrigation, livestock watering, and mining. However, groundwater is the primary and almost exclusive source for the domestic and municipal water supply (Buchwald 2011; Chippewa County 2010).

No industrial wastewater discharges have been identified in the site vicinity. Sanitary sewer service is provided to Wissota Business Park by the City of Chippewa Falls through a 24-in (61-cm) sanitary sewer line (WEDC 2014a). The Chippewa Falls Wastewater Treatment Plant (WTP) has a capacity of 5.6 million gallons per day (mgd) (21,200 m^3 per day (m^3/d)), and demand is approximately 2.2 mgd (8,330 m^3/d) (Chippewa County 2010; WEDC 2013a).

Groundwater

The surficial aquifer system occurs in the Chippewa River Basin and its associated drainages across Chippewa County (Olcott 1992). It is predominantly composed of Pleistocene-age glacial sediments and younger alluvial sediments that lie atop the bedrock surface (Olcott 1992). At the Chippewa Falls site, the surficial aquifer resides in the thick blanket of the Copper Falls glacial outwash identified at the site (Section 5.2.2.3). Consolidated bedrock aquifers of the Cambrian–Ordovician aquifer system and of the Jacobsville sandstone and crystalline rock aquifers underlie the site or are present in the region.

In the vicinity of the site, potential yields from wells screened in the surficial aquifer can yield up to 500 gallons per minute (gpm) (1.9 m^3/min) of water (Lippelt 1988). The depth to groundwater at the site is 50 ft (15 m), as noted in Section 5.2.2.3. Groundwater beneath the site would also be expected to flow south and southeast toward the Chippewa River.

No groundwater quality data are available for the surficial (sand and gravel) unit beneath the site, and no wells are known to have been drilled on the site location. Groundwater across the county is generally suitable in quantity and quality to meet domestic potable, agricultural, municipal, and industrial needs (Chippewa County 2010). The water is generally soft with local high concentrations of iron (Chippewa County 2010). Nitrate is a contamination of concern in many areas. The State of Wisconsin regulates groundwater quality and administers groundwater protection programs in accordance with the Wisconsin Administrative Code (NR 140).

As previously noted, municipalities in Chippewa County obtain potable water from groundwater sources. The Wissota Business Park, in which the Chippewa Falls site is located, would be served by a 16-in. (41-cm) water main with water originating from the City of Chippewa Falls (WEDC 2014a). The City of Chippewa Falls has nine wells and can supply 2.4 mgd (9,100 m^3/d) of water (Chippewa County 2010). These wells are all completed in the surficial unit at depths ranging from 43 to 97 ft (13 to 30 m) (WDNR 2013b). Communities that provide water service through municipal wells must follow Chippewa County's wellhead protection plan (Chippewa County 2010).

Construction

Facility construction activities at the Chippewa Falls site would not have any direct impact on surface-water resources, as no streams or other surface-water bodies originate within the boundaries of the site. The major surface-water feature in the vicinity of the site is Lake Wissota, located about 0.8 mi (1.33 km) east of the site. In addition, construction and excavation activities would not be expected to have any impact on groundwater hydrology at the Chippewa Falls site, as the depth to groundwater is about 50 ft (15 m) (American Engineering Testing 2011).

As discussed above (Geologic Environment) and detailed in Section 4.4.1.1 for the Janesville site, ground-disturbing activities at the Chippewa Falls site would be subject to a Wisconsin General Permit (WPDES Permit No. WI-S067831-4). This General Permit requires the development of appropriate soil erosion and sediment control measures and spill prevention and waste management practices to minimize suspended sediment, the transport of other deleterious materials, and potential water-quality impacts.

No surface water would be withdrawn to support construction at the site (SHINE 2013a). The relatively small volume of water required to support construction activities (averaging about 0.012 mgd (45 m^3/day)) would be supplied by the City of Chippewa Falls, which uses groundwater. Water could either be supplied by a temporary water tap or trucked to the point of use. Wastewater generation would be limited to sanitary waste from the construction workforce and would likely be accommodated through the use of portable restroom facilities.

As no natural surface-water features occur on the site, SHINE would not divert or withdraw surface water to support facility construction, there would be no onsite withdrawal of groundwater, and SHINE would be subject to the Wisconsin General Permit (WPDES Permit No. WI-S067831-4), the NRC staff concludes that the impacts on surface and groundwater hydrology, water quality, and water use from the construction of the proposed SHINE facility at the Chippewa Falls site would be SMALL.

Operations

Normal facility operations would not have any direct impact on surface water or groundwater hydrology or quality. Compliance with the Wisconsin General Permit (WPDES Permit No. WI-S067831-4), as described for construction, specifically requires the development of a stormwater management plan with appropriate BMPs to address runoff from buildings and other impervious surfaces. As detailed in Sections 4.4.1.2 and 4.4.2.2 for the Janesville site, the design, construction, and operation of the proposed facility would include necessary structural controls, and operations would be subject to appropriate plans and procedures (including a Spill Prevention, Control, and Countermeasure (SPCC) Plan) to prevent any spills or other releases from reaching soils or surfaces where they could be conveyed to surface waters or groundwater.

Total water use is projected to be 6,073 gpd (22,990 liters per day (Lpd)), or 0.006 mgd (23 m^3/day) and would be supplied by the City of Chippewa Falls by a service connection from the Wissota Business Park (SHINE 2013a, 2013b, 2014). Estimated demand is a small percentage of the City of Chippewa Falls' supply capacity.

Operation of the proposed SHINE facility would entail no direct discharge of wastewater effluents to either surface water or groundwater. Wastewater generated by facility operations, composed primarily of sanitary waste, would be discharged to the City of Chippewa Falls WTP (SHINE 2013a). Section 5.2.2.9 discusses the management of other waste forms.

Given that SHINE would not divert or withdraw surface water to support facility operation and would develop and implement spill prevention and response procedures, the NRC staff concludes that the impacts on surface and groundwater hydrology, water quality, and water use from the operation of the proposed SHINE facility at the Chippewa Falls site would be SMALL.

Decommissioning

Facility decontamination, demolition, and site-restoration activities would be similar, regardless of the site, with the potential magnitude of the impacts on surface water and groundwater similar to those discussed for construction. Specifically, SHINE would conduct site activities in accordance with appropriate BMPs and would observe waste handling and pollution prevention practices and spill prevention and response procedures during decommissioning, so that no materials or contaminants are released to soils or exposed to stormwater, where they could contaminate water resources.

Small quantities of water that may be required for dust control and soil compaction in association with site restoration activities would be supplied from municipal sources, as discussed for construction.

Given that no natural surface-water features occur on the site, that water requirements would be minimal, and that SHINE would develop and implement spill prevention and response procedures as part of State permit requirements for ground-disturbing activities, the NRC staff concludes that the impacts on water resources from facility decommissioning would be SMALL.

5.2.2.5 Ecological Resources

The Chippewa Falls site consists of 66.5 ac (26.9 ha) of agricultural land, 9.1 ac (3.7 ha) of developed land, and 0.8 ac (0.3 ha) of deciduous forest (Table 5–2). As described in Section 5.2.2.1, these land use covers are based on the USGS (2006) land cover database. During a field reconnaissance survey, the SHINE staff observed a small wetland community in a narrow drainage way along the eastern edge of the site that was not included in the USGS land cover database. Plant species on the site vary depending on previous land uses. For example, actively cultivated crops on the site include corn (*Zea mays*) and soybeans (*Glycine max*). Fallow agricultural land on the southern portion of the site has been graded in preparation for use by the Wissota Lake Business Park. Plants in this portion of the site are typical of an old field plant community, such as goldenrod (*Solidago* spp.) and aster *(Symphyotrichum* spp.*).* An abandoned railroad right-of-way crosses the site and is surrounded by a few deciduous tree species (trembling aspen *(Populus tremuloides*), eastern cottonwood (*Populus deltoides* and dogwoods *(Cornus* spp.*)*); a few prairie remnant species; and plants tolerant of physical disturbances. Wetland species observed in the narrow drainage way along the eastern edge of the site include common cottontail (*Typha latifolia*), woolgrass (*Scirpus cyperinus*), dock (*Rumex* spp.), reed canary grass (*Phalaris arundinacea*), and spikerush (*Eleocharis* spp.) (SHINE 2013a).

The Chippewa Falls site provides habitat for birds, mammals, amphibians, reptiles, and other wildlife tolerant of open fields, cultivated grasses, and frequent disturbances from human activity. During a reconnaissance survey, SHINE observed several birds at the Chippewa Falls site, including red-tailed hawk (*Buteo jamaicensis)*, American crow (*Corvus brachyrhynchos)*, black-capped chickadee (*Poecile atricapillus*), and various sparrows (SHINE 2013a). Common mammals that inhabit the site likely include deer, raccoons, squirrels, and rabbits. Common reptiles and amphibians that inhabit the site likely include frogs and snakes.

Other than the one wetland identified along the eastern edge of the site, no water bodies or aquatic habitats exist within the boundaries of the Chippewa Falls site. The closest aquatic features to the Chippewa Falls site include a wetland that is 0.25 mi (0.4 km) from the site, Lake Wissota, that is approximately 0.8 mi (1.3 km) north-northwest of the site, and the Chippewa River that is approximately 0.9 mi (1.4 km) south of the site (SHINE 2013a). Lake Wissota and the Chippewa River are important ecological habitats for fish, invertebrates, and other aquatic organisms and plants (WDNR 2014a, 2014b).

In correspondence with the NRC, FWS (2013) did not identify any Federally listed species on or near the Chippewa Falls site (FWS 2013). Three species of special concern and one State-endangered fish could occur within 6 mi (10 km) of the Chippewa Falls site (Table 5–3) (SHINE 2013a; WDNR 2014a). While these species may occur within the vicinity of the site, the Chippewa Falls site provides unsuitable habitat for any of the four State-protected species (SHINE 2013a; WDNR 2014a). SHINE did not observe any Federally or State-protected species on the Chippewa Falls site during reconnaissance surveys (SHINE 2013a).

Table 5–3. Federally and State-Protected Species Within a 6-mi (10-km) Radius of the Chippewa Falls Site

Scientific Name	Common Name	Federal Status[a]	State Status[a]	State Rank[b]
Bird				
Haliaeetus leucocephalus	bald eagle	BGEPA	SSC	S4
Fish				
Acipenser fulvescens	lake sturgeon		SSC	S3
Insects				
Ophiogomphus smithi	sand snaketail		SSC	S3

[a] BGEPA= Protected under the Bald and Golden Eagle Protection Act; E = endangered; SSC = Species of Special Concern

[b] S3 = Rare or uncommon in Wisconsin; S4 = Secure in Wisconsin with many occurrences.

Sources: FWS 2013, WDNR 2014a, SHINE 2013a

The FWS administers the BGEPA, which prohibits anyone from taking bald (*Haliaeetus leucocephalus*) or golden eagles (*Aquila chrysaetos*), including their nests or eggs, without a permit issued by the FWS. FWS (2013) determined that bald eagles occur within the vicinity of the Chippewa Falls site.

The FWS also administers the Migratory Bird Treaty Act, which prohibits anyone from taking native migratory birds or their eggs, feathers, or nests. The majority of the bird species that occur in Wisconsin, except for resident games birds and feral species, are protected under this Act (WDNR 2014c). In the vicinity of the site, migratory birds rely on riparian, forested, grassland, and wetland habitats as important areas for foraging, resting, avoiding predators, and, for some species, breeding. On the Chippewa Falls site, migratory birds likely use trees for resting and possibly breeding, nesting, and foraging.

<u>Construction</u>

Construction of the SHINE facility would result in permanently converting 0.5 ac (0.2 ha) of deciduous forest and 14.9 ac (6.0 ha) of agricultural fields into an industrial facility or developed open space, such as parking lots. The deciduous forest would include trees growing along the abandoned railroad right-of-way. The agricultural fields would include part of the cropland in the northern half of the site and part of the fallow field in the southern part of the site. In addition, 13.7 ac (5.5 ha) of cropland in the northern part of the site would be temporarily disturbed during construction. Agricultural and open fields are abundant within the region and provide relatively low-quality habitat for birds and wildlife in comparison to forests, grasslands, and wetland habitats. In addition to a loss of habitat, noise from construction activities could disturb birds and wildlife. In response to such disturbances, birds and wildlife could move out of the immediate area and find adequate, similar habitat within the vicinity.

During construction, bird collisions with construction equipment and the new facility could result in mortality from the presence of tall structures (e.g., stacks or cranes) and artificial night lighting during nighttime construction. The size of structures and the likelihood of mortality from bird collisions would be similar to that described in Section 4.5 for the proposed SHINE site in Janesville. In that analysis, the NRC staff determined that impacts from bird collisions would be negligible and unlikely to affect local or migratory populations, based on previous reviews of bird collisions at nuclear power plants that are similar or larger in height and size than the proposed SHINE facility.

Construction at the Chippewa Falls site is not expected to result in any direct impacts on aquatic resources, such as habitat loss, because no aquatic resources would be within the footprint of the proposed facility or the construction laydown areas. Runoff from the site could affect the onsite wetland or offsite aquatic resources by increasing turbidity or introducing various chemicals or other pollutants. WDNR recommended that SHINE implement strict erosion and siltation controls during the entire construction period to minimize impacts on State-protected species that could use Lake Wissota and the Chippewa River (SHINE 2013a). SHINE (2013a) stated, in its ER, that if the Chippewa Falls site were selected, SHINE would implement appropriate soil erosion and sediment control BMPs to minimize the transport of suspended sediment and other pollutants.

In response to the NRC staff’s request for endangered and threatened species that could be affected by the proposed construction and operations, FWS (2013) stated that bald eagles and migratory birds could be found either on or within the vicinity of the site. FWS (2013) recommended further discussions if any active bald eagle nests are identified on the site. In addition, if the Chippewa Falls site is selected, FWS (2013) recommended that any tree removal occur before May 1 or after August 30 to minimize impacts on breeding migratory birds, which may use the trees for breeding, nesting, foraging, or resting. Given that construction would not permanently or temporarily affect any high-quality habitats, such as grasslands, undisturbed forests, or wetlands; permanently and temporarily affected habitats are abundant within the region; and mortality from bird collisions is expected to be negligible, the NRC staff concludes that impacts on ecological resources during construction would be SMALL. If the Chippewa Falls site were selected, FWS (2013) recommended that SHINE survey the site for any active bald eagle nests and refrain from tree removal from May 1 to August 30. If SHINE identified active bald eagle nests at the site, or removed trees from May 1 to August 30, the impacts would be greater.

<u>Operations</u>

During operations, impacts on ecological resources could result from bird collisions, herbicide applications for landscape maintenance activities, elevated noise levels, and increased turbidity or introduction of pollutants from runoff. As described in Section 4.5, mortality from bird collisions is expected to be negligible, given that the tallest structure would be a stack approximately 66 ft (20 m) tall. Disturbance from daily activities, herbicide applications, or elevated noise levels is likely to have minimal impacts on wildlife and plant species, given that the species identified at the Chippewa Falls site are generally tolerant of disturbance, because the land has been actively farmed or modified for human use over the past several decades. In response to any disturbances during operations, birds and wildlife could move out of the immediate area and find adequate, similar habitat within the vicinity.

Operation of the facility is not expected to result in any direct impacts on aquatic resources, because wastewater would be discharged to the City of Chippewa Falls sanitary sewer system after being treated (SHINE 2013a). Indirect impacts during operations could include runoff that may contain sediments, contaminants from road and parking surfaces, or herbicides. However, as described above, impacts on aquatic resources are expected to be minimal because of the distance to Lake Wissota and the Chippewa River, and SHINE would be required, in its stormwater permit, to use appropriate soil erosion and sediment control BMPs.

Given that mortality from bird collisions is expected to be negligible, habitat disturbances during operations would be minimal, any disturbed wildlife could find similar habitat in the vicinity, BMPs would be required in the SHINE stormwater permit, and no Federally or State-listed species occur on the SHINE site, impacts on ecological resources during operations would be SMALL.

Decommissioning

Decommissioning activities would have similar impacts on those that occur during construction of the proposed facility. For example, SHINE would use construction equipment to dismantle large buildings, which could result in disturbances to wildlife and birds and potential runoff to nearby water bodies. In addition, some land on the site could be used as staging areas for the equipment and to conduct certain dismantling activities. As described above, if noise or other activities disturb birds or wildlife, similar habitat is available in nearby offsite areas. No surface water would be used during decommissioning, and SHINE would develop and implement spill prevention and response procedures as part of State permit requirements for ground-disturbing activities. Therefore, impacts during decommissioning are expected to be SMALL.

5.2.2.6 Historic and Cultural Resources

A review of databases maintained by the National Park Service indicates that there are 12 historic properties listed in the NRHP within Chippewa County (NPS 2015a). These properties reflect the historic cultural contexts for the proposed Chippewa Falls site and include buildings, structures, and districts dating from the mid-19th to mid-20th centuries. However, no historic properties are located within the area of potential effect (APE), the Chippewa Falls site, or its immediate vicinity. The closest NRHP-listed property is the Notre Dame Church and Goldsmith Memorial Chapel, approximately 2 mi (3.2 km) southwest of the Chippewa Falls site. The Church and Chapel are Romanesque in style. They are significant for their architectural design and for being the first church established in Chippewa County (NHRP 2013a). No archeological survey was commissioned by SHINE for the Chippewa Falls site. The NRC staff queried the Archaeological Sites Inventory and Architectural History Inventory, the Burial Sites Inventory, and the Bibliography of Archaeological Reports at the Wisconsin Historical Society (WHS). No known historic or cultural resources or historic properties were found at the Chippewa Falls site (NRC 2013).

As there are no known historic properties, under 36 CFR 800.4(d)(1), or historic and cultural resources located within the APE, impacts on these resources are not likely during the construction, operations, and decommissioning of the proposed SHINE facility. The facility would also have little or no visual or aesthetic impact, as potential visual impacts during construction and decommissioning would be temporary. The proposed SHINE facility is a low-profile build, and the nearest NRHP site is approximately 2 mi (3.2 km) away and is surrounded by residential and commercial properties. However, previously unidentified cultural resources could be inadvertently discovered during land-disturbing activities associated with construction, maintenance during operations, and decommissioning. It is expected that SHINE would employ a cultural resource management plan (CRMP), similar to the one discussed in Section 4.6, to manage and protect as-yet-unidentified cultural resources.

Based on (1) no known NRHP-eligible historic properties or historic and cultural resources on the proposed SHINE facility site, (2) CRMP procedures, and (3) cultural resource assessment and consultations, construction, operations, and decommissioning of the SHINE facility at the Chippewa Falls site would have no impact on known historic and cultural resources. However, given the possibility of the inadvertent discovery of unidentified cultural resources caused by land disturbance during construction, operations, and decommissioning, the overall impact would be SMALL.

5.2.2.7 Socioeconomics

Affected Environment

For the purposes of this analysis, the ROI is Chippewa County, Wisconsin, with special consideration being given to the site of the facility in Chippewa Falls. The City of Chippewa Falls is the county seat in Chippewa County. According to the 2010 Census, the total population of Chippewa Falls was 13,661 and the total population of Chippewa County was 62,415 (USCB 2014a). The population in Chippewa County steadily increased from 1970 to 2010, with a large increase of 13.1 percent from 2000 to 2010. According to the 2010 Census, there were 6,304 total housing units in the City of Chippewa Falls and 27,185 total housing units for Chippewa County. The total number of vacant housing units in the City of Chippewa Falls was 408 (6 percent) and 2,775 (10 percent) in Chippewa County (USCB 2014b).

Chippewa County had the highest employment by industry in manufacturing with employment at 5,121 (26.97 percent), followed by the trades, transportation, and utilities (BLS 2013). Several industries are represented in the City of Chippewa Falls; the top employers are in the medical, education, retail, government, and manufacturing industries. The top three employers in Chippewa County were TTM Advanced Circuits Inc., Chippewa Falls Public School, and Saint Joseph’s Hospital, as reported by the Wisconsin Department of Workforce Development (WDWD) for the first quarter of 2013 (WDWD 2013).

There was a slight decline in the labor force total between 2011 and 2012 in the City of Chippewa Falls. However, during this same time period, the unemployment rate in the City of Chippewa Falls dropped from 9.5 percent to 7.6 percent. In 2011, the Chippewa County unemployment rate was 6.5 percent, while the State of Wisconsin unemployment rate was 6.9 percent. Both were lower than in the City of Chippewa Falls (BLS 2013). According to the *2011 Migrant Population Report* issued by the WDWD, there are no migrant workers in Chippewa County (WDWD 2014).

According to 2007–2011 American Community Survey 5-year estimates, the median family income for the City of Chippewa Falls for 2007–2011 was $51,486, while for Chippewa County, it was $58,544. The Chippewa County per capita income was $23,777 and the City of Chippewa Falls was slightly higher, with a per capita income of $23,885 (USCB 2014a). Tax rates vary by jurisdiction.

The City of Chippewa Falls has a fire and emergency services department and police department and houses the Chippewa County Emergency Management Department. This Department is responsible for developing hazardous materials plans, maintaining public files for facilities storing more than 10,000 pounds (4,536 kg) of hazardous materials, conducting disaster exercises and training activities, coordinating highway safety programs and grants, and coordinating Chippewa County radio communications (Chippewa County 2013). The City of Chippewa Falls Water Department gets its water supply from nine drilled wells. In addition to supplying water, it is responsible for preventing groundwater contamination.

The Chippewa Falls Area Unified School District had a total of 5,007 students enrolled in pre-kindergarten to grade 12 for 2012–2013 in six elementary schools, one middle school, one high school, and one alternative school (Chippewa Area Unified School District 2013).

There are also several higher education schools in the area, including: the University of Wisconsin—Eau Claire, University of Wisconsin—Stout, Chippewa Valley Technical College, and Lakeland College—Chippewa Falls Center (Chippewa Area Unified School District 2013).

The City of Chippewa Falls has a number of recreational facilities, including several trails for walking, biking, and cross-country skiing, and an ice arena. In addition, there are 31 campgrounds in the City of Chippewa Falls, numerous community parks, and 2 golf courses (WDNR undated). Cultural institutions include the Chippewa Falls Museum of Industry and Technology, the County Historical Society & Genealogical Society, the Cook–Rutledge Mansion, the Eau Claire Regional Arts Center (Eau Claire), the Fanny Hill Dinner Theater (Eau Claire), the Heyde Center for the Arts, and the Irvine Park and Zoo.

Impact Analysis

The estimated number of workers needed to construct, operate, and decommission the SHINE facility at the Chippewa Falls site would be the same as the number of workers required for the proposed SHINE facility at the Janesville site.

Construction

The 451 workers needed to construct the proposed SHINE facility would represent 3 percent of the total population (13,661) of Chippewa Falls and less than 1 percent of the population of Chippewa County (62, 415) in 2010 (USCB 2014a). Most construction workers would likely reside within the ROI and would not permanently relocate because of the relatively short duration (18 months) of construction. In addition, support infrastructure within the ROI would be able to accommodate a temporary increase in population. Since most of the 451 construction workers would likely already reside in the ROI, there would be no increase in demand for public services. Assuming that SHINE would enter into a Tax Increment Financing (TIF) agreement with the City of Chippewa Falls, similar to the agreement with the City of Janesville, in the first 10 years of the proposed project, the TIF agreement would allow SHINE to make payments in lieu of taxes to the City of Chippewa Falls. Tax payments totaling $600,000 per year would be used to offset infrastructure expenses (SHINE 2013a). SHINE would also pay property taxes, estimated to be $35,000 per year, based on the assessed property before improvements during this 10-year period (SHINE 2013a). The Chippewa Area Unified School District would receive a portion of the property tax benefits, since the Chippewa Falls site is located in that district. Sales tax revenue would also increase if materials and services were purchased within the ROI during construction. However, the total amount of tax revenue generated within the ROI during construction would be relatively small in comparison to the established tax base of Chippewa Falls and Chippewa County; Chippewa Fall's 2012 collected taxes were approximately $7.6 million, while Chippewa County collected approximately $20.6 million in taxes in 2012 (WDOR 2014). Therefore, the overall socioeconomic impact during the construction of the proposed SHINE facility would be SMALL.

Operations

The 150 operations workers would represent 1 percent of the total 2010 population of Chippewa Falls (13,661) and less than 1 percent of Chippewa County (62,415) (USCB 2014a). It is likely that some workers would relocate to the ROI. However, the total number of operations workers would not create a significant socioeconomic impact. There is sufficient housing available in the ROI to accommodate any increase in the population from the proposed SHINE facility. There is also sufficient capacity in the public schools to accommodate the small increase in the school-age population when the proposed SHINE facility operations workers and their families relocate to the ROI. Public services, including water utilities, would be able to support the increased needs of operations workers and their families. SHINE would continue to make payments in lieu of taxes (estimated $600,000) and property taxes (estimated $35,000) during facility operations (SHINE 2013a). However, after expiration of the 10-year TIF agreement with the City of Chippewa Falls, SHINE would pay property taxes of approximately $660,000 per year (SHINE 2013a). The amount of property taxes could change, depending on the assessed value of the proposed SHINE facility. The Chippewa Area Unified School District would also continue to receive property tax revenue from SHINE during facility operations. In addition, overall sales and property tax revenues would increase within the ROI, caused by the increase in the population from operations workers relocating to the ROI. However, the total amount of tax revenue generated during this period within the ROI would be relatively small in comparison to the established tax base of Chippewa Falls and Chippewa County. In 2012, Chippewa Falls received approximately $7.6 million in tax revenue, while Chippewa County received approximately $20.6 million (WDOR 2014). Therefore, the overall socioeconomic impact during SHINE facility operations would be SMALL.

Decommissioning

The 261 decommissioning workers would represent 2 percent of the total population of Chippewa Falls (13,661) in 2010 (USCB 2014a). Because of the short duration of decommissioning (6 months), workers would not likely relocate permanently to Chippewa Falls, and some of the SHINE operations workers could transition to decommissioning. Since it is likely that most decommissioning workers would already reside in the ROI, there would be little or no increased demand for public services. In addition, support infrastructure within the ROI would be able to accommodate any temporary increase in population. Therefore, the overall socioeconomic impact during the decommissioning of the SHINE facility would be SMALL.

5.2.2.8 Human Health

<u>Construction</u>

The construction of the SHINE facility at the Chippewa Falls site would be similar to that for the Janesville site. For example, there would be no significant physical differences in the design of the facility, workers would be exposed to similar construction hazards, and SHINE would implement similar construction methods and safety practices (SHINE 2013a). In Section 4.8 of this EIS, the NRC concluded the impacts from construction of the proposed SHINE facility at the Janesville site would be SMALL. Therefore, because there are no significant differences between the two sites or their facility design, the NRC staff concludes the impacts from construction of the proposed SHINE facility at the Chippewa Falls site would be SMALL.

<u>Operations</u>

The radiological operation of the SHINE facility at the Chippewa Falls site would be similar to that for the Janesville site. Radiological exposures associated with a SHINE facility at the Chippewa Falls site would include similar radiation sources and radioactive effluents, as well as implementation of a radiation protection program to minimize and ensure compliance with worker and public dose limits in 10 CFR Part 20 (SHINE 2013a).

The nonradiological operation of the SHINE facility at the Chippewa Falls site also would be similar to that for the Janesville site. Nonradiological factors associated with a SHINE facility at the Chippewa Falls site, including nonradioactive chemical sources, nonradioactive waste management and effluent control systems, chemical exposure to the workers and the public, physical occupational hazards, and mitigation measures to minimize exposure to nonradioactive material, would be essentially the same as those for a SHINE facility at the Janesville site (SHINE 2013a).

In Section 4.8 of this EIS, the NRC concluded the impacts from operation of the proposed SHINE facility at the Janesville site would be SMALL. Therefore, because there are no significant differences between the two sites or their facility design, the NRC staff concludes the radiological and nonradiological impacts on human health from operations at the proposed SHINE facility at the Chippewa Falls site would be SMALL.

<u>Decommissioning</u>

The decommissioning of the SHINE facility at the Chippewa Falls site would be similar to that proposed for the Janesville site. There are no significant physical differences between the two sites that would affect the potential impacts from decommissioning (SHINE 2013a).

After permanent cessation of operations, the equipment used for radioisotope production and associated processing equipment would be taken out of service and maintained in a safe condition. The uranium fuel and other radioactive materials would be stored in a safe condition until packaged and transported to a disposal facility. Facility workers would continue to receive radiation exposure during work activities relating to the cleanup, movement, storage, and disposal of radioactive material. The types and amounts of nonradioactive material generated during decommissioning would be similar to those generated at the Janesville site. The radiological and nonradiological controls discussed in Section 3.8 of this EIS would be used during decommissioning to ensure that worker and public radiation doses and exposure to nonradioactive chemicals remain within NRC and State limits.

In Section 4.8 of this EIS, the NRC concluded the impacts from decommissioning the proposed SHINE facility at the Janesville site would be SMALL. Therefore, because there would be no significant differences between the two sites or their facility design and operations, and radiological and nonradiological controls would be in place to ensure hazards to workers and the public would be within NRC and State limits, the NRC staff concludes the impacts on human health from decommissioning the proposed SHINE facility at the Chippewa Falls site would be SMALL.

5.2.2.9 Waste Management

<u>Construction</u>

The construction of the SHINE facility at the Chippewa Falls site would generate similar types and volumes of waste to those for the Janesville site. There are no significant physical differences between the design of the facility or the two sites that would affect the potential types and volume of waste generated from construction (SHINE 2013a). In Section 4.9 of this EIS, the NRC concluded the impacts from waste during construction of the proposed SHINE facility at the Janesville site would be SMALL. Therefore, because there are no significant differences between the two sites or their facility design, the NRC staff concludes the impacts from construction of the proposed SHINE facility at the Chippewa Falls site would be SMALL.

<u>Operations</u>

The radiological operations of the proposed SHINE facility at the Chippewa Falls site would generate similar types and volumes of radioactive waste to those for the Janesville site. There are no significant physical differences between the design of the facility or the two sites that would affect the potential types and volume of waste generated from operation of the proposed facility (SHINE 2013a). In addition, management of the radioactive waste would be similar, regardless of the location of the proposed facility. Implementation of a radiation protection program to minimize radiation exposure from the radioactive waste and to ensure compliance with worker and public dose limits in 10 CFR Part 20 would be essentially the same as those discussed in Section 4.9 of this EIS for a proposed SHINE facility at the Janesville site (SHINE 2013a).

The nonradiological operations of the proposed SHINE facility at the Chippewa Falls site would generate similar types and volumes of nonradioactive waste to those for the Janesville site. There are no significant physical differences between the design of the facility or the two sites that would affect the potential types and volume of waste generated from operation of the proposed facility (SHINE 2013a). Nonradiological factors associated with a SHINE facility at the Chippewa Falls site, including nonradioactive chemical sources, nonradioactive waste management and effluent control systems, chemical exposure to the workers and the public, physical occupational hazards, and mitigation measures to minimize exposure to nonradioactive material, would be essentially the same as those discussed in Section 4.9 of this EIS for a proposed SHINE facility at the Janesville site (SHINE 2013a).

In Section 4.9 of this EIS, the NRC concluded the impacts from radiological and nonradiological waste generated during facility operations at the proposed SHINE facility at the Janesville site would be SMALL. Therefore, because there are no significant differences between the two sites or their facility design, the NRC staff concludes the radiological and nonradiological impacts on human health from waste generated from operating the proposed SHINE facility at the Chippewa Falls site would be SMALL.

<u>Decommissioning</u>

Decommissioning the proposed SHINE facility at the Chippewa Falls site would be similar to that proposed for the Janesville site. There are no significant physical differences between the two sites that would affect the potential impacts from decommissioning (SHINE 2013a).

After permanent cessation of operations, the equipment used for radioisotope production and associated processing equipment would be taken out of service and maintained in a safe condition. The uranium fuel and other radioactive materials would be stored in a safe condition until packaged and transported to a disposal facility. The types and amounts of radioactive and nonradioactive wastes generated during decommissioning would be similar to those generated at the Janesville site. The radiological and nonradiological controls discussed in Section 3.8 of this EIS would be used during decommissioning to protect workers and the public from the waste (SHINE 2013a).

In Section 4.9 of this EIS, the NRC concluded the impacts from waste during decommissioning of the proposed SHINE facility at the Janesville site would be SMALL. Therefore, because there would be no significant differences between the two sites or the facility's design and operation, and radiological and nonradiological controls would be in place to protect workers and the public from the waste, the NRC staff concludes the impacts from waste during decommissioning of the proposed SHINE facility at the Chippewa Falls site would be SMALL.

5.2.2.10 Transportation

Major roads and transportation features in the vicinity of the Chippewa Falls site are shown in Figure 5–1. The site lies northeast of the City of Chippewa Falls and is bordered by Commerce Parkway (Old State Trunk Highway 178) to the west, County Highway S to the north, and State Trunk Highway 178 (Seymour Cray Boulevard) to the east. Commerce Parkway is a two-lane road along which access to the site would be constructed. At the northwest corner of the site, Commerce Parkway intersects with County Highway S at a two-way stop. South of the site, Commerce Parkway intersects with County Highway I at a signalized intersection. Like Commerce Parkway, County Highway S is also a two-lane road with paved shoulders, while County Highway I is a four-lane road with curbed shoulders and a two-way turning lane as the median. The nearest major highway to the Chippewa Falls site is U.S. Highway 53, located approximately 5 mi (8 km) to the west, while Interstate 94 is located approximately 13 mi (21 km) to the south (SHINE 2013a).

Annual average daily traffic volumes for various roads and locations in the vicinity of the Chippewa Falls site are listed in Table 5–4. Morning, midday, and evening peak hourly traffic counts for associated locations are listed in Table 5–5. Available traffic data for Commerce Parkway near the Chippewa Falls site suggests that peak traffic along this corridor averages between 200 and 300 vehicles per hour (WDOT 2011a).

Table 5–4. Annual Average Daily Traffic Counts—Vicinity of Chippewa Falls Site

Traffic Count Location	Vehicles Per Day
Commerce Parkway, between County Highway S & County Highway I	3,700
County Highway S, west of Commerce Parkway	4,600
County Highway S, east of Commerce Parkway	3,800
County Highway I, west of Commerce Parkway near 140th Street	3,400
County Highway I, between Commerce Parkway and State Highway 178	5,600
Interstate 39, U.S. Highway 53, north of County Highway S	11,100

Source: WDOT 2008a

Table 5–5. Estimated Annual Average Peak and Daily Total Traffic Counts—Vicinity of Chippewa Falls Site—Number of Vehicles

WDOT Count Site #	Location	Year of Count	A.M. Peak[(a)]	Midday Peak[(b)]	P.M. Peak[(c)]	Daily Total
090200	Commerce Parkway (Old State Trunk Highway 178), south of County Highway S	2011	207	211	284	3,050
090882	County Highway S, west of State Trunk Highway 178	2011	355	344	439	5,166
090198	County Highway S, between State Trunk Highway 24 & 149th Street	2011	347	341	394	4,923
090796	County Highway I, between Scheidler Road & State Trunk Highway 178 (Seymour Cray Blvd)	2011	457	488	529	6,098
090794	State Trunk Highway 178 (Seymour Cray Boulevard), between County Highway I and Chippewa River	2011	670	656	890	9,895

[(a)] Highest single hourly traffic count for the hours between 00:00 and 09:59.

[(b)] Highest single hourly traffic count for the hours between 10:00 and 14:59.

[(c)] Highest single hourly traffic count for the hours between 15:00 and 23:59.

Source: WDOT 2011a

Construction

Given that construction at the Chippewa Falls site would be very similar to that described for the proposed Janesville site, SHINE estimated that construction of the proposed SHINE facility at the Chippewa Falls site would require an average of 420 deliveries per month (14 deliveries per day) and 9 offsite waste shipments per month using heavy vehicles (dump trucks/delivery trucks) (SHINE 2013a, 2014). Peak worker traffic volume during construction would add an estimated 451 vehicles (pickup trucks and cars) per day (SHINE 2013a, 2014). The NRC staff similarly assumed that, with a total of 465 vehicles per day, each having an arrival and departure trip, and some vehicles making return trips during the day (e.g., offsite trips for lunch), vehicle counts immediately adjacent to the proposed SHINE facility may temporarily increase by approximately 1,000 trips per day.

As with the proposed SHINE facility in Janesville, no sources or routes for construction materials, including concrete, have been specified, and SHINE plans to ensure that delivery routes would avoid residential and sensitive areas associated with the Chippewa Falls site (SHINE 2013b). SHINE and the common-carrier trucks would be required to adhere to the applicable regulatory packaging and transportation requirements for radioactive material in NRC's regulations (10 CFR Parts 20 and 71); the State of Wisconsin's Administrative Code, Chapter 326, "Transportation"; and the Department of Transportation (DOT) requirements (49 CFR Parts 172 and 173) (SHINE 2013a). Table 5–4 indicates that Commerce Parkway experiences approximately 3,700 vehicles per day adjacent to the Chippewa Falls site. Accordingly, the addition of up to 465 vehicles per day (or approximately 1,000 trips per day) from SHINE construction activities would result in an increased traffic volume on Commerce Parkway of up to 27 percent. Additionally, the percentage of heavy trucks on this route would temporarily increase. However, available traffic counts do not distinguish between types of vehicles currently traveling this route, and the increase in traffic volume would be temporary and limited to the period of construction.

SHINE's traffic analysis indicated that projected levels of peak construction-related traffic could noticeably alter existing transportation conditions, but these delays would not be sufficient to destabilize the transportation infrastructure (SHINE 2013a). SHINE plans to use a staggered construction work shift schedule to reduce the hourly traffic flow onto Commerce Parkway and schedule truck deliveries early in the day to help mitigate the potential two-to-three-fold increases in traffic that could occur during peak periods (SHINE 2013b). Increased traffic volumes on Commerce Parkway may also merit mitigation in the form of infrastructure upgrades at its intersections with County Highways S and I. Increased traffic volumes on other roads in the vicinity are expected to be less but could still be significant (SHINE 2013a). Therefore, the impact on transportation infrastructure during construction would be MODERATE.

Operations

Given that operation of the SHINE facility at the Chippewa Falls sites would be very similar to that described for the Janesville site, SHINE estimates that a maximum of 150 worker vehicles distributed over three work shifts per day would access the site using Commerce Parkway (SHINE 2013a, 2014). The NRC staff estimated that each vehicle would require separate trips to and from the proposed SHINE facility, plus a number of trips to and from the proposed SHINE facility during the midshift, resulting in approximately 325 additional worker vehicle trips daily. The additional 325 vehicle trips associated with the Chippewa Falls site represents an increase of less than 10 percent of the average annual daily traffic on roads in the area.

In addition to operations employees commuting to the proposed facility, SHINE estimated that additional traffic to and from the facility would also include:

- an average of 36 truck deliveries per month to the proposed SHINE facility, which would include both radioactive and nonradioactive materials (SHINE 2013a, 2015);
- an average of 39 outbound product shipments per month through the Chippewa Valley Regional Airport (SHINE 2015);
- an average of 25.6 radioactive waste shipments per year (SHINE 2015); and
- an average of one shipment per month of nonradioactive domestic and industrial waste (SHINE 2013a, 2015).

SHINE's preferred method of product shipments would be to transport product by truck from the Chippewa Falls site to the Chippewa Valley Regional Airport, approximately 10 mi (16 km) away, for air transport to customers. The next closest available airport for product shipment is the Minneapolis–St. Paul Airport, located approximately 2 hours west of the Chippewa Falls site on Interstate 94 (SHINE 2013a).

The NRC staff expects the overall daily traffic flow in the immediate vicinity of the proposed SHINE facility to increase slightly above current levels during operation but not to an appreciable extent when compared with the average daily and annual traffic flow of roads in the immediate vicinity of the Chippewa Falls site, as presented in Tables 5–3 and 5–4.

Similar to the activities that would occur at the Janesville site, SHINE would transport radioactive waste from the Chippewa Falls site to an offsite storage, treatment, or disposal facility. A common-carrier truck would likely transport the waste. SHINE and the common-carrier trucks would be required to adhere to the applicable regulatory packaging and transportation requirements for radioactive material in NRC's regulations (10 CFR Parts 20 and 71); the State of Wisconsin's Administrative Code, Chapter 326, "Transportation"; and DOT requirements (49 CFR Parts 172 and 173) (SHINE 2013a). These regulations help ensure public health and safety on roadways.

Based on the relatively small increase in traffic compared to the average daily and annual traffic flows near the Chippewa Falls site, and because SHINE and common-carrier trucks would be required to adhere to the applicable NRC, DOT, and the State of Wisconsin regulatory packaging and transportation requirements for radioactive material, the NRC staff concludes that the impact on transportation infrastructure during operations would be SMALL.

Decommissioning

Given that decommissioning the SHINE facility at the Chippewa Falls site would be very similar to that described for the Janesville site, SHINE estimates that an average of 72 truck deliveries and 191 offsite waste shipments per month, (a total of approximately nine heavy-vehicle shipments per day) would be required (SHINE 2013a, 2014). Peak worker traffic volume during decommissioning would add an estimated 261 vehicles per day (SHINE 2013a, 2014). Therefore, the NRC staff estimates that there could be an increase of approximately 580 trips a day on local roads during the decommissioning phase, increasing average daily traffic on roads in the immediate vicinity of the Chippewa Falls site from what was being experienced during the operations phase.

Peak decommissioning-related traffic could noticeably alter existing transportation conditions, but these delays would not be sufficient to destabilize the transportation infrastructure. SHINE could use a staggered work shift schedule, similar to that employed during construction, to reduce the hourly traffic flow onto Commerce Parkway and schedule truck deliveries early in the day to help reduce traffic congestion (SHINE 2013b). However, the change in average daily traffic flows in the immediate vicinity of the Chippewa Falls site and an increase in commuter, truck delivery, as well as waste traffic directly related to decommissioning activities, could affect local commuting patterns. Therefore, the impact on transportation infrastructure during the decommissioning phase would be MODERATE.

5.2.2.11 Accidents

SHINE stated, in its ER, that no conditions have been identified for the Chippewa Falls site that would significantly affect the radiological or nonradiological impacts from postulated accidents differently than at the proposed facility (SHINE 2013a). The NRC staff considers this assumption reasonable, because the construction, operations, and decommissioning of the SHINE facility at the Chippewa Falls site would be essentially the same as at the Janesville site since the design, construction, operations, and decommissioning are similar. In addition, the same radiological and nonradiological safety regulations applicable to the Janesville site would apply to the Chippewa Falls site (SHINE 2013a).

In Section 4.11 of this EIS, the NRC concluded that the impacts from radiological and nonradiological accidents at the proposed SHINE facility at the Janesville site would be SMALL. Given that no significant differences exist between the two sites or their facility design and operations, the NRC staff concludes the impacts from potential accidents at the proposed SHINE facility at the Chippewa Falls site would be SMALL.

5.2.2.12 Environmental Justice

This section describes the potential human health and environmental effects from the construction, operations, and decommissioning of the proposed SHINE facility on minority and low-income populations living in the vicinity of the Chippewa Falls site. The NRC addresses environmental justice issues and concerns by first identifying potentially affected minority and low-income populations and then determining whether there would be any potential human health or environmental effects and whether these effects may be disproportionately high and adverse.

Minority-population data were available for Census block groups within a 5-mi (8-km) radius around the Chippewa Falls site. Low-income population data were only available at the Census tract level, because of the limited availability of poverty data at the block group level. To protect confidentiality, the U.S. Census Bureau (USCB) does not publish information about small geographic areas if the population size is too small. Race and ethnicity and poverty Census data were used to identify the location of minority and low-income populations near the Chippewa Falls site. If the Census tract and block group boundaries crossed the 5-mi (8-km) radius boundary, the entire Census tract or Census block group data were used. Geographic information system software was used to create the maps.

Minority Population

According to 2010 Census information, 6.5 percent of the total population in the City of Chippewa Falls identified themselves as a minority. The largest minority group was Black or African American, followed by Hispanic or Latino (of any race). In Chippewa County, 5.4 percent of the total population identified themselves as a minority (USCB 2014c).

Table 5–6 lists minority population block groups within a 5-mi (8-km) radius of the Chippewa Falls site; 4.7 percent of the total population within that radius identified themselves as a minority (UCSB 2014a). The largest minority group was Hispanic or Latino (of any race) at 1.3 percent, followed by Asian at 1.1 percent (USCB 2014c).

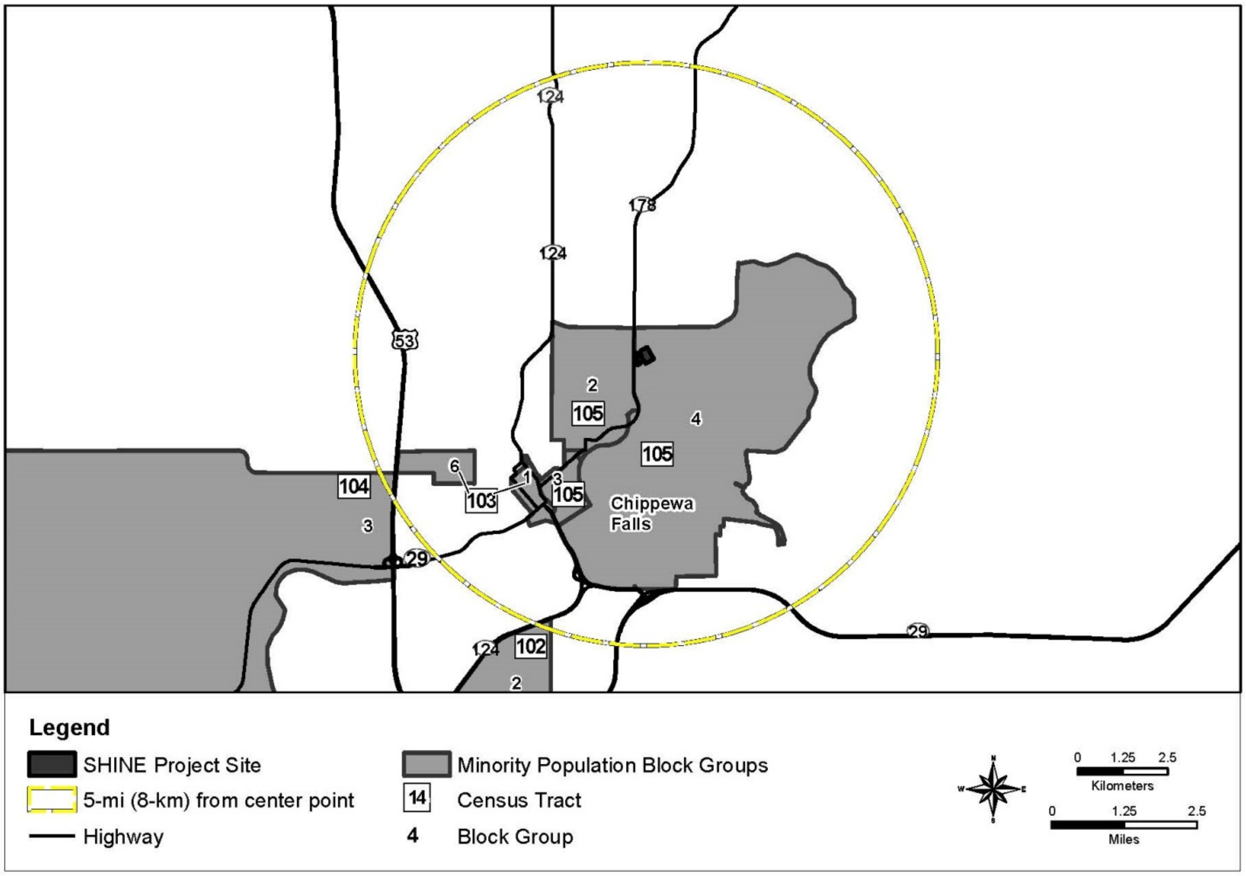
Figure 5–3 shows minority population block groups within a 5-mi (8-km) radius of the Chippewa Falls site. Census block groups were considered minority population block groups if the percentage of the minority population within any block group exceeded 4.7 percent. Seven of the 20 Census block groups were determined to have meaningfully greater minority populations. The Chippewa Falls site is located in Census Tract 105, Block Group 4, which has the highest minority population, at 12.4 percent.

Table 5–6. Minority Populations Within 5 mi (8 km) of the Chippewa Falls Site

Census Tract	Block Group	Total Population	Percent Minority	Total Minority Population	Hispanic or Latino	Black or African American	American Indian or Alaska Native	Asian	Native Hawaiian and Other Pacific Islander	Two or More Races
102	1	2,312	4.2	98	30	12	14	30	0	12
102	2	2,764	6.9	191	67	16	8	72	0	28
102	3	1,691	4.6	78	28	6	10	14	0	20
103	1	729	5.8	43	16	12	4	1	0	10
103	2	791	3.7	30	14	0	5	1	1	9
103	3	754	3.3	25	4	5	4	4	0	8
103	4	944	3.8	36	13	6	7	1	0	9
103	5	1,281	3.7	48	14	4	4	14	0	12
103	6	966	5.5	54	25	1	2	19	0	7
104	1	2,340	2.2	52	22	3	7	10	0	10
104	3	1,345	5.8	79	10	5	5	57	0	2
105	1	778	3.8	30	14	7	0	4	0	5
105	2	1,076	5.6	61	11	13	1	14	1	21
105	3	1,047	5.4	57	7	6	13	6	0	25
105	4	2,477	12.4	306	55	158	36	27	1	29
107	2	2,505	2.7	69	20	7	3	18	0	21
107	3	3,760	4.2	158	43	17	16	38	0	44
110	4	1,395	2.0	28	7	1	2	6	0	12
110	5	1,403	2.4	35	6	8	2	4	0	15
112	4	1,288	1.0	13	7	1	0	3	0	2

Source: USCB 2014c, 2010 Census Summary File 1. Table P9. Hispanic or Latino or Not Hispanic or Latino by Race.

Figure 5–3. Minority Populations Within 5 mi (8 km) of the Chippewa Falls Site



Source: USCB 2014c, 2010 Census Summary File 1. Table P9. Hispanic or Latino or Not Hispanic or Latino by Race

<u>Low-Income Population</u>

According to the 2006–2010 American Community Survey estimates, 10.7 percent of families and 14.3 percent of all people residing in Chippewa County were identified as living below the Federal poverty threshold. In addition, in the City of Chippewa Falls, 11.4 percent of families and 14.8 percent of all people were identified as living below the Federal poverty level. The 2010 Federal poverty threshold was $22,314 for a family of four (USCB 2014d).

Table 5–7 lists low-income population Census tracts within a 5-mi (8-km) radius of the Chippewa Falls site; 9.3 percent of the total population within that radius was identified as living below the Federal poverty level (UCSB 2014d).

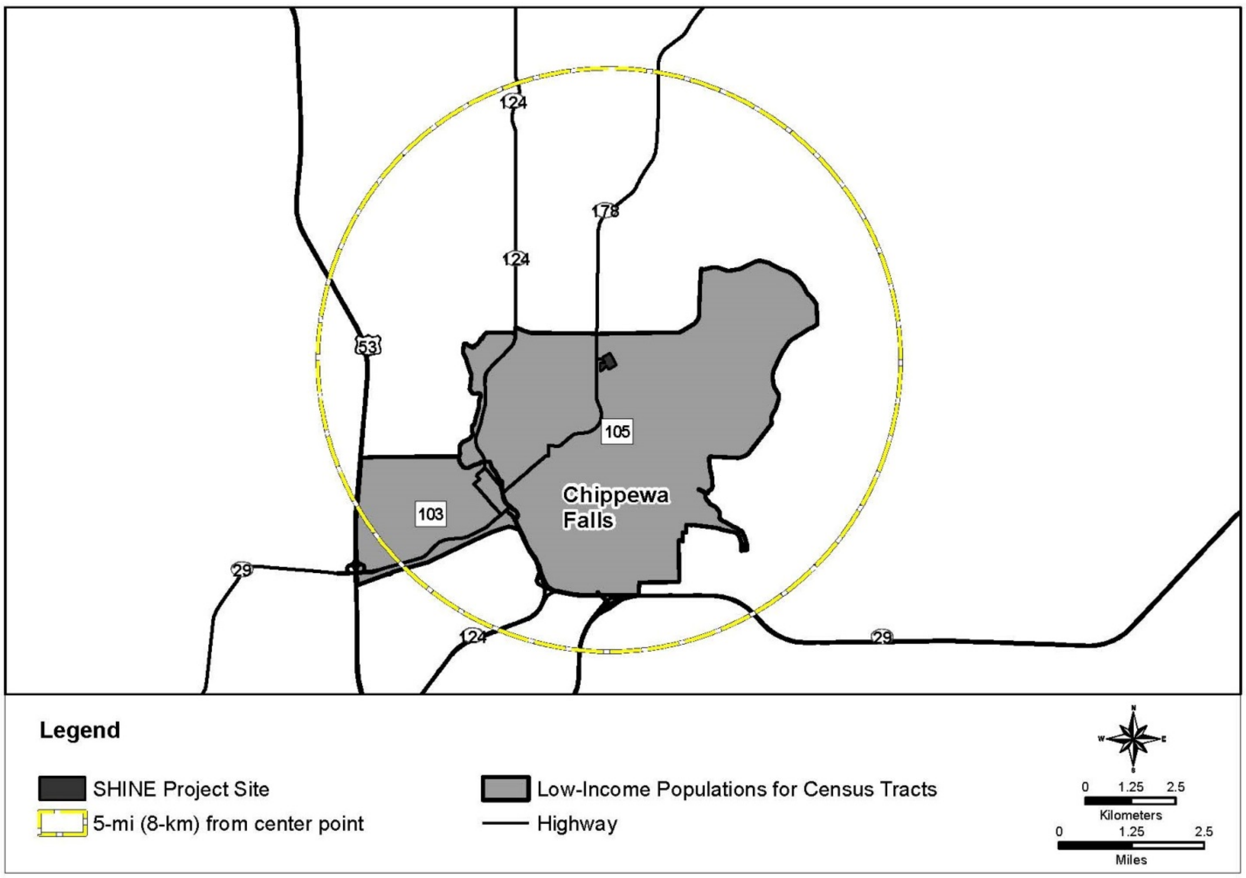
Census tracts were considered low-income population tracts if the percentage of individuals living below the Federal poverty level exceeded 9.3 percent. Figure 5–4 shows low-income population Census tracts within a 5-mi (8-km) radius of the Chippewa Falls site. Two of the seven Census tracts were found to have meaningfully greater low-income populations. The Chippewa Falls site is located within Census Tract 105 and has the highest percentage (15.3 percent) of population living below the Federal poverty level.

Table 5–7. Low-Income Populations Within 5 mi (8 km) of the Chippewa Falls Site

Census Tract	Census Tract Total Population Estimates	Number of People Below Poverty Level for Census Tract	Percentage Below Poverty Level for All People (Estimates)
102	6,349	599	8.8
103	5,518	723	13.1
104	4,644	223	4.8
105	5,221	779	15.3
107	7,295	635	8.7
110	6,990	594	8.5
112	6,428	431	6.7

Source: USCB 2014d, 2006–2010 American Community Survey 5-Year Estimates. Table DP03 Selected Economic Characteristics

Figure 5–4. Low-Income Populations Within 5 mi (8 km) of the Chippewa Falls Site



Source: USCB 2014d, 2006–2010 American Community Survey 5-Year Estimates. Table DP03 Selected Economic Characteristics

Analysis of Impacts

As previously discussed, the environmental justice impact analysis evaluates the potential for disproportionately high and adverse human health and environmental effects on minority and low-income populations from the construction, operations, and decommissioning of the proposed SHINE facility. Some of these potential effects have been described in the other resource areas discussed in this EIS. Chapter 5 presents the assessment of environmental and human health impacts for each environmental resource area.

In the impact analysis, the NRC first identified all potential human health and environmental effects and then determined the significance of the impact and whether or not minority or low-income populations would experience disproportionately high and adverse effects. The NRC then considered whether the radiological or other health effects were significant or above generally accepted norms, whether the risk or rate of the hazard was significant and appreciably in excess of that of the general population, and whether the radiological or other health effects would occur in populations affected by cumulative or multiple adverse exposures from environmental hazards. The NRC determined whether the following human health and environmental effects have the potential to disproportionately affect minority and low-income populations living in close proximity to the proposed SHINE facility site:

- radiological and nonradiological human health impacts (Section 5.2.2.8),
- noise impacts (Section 5.2.2.2), and
- traffic impacts (Section 5.2.2.10).

The NRC also considered whether there would be an impact on the natural or physical environment that would significantly and adversely affect a particular group, whether there would be any significant adverse impacts on a group that appreciably exceed or are likely to appreciably exceed those on the general population, and whether environment effects would occur in populations affected by cumulative or multiple adverse exposures from an environmental hazard.

Construction

Similar to constructing the SHINE facility at the Janesville site, potential impacts on minority and low-income populations residing near the Chippewa Falls site would mostly consist of environmental effects during construction (e.g., noise, dust, traffic, employment, and housing impacts). Noise and dust impacts during construction would be short term and primarily limited to onsite activities. Minority and low-income populations residing along site access roads, particularly in Census Tract 105, could be disproportionately affected by increased commuter vehicle and truck traffic and noise and dust from construction. However, because of the temporary nature of construction, these effects are not likely to be high and adverse and would be contained within a limited period during certain hours of the day. Increased demand for temporary housing during construction could cause rental housing costs to rise, disproportionately affecting low-income populations within the ROI (Chippewa County), who rely on inexpensive housing. However, given the small number of construction workers and the likelihood that most workers would already reside within the ROI, workers could commute to the construction site, thereby reducing the need for rental housing.

Operations

Potential impacts on minority and low-income populations during SHINE facility operations at the Chippewa Falls site would mostly consist of radiological and nonradiological human health and environmental (e.g., noise and traffic) effects. Everyone living near the Chippewa Falls site would be exposed to the same potential operational effects, and any impacts would depend on the magnitude of the change in current environmental conditions.

As discussed in the Human Health section of this EIS (Section 5.2.2.8), the level of potential radiological doses to the public from SHINE facility operations would be well below the annual dose limit and well within the NRC and State of Wisconsin regulatory limits. As a result, minority or low-income populations, as well as the general population living in close proximity to the proposed SHINE facility site, would not be adversely affected by radiation exposure during facility operations. Permitted nonradiological air emissions are also expected to remain within regulatory standards.

As discussed in the Noise section of this EIS (Section 5.2.2.2), noise emissions from commuter traffic during SHINE facility operations would increase. Noise from operating equipment would be contained inside buildings and would not be audible outside the proposed SHINE facility buildings at the site. However, additional noise emissions from worker vehicles would be minor (1 dBA), and noise emissions from shipments are not anticipated to increase noise levels beyond current levels.

Minority and low-income populations residing along site access roads would be directly affected by increased commuter vehicle and truck traffic during facility operations. However, as discussed in the Transportation section of this EIS (Section 5.2.2.10), the only appreciable impact would be a “slight degradation of service” (i.e., traffic delays) at intersections during the morning peak hour. The overall daily traffic flow in the immediate vicinity of the proposed SHINE facility would increase slightly during facility operations but would not be of an appreciable nature when compared with the average daily and annual traffic flow of roads in the immediate vicinity of the Chippewa Falls site.

Therefore, offsite noise and traffic impacts caused by the proposed SHINE facility operations would be SMALL for both of these resource areas. Nevertheless, given the fact that the Chippewa Falls site is located in a designated minority block group and low-income Census tract, minority and low-income populations living in close proximity to the proposed SHINE facility during operations could be disproportionately affected. However, based on the analyses of impacts conducted for other resource areas discussed in this EIS, impacts on minority or low-income populations, as well as to the general population living in close proximity to the Chippewa Falls site, would not be considered high and adverse.

Decommissioning

Similar to construction impacts, potential impacts on minority and low-income populations would mostly consist of environmental and socioeconomic effects during decommissioning (e.g., noise, dust, traffic, employment, and housing impacts). Noise and dust impacts during the decommissioning of the proposed SHINE facility at the Chippewa Falls site would be short term and primarily limited to onsite activities. Minority and low-income populations residing along site access roads, particularly in Census Tract 105, would be disproportionately affected by increased commuter vehicle and truck traffic and noise and dust during decommissioning. However, because of the temporary nature of decommissioning, these effects are not likely to be high and adverse and would be contained within a limited period during certain hours of the day. Increased demand for rental housing during decommissioning could cause rental costs to rise, disproportionately affecting low-income populations who rely on inexpensive housing. However, given the small number of decommissioning workers and the likelihood that most workers would already reside within the ROI, workers could commute to the Chippewa Falls site, thereby reducing the need for rental housing.

In addition, the environmental impacts from decommissioning the proposed SHINE facility would be SMALL for all resource areas. There is no evidence that impacts from decommissioning would be disproportionately high and adverse to minority or low-income populations.

Subsistence and Special Conditions

As discussed in Section 4.12, the special pathway receptors analysis is an important part of the environmental justice analysis, because consumption patterns may reflect the traditional or cultural practices of minority and low-income populations in the area, such as migrant workers or Native Americans. Based on the air and water quality discussions and the discussion of human health effects in this EIS for this alternative, it is unlikely that there would be any disproportionately high and adverse human health impacts in special pathway receptor populations in the region as a result of subsistence consumption of water, local food, fish, or wildlife. The operation of the SHINE facility at the Chippewa Falls site would not have disproportionately high and adverse human health and environmental effects on these populations.

Summary

The Chippewa Falls site is located in the pre-existing Wissota Lake Business Park in a designated minority and low-income population block group and Census tract. Similar to the Janesville site, minority and low-income populations residing along site access roads could be disproportionately affected by noise and dust and increased commuter and vehicular traffic during construction, operations, and decommissioning. However, during construction and decommissioning, these impacts would be short term and primarily limited to onsite activities. Facility operations at the Chippewa Falls site would not adversely affect minority and low-income populations living near the existing business park. The level of potential radiological doses to the public from SHINE facility operations would be well below the annual dose limit and well within the NRC and State of Wisconsin regulatory limits. Permitted air emissions are expected to remain within regulatory standards. As a result, minority and low-income populations residing near the existing business park and the Chippewa Falls site could experience short-term disproportionate, but not high and adverse, environmental effects during construction and decommissioning. In addition, based on the discussions of air and water quality and human health effects for this alternative, SHINE facility operations at the Chippewa Falls site would not likely cause high and adverse human health or environmental effects for minority and low-income populations.

5.2.2.13 Cumulative Impacts

The past, present, and reasonably foreseeable future development projects and other actions that could result in cumulative impacts at the Chippewa Falls site were identified by reviewing published and unpublished data, including economic development plans, permit lists, news releases, and similar sources of information. Current and reasonably foreseeable activities included relevant activities conducted, regulated, approved, or proposed by a Federal agency or non-Federal entity within 5 mi (8 km) of the Chippewa Falls site. Available information about the past, present, and reasonably foreseeable projects and other activities is provided in Table 5–8.

Table 5–8. Past, Present, and Reasonably Foreseeable Future Projects and Other Actions Within a 5-mi (8-km) Radius of the Chippewa Falls Site

Project/ Company Name	Summary of Project	Location	Status
EOG Resources Inc.	Silica sand processing plant	Chippewa Falls, 1.0 mi (1.6 km) southwest	Operational (Chippewa Herald 2012; EOG Resources 2012)
Wissota Green Housing Development	Building of 120 housing unit neighborhood with an estimated capacity of 300 residents	Chippewa Falls, 1.0 mi (1.6 km) southwest	Initial project proposal denied by Chippewa Falls Planning Commission in 2013; developer plans to adjust design and conduct public outreach and reapply for approval (Chippewa Herald 2013)
CN Railway Intermodal Facility	Rail-to-truck transfer facility	Chippewa Falls, 2.0 mi (3.2 km) southwest	Operational (CN 2014)
Chippewa Falls Irvine Park and Zoo	Updates to current exhibits, such as visitor and artifact center	Chippewa Falls, 2.0 mi (3.2 km)	Currently operational; proposed construction to begin in 2015 after fundraising is completed (Vetter 2013)
Indianhead Plating, Inc.	Industrial hard-chrome plating and cylindrical grinding facility	Chippewa Falls, 2.0 mi (3.2 km)	Operational (WDNR 2015a)
Spectrum Industries	Construction of burnoff oven for paint hangers	Chippewa Falls, 2.0 mi (3.2 km)	Air construction permit issued in February 2011 (WDNR 2015b)
Great Northern Corporation	Construction of printers	Chippewa Falls, 2.0 mi (3.2 km)	Air construction permit issued in March 2011 (WDNR 2015c)
Dairyland Power Cooperative—Seven Mile Creek Landfill Gas to Renewable Energy Station	Modifications to an existing internal combustion engine and existing landfill gas to energy generating facility	Eau Claire, 2.0 mi (3.2 km)	Air construction permit issued in March 2011 (WDNR 2015d)
Lake Wissota Business Park	200-ac (80-ha)-plus mixed-use business park available for industrial, office, and commercial uses	SHINE site would occupy northern third of park	Majority of site currently undeveloped; site is a Wisconsin-Certified Shovel-Ready Site, meaning Chippewa County and the State have proactively addressed major permitting and development issues (WEDC 2014a, 2014b)

<u>Land Use and Visual Resources</u>

This section addresses the direct and indirect effects of the construction, operations, and decommissioning of the SHINE facility at the Chippewa Falls site on land use and visual resources, when added to the aggregate effects of other past, present, and reasonably foreseeable future actions. The description of the affected environment in Section 5.2.2.1 serves as baseline conditions for the cumulative impact assessment of land use and visual resources. The incremental impacts from construction, operations, and decommissioning of the proposed SHINE facility on land use and visual resources would be SMALL, as described in Section 5.2.2.1.

Land Use

The projects and activities described in Table 5–8 would result in minimal changes to existing land uses, because new construction would occur either within or adjacent to existing facilities, or within areas that are currently zoned for industrial or residential use. Future urbanization and global climate change could contribute to additional decreases in agricultural lands, forests, grasslands, and wetlands. Urbanization in the vicinity of the Chippewa Falls site would alter important attributes of land use. Urbanization would reduce natural vegetation and agricultural fields, resulting in an overall decline in the extent and connectivity of wetlands, forests, grasslands, and wildlife habitat. Global climate change could reduce crop yields and livestock productivity (USGCRP 2014), which may change portions of agricultural land uses. However, existing parks, reserves, and managed areas would help preserve wetlands and forested areas. In addition, zoning laws and comprehensive land use plans would help ensure a proper balance of development (City of Chippewa Falls 1999).

Pursuant to the Farmland Protection Policy Act and its implementing regulations, the presence of important farmland soils (7 CFR 657.5), including prime farmland, was included in the cumulative impacts analysis. Development projects listed in Table 5–8 would incrementally and cumulatively add to the loss of important farmland soils, including prime farmland soils, in the region surrounding the proposed site and across the City of Chippewa Falls. Otherwise qualifying farm lands in or already committed to urban development; lands acquired for a project on or before August 4, 1984; and lands acquired or used by a Federal agency for national defense purposes are exempt from the Act’s provisions (7 CFR 658.2 and 658.3). Because many of the proposed projects have been committed to development, the sites do not have qualifying important farmland soils subject to the Act. Some of the proposed projects would convert prime farmland into other uses. Regardless, the conversion of otherwise qualifying soils by projects within 5 mi (8 km) of the Chippewa Falls site would have a relatively minor impact on the inventory of important farmland soils within Chippewa County. This is because approximately 60 percent of the soils in the county would be classified as important farmland soil (Chippewa County 2010).

Given that reasonably foreseeable new construction activities would occur within or adjacent to existing facilities or within areas zoned for industrial or residential use, cumulative impacts on land use resources would be SMALL.

Visual Resources

The projects and activities described in Table 5–8 would result in minimal changes to the existing viewshed, because new construction would occur either within or adjacent to existing facilities, or within areas that are currently zoned for industrial or residential use. Furthermore, the viewshed within the vicinity of the Chippewa Falls site is agricultural, light industrial, or residential. Within undeveloped areas, where a new structure would change qualities of the existing landscape, the viewshed is generally of low scenic quality because of a lack of notable features, uniform landform, low vegetation diversity, an absence of water, mute colors, and a commonality within the physiographic province.

Given that reasonably foreseeable new construction activities would occur within or adjacent to existing facilities or within areas zoned for industrial or residential use and of low scenic quality, the NRC staff determined that cumulative impacts on visual resources would be SMALL.

Air Quality and Noise

This section addresses the direct and indirect effects of the construction, operations, and decommissioning of the SHINE facility at the Chippewa Falls site on air quality and noise, when added to the aggregate effects of other past, present, and reasonably foreseeable future actions. The incremental impacts from construction, operations, and decommissioning of the proposed SHINE facility on air quality would be SMALL, as described in Section 5.2.2. The incremental impacts from construction, operations, and decommissioning of the proposed SHINE facility on noise would be SMALL to MODERATE.

Air Quality

The ROI considered for the air quality analysis for a facility located in Chippewa Falls is Chippewa County, since air quality designations for criteria air pollutants are generally made at the county level.

As shown in Table 5–8, the ongoing and future projects located within 5 mi (8 km) of the Chippewa Falls site involve air permits. While these projects increase air emission concentrations within the county, the activities would need to comply with the requirements stipulated in the permit, which would minimize cumulative impacts. Therefore, these activities and projects are not expected to have significant impacts on air quality. Climate change can affect air quality as a result of changes in meteorological conditions. The combination of higher temperatures, stagnant air masses, sunlight, and emissions of precursors may make it difficult to meet NAAQSs (USGCRP 2014). States, however, must continue to comply with the Clean Air Act and ensure air quality standards are met.

The NRC staff determined that the potential cumulative air quality impact associated with SHINE operations, in conjunction with other reasonably foreseeable projects, would be SMALL, primarily because projects that have overlapping impacts with the proposed SHINE facility would need to comply with requirements stipulated in air permits and would have relatively low emissions.

Noise

The ROI considered for noise is a 1-mi (1.6-km) radius from the site boundary of the SHINE facility at the Chippewa Falls site. Noise levels attenuate rapidly with distance. When distance is doubled from a point source, noise levels decrease by 6 dBA (MPCA 2014). For example, at half a mile distance from construction equipment with noise levels in the range of 85–90 dBA, noise levels can drop to 51–61 dBA and at a 1-mi (1.6-km) distance, noise levels drop further to 45-55 dBA. Generally, a 3-dBA change over existing noise levels is considered to be a “just noticeable” difference, and a 10-dBA increase is subjectively perceived as a doubling in loudness and almost always causes an adverse community response (NWCC 2002).

Some of the projects in Table 5–8 could produce increases in ambient noise that might affect some of the same areas at the Chippewa Falls site, since they involve construction activities. However, these projects are located 1 to 2 mi (1.6 to 3.2 km) from the Chippewa Falls site and noise impacts are not expected to be significant. For instance, construction equipment can result in noise levels in the range of 85–90 dBA; however, noise levels attenuate rapidly with distance, such that at half a mile distance from construction equipment, noise levels can drop to 51–61 dBA (NRC 2002). Therefore, these projects would not be expected to have significant noise impacts. The NRC staff determined that cumulative impacts on noise levels would be SMALL to MODERATE.

Geologic Environment

This section addresses the direct and indirect effects of the construction, operations, and decommissioning of the SHINE facility at the Chippewa Falls site on the geologic environment, when added to the aggregate effects of other past, present, and reasonably foreseeable future actions. The cumulative impacts on the geologic environment primarily relate to land disturbance and the potential for soil erosion and loss, as well as the projected consumption of geologic resources. The description of the affected environment in Section 5.2.2.3 serves as the baseline for the cumulative impact assessment of the geologic environment. The geographic area of analysis for evaluating cumulative impacts on soil resources includes the 5-mi (8-km) vicinity surrounding the proposed site. For geologic resources, the extent of the geologic area of analysis has been expanded to all of Chippewa County to encompass potential commercial sources of rock and mineral resources to support construction activities at the propose site and vicinity. As the aspects of land disturbance and conversion are addressed separately in the Land Use section above, the cumulative impacts analysis here will focus on soil loss, including the loss of prime farmland soils and other important farmland soils, and consumption of geologic resources.

The incremental impacts from construction, operations, and decommissioning of the proposed SHINE facility on the geologic environment, including geologic and soil resources, would be SMALL, as described in Section 5.2.2.3.

New development and expansion projects listed in Table 5–8 would consume or extract geologic resources, including rock and mineral resources, or would require materials derived from such geologic resources (e.g., concrete). However, common construction materials such as sand and gravel and crushed stone are available and widely abundant in Chippewa County (Section 5.2.2.3) or are available regionally. Neither the geologic resource requirements to construct the proposed SHINE facility nor the resource requirements of the other projects identified in Table 5–8 are on a scale that would be likely to affect the regional sources and supplies of the identified resources. Given the relatively minor impact on important farmland soils and the abundance of geologic resources regionally, the NRC staff concludes that the cumulative impacts on geologic and soil resources would be SMALL.

Water Resources

This section addresses the direct and indirect effects of the construction, operations, and decommissioning of the SHINE facility at the Chippewa Falls site on water resources, when added to the aggregate effects of other past, present, and reasonably foreseeable future actions. The cumulative impacts on surface-water resources relate to issues concerning water use, water quality, and potential climate change. This further encompasses water withdrawal, effluent discharges, accidental spills and releases, and stormwater drainage and runoff. The description of the affected environment in Section 5.2.2.4 serves as a baseline for the cumulative impact assessment of water resources. For surface-water resources, the extent of the geographic area of analysis has been expanded to include Lake Wissota and portions of the Chippewa River downstream of the proposed site. For groundwater resources, the area considered encompasses the local groundwater basin in which groundwater is recharged and flows to discharge points and those aquifers from which groundwater is withdrawn through wells. Specifically, the cumulative impacts analysis focuses on those projects and activities that, when combined with the proposed action, would: (1) withdraw water from or discharge wastewater to the segment of the Chippewa River downstream of the proposed site or (2) would use groundwater or could otherwise affect the same aquifers that would supply water to the proposed site. As discussed in Section 5.2.2.4, impacts on water resources at the Chippewa Falls site would be SMALL.

In addition to the proposed SHINE facility, new development and expansion projects listed in Table 5–8 and disturbing greater than 1 ac (0.4 ha) of land would have to obtain and comply with the provisions of a General Permit (WPDES Permit No. WI-S067831-4). This permit requires the development and implementation of a site-specific construction site erosion control plan, including specific BMPs, and a stormwater management plan (for postconstruction stormwater management).

Permits issued to all new stormwater and industrial wastewater dischargers would include provisions as part of Wisconsin-issued NPDES permits to comply with applicable water-quality-based effluent limitations and wasteload allocations established for downstream receiving waters. The proposed SHINE facility would have no direct sanitary or other wastewater discharges to surface water or groundwater. The SHINE facility and other entities within the Wissota Lake Business Park would be served by the City of Chippewa Falls WTP, which has excess treatment capacity (Section 5.2.2.4).

While protection of groundwater quality in surficial aquifers and conservation of local groundwater supplies is a concern across Wisconsin, the county's groundwater supply is considered adequate to meet the domestic, agricultural, municipal, and industrial needs in the county for the foreseeable future (Chippewa County 2010). As a result of climate change, the Midwest may continue to experience an increase in annual precipitation, along with an increase in annual and seasonal temperatures. Increased precipitation, particularly during the spring and winter months, could increase groundwater recharge (USGCRP 2014). Regardless, the proposed SHINE facility and other projects within the Wissota Lake Business Park would be served by the Chippewa Falls municipal water system (Section 5.2.2.4). Furthermore, neither the proposed SHINE facility nor any of the projects identified in Table 5–8 would be expected to require substantial volumes of groundwater or surface water that would affect water availability for other potential uses or users.

Given the requirements to comply with stormwater permits, the capacity of the City of Chippewa Falls WTP, and the relatively small volumes of water required for the projects listed in Table 5-8, the NRC staff finds that the cumulative impacts on water resources would be SMALL.

Ecological Resources

This section addresses the direct and indirect effects of the construction, operations, and decommissioning of the SHINE facility at the Chippewa Falls site on ecological resources, when added to the aggregate effects of other past, present, and reasonably foreseeable future actions. The description of the affected environment in Section 5.2.2.5 serves as a baseline for the cumulative impact assessment of ecological resources. The geographic area of analysis for evaluating cumulative impacts on ecological resources includes the area surrounding the Chippewa Falls site that is ecological, connected to the onsite ecological resources (e.g., the watershed surrounding the Chippewa Falls site). The incremental impacts from construction, operations, and decommissioning the proposed SHINE facility would be SMALL, as described in Section 5.2.2.5.

Since European settlement, prairies, forests, and wetlands have been greatly reduced by at least 50 to 80 percent and converted into agricultural fields, industrial uses, and residential and commercial areas. Remaining tracts of grasslands, forests, and wetlands tend to be relatively small and isolated, which results in lower quality habitat than large tracts of habitat, because of the different biological and physical characteristics along the edge of a habitat patch (WDNR 2013c).

Current threats to terrestrial and aquatic habitats include increased soil, nutrients, and other pollutants washing into streams and lakes from urban and agricultural stormwater runoff;

continued conversion and fragmentation of wildlife habitat from development; introduction of invasive species; and climate change (WDNR 2013c; USGCRP 2014). These activities will likely decrease the overall availability and quality of forested, grassland, and wetland habitats. Species with threatened, endangered, or declining populations are likely to be more sensitive to declines in habitat availability and quality and the introduction of invasive species.

New development projects identified in Table 5–8 are likely to have minimal impacts on ecological resources, because all the projects are sited within areas that are currently agricultural land, open space, or developed. These types of land covers provide low-quality habitat for wildlife, birds, and aquatic resources. However, as environmental stressors, such as runoff from agricultural fields and urban areas and climate change, continue over the next few decades, certain attributes of the terrestrial and aquatic environment (such as habitat quality) are likely to noticeably change. The staff does not expect these impacts to destabilize any important attributes of the terrestrial and aquatic environment, because such impacts will cause gradual change, which should allow the terrestrial and aquatic environment to appropriately adapt. The NRC staff concludes that the cumulative impacts of the proposed construction and operation of the SHINE facility, plus other past, present, and reasonably foreseeable future projects or actions would result in MODERATE impacts on terrestrial and aquatic resources.

Historic and Cultural Resources

This section addresses the direct and indirect contributory effects on historic and cultural resources from the construction, operations, and decommissioning of the proposed SHINE facility at the Chippewa Falls site, when added to the aggregate effects of other past, present, and reasonably foreseeable future actions. The geographic area considered in this analysis is the APE associated with the proposed SHINE facility, the Chippewa Falls site, and its immediate vicinity. As discussed in Section 5.2.2.6, the impacts on historic and cultural resources from the construction, operations, and decommissioning of the SHINE facility at the Chippewa Falls site would be SMALL.

The archaeological record for the region indicates prehistoric and historic occupation. Historic land development and prolonged agricultural use of the APE resulted in impacts on, and the loss of, cultural resources in the APE and its immediate vicinity. As described in Section 5.2.2.6, no known historic or cultural resources or historic properties are present within the APE. However, there remains the possibility for inadvertent discovery of historic or cultural resources within the APE. Direct impacts would occur if historic and cultural resources in the APE were to be physically removed or disturbed. Indirect visual impacts could occur from new construction or maintenance. The only foreseeable project within the APE is the SHINE facility and the potential discovery of cultural resources on the proposed site. Should they be discovered, any cultural resources would be managed using SHINE BMPs developed for the proposed Janesville site (e.g., cultural resource management procedures and training) (SHINE 2013a, 2013b). Therefore, the cumulative impact on historic and cultural resources of the proposed SHINE facility, when combined with other past, present, and reasonable foreseeable future activities, would be SMALL.

Socioeconomics

This section addresses the direct and indirect contributory effects on current socioeconomic conditions within the ROI from the construction, operations, and decommissioning of the SHINE facility at the Chippewa Falls site, when added to the effects from other past, present, and reasonably foreseeable future actions. The description of the affected environment in Section 5.2.2.7 serves as a baseline for the cumulative socioeconomic impact assessment. The geographic area of analysis is the ROI, Chippewa County. Section 5.2.2.7 found that socioeconomic impacts from the construction, operations, and decommissioning of the proposed SHINE facility would be SMALL.

Table 5–8 identifies past, present, and reasonably foreseeable future actions within the ROI that could contribute to cumulative socioeconomic impacts. Relevant "other actions" that are considered in this cumulative impacts analysis are future construction projects that would bring new business and people to the ROI, such as the Wissota Green Housing Development and expansion of the Chippewa Falls Zoo.

Depending on the number of workers needed to support the construction of the Wissota Green Housing Development and expansion of the Chippewa Falls Zoo, as well as the total number of units built within the Wissota Green Housing Development, there is the potential for increased population, employment, tax revenue, and demand for public services in the ROI. The Wissota Green Housing Development would house 300 residents (Chippewa Herald 2013). However, as discussed in Section 5.2.2.7, Chippewa County has adequate public services, including the water utility, to accommodate any population changes. Any increase in employment from construction or decommissioning would be temporary, while permanent job creation as a result of the Chippewa Falls Zoo expansion would have little if any socioeconomic impact. Therefore, the contributory effects from the construction, operations, and decommissioning of the SHINE facility at the Chippewa Falls site, when added to other past, present, and reasonably foreseeable actions, would be SMALL.

<u>Human Health</u>

This section addresses the radiological and nonradiological direct and indirect effects on human health of the construction, operations, and decommissioning of the SHINE facility at the Chippewa Falls site, when added to the aggregate effects of other past, present, and reasonably foreseeable future actions. The geographic area of analysis for evaluating cumulative impacts on human health is the 5-mi (8-km) region surrounding the proposed Chippewa Falls site. In Section 5.2.2.8, the NRC staff concluded that the impacts from the construction, operations, and decommissioning of the proposed SHINE facility at the Chippewa Falls site would be SMALL.

St. Joseph's Hospital, which conducts radiological procedures, is within 1 mi (1.6 km) of the Chippewa Falls site (SHINE 2013a). The use of radioactive materials for medical diagnosis and treatment is regulated by the State of Wisconsin. The NRC and the Governor of Wisconsin signed an agreement transferring regulatory authority over byproduct, source, and special nuclear materials to the State of Wisconsin, which became the 33rd Agreement State, effective August 11, 2003. As an Agreement State, the Wisconsin Department of Health Services is responsible for licensing and inspecting the above-named materials, except at nuclear power plants and Federal facilities (WDHS 2014).

No nuclear fuel cycle facilities occur within the 5-mi (8-km) region surrounding the proposed Chippewa Falls site that would contribute to the cumulative radiological impacts. Therefore, the NRC staff assessed the potential cumulative radiological impacts from the proposed SHINE facility at the Chippewa Falls site and the potential impacts from the use of radioactive materials at St. Joseph's Hospital. Both facilities are or would be licensed and regulated, SHINE by the NRC and St. Joseph's Hospital by the State of Wisconsin; the facilities are or would be required to maintain radiation doses to their workers and members of the public within Federal and State dose limits. Also, being approximately 1 mi (1.6 km) apart, radioactive emissions within regulatory limits would be further reduced through the processes of dispersion and dilution as they travel in the atmosphere. Based on the regulatory controls that are or would be in place to control radiation exposure, the distance between the facilities, and the dilution of the radioactive materials, the NRC staff concludes that the cumulative radiological impacts on human health would be SMALL.

Table 5–8 identifies past, present, and reasonably foreseeable future actions within the ROI that could contribute to cumulative nonradiological impacts. The State of Wisconsin regulates the use of nonradioactive materials (i.e., chemicals and hazardous materials) at St. Joseph's Hospital and would regulate their use at the proposed SHINE facility at the Chippewa Falls site. As discussed in Section 4.9, the State of Wisconsin has regulations for the safe use, storage, and disposal of nonradioactive materials. Wisconsin Administrative Code NR 460 addresses the identification; generation; minimization; transportation; and final treatment, storage, or disposal of hazardous and nonhazardous waste (SHINE 2013a). Both SHINE and St. Joseph's Hospital are or would be regulated by the State and are or would be required to maintain chemical exposure to their workers and members of the public within State limits. Also, being approximately 1 mi (1.6 km) apart, nonradioactive emissions that are within regulatory limits are or would be reduced as they travel in the atmosphere through the processes of dispersion and dilution. Based on the regulatory controls that will be in place to control chemical exposure, the distance between the facilities listed in Table 5–8, and the dilution of the nonradioactive materials, the NRC staff concludes that the cumulative nonradiological impacts on human health would be SMALL.

Waste Management

This section addresses the radiological and nonradiological direct and indirect effects of the construction, operations, and decommissioning of the SHINE facility at the Chippewa Falls site from radioactive and nonradioactive wastes, when added to the aggregate effects of other past, present, and reasonably foreseeable future actions. The geographic area of analysis for evaluating cumulative impacts on human health is the 5-mi (8-km) region surrounding the proposed Chippewa Falls site. In Section 5.2.2.9, the NRC staff concluded that the impacts from types and volumes of radioactive and nonradioactive wastes from the construction, operations, and decommissioning of the proposed SHINE facility at the Chippewa Falls site would be SMALL.

As described above in the Human Health section, St. Joseph's Hospital, which conducts radiological procedures, is within 1 mi (1.6 km) of the Chippewa Falls site and is regulated by the State of Wisconsin (SHINE 2013a). No nuclear fuel cycle facilities occur within the 5-mi (8-km) region surrounding the proposed Chippewa Falls site that would contribute to the cumulative impacts from radioactive wastes. Therefore, the NRC staff assessed the potential cumulative impacts from radioactive waste from the proposed SHINE facility at the Chippewa Falls site and the potential impacts from the disposal of radioactive waste at St. Joseph's Hospital. Radioactive waste at both facilities is or would be regulated, at SHINE by the NRC and at St. Joseph's Hospital by the State of Wisconsin. The facilities are or would be required to store, process, and dispose of radioactive wastes in accordance with Federal and State requirements. As discussed in Section 4.9, radioactive wastes generated by the proposed SHINE facility would be packaged and transported off site to a licensed low-level radioactive waste facility for disposal (SHINE 2013a). In Section 4.9, the NRC staff concluded that the impacts from radioactive wastes generated by and disposed of from the proposed SHINE facility would be SMALL. Radioactive waste generated at St. Joseph's Hospital would also be packaged and transported off site to a licensed low-level waste facility for disposal. Based on the regulatory controls on packaging and transporting radioactive waste, the NRC staff concludes that the cumulative impacts from radioactive waste would be SMALL.

Table 5–8 identifies past, present, and reasonably foreseeable future actions within the ROI that could contribute to cumulative nonradiological impacts. The State of Wisconsin regulates the use and disposal of nonradioactive waste (i.e., chemicals and hazardous materials) at St. Joseph's Hospital and would regulate their use and disposal at the proposed SHINE facility at the Chippewa Falls site. As discussed in Section 4.9, the State of Wisconsin has regulations for the safe use, storage, and disposal of nonradioactive materials. Wisconsin Administrative Code NR 460 addresses the identification; generation; minimization; transportation; and final treatment, storage, or disposal of hazardous and nonhazardous waste. Both facilities, SHINE and St. Joseph's Hospital, are or would be regulated by the State and are or would be required to safely store, package, transport, and dispose of nonradioactive wastes in accordance with State requirements. Based on the state's regulatory controls that are or would be in place to control nonradioactive wastes for the facilities listed in Table 5–8, the NRC staff concludes that the cumulative impacts from nonradioactive wastes would be SMALL.

<u>Transportation</u>

This section addresses the direct and indirect effects of the construction, operations, and decommissioning of the SHINE facility at the Chippewa Falls site on radiological and nonradiological transportation, when added to the aggregate effects of other past, present, and reasonably foreseeable future actions. The geographic area of analysis for evaluating cumulative impacts on transportation is primarily the same as that used in Section 5.2.2.10 and includes the site boundary and the 5-mi (8-km) region surrounding the proposed Chippewa Falls site. However, the roads for routes that could be used for delivery of medical isotopes (if air transport is not possible) or disposal of wastes were also considered. Transportation infrastructure includes roadways, rail lines, airports, and traffic-control devices. As discussed in Section 5.2.2.10, transportation impacts would be SMALL to MODERATE.

Construction projects in Table 5–8 could produce an increase in vehicular traffic on roads within the 5-mi (8-km) radius of the Chippewa Falls site. For example, the Wissota Green Housing Development would involve the construction of a new housing development for approximately 300 people, and the construction and operation of the Wissota Business Park would add employees commuting on roads near the Chippewa Falls site. Depending on the number of workers required and whether construction projects within the vicinity of the Chippewa Falls site were occurring at the same time as the SHINE facility's construction, operations, or decommissioning, traffic on access roads would increase. Most existing roads would be sufficient to handle the construction project's transportation activities, and alternative routes could be used to minimize transportation impacts. In some cases, however, a noticeable increase in traffic could occur, especially if construction timeframes overlapped and construction workers and vehicles used the same roads. Therefore, depending on whether other construction projects overlapped with construction, operations, or decommissioning of the SHINE facility, or whether increased vehicular activity from workers or residents on roads near the Chippewa Falls site had a noticeable impact on traffic, the NRC staff concludes that cumulative transportation impacts would be SMALL to MODERATE.

<u>Environmental Justice</u>

The environmental justice cumulative impact analysis evaluates the potential contributory human health and environmental effects from the construction, operations, and decommissioning of the SHINE facility at the Chippewa Falls site, when added to the effects from other past, present, and reasonably foreseeable future actions on minority and low-income populations, and whether these effects might be disproportionately high and adverse. Minority and low-income populations are subsets of the general public residing near the Chippewa Falls site, and everyone would be exposed to the same environmental effects generated by the construction, operations, and decommissioning of the SHINE facility.

As discussed in Section 5.2.2, the Chippewa Falls site is located in the preexisting Wissota Lake Business Park in a block group and Census tract that exceed both geographic area averages for minority and low-income populations. The geographic area of analysis is the 5-mi (8-km) region surrounding the proposed SHINE facility at the Chippewa Falls site. Minority and low-income populations residing along site access roads could be disproportionately affected by noise and dust and increased commuter and other vehicular traffic during construction, operations, and decommissioning. However, during construction and decommissioning, these would be short term and primarily limited to onsite activities. Facility operations at the Chippewa Falls site would not have high and adverse human health and environmental effects on minority and low-income populations.

Table 5–8 identifies past, present, and reasonably foreseeable future actions within the geographic area of analysis that could contribute cumulative human health and environmental effects. Potential impacts on minority and low-income populations would mostly consist of environmental effects from construction (e.g., noise, dust, traffic, employment, and housing impacts). However, increased noise and dust during construction would be short term and primarily limited to onsite activities. Minority and low-income populations residing along site access roads could be disproportionately affected by noise and dust and increased commuter and vehicular traffic during construction. However, these effects are not likely to be high and adverse and would be contained within a limited period during certain hours of the day. Increased demand for temporary housing during construction could cause rental housing costs to rise, disproportionately affecting low-income populations that rely on inexpensive housing. However, given the availability of workers and the likelihood of workers commuting to the construction site, the need for rental housing could be reduced.

Operational emissions from manufacturing or industrial facilities within the 5-mile (8-km) radius of the Chippewa Falls site could disproportionately affect minority and low-income populations living in the vicinity of the proposed SHINE facility. However, everyone would be exposed to the same potential contributory effects, and any impacts would depend on the magnitude of the change in current environmental conditions. Permitted air emissions from all manufacturing and industrial facilities, including the contributory effects from the proposed SHINE facility, would be expected to remain within regulatory standards.

Based on this information and the analysis of human health and other environmental impacts presented in this section of the EIS, the contributory effects of constructing, operating, and decommissioning the SHINE facility are not likely to create high and adverse human health and environmental effects on minority and low-income populations living in the vicinity of the Chippewa Falls site.

5.2.3 Stevens Point Site

The NRC staff evaluated the Stevens Point site as a reasonable alternative. The city of Stevens Point is located in central Wisconsin, approximately 110 mi (176 km) north of Madison, Wisconsin; 215 mi (344 km) east of Minneapolis, Minnesota; and 250 mi (400 km) northwest of Chicago, Illinois (Figures 5–5 and 5–6). Specifically, the site is located adjacent to the eastern edge of the corporate boundaries of the City of Stevens Point in Portage County, Wisconsin. No public roads currently border the site.

The site is relatively flat with a gentle slope to the south. The site is composed of deciduous forest and cropland. No residences or other buildings occur on site.

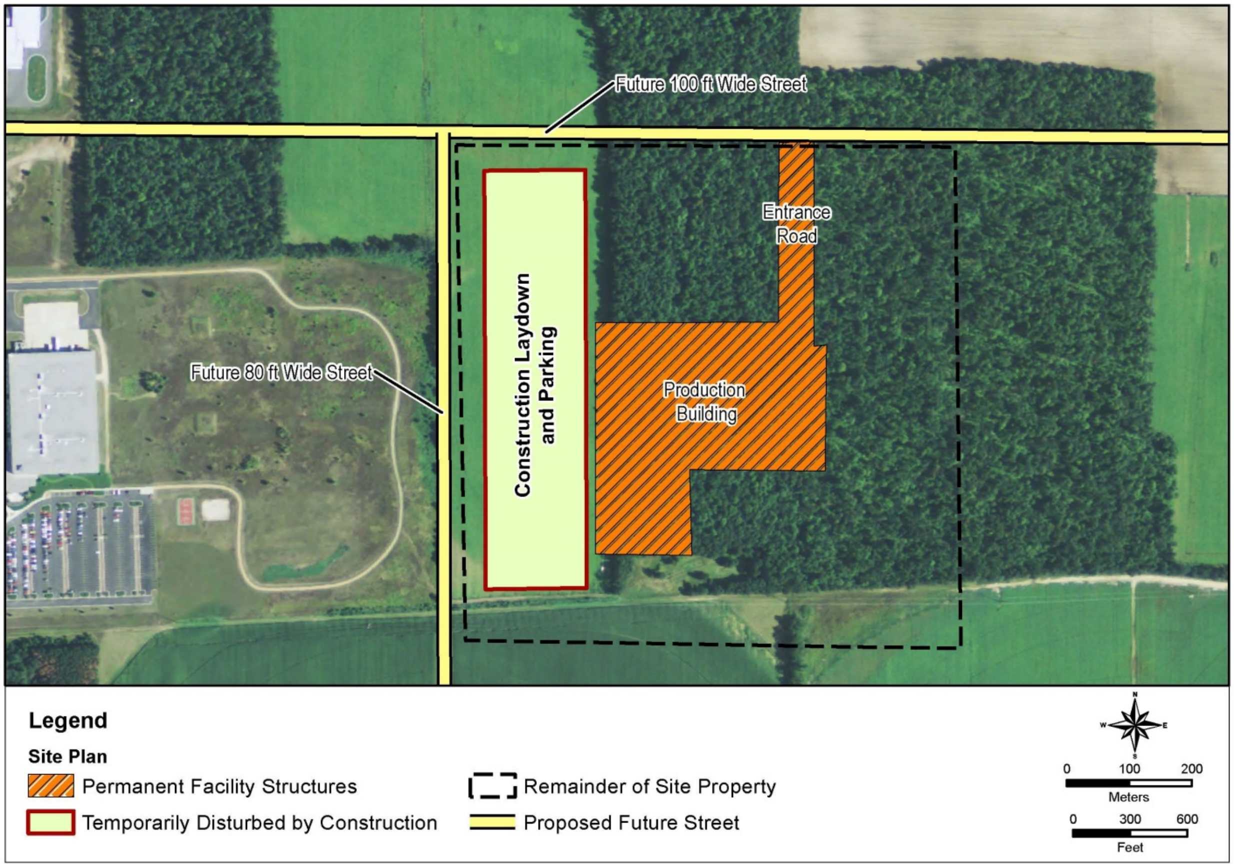
The City of Stevens Point created and recommended the Stevens Point site to SHINE. The city indicated to SHINE that, if the Stevens Point site were selected as the proposed site, the City would annex the site property and install public roads along the northern and western site boundaries. In addition, an overhead electrical line, municipal water supply pipeline, sanitary sewer pipeline, and natural gas pipeline, currently located approximately 0.3 mi (0.48 km) from the site, would need to be extended to the site. The analysis below considers the environmental impacts of building roads, electrical lines, and pipelines, because construction and operation of the SHINE facility would be dependent upon this infrastructure.

1 **Figure 5–5. Population Centers and Transportation Features in Portage County,**
2 **Wisconsin**

3

4 Source: SHINE 2013a

Figure 5–6. Stevens Point Site



Source: SHINE 2013a

5.2.3.1 Land Use and Visual Resources

Land Use

The Stevens Point site includes 80.4 ac (32 5 ha) of land adjacent to the eastern edge of the corporate boundaries of the City of Stevens Point in Portage County, Wisconsin (Figure 5–6). Based on a review of the National Land Cover Database, the Stevens Point site is composed of 48.2 ac (19.5 ha) of deciduous forest, 30.6 ac (12.4 ha) of cultivated agricultural land, and 1.6 ac (0.6 ha) of mixed forest (Table 5–9) (USGS 2006; SHINE 2013a). Warehouses and open spaces are located west of the site. Agricultural land and forested areas surround the remaining portions of the Stevens Point site (SHINE 2013a). No residences, other structures, special land uses, or mineral resources are located within the Stevens Point site boundaries.

Portage County has currently zoned the site partly for agricultural use and partly for industrial use (Portage County 2012). The City of Stevens Point has indicated to SHINE that if the Stevens Point site were selected, the City would annex the site property and zone it entirely for industrial use (SHINE 2013a).

The entire site is composed of prime farmland or farmland with soils of statewide importance where otherwise not committed to developed uses (NRCS 2013b; 7 CFR 657.5). As described above, otherwise qualifying “farmland” soils do not include those on land already in or committed to urban development or water storage, as defined in 7 CFR 658.2.

Table 5–9. Potential Land Use and Natural Habitat Impacts at the Stevens Point Site

Land Use Category	Permanently Disturbed	Temporarily Disturbed	Total Within Site Boundaries	Total Within 5-mi (8-km) Radius	Percentage Within 5-mi (8-km) Radius
Developed land				13,555 ac (5,486 ha)	27
Cultivated Crops	3.6 ac (1.4 ha)	13.6 ac (5.5 ha)	30.6 ac (12.4 ha)	18,062 ac (7,310 ha)	36
Pasture/Hay				3,617 ac (1,464 ha)	7
Grassland/ Herbaceous				263 ac (106 ha)	1
Shrub/Scrub				51 ac (21 ha)	<1
Deciduous Forest	13.9 ac[(a)] (6.5 ha)		48.2 ac (19.5 ha)	7,538 ac (3,050 ha)	15
Evergreen Forest				1,567 ac (634 ha)	3
Mixed Forest			1.6 ac (0.6 ha)	935 ac (378 ha)	2
Woody Wetlands				2,627 ac (1,063 ha)	5
Emergent, Herbaceous Wetlands				815 ac (330 ha)	2
Open Water				1,127 ac (456 ha)	2
Barren Land (Rock/Sand/ Clay)				109 ac (44 ha)	<1
Totals[(b)]	17.5 ac (7.9 ha)	13.6 ac (5.5 ha)	80.4 ac (32.5 ha)	50,265 ac (20,342 ha)	100

Notes:

[(a)] The footprint of the facility would permanently convert 13.9 ac (6.5 ha). In addition, up to 48.2 ac (19.5 ha) could be cleared to comply with security requirements or other measures.

[(b)] Totals may not add due to rounding.

Source: USGS 2006, SHINE 2013a

Construction

Construction of the SHINE facility at the Stevens Point site would permanently disturb and convert 13.9 ac (6.5 ha) of deciduous forest and 3.6 ac (1.4 ha) of agricultural land to industrial use (Table 5-8). If SHINE needed to clear additional portions of the site to comply with security requirements or other measures, the amount of affected forested areas could be up to 48.2 ac (19.5 ha) (SHINE 2013a). In addition, 13.6 ac (5.5 ha) of agricultural land would be temporarily converted from agricultural land to a construction parking area and construction material staging or laydown areas. Once construction activities are complete, SHINE would likely restore temporarily affected areas to agricultural fields, cool season grasses, or native prairie. The remaining portion of the site would likely remain as open area, forested areas, or agricultural fields, or would be converted to cool season grasses or native prairie. The potential conversion of up to 30.6 ac (12.4 ha) used for agricultural and cultivated crops to other uses would be minor when compared to the 18,062 ac (7,310 ha) of agricultural land remaining within 5 mi (8 km) of the Stevens Point site. Similarly, the potential conversion of up to 48.2 ac (19.5 ha) of deciduous forest to other uses would be minor when compared to the 7,538 ac (3,050 ha) of deciduous forest remaining within 5 mi (8 km) of the Stevens Point site. Additional forested or agricultural land adjacent to the site would be converted to a new land use to extend existing infrastructure to the site, such as roads, electrical lines, and pipelines.

The Farmland Protection Policy Act and its implementing regulations require agencies to make Farmland Protection Policy Act evaluations part of the NEPA process to reduce the conversion of farmland to nonagricultural uses by Federal projects and programs. Construction of the proposed SHINE facility at the Stevens Point site would permanently convert 3.6 ac (1.4 ha) and temporarily convert 13.6 ac (5.5 ha) of prime farmland or farmland of statewide importance to industrial use. However, this is a small percentage of the prime farmland or farmland of statewide importance within the region surrounding the Stevens Point site. Furthermore, a portion of the site is currently zoned for light industrial use, and, therefore, this portion of the site would not have qualifying important farmland soils subject to the Act.

Impacts on land use from construction would be SMALL, based on the relatively small amount of farmland and forested areas that would be permanently converted to industrial use, the lack of qualifying important farmland soils within a portion of the affected areas, and the lack of any effect on special land use or mineral resources.

Operations

Operation of the SHINE facility would not require any new land or require land use changes beyond those required for construction. Therefore, impacts on land use during operations would be SMALL.

Decommissioning

Decommissioning activities would be similar to construction activities, as they would involve heavy equipment to dismantle buildings and remove roadway and parking facilities. Land requirements to perform these activities would be similar to those required during construction. After decommissioning activities are complete, the Stevens Point site could remain industrial or be reconverted to agricultural land or open space. Given that land requirements would be similar to those described during construction and that, after decommissioning is complete, the land would be industrial, agricultural, or an open space, the NRC staff determined that the impacts on land use during decommissioning would be SMALL.

<u>Visual Resources</u>

The visual setting of the area that would be affected by the proposed SHINE facility at the Stevens Point site includes agricultural, forested, and light industrial viewsheds. The viewshed to the north, south, and east of the Stevens Point site is mainly flat or has slightly rolling cultivated fields and deciduous forest. The viewshed to the west is a light industrial landscape, with a few warehouses and other buildings adjacent to the Stevens Point site.

Construction

The activities associated with constructing the proposed SHINE facility (e.g., excavation, earthmoving, pile driving, and erecting the facility) and extending currently existing infrastructure to the site (e.g., roads, electrical lines, and pipelines) would require large pieces of construction equipment, significantly altering the appearance and partially obstructing views of the existing landscape. Portions of the Stevens Point site with agricultural fields have low scenic quality caused by a lack of notable features, low vegetation diversity, and mute colors. The forested portion of the site has a higher scenic quality because of its natural setting and higher diversity of vegetation. The viewshed surrounding the site also varies from low to moderate to the mixed presence of cultural modified landscapes (agricultural fields, buildings, and warehouses) along with natural wooded areas.

The Stevens Point site has a low-to-moderate sensitivity rating, as it is located in an area with low scenic values resulting from a low amount of use by viewers and a lack of special natural and wilderness areas. The sensitivity rating could be moderate because several sensitive viewing areas exist within 1.0 mi (1.6 km) of the Stevens Point site, including the following: more than 100 residences, a preschool, two child daycare facilities, a medical clinic, a city park, and an exercise track. Nonetheless, trees and existing buildings would block the view from most of these locations, resulting in a partial view of the Stevens Point site during construction. In addition, the viewshed surrounding the Stevens Point site is partially aesthetically altered by light industrial buildings, such as warehouses and other buildings, and agricultural fields. If SHINE clears the majority of the onsite wooded areas, visibility of the new facility and the contrast between the surrounding landscape and the new facility would be greater. Based on the low-to-moderate scenic quality and the forested and light industrial viewshed in the vicinity of the Stevens Point site, construction-related aesthetic impacts would be SMALL to MODERATE during construction.

Operations

The appearance of the SHINE facility at the Stevens Point site would not change during operation, other than a small steam plume that may be visible coming from the exhaust stack. The steam plume from the exhaust stack is expected to be minimal, because opacity associated with the natural-gas-fired boiler and heaters tends to be low, as described in Section 4.2.2.1. The steam plume would be more visible during periods of cold weather, although the size of the steam plume would still be relatively small. Therefore, visual impacts during operations would be SMALL.

Decommissioning

Decommissioning activities would be similar to construction activities, as they would involve heavy equipment to dismantle buildings and remove roadway and parking facilities. After SHINE completed decommissioning activities, the Stevens Point site could remain industrial, or be reconverted to agricultural land or open space. As the facility would be located in a district partially zoned for light industrial use, and the viewshed surrounding the Stevens Point site is partially aesthetically altered by light industrial buildings, the NRC staff would not expect any changes to the landscape during decommissioning to significantly affect any viewsheds. Therefore, visual impacts during decommissioning would be SMALL.

5.2.3.2 Air Quality and Noise

<u>Air Quality</u>

The climate at Stevens Point is similar to that in Janesville but is colder and has more snowfall, since the site is farther north. According to NCDC records for the years 1981 to 2010 (NCDC 2010b), the average annual temperature is 44 °F (6.5 °C), average annual snowfall is 44.7 in. (114 cm), and average annual precipitation (rain) is 32.63 in. (82.8 cm). July is the warmest month of the year and January the coldest. The NCDC records identify the following extreme weather events in Portage County from 1996 to 2013: thunderstorms (56 events), lightning (11 events), hail (60 events), tornadoes (5 events), heavy rain (7 events), and floods (5 events) (NCDC 2014b). The Stevens Point site is located in Portage County and is part of the North Central Wisconsin Intrastate Air Quality Control Region (40 CFR 81.157). Portage County is designated as an attainment area for sulfur dioxide and an attainment/unclassifiable area for carbon monoxide, ozone, nitrogen dioxide, lead, and particulate matter (40 CFR 81.350). Therefore, criteria pollutant concentrations in the county are lower than the NAAQS or there is insufficient data to determine if the NAAQS are met. The ROI for the air quality analysis discussed below is Portage County, because air quality designations are made at the county level. The nearest currently listed Class I Federal Area for visibility protection is the Seney Wilderness Area in Michigan, about 197 mi (316 km) from the site (EPA 2014).[6]

Construction

Sources of air pollutant emissions during construction of the facility at Stevens Point site would include fugitive dust from earth-moving equipment and other vehicles, criteria pollutants from diesel engines, and exhaust gases from worker vehicles as they commute to and from the Stevens Point construction site. Air emissions from construction of the facility at Stevens Point would be similar to those calculated for the proposed SHINE facility in Janesville (Section 4.2), since construction activities and sources would be similar (e.g., worker vehicles, diesel equipment, equipment activity, fuel combustion). Additional air emissions would also result from the additional infrastructure needed at the Stevens Point site, such as roads, electrical lines, and pipelines. Air emissions would include nitrogen oxides, sulfur oxides, particulate matter, carbon monoxide, and carbon dioxide, as provided in Table 4–3. Construction air emissions would be temporary and localized. Portage County, as discussed above, is designated an attainment/unclassifiable area and, therefore, air quality is generally good. Based on the estimated air emissions presented in Section 4.2, the NRC staff does not expect emissions from construction activities at the Stevens Point site to contribute to concentrations in the air that would exceed NAAQS or that would deteriorate Portage County's attainment/unclassifiable designation. Furthermore, as discussed in Section 4.2.1, SHINE may be required to obtain a Type A Registration Construction Permit from the Wisconsin Department of Natural Resources (WDNR); SHINE would be required to comply with the requirements and limitations stipulated within the Type A Registration Construction Permit obtained from WDNR.

Given the low emissions, the temporary nature of construction activities (18 months), and the pollution control measures that would be required in air permits from WDNR, the NRC staff concludes that air quality impacts during construction would be SMALL.

Operations

Sources of air emissions from operating the facility would be from radioisotope production, fuel combustion associated with processing and facility heating, and vehicular traffic from workers commuting and from monthly truck shipments in and out of the facility. Air pollutants from these sources will include nitrogen oxides (from radioisotope production, fuel combustion, vehicular traffic), sulfur dioxide (from fuel combustion and vehicular traffic), particulate matter (from fuel combustion and vehicular traffic), carbon dioxide (from fuel combustion and vehicular traffic), and carbon monoxide (from fuel combustion and vehicular traffic). Air emissions would be similar to those calculated for the proposed SHINE facility in Janesville (Section 4.2), since operation activities and sources would be similar (worker vehicles, fuel combustion associated with processing and facility heating, and the production process). Portage County, as discussed above, is designated an attainment/unclassifiable area and therefore air quality is generally good. Based on the estimated air emissions presented in Section 4.2, the NRC staff does not

[6] Rainbow Lake in Wisconsin is the nearest Class 1 area (about 119 mi (192 km) from the Stevens Point site); however, in 1980, Rainbow Lake was excluded for purposes of visibility protection as a Class I area.

expect emissions from a facility at the Stevens Point site to contribute to concentrations in the air that would exceed NAAQS or that would deteriorate Portage County's attainment/unclassifiable designation. Furthermore, SHINE would be required to comply with the requirements and limitations stipulated within the Type A Registration Operation Permit from WDNR.

Given that NAAQS are not expected to be exceeded, that the Portage County air quality status is good, and that pollution control measures would be required in air permits from WDNR, the NRC staff concludes that air quality impacts during operation would be SMALL.

Decommissioning

Decommissioning activities would be similar to construction activities in type and duration. Sources of air emissions would be from diesel equipment, vehicle worker emissions, and fugitive dust from earth-moving activities. Air emissions would be similar to those calculated for the proposed SHINE facility in Janesville (Section 4.2), since decommissioning activities and sources would be similar (e.g., worker vehicles, diesel equipment, equipment activity, fuel combustion). Air emissions would include nitrogen oxides, sulfur oxides, particulate matter, carbon monoxide, and carbon dioxide, as provided in Table 4–9. Air emissions from decommissioning would be temporary and localized. Portage County, as discussed above, is designated an attainment/unclassifiable area and, therefore, air quality is generally good. Based on the estimated air emissions presented in Section 4.2, the NRC staff does not expect emissions from decommissioning at the Stevens Point site to contribute to concentrations in the air that would exceed NAAQS or that would deteriorate Portage County's attainment/unclassifiable designation.

Given that NAAQS are not expected to be exceeded, the decommissioning activities would be temporary, and the Portage County air quality is good, the NRC staff concludes that air quality impacts during decommissioning would be SMALL.

<u>Noise</u>

The ROI considered for noise is a 1-mi (1.6-km) radius from the site boundary of Stevens Point. There are a number of noise-sensitive receptors within a 1-mi (1.6-km) radius from the Stevens Point site and the closest noise-sensitive receptor is a residence located approximately 2,060 ft (628 m) from the center point of the Stevens Point site and 1,050 ft (320 m) from the Stevens Point site boundary. The NRC staff did not identify or obtain noise surveys of the Stevens Point site and surrounding area. As discussed in Section 5.3.2.1, the Stevens Point site and surrounding area are agricultural land. Background noise levels are approximately 45 dBA in agricultural cropland areas (EPA 1978).

Construction

Noise sources during construction of the Stevens Point site would include construction equipment on site and increased traffic volumes. The maximum number of worker vehicles expected on site during construction is 451. The Stevens Point Site is bordered by Eisenhower Road to the west, McDill Avenue to the south, Burbank Road to the east, and Old Highway 18 to the north. The entrance road to the Stevens Point site would connect to a new road that the City of Stevens Point would construct along the northern boundary of the site (Section 5.2.3.10 below). Therefore, it is reasonable to assume that the Eisenhower Highway and McDill Avenue will experience an increase in traffic volumes, regardless of the specific route taken to get to the site, and subsequently will see an increase in noise. Furthermore, because of the location of the entrance road, the nearest resident (approximately 1,050 ft [320 m] away) may experience increased noise levels as workers access the site. The NRC staff expects that, similar to the Janesville site, noise levels from construction traffic would increase no more than 3 dBA.

The types of equipment that would be used on site during construction are listed in Table 4–2. The closest noise-sensitive receptor is a residence located approximately 1,060 ft (320 m) from the facility site boundary and 2,060 ft (628 m) from the center point of the Stevens Point facility. The NRC staff estimates noise levels of 58 dBA at the nearest residence to the Stevens Point site. Compared to estimated background noise levels (45 dBA), noise levels from construction may be noticeable to people in the vicinity of the site.

Given the distance of the nearest resident to the Stevens Point site and the noise levels from construction activities, the NRC staff estimates that noise impacts would be SMALL to MODERATE.

Operations

Noise sources during operation would be from worker vehicular traffic. Noise from operating equipment would be contained inside buildings and is not expected to be audible outside the proposed building facility. The number of worker vehicles expected during operation is 150 (SHINE 2013a). As discussed above, Eisenhower Road, McDill Road, and the entrance road will experience noise from operations worker's traffic. Additional traffic volume will increase noise levels by about 1 dBA.

Given that noise emissions from operating equipment are not expected to be audible beyond the building facility and additional noise emissions from worker vehicles are minor, the NRC staff concludes that impacts from facility operation would be SMALL.

Decommissioning

Noise sources during decommissioning of the Stevens Point site would include construction equipment on site and increased traffic volumes, similar to construction activities. The maximum number of worker vehicles expected on site during decommissioning is 261. As discussed above, Eisenhower Road, McDill Road, and the entrance road will experience noise from operation worker traffic. Noise levels from decommissioning traffic would be similar to those during construction and would increase about 2 dBA.

The types of equipment that would be used on site during decommissioning are listed in Table 4–9. The closest noise-sensitive receptor is a residence located approximately 1,060 ft (320 m) from the facility site boundary and 2,060 ft (628 m) from the center point of the Stevens Point facility. The NRC staff estimates noise levels of about 52 to 58 dBA at the residence nearest to the Stevens Point site. Compared to estimated background noise levels (45 dBA), noise levels from construction may be noticeable to people in the vicinity of the site.

Given the distance of the nearest resident to the Stevens Point site and the noise levels from decommissioning activities, the NRC staff estimates that noise impacts would be SMALL to MODERATE.

5.2.3.3 Geologic Environment

The Stevens Point site is situated on the boundary between the Wisconsin Northern Highland and Central Plain physiographic provinces. This is between the Superior Upland and Central Lowland physiographic provinces of the United States (USGS 2003; SHINE 2013a). The site location is near a dividing line between areas affected by the younger Wisconsin glaciations that ended about 11,700 years ago and older glaciations of Illinoian age (WGNHS 2011). These events are further discussed in Section 3.3.1.

The topography of the site is flat to slightly hummocky. At the time of the NRC environmental site audit, portions of the site were being actively cultivated, with the remainder in forest coverage. A center point elevation of 1,113 ft (339 m), with a general slope gradient of southwest was established during the Phase I site assessment of the property (GAI 2012a, 2012b). This is consistent with spot elevations taken from USGS topographic map coverage.

The surficial geologic unit at the Stevens Point site is mapped as meltwater sand and gravel (glacial outwash) of the Horicon formation. This unit is extensive across the central portion of Portage County and encompasses much of Stevens Point, including the proposed site. These sediments primarily consist of gravelly sands with dolomitic pebbles and cobbles in the upper part. It was deposited directly on the land surface by shallow, braided streams emanating from the Green Bay ice lobe to the east of the site (Clayton 1986).

SHINE contracted a preliminary geotechnical and hydrogeological investigation of the site, which included the installation of four monitoring wells (GAI 2012a, 2012b). Logs from the well borings revealed approximately 1 ft (0.3 m) of topsoil underlain by brown, medium-to-coarse grained-silty sand with trace gravel to a depth of 9- to 14-ft (2.7- to 4.3-m) bgs. Below this depth, the sediment consisted of medium-to-coarse grained and poorly graded sands, with silt up to 31-ft (9.4-m) deep, where the boreholes had to be terminated because of caving. All the sands were characterized as loose and wet, with no cobbles or larger fragments noted during drilling. Although not logged, an additional borehole was advanced to a depth of 140 ft (43 m) through sediments, without reaching bedrock (GAI 2012a, 2012b).

As for bedrock beneath the glacial sediments, county-level geological mapping shows the site to be located near the contact between Cambrian age sandstones of the Elk Mound Group and Precambrian intrusive igneous rocks (i.e., quartz monzonite and granite) (Greenberg and Brown 1986).

Construction sand and gravel is a commodity in the county (USGS 2013a). Geologic maps indicate several recent or historic quarrying operations in the vicinity of the site. Specifically, construction aggregate has been mined from large pits east and southeast of Stevens Point from glacial outwash materials (Clayton 1986).

Soil unit mapping by NRCS identifies the vast majority of soils across the site as consisting of Richford loamy sand, 0- to 2-percent slopes. This soil mapping unit is composed of somewhat excessively drained loamy sands to sandy loams, with sand in the lower portion of the soil profile at 41 to 60 in. (104 to 152 cm). The soil occurs on outwash plains and developed from sandy outwash materials. The depth to the water table in these soils is generally greater than 80 in. (200 cm) and they are not prone to ponding. The only building site limitation these soils have is that excavations tend to be very unstable because of the coarse and loose sandy texture of subsoils. The southeast corner of the site is mapped as Billet sandy loam, 0- to 2-percent slopes. This soil has characteristics similar to those of the Richford loamy sand. The Richford soil is classified as farmland of statewide importance while the Billet soil is prime farmland where otherwise not committed to developed uses (NRCS 2013b; 7 CFR 657.5).

As further described in Section 3.3.3, the State of Wisconsin lies within the central portion of the stable North American craton. Regional seismicity is characterized by relatively infrequent, small-to-moderate earthquakes that are typical of much of the central and eastern United States (USGS 2013b). Similar to the Janesville site, seismic hazard estimates prepared by the USGS indicate that the site is located within one of the lowest earthquake hazard areas in the conterminous United States (Petersen et al. 2011).

Within a radius of 200 mi (322 km) of the Stevens Point site, there have been 5 earthquakes with a magnitude equal to or greater than 2.5 recorded since 1973. The closest was a magnitude 2.6 earthquake with an epicenter approximately 180 mi (290 km) southeast of the site near Campton Hills, Illinois (USGS 2013c). The largest earthquake was a magnitude 3.8 event in the same general area of Illinois in February 2010 (USGS 2013d).

Construction

Ground-disturbing activities associated with facility construction would have impacts on geologic and soil resources similar to those discussed for the Janesville site (Section 4.3.1). Earthwork requirements and the ease of excavation would be very similar, as soils and surficial strata are comparable for the two sites. The depth to bedrock is not a concern for excavation work for the below-grade portions of the facility.

As at the Janesville site, shallow excavations could be prone to slumping. In addition, the presence of loose, water-bearing soils at depths below about 10-ft (3-m) bgs could require the use of bracing in trenches and other measures (e.g., cofferdams) during construction of the below-grade portion of the facility. The potential for soil erosion and loss would be similar to that at the Janesville and Chippewa Falls sites. However, as described in Section 4.3.1, adherence to standard BMPs for soil erosion and sediment control, and compliance with the provisions of the Wisconsin General Permit (WPDES Permit No. WI-S067831-4), would serve to minimize soil erosion and loss.

Site work and the creation of an impervious surface would result in the irretrievable loss of important farmland soils equal to the acreage disturbed and converted to an impervious surface. However, as a result of adherence to the Wisconsin General Permit (WPDES Permit No. WI-S067831-4) and implementation of the associated BMPs, the NRC staff finds that the overall impacts on the geologic environment from the construction of the proposed SHINE facility at the Stevens Point site would be SMALL.

Operations

There would be no additional impact on geology and soils from facility operations at the Stevens Point site. Land temporarily disturbed during construction within the site boundary and lying outside the facility footprint would be revegetated and would not be subject to continued soil erosion.

Regardless of the site location, the proposed SHINE facility would be sited, designed, and constructed in accordance with all applicable building codes, which provide for the evaluation of site geologic and soil conditions, including potential seismic hazards. As a result of these considerations, the NRC staff finds that the operational impacts associated with the geologic environment at the Stevens Point site would be SMALL.

Decommissioning

Facility demolition and other ground-disturbing activities associated with decommissioning would have impacts on soils and sediments similar to those described for construction. As site activities would be conducted in accordance with applicable local, State, and other Federal regulations and permits, the NRC staff finds that the impacts on the geologic environment from decommissioning the facility at the Stevens Point site would be SMALL.

5.2.3.4 Water Resources

Surface Water

No streams or other surface-water bodies exist within the boundaries of the Stevens Point site. The only major surface-water feature in the immediate vicinity of the site is McDill Pond, an impoundment on the Plover River, located approximately 2.1 mi (3.4 km) west of the site. McDill pond covers 261 ac (106 ha) and attains a maximum depth of 20 ft (6.1 m) (University of Wisconsin 2005). Outflow from the south end of the impounded Plover River at the McDill Dam enters the Wisconsin River at a point approximately 4 mi (6.4 km) southwest of the site and south of Stevens Point. Drainage from the site would be expected to travel south and southwest toward the Plover River drainage. The Plover and Little Plover River watershed drains an area of 202 mi^2 (523 km^2) (WDNR 2013a).

There are no USGS gaging stations immediately downstream of the Stevens Point site. There is a USGS gaging station upstream of McDill Pond on the Plover River (Station 05400513) with a short period of record, as well as a station downstream of Stevens Point on the Wisconsin River at Wisconsin Rapids (Station 05400760). For the Plover River upstream of McDill Pond at Highway 66, the mean annual discharge measured at the USGS gage for water years 2010 to 2012 is 185 cfs (5.23 m^3/s). The 90 percent exceedance flow, a measure of drought conditions, is 90 cfs (2.5 m^3/s). For water year 2012, the mean discharge was 151 cfs (4.27 m^3/s). The drainage area of the river upstream of the station encompasses 116 mi^2 (430 km^2) (USGS 2012b).

No floodplains have been delineated on or near the site (City of Stephens Point 2006), and no tributaries to the Plover or Wisconsin Rivers originate on or near the site that could present backwater flooding concerns.

The State of Wisconsin has established water-quality standards and numeric criteria and associated designated-use categories for all waters of the State, as previously described in Section 3.4.1, and in accordance with the Wisconsin Administrative Code (NR 102 and NR 104). Section 303(d) of the CWA requires states to identify “impaired” water for which effluent limitations and pollution control activities are not sufficient to attain water-quality standards in such waters. The segment of the Plover River including McDill Pond has a designated use for fish and aquatic life, has good water quality, and is listed as attaining designated uses (WDNR 2013a). Upstream of McDill Pond, the Plover River has experienced high fecal coliform bacteria levels that have resulted in the closure of the public beach at Iverson Park at some point during most swimming seasons. The contamination has been attributed to upstream livestock farms. The City of Stevens Point has focused on urban runoff as a water-quality concern for McDill Pond (City of Stevens Point 2006).

In Portage County, surface water is extensively used for self-supplied industrial and commercial uses but with very minor use for irrigation and livestock watering. However, groundwater is the primary and almost exclusive source for the domestic and municipal water supply (Buchwald 2011; City of Stevens Point 2006).

No industrial wastewater discharges have been identified in the site vicinity. Sanitary sewer service would be provided by the City of Stevens Point from nearby service areas (SHINE 2013a). The city’s treatment plant has a capacity of 5.23 mgd (19,800 m^3/d), with a recorded peak demand of 3.68 mgd (13,900 m^3/d) (City of Stevens Point 2006).

Groundwater

Except for the northwest portion, the surficial aquifer system is extensive across Portage County and is the principal water-bearing unit (Olcott 1992; Portage County 2004). As noted in Section 5.2.3.3, the aquifer is locally composed of meltwater sand and gravel (glacial outwash) of the Horicon formation. Locally, wells completed in the sand and gravel aquifer of the sand plain province of the county, in which the proposed site is located, have a potential yield exceeding 1,000 gpm (3,780 Lpm) of water (Portage County 2004). Well completion information for the four monitoring wells installed on the site in December 2011 indicates water-table conditions at depths ranging from about 8- to 11-ft (2.4- to 3.4-m) bgs (GAI 2012b). Other wells drilled in the vicinity of the site reflect groundwater depths ranging from 7 to 20 ft (2.1 to 6.1 m) bgs (SHINE 2013a). Groundwater in the vicinity of the site is mapped as flowing to the southwest, which is consistent with the topographic gradient in the vicinity of the site (Portage County 2004).

No groundwater quality data were obtained from the four monitoring wells installed on the site, and the wells were properly abandoned (closed) in March 2012 (GAI 2012b). However, the quality of groundwater across the county is reported as generally good, except for some natural occurrences of iron, manganese, radionuclides, and corrosive (i.e., soft-acidic) groundwater. Agricultural and petrochemical contamination of the local surficial (sand and gravel) aquifer is a concern, including nitrate and the pesticide atrazine (Portage County 2004). The State of Wisconsin regulates groundwater quality and administers groundwater protection programs in accordance with the Wisconsin Administrative Code (NR 140).

As referenced above, groundwater is the source of potable and municipal water in Portage County and Stevens Point. The City of Stevens Point Water Utility maintains seven large-capacity wells with a total reliable system supply capacity of 14.8 mgd (56,000 m^3/d) (City of Stevens Point 2006, 2014). These wells are all completed in the local surficial (sand and gravel) aquifer at depths ranging from 53 to 90 ft (16 to 27 m) (WDNR 2013b). The Stevens Point water supply is protected both within and beyond the city limits by wellhead protection ordinances adopted by the various communities and by Portage County (City of Stevens Point 2006).

<u>Construction</u>

Facility construction activities at the Stevens Point site would not have any direct impact on surface-water resources, as no streams or other surface-water bodies originate within the boundaries of the site. The only major surface-water feature nearby is McDill Pond, an impoundment of the Plover River, located approximately 2.1 mi (3.4 km) west of the site. Because of the apparent shallow depth to the water table beneath the site, the need for groundwater dewatering would be likely during construction. Water removed from facility excavations would need to be discharged in accordance with appropriate State and local permits. The relatively shallow depth to groundwater would also likely require the installation of subdrain or permanent dewatering systems for the below-grade portions of the facility.

As discussed above (Geologic Environment) and detailed in Section 4.4.1.1 for the Janesville site, ground-disturbing activities at the site would be subject to a Wisconsin General Permit (WPDES Permit No. WI-S067831-4). This General Permit requires the development of appropriate soil erosion and sediment control measures and spill prevention and waste management practices to minimize suspended sediment, the transport of other deleterious materials, and potential water-quality impacts.

No surface water or onsite groundwater would be withdrawn to support construction at the site. The relatively small volume of water required to support construction activities (averaging about 0.012 mgd (45 m^3/day)) would be supplied by the City of Stevens Point, which uses groundwater. Water could either be supplied by a temporary water tap or trucked to the point of use. Wastewater generation would be limited to sanitary waste from the construction workforce and would likely be accommodated through the use of portable restroom facilities.

As no natural surface-water features occur on the site, SHINE would not divert or withdraw surface water to support facility construction, there would be no onsite withdrawal of groundwater, and SHINE would be subject to the Wisconsin General Permit (WPDES Permit No. WI-S067831-4), the NRC concludes that the impacts on surface and groundwater hydrology, water quality, and water use from the construction of the proposed SHINE facility at the Stevens Point site would be SMALL.

<u>Operations</u>

Normal facility operations would not have any direct impact on surface-water or groundwater hydrology or quality. Compliance with the Wisconsin General Permit (WPDES Permit

No. WI-S067831-4), as described for construction, specifically requires the development of a stormwater management plan with appropriate BMPs to address runoff from buildings and other impervious surfaces. As detailed in Sections 4.4.1.2 and 4.4.2.2 for the Janesville site, the design, construction, and operation of the proposed facility would include necessary structural controls, and operations would be subject to appropriate plans and procedures to prevent any spills or other releases from reaching soils or surfaces where they could be conveyed to surface waters or groundwater.

Total water use is projected to be 6,073 gpd (22,990 Lpd), or 0.006 mgd (23 m^3/day) and would be supplied by the City of Stevens Point by a service connection. Projected water use would be a small percentage of the City of Stevens Point's supply capacity.

Operation of the proposed SHINE facility would entail no direct discharge of wastewater effluents to either surface water or groundwater. Wastewater generated by facility operations, composed primarily of sanitary waste, would be discharged to the City of Stevens Point WTP. Section 5.2.3.9 discusses the management of other waste forms.

Given that no natural surface-water features occur on the site, SHINE would not divert or withdraw surface water to support facility operation, and no direct discharge of wastewater effluents to surface or groundwater would occur, the NRC staff concludes that the impacts on surface water and groundwater hydrology, water quality, and water use from the operation of the proposed SHINE facility at the Stevens Point site would be SMALL.

Decommissioning

Facility decontamination, demolition, and site restoration activities would be similar regardless of the site, with the potential magnitude of the impacts on surface water and groundwater similar to those discussed for construction. All decommissioning activities would be conducted in accordance with appropriate BMPs and would observe waste handling and pollution prevention practices and spill prevention and response procedures during decommissioning, so that no materials or contaminants are released to soils or exposed to stormwater, where they could contaminate water resources.

Small quantities of water that may be required for dust control and soil compaction in association with site restoration activities would be supplied from municipal sources, as discussed for construction. Therefore, the NRC staff concludes that the impacts on water resources from facility decommissioning would be SMALL.

5.2.3.5 Ecological Resources

The Stevens Point site consists of 30.6 ac (12.4 ha) of agricultural land, 48.2 ac (19.5 ha) of deciduous forest, and 1.6 ac (0.6 ha) of mixed deciduous and evergreen forest (Table 5–9). Plant species on the site vary depending on previous land uses (Table 5–10). For example, approximately two-thirds of the site is a second-growth deciduous and evergreen forest. Common tree types include oaks (*Quercus* spp.), maples (*Acer* spp.), and pines (*Pinus* spp.). Various flower plants and grasses such as goldenrod (*Solidago* spp.) and aster *(Symphyotrichum* spp.*)* occur along the edge of cultivated fields*.* Such species are representative of an early successional plant community, or type of species found in the few years after a large disturbance, such as plowing. Actively cultivated crops on the site primarily include corn (*Zea mays*) (SHINE 2013a).

Table 5–10. Vegetation on the Stevens Point Site

Scientific Name	Common Name
Forest Species	
Abies balsamea	balsam fir
Acer saccharum	sugar maple
Carex spp.	sedge
Ostrya virginiana	hop hornbeam
Pinus strobus	white pine
Pinus sylvestris	scotch pine
Prunus serotina	black cherry
Quercus alba	white oak
Quercus macrocarpa	bur oak
Quercus rubra	red oak
Quercus spp.	oak species
Ribes spp.	gooseberry
Rubus spp.	blackberry
Smilax spp.	green briar
Tilia americana	American basswood
Viburnum spp.	virburnum species
Vegetative Communities Along Field Edges	
Ambrosia artemisiifolia	common ragweed
Amorpha canescens	lead plant
Bromus inermis	smooth brome
Conyza canadensis	horseweed
Euthamia graminifolia	flattop goldenrod
Panicum spp.	panic grass
Potentilla quinquefolia	creeping cinquefoil
Rubus flagellarus	dewberry
Setaria glauca	foxtail grass
Solidago spp.	goldenrod species
Symphyotrichum spp.	aster species

Source: SHINE 2013a

The Stevens Point site provides habitat for birds, mammals, amphibians, reptiles, and other wildlife tolerant of open fields, cultivated grasses, and frequent disturbances from human activity. During a reconnaissance survey, SHINE observed several birds at the Stevens Point site, including red-tailed hawk (*Buteo jamaicensis*), blue jay (*Cyanocitta cristata*), red-bellied woodpecker (*Melanerpes carolinus*), white-breasted nuthatch (*Sitta carolinensis*), American crow (*Corvus brachyrhynchos*), black-capped chickadee (*Poecile atricapillus*), and various sparrows (SHINE 2013a). Common mammals that inhabit the site likely include deer, raccoons, squirrels, and rabbits. Common reptiles and amphibians that inhabit the site likely include frogs, turtles, and snakes.

No wetlands, water bodies, or other aquatic habitats exist within the boundaries of the Stevens Point site. The closest wetland is approximately 1.2 mi (1.9 km) north of the site boundary. In addition, the Plover River is approximately 2.0 mi (3.2 km) northwest of the site and the Wisconsin River is approximately 3.5 mi (5.6 km) southwest of the site. However, runoff is not expected to flow into these aquatic habitats because of drainage patterns, the distance from the site to the habitats, and the number of human-made features (such as roads, buildings, and railroads) separating the site from the aquatic habitats. Several ditches occur within the vicinity of the site, which provide minimal, low-quality aquatic habitats.

In correspondence with the NRC, FWS (2013) stated that the Stevens Point site is within the high potential range for the Karner blue butterfly (*Lycaeides melissa samuelis*), a Federally endangered species (FWS 2013). Habitat for the Karner blue butterfly includes dry sandy prairie, oak savanna, jack pine forests, and sandy open scrub-shrub areas (FWS 2013). In Wisconsin, Karner blue butterflies are found along utility and road right-of-ways, abandoned agricultural fields, forest openings, and managed forests (FWS 2013; WDNR 2014d). The only food plant for the Karner caterpillar is wild blue lupine (*Lupinus perennis*) and, therefore, occurrence of this species is greatly limited to areas with wild blue lupine (FWS 2008). Caterpillars generally hatch from eggs in April and then pupate and emerge from their cocoon-like chrysalis by the end of May or in early June. A second generation generally hatches from eggs in late June and pupates and emerges as adults in July (FWS 2008).

Two species of special concern and two State-threatened species could occur within 6 mi (10 km) of the Stevens Point site (Table 5–11) (SHINE 2013a; WDNR 2014a). While these species may occur within the vicinity of the site, the Stevens Point site provides unsuitable habitat for any of the four State-protected species (SHINE 2013a; WDNR 2014a). SHINE did not observe any Federally or State-protected species on the Stevens Point site during reconnaissance surveys (SHINE 2013a).

Table 5–11. Federally and State-Protected Species Within a 6-mi (10-km) Radius of the Stevens Point Site

Scientific Name	Common Name	Federal Status[(a)]	State Status[(a)]	State Rank[(b)]
Insects				
Lycaeides melissa samuelis	Karner blue butterfly	E	SSC	S3
Microtus ochrogaster	prairie vole		SSC	S2
Plants				
Asclepias lanuginose	wooly milkweed		T	S1
Arabis missouriensis	Missouri rockcress		SSC	S2
Reptiles				
Glyptemys insculpta	wood turtle		T	S2

[(a)] E = endangered; SSC = Species of Special Concern; T= Threatened

[(b)] S1 = Critically imperiled in Wisconsin because of extreme rarity; S2 = Imperiled in Wisconsin because of rarity; S3 = Rare or uncommon in Wisconsin

Sources: FWS 2013; WDNR 2014b, 2014d

The FWS also administers the Migratory Bird Treaty Act, which prohibits anyone from taking native migratory birds or their eggs, feathers, or nests. The majority of the bird species that occur in Wisconsin, except for resident games birds and feral species, are protected under the Act (WDNR 2014c). In the vicinity of the site, migratory birds rely on riparian, forested, grassland, and wetland habitats as important areas for foraging, resting, avoiding predators, and, for some species, breeding. On the Stevens Point site, migratory birds could use trees for resting, breeding, nesting, and foraging.

Construction

Construction of the facility at the Stevens Point site would result in permanently converting 13.9 ac (5.6 ha) of deciduous forest and 3.6 ac (1.4 ha) of agricultural fields into an industrial facility or developed open space, such as parking lots. Furthermore, 13.6 ac (5.5 ha) of cropland would be temporarily disturbed during construction. Additional forested or agricultural land adjacent to the site would be disturbed to extend existing infrastructure to the site, such as roads, electrical lines, and pipelines. In addition to a loss of habitat from construction activities, noise from construction activities could disturb birds and wildlife. In response to such disturbances, birds and wildlife could move out of the immediate area and find adequate, similar habitat within the vicinity.

During construction, bird collisions with construction equipment and the new facility could result in mortality from the presence of tall structures and artificial night lighting during nighttime construction. The size of structures and the likelihood of mortality from bird collisions would be similar to that described in Section 4.5 for the proposed SHINE site in Janesville. In that analysis, the NRC staff determined that impacts from bird collisions would be negligible and unlikely to affect local or migratory populations, based on previous reviews of bird collisions at nuclear power plants that are similar or larger in height and size than the proposed SHINE facility.

Construction at the Stevens Point site is not expected to result in any direct impacts on aquatic resources, such as habitat loss, because no aquatic resources occur on the Stevens Point site. Runoff from the site could affect the offsite aquatic resources, such as drainage ditches, by increasing turbidity or introducing various chemicals or other pollutants. SHINE (2013a) stated, in its ER, that if the Stevens Point site is selected, SHINE would implement appropriate soil erosion and sediment control BMPs to minimize the transport of suspended sediment and other pollutants. In addition, SHINE would be required, in its stormwater permit, to develop a site-specific plan to minimize pollution and runoff (Section 5.2.3.4).

In response to the NRC staff's request for endangered and threatened species that could be affected by the proposed construction and operation, FWS (2013) stated that the Stevens Point site is within the high potential range for the Karner blue butterfly (*Lycaeides melissa samuelis*). Furthermore, if the Stevens Point is selected as the proposed site for construction, FWS (2013) recommended surveys for the presence of wild blue lupines, and if present, then additional surveys to determine the presence of Karner blue butterflies. Therefore, if the Stevens Point site is selected for construction, additional consultation with FWS would be required to determine the potential occurrence of the Karner blue butterfly at the Stevens Point site.

FWS (2013) also stated that migratory birds could occur either on or within the vicinity of the site. If the Stevens Point site is selected, FWS (2013) recommended that any tree removal occur before May 1 or after August 30 to minimize impacts on breeding migratory birds that might use the trees for breeding, nesting, foraging, or resting.

Given that construction would not permanently or temporarily affect any high-quality habitats such as grasslands, undisturbed forests, or wetlands; permanently and temporarily affected habitats are available within the region; mortality from bird collisions is expected to be negligible; and no aquatic resources occur on the Stevens Point site, impacts on ecological resources during construction would be SMALL. If the Stevens Point site is selected, additional consultation with FWS would be required, under the Endangered Species Act, to determine the potential presence of, and any effects on, the Karner blue butterfly.

Operations

During operations, impacts on ecological resources could result from bird collisions, herbicide applications for landscape maintenance activities, elevated noise levels, and increased turbidity or introduction of pollutants from runoff. As described in Section 4.5, mortality from bird collisions is expected to be negligible, given that the tallest structure would be a stack at approximately 66 ft (20 m) tall. Disturbance from daily activities, herbicide applications, or elevated noise levels is likely to have minimal impacts on wildlife and plant species, given that the species identified at the Stevens Point site are generally tolerant of disturbance, because portions of the site have been actively farmed or modified for human use over the past several decades. In response to any disturbances during operation, birds and wildlife could move out of the immediate area and find adequate, similar habitat within the vicinity.

Operation of the facility is not expected to result in any direct impacts on aquatic resources, because wastewater would be discharged to the City of Stevens Point sanitary sewer system after being treated (SHINE 2013a). Indirect impacts during operations could include runoff that may contain sediments, contaminants from road and parking surfaces, or herbicides. However, as described above, impacts on aquatic resources are expected to be minimal, because nearby aquatic resources are drainage ditches that provide low-quality habitat, and SHINE would be required, in its stormwater permit, to use appropriate soil erosion and sediment control BMPs.

Given that mortality from bird collisions is expected to be negligible, habitat disturbances during operations would be minimal, any disturbed wildlife could find similar habitat in the vicinity, and BMPs would be required in the SHINE stormwater permit, impacts on ecological resources during operations would be SMALL. As described above, if the Stevens Point site is selected, additional consultation with FWS would be required, under the Endangered Species Act, to determine the potential presence of, and any effects on, the Karner blue butterfly.

Decommissioning

Decommissioning activities would have similar impacts to those that occur during construction of the proposed facility. For example, SHINE would use construction equipment to dismantle large buildings, which could result in disturbances to wildlife and birds and potential runoff to nearby water bodies. In addition, some land on the site could be used as staging areas for the equipment and to conduct certain dismantling activities. As described above, if noise or other activities disturb birds or wildlife, similar habitat is available in nearby offsite areas. No surface water would be used during decommissioning, and SHINE would develop and implement spill prevention and response procedures as part of State permit requirements for ground-disturbing activities. Therefore, impacts during decommissioning are expected to be SMALL. As described above, if the Stevens Point site is selected, additional consultation with FWS would be required under the Endangered Species Act to determine the potential presence of, and any effects on, the Karner blue butterfly.

5.2.3.6 Historic and Cultural Resources

A review of databases maintained by the National Park Service indicates that there are 18 properties listed in the NRHP within Portage County (NPS 2015b). These historic properties reflect the historic cultural contexts for the proposed Stevens Point site and include historic buildings, structures, and districts dating from the mid-19th to mid-20th centuries. However, no historic properties are located within the APE, the Stevens Point site, or its immediate vicinity. The closest NRHP-listed property is Nelson Hall, approximately 3.8 mi (6.1 km) northwest of the Stevens Point site, surrounded by commercial and residential land. Nelson Hall was the first dormitory established at the Stevens Point Normal School, the precursor to University of Wisconsin—Stevens Point (NRHP 2013b). No archeological survey was commissioned by

SHINE for the Stevens Point site. The NRC staff queried the Archaeological Sites Inventory and Architectural History Inventory, Burial Sites Inventory, and the Bibliography of Archaeological Reports at the Wisconsin Historical Society. No known historic or cultural resources or historic properties were found at the Stevens Point site (NRC 2013).

As there are no known historic properties, under 36 CFR 800.4(d)(1), or historic and cultural resources located within the APE, impacts on these resources are not likely during the construction, operations, and decommissioning of the proposed SHINE facility. The facility would also incur little or no visual or aesthetic impact, as potential visual impacts during construction and decommissioning would be temporary. The proposed SHINE facility is a low-profile build, and the nearest NRHP site is approximately 3 mi (5 km) away and is surrounded by residential and commercial properties. However, previously unidentified cultural resources could be inadvertently discovered during land-disturbing activities associated with construction, maintenance during operations, and decommissioning. It is expected that SHINE would employ a CRMP, similar to the one discussed in Section 4.6, to manage and protect as-yet-unidentified cultural resources.

Based on (1) no known NRHP-eligible historic properties or historic and cultural resources on the proposed SHINE facility site, (2) CRMP procedures, and (3) cultural resource assessment and consultations, construction, operations, and decommissioning of the SHINE facility at the Stevens Point site would have no impact on known historic and cultural resources. However, given the possibility of the inadvertent discovery of unidentified cultural resources caused by land disturbance during construction, operations, and decommissioning, the overall impact would be SMALL.

5.2.3.7 Socioeconomics

Affected Environment

For the purposes of this analysis, the ROI is Portage County, Wisconsin, with special consideration being given to the site of the facility in Stevens Point. The City of Stevens Point is the county seat located in Portage County. According to the 2010 Census, the total population of Portage County was 70,019, while the City of Stevens Point had a population of 26,717 (USCB 2014e). Approximately one third of the population of Portage County resides in Stevens Point. The population in Portage County steadily increased from 1970 to 2010. According to the 2010 Census, there were 11,220 total housing units in the City of Stevens Point and 30,054 housing units in Portage County. The total number of vacant housing units in the City of Stevens Point was 622 (5.5 percent) and 2,240 (7.5 percent) in Portage County (USCB 2014f).

Portage County had the highest employment by industry in trade, transportation, and utilities at 7,368 employed (27.11 percent of employment), followed by manufacturing, with 4,254 employed (15.65 percent), and financial activities, with 4,240 employed (15.60 percent) (BLS 2013). Several industries are represented in Stevens Point, which include insurance, education, medical, government, and manufacturing. The top three employers in Portage County are in Stevens Point: Sentry Insurance A Mutual Co., University of Wisconsin—Stevens Point, and Stevens Point Public School (WDWD 2013).

There was a slight decline in the labor force and employment totals between 2011 and 2012 in the City of Stevens Point. In 2011, the labor force total was 15,784, and it declined to 15,621 in 2012. The employed total was 14,536 in 2011, and it dropped to 14,357 in 2012. There were also small declines in the labor force and employment totals for Portage County. The State of Wisconsin had a slight decline in the labor force figure, but the employment figure rose slightly from 2011 to 2012. The unemployment rate in Stevens Point was 8.1 percent, which was 1.5 percent higher than the Portage County total of 6.6 percent and 1.2 percent higher than the

6.9 percent for the State of Wisconsin in 2012 (BLS 2013). According to the *Migrant Population Report* issued by the WDWD, 268 migrant workers were employed in Portage County in agricultural and food processing jobs in 2011 (WDWD 2014).

According to 2007–2011 American Community Survey 5-year estimates, the median family income for the City of Stevens Point was $56,992, while Portage County was $64,227. The per capita income for Stevens Point during the same time period was $21,893, while Portage County was slightly higher at $25,207. Tax rates vary by jurisdiction. Portage County has a 0.5 percent county tax rate. The City of Stevens Point's proposed government budget for 2014 is $2,894,227, and the general property taxes in 2012 were $2,213,414 (City of Stevens Point 2013a).

The Stevens Point Area Public School District had a total of 7,402 students enrolled in pre-K to 12th grade in 2012–2013. Nine elementary schools, two junior high schools, one senior high school, two specialized schools, and a 4K (kindergarten for 4 year olds) program make up the school district (Stevens Point Area Public School District 2013). Mid-State Technical College and the University of Wisconsin—Stevens Point are located in Stevens Point.

The City of Stevens Point has a number of recreational facilities, including several trails for walking, biking, and cross-country skiing. In addition there are 43 campgrounds in Stevens Point, numerous local parks, and the Main Street Historic District (WDNR undated). Cultural institutions include a Central Wisconsin Children's Museum and a Museum of Natural History, Observatory, and Planetarium at the University of Wisconsin—Stevens Point.

Impact Analysis

The estimated number of workers needed to construct, operate, and decommission the SHINE facility at the Stevens Point site would be the same as the number of workers required for the proposed SHINE facility at the Janesville site.

Construction

The 420 workers needed to construct the proposed SHINE facility would represent 2 percent of the total population (26,717) of Stevens Point and less than 1 percent of the population of Portage County (70,019) in 2010 (USCB 2014a). Most construction workers would likely reside within the ROI and would not permanently relocate because of the relatively short duration (18 months) of construction. In addition, the support infrastructure within the ROI would be able to accommodate a temporary increase in population. Since most of the 420 construction workers would likely already reside in the ROI, there would be no increase in demand for public services. Assuming that SHINE would enter into a TIF agreement with the City of Stevens Point, similar to the agreement in Janesville, in the first 10 years of the proposed project, the TIF agreement would allow SHINE to make payments in lieu of taxes to the City of Stevens Point. Tax payments totaling $600,000 per year would be used to offset infrastructure expenses. SHINE would also pay property taxes estimated to be $35,000 per year, based on the assessed property before improvements during this 10-year period (SHINE 2013a). The Stevens Point Area Public School District would receive a portion of the property tax benefits, since the Stevens Point site is located in that district. Sales tax revenue would also increase if materials and services were purchased within the ROI during construction. However, the total amount of tax revenue generated within the ROI during construction would be relatively small in comparison to the established tax base of Stevens Point and Portage County; Stevens Point's 2012 collected taxes were approximately $16.4 million, while Portage County collected $32.1 million in taxes in 2012 (WDOR 2014). Therefore, the overall socioeconomic impact during the construction of the proposed SHINE facility would be SMALL.

Operations

The 150 operations workers would represent 1 percent of the total 2010 population of Stevens Point (26,717) and less than 1 percent of Portage County (70,019) (USCB 2014a). It is likely that some workers would relocate to the ROI. However, the total number of operations workers would not create a significant socioeconomic impact. There is sufficient housing available in the ROI to accommodate any increase in the population from the proposed SHINE facility. There is also sufficient capacity in the public schools to accommodate the small increase in the school-age population when the proposed SHINE facility operations workers and their families relocate to the ROI. Public services, including water utilities, would be able to support the increased needs of operations workers and their families. SHINE would continue to make payments in lieu of taxes (estimated $600,000) and property taxes (estimated $35,000) during facility operations. However, after expiration of the 10-year TIF agreement with the City of Stevens Point, SHINE would pay property taxes of approximately $660,000 per year (SHINE 2013a). The amount of property taxes could change, depending on the assessed value of the proposed SHINE facility. Stevens Point Area Public School District would also continue to receive property tax revenue from SHINE during facility operations. In addition, overall sales and property tax revenues would increase within the ROI, caused by the increase in the population from operations workers relocating to the ROI. However, the total amount of tax revenue generated during this period within the ROI would be relatively small in comparison to the established tax base of Stevens Point and Portage County. In 2012, Stevens Point received approximately $16.4 million in tax revenue, while Portage County received approximately $32.1 million (WDOR 2014). Therefore, the overall socioeconomic impact during SHINE facility operations would be SMALL.

Decommissioning

The 261 decommissioning SHINE workers would represent less than 1 percent of the total population of Stevens Point (26,717) and Portage County (70,019) in 2010 (USCB 2014a). Because of the short duration of decommissioning (6 months), workers would not likely relocate permanently to Stevens Point, and some of the SHINE operations workers could transition to decommissioning. Since it is likely that most decommissioning workers would already reside in the ROI, there would be little or no increased demand for public services. In addition, support infrastructure within the ROI would be able to accommodate any temporary increase in population. Therefore, the overall socioeconomic impact during the decommissioning of the SHINE facility would be SMALL.

5.2.3.8 Human Health

Construction

The construction of the SHINE facility at the Stevens Point site would be similar to that for the Janesville site. For example, there would be no significant physical differences in the design of the facility, workers would be exposed to similar construction hazards, and SHINE would implement similar construction methods and safety practices (SHINE 2013a). In Section 4.8 of this EIS, the NRC concluded the impacts from construction of the proposed SHINE facility at the Janesville site would be SMALL. In addition, existing infrastructure would need to be extended to the site, such as roads, electrical lines, and pipelines. Construction workers would encounter potential hazards typical of any industrial or road construction site. The NRC staff assumed that normal construction safety practices contained in Occupational Safety and Health Administration (OSHA) regulations, such as safety training, safety equipment, and supervision of the work force, would promote worker safety and reduce the likelihood of worker injury during construction (SHINE 2013a). Therefore, because there are no significant differences between the two sites or their facility design and injuries during the construction of related infrastructure would be minimized through normal construction safety practices, the NRC staff concludes the impacts from construction of the proposed SHINE facility at the Stevens Points Falls site would also be SMALL.

Operations

The radiological operation of the SHINE facility at the Stevens Point site would be similar to that for the Janesville site. Radiological factors associated with a SHINE facility at the Stevens Points site, including radiation sources and radioactive effluents, as well as implementation of a radiation protection program to minimize and ensure compliance with worker and public dose limits in 10 CFR Part 20, would be essentially the same as those for a SHINE facility at the Janesville site (SHINE 2013a).

The nonradiological operation of the SHINE facility at the Stevens Point site would also be similar to that for the Janesville site. Nonradiological factors associated with a SHINE facility at the Stevens Point site, including nonradioactive chemical sources, nonradioactive waste management and effluent control systems, chemical exposure to the workers and the public, physical occupational hazards, and mitigation measures to minimize exposure to nonradioactive material, would be essentially the same as those for a SHINE facility at the Janesville site (SHINE 2013a).

In Section 4.8 of this EIS, the NRC concluded the impacts from operation of the proposed SHINE facility at the Janesville site would be SMALL. Therefore, because there are no significant differences between the two sites or their facility design, the NRC staff concludes the radiological and nonradiological impacts on human health from operations at the proposed SHINE facility at the Stevens Point site would also be SMALL.

Decommissioning

The decommissioning of the SHINE facility at the Stevens Point site would be similar to that proposed for the Janesville site. There are no significant physical differences between the two sites that would affect the potential impacts from decommissioning (SHINE 2013a).

After permanent cessation of operations, the equipment used for radioisotope production and associated processing equipment would be taken out of service and maintained in a safe condition. The uranium fuel and other radioactive materials would be stored in a safe condition until packaged and transported to a disposal facility. Facility workers would continue to receive radiation exposure during work activities relating to the cleanup, movement, storage, and disposal of radioactive material. The radiological and nonradiological controls discussed in Section 3.8 of this EIS would be used during decommissioning to ensure that worker and public radiation doses and exposure to nonradioactive chemicals remain within NRC and State limits.

In Section 4.8 of this EIS, the NRC concluded the impacts from decommissioning the proposed SHINE facility at the Janesville site would be SMALL. Therefore, because there would be no significant differences between the two sites or their facility design and operation, and radiological and nonradiological controls would be in place to ensure hazards to workers and the public would be within NRC and State limits, the NRC staff concludes the impacts on human health from decommissioning the proposed SHINE facility at the Stevens Point site would also be SMALL.

5.2.3.9 Waste Management

Construction

The construction of the SHINE facility at the Stevens Points site would generate similar types and volume of waste to those for the Janesville site. For example, there are no significant physical differences between the design of the facility or the two sites that would affect the potential types and volume of waste generated from construction (SHINE 2013a). In addition, existing infrastructure would need to be extended to the site, such as roads, electrical lines, and pipelines. Nonradiological waste would be generated during the construction of such infrastructure. The NRC staff assumed waste would be minimized because waste management systems would be implemented in accordance with applicable regulatory requirements. In Section 4.9 of this EIS, the NRC concluded the impacts from waste during construction of the proposed SHINE facility at the Janesville site would be SMALL. Therefore, because there are no significant differences between the two sites or their facility design and because waste generated during the construction of related infrastructure would be minimized in accordance with applicable regulatory requirements, the NRC staff concludes the impacts from construction of the proposed SHINE facility at the Stevens Point site would also be SMALL.

Operations

The radiological operations of the proposed SHINE facility at the Stevens Point site would generate similar types and volumes of radioactive waste to those for the Janesville site. There are no significant physical differences between the design of the facility or the two sites that would affect the potential types and volume of waste generated from operation of the proposed facility (SHINE 2013a). In addition, the management of the radioactive waste would be similar, regardless of the location of the proposed facility. Implementation of a radiation protection program to minimize radiation exposure from the radioactive waste and ensure compliance with worker and public dose limits in 10 CFR Part 20 would be essentially the same as those discussed in Section 4.8 of this EIS for a proposed SHINE facility at the Janesville site (SHINE 2013a).

The nonradiological operations of the proposed SHINE facility at the Stevens Point site would generate similar types and volumes of nonradioactive waste to those for the Janesville site. There are no significant physical differences between the design of the facility or the two sites that would affect the potential types and volume of waste generated from operation of the proposed facility (SHINE 2013a). Nonradiological factors associated with a SHINE facility at the Stevens Point site, including nonradioactive chemical sources, nonradioactive waste management and effluent control systems, chemical exposure to the workers and the public, physical occupational hazards, and mitigation measures to minimize exposure to nonradioactive material, would be essentially the same as those discussed in Section 4.8 of this EIS for a proposed SHINE facility at the Janesville site (SHINE 2013a).

In Section 4.8 of this EIS, the NRC concluded the impacts from radiological and nonradiological waste generated during facility operations at the proposed SHINE facility at the Janesville site would be SMALL. Therefore, because there are no significant differences between the two sites or their facility design, the NRC staff concludes the radiological and nonradiological impacts on human health from waste generated from operating the proposed SHINE facility at the Stevens Point site would also be SMALL.

Decommissioning

The decommissioning of the proposed SHINE facility at the Stevens Point site would be similar to that proposed for the Janesville site. There are no significant physical differences between the two sites that would affect the potential impacts from decommissioning (SHINE 2013a).

After permanent cessation of operations, the equipment used for radioisotope production and associated processing equipment would be taken out of service and maintained in a safe condition. The uranium fuel and other radioactive materials would be stored in a safe condition until packaged and transported to a disposal facility. The types and amounts of radioactive and nonradioactive wastes generated during decommissioning would be similar to those generated at the Janesville site. The radiological and nonradiological controls discussed in Section 3.8 of this EIS would be used during decommissioning to protect workers and the public from the waste (SHINE 2013a).

In Section 4.8 of this EIS, the NRC concluded the impacts from waste during decommissioning of the proposed SHINE facility at the Janesville site would be SMALL. Therefore, because there would be no significant differences between the two sites or their facility design and operation, and radiological and nonradiological controls would be in place to protect workers and the public from the waste, the NRC staff concludes the impacts on human health from waste during decommissioning of the proposed SHINE facility at the Stevens Point site would be SMALL.

5.2.3.10 Transportation

Major roads and transportation features in the vicinity of the Stevens Point site are shown in Figure 5–5. The site lies east of the town of Stevens Point, near Interstate 39, and there are currently no roads that access or border the undeveloped site. Existing local roads nearest to the Stevens Point site are County Highway R (Eisenhower Road), approximately 1 mi (1.6 km) to the west; County Highway HH (McDill Avenue), approximately 1 mi (1.6 km) to the south; and Burbank Road, approximately 1.5 mi (2.4 km) to the east. County Highway R is an undivided four-lane road with a curbed shoulder, whereas County Highway HH and Burbank Road are two-lane roads with minimal paved shoulders. Interstate 39 would provide major highway access to the site using U.S. Highway 10 to the north or County Highway HH to the south (SHINE 2013a).

Annual average daily traffic volumes for various roads and locations in the vicinity of the Stevens Point site are listed in Table 5–12. Morning, midday, and evening peak hourly traffic counts for associated locations are listed in Table 5–13. Available traffic data for road segments near the Stevens Point site suggests that peak volume along County Road R averages approximately 450 to 800 vehicles per hour, while peak volume along County Road HH averages approximately 300 to 500 vehicles per hour (WDOT 2011a).

Table 5–12. Annual Average Daily Traffic Counts—Vicinity of Stevens Point Site

Traffic Count Location	Vehicles Per Day
County Highway R (Eisenhower Road), north of Old Highway 18 Road	8,000
Interstate-39 between U.S. Highway 10 and County Highway HH (McDill Avenue)	22,100
County Highway HH (McDill Avenue), west of County Highway R (Eisenhower Road)	6,100
U.S. Highway 10 between Interstate 39 and County Highway R	28,000

Source: WDOT 2008b

Table 5–13. Estimated Annual Average Peak and Daily Total Traffic Counts—Vicinity of the Stevens Point Site—Number of Vehicles

WDOT Count Site No.	Location	Year of Count	A.M. Peak[(a)]	Midday Peak[(b)]	P.M. Peak[(c)]	Daily Total
490964	County Highway R (Brilowski Road), south of U.S. Highway 10	2011	450	684	783	8,662
490218	U.S. Highway 10, between Interstate 39 and Maple Bluff Road	2011	1,731	2,491	2,505	30,958
491061	Off Ramp from Interstate 39 northbound to County Highway HH	2011	224	229	233	3,139
491062	Off Ramp from Interstate 39 southbound to County Highway HH	2011	282	340	466	4,757
490980	County Highway HH between Interstate 39 and County Highway R	2011	312	404	466	5,351

(a) Highest single hourly traffic count for the hours between 00:00 and 09:59.

(b) Highest single hourly traffic count for the hours between 10:00 and 14:59.

(c) Highest single hourly traffic count for the hours between 15:00 and 23:59.

Source: WDOT 2011b

Construction

Construction of the Stevens Point site would require new access roads to the site. As shown in Figure 5–2, the SHINE facility entrance road would connect with a new east-west street that would be constructed by the City of Stevens Point along the northern boundary of the site, between County Highway R to the west and Burbank Road to the east. A second street, running north-south along the western boundary of the site, would also be constructed to connect the new east-west street with County Highway HH to the south (SHINE 2013a).

Given that construction at the Stevens Point site would be very similar to that described for the proposed Janesville site, SHINE estimated that construction of the proposed facility at the Stevens Point site would require an average of 420 deliveries per month (14 deliveries per day) and 9 offsite waste shipments per month using heavy vehicles (dump trucks/delivery trucks) (SHINE 2013a, 2014). Peak worker traffic volume during construction would add an estimated 451 vehicles (pickup trucks and cars) per day (SHINE 2013a, 2014). The NRC staff similarly assumed that, with a total of 465 vehicles per day, each having an arrival and departure trip, and some vehicles making return trips during the day (e.g., off site trips for lunch), vehicle counts immediately adjacent to the proposed SHINE facility may temporarily increase by approximately 1,000 trips per day.

As with the proposed SHINE facility in Janesville, no sources or routes for construction materials, including concrete, have been specified, and SHINE plans to ensure that delivery routes would avoid residential and sensitive areas associated with the Stevens Point site (SHINE 2013b). SHINE and the common-carrier trucks would be required to adhere to the applicable regulatory packaging and transportation requirements for radioactive material in NRC's regulations (10 CFR Parts 20 and 71); the State of Wisconsin's Administrative Code, Chapter 326, "Transportation"; and DOT requirements (49 CFR Parts 172 and 173) (SHINE 2013a). Table 5–12 indicates that County Highway R and County Highway HH experience approximately 8,000 and 6,100 vehicles per day, respectively, near the Stevens Point site. Accordingly, the addition of up to 465 vehicles per day (or approximately 1,000 trips per day) from SHINE construction activities would result in increased traffic volumes on County Highway R and County Highway HH of approximately 13 and 16 percent, respectively. Additionally, the percentage of heavy trucks on this route would temporarily increase. However, available traffic counts do not distinguish between types of vehicles currently traveling this route, and the increase in traffic volume would be temporary and limited to the period of construction.

SHINE's traffic analysis indicated that projected levels of peak construction-related traffic could noticeably alter existing transportation conditions, but these delays would not be sufficient to destabilize the transportation infrastructure (SHINE 2013a). SHINE plans to use a staggered construction work shift schedule to reduce the hourly traffic flow onto County Highway R and County Highway HH and schedule truck deliveries early in the day to help mitigate the potential increases in traffic that could occur during peak periods (SHINE 2013b). Increased traffic volumes may also merit mitigation in the form of infrastructure upgrades, such as widening or adding turning lanes. Increased traffic volumes on other roads in the vicinity are expected to be less but could still be significant (SHINE 2013a). Therefore, the impact on transportation infrastructure during construction would be MODERATE.

Operations

Given that operation of the SHINE facility at the Stevens Point site would be very similar to that described for the Janesville site, SHINE estimates that a maximum of 150 worker vehicles distributed over three work shifts per day would access the site using the planned new access roads that would be constructed (SHINE 2013a, 2014). The NRC staff estimated that each vehicle would require separate trips to and from the proposed SHINE facility, plus a number of trips to and from the proposed facility during the midshift, resulting in approximately 325 additional worker vehicle trips daily. The additional 325 vehicle trips associated with the Stevens Point site represents an increase of 5 percent or less to the average annual daily traffic on roads in the area.

In addition to operations employees commuting to the proposed facility, SHINE estimates traffic to and from the facility would also include:

- an average of 36 truck deliveries per month to the proposed SHINE facility, which would include both radioactive and nonradioactive materials (SHINE 2013a, 2015);
- an average of 39 outbound product shipments per month through the Stevens Point Municipal Airport (SHINE 2015);
- an average of 25.6 radioactive waste shipments per year (SHINE 2015); and
- an average of one shipment per month of nonradioactive domestic and industrial waste (SHINE 2013a, 2015).

SHINE's preferred method for shipping radioisotope products from the Stevens Point site would be to transport them by truck to Stevens Point Municipal Airport, approximately 4 miles (6 km) away, for subsequent air transport to customers. Other airports that would be suitable for shipping these products, including Minneapolis–St. Paul Airport, Dane County Regional Airport, and O'Hare International Airport, would be more than 2 hours away by truck (SHINE 2013a).

The NRC staff expects the overall daily traffic flow in the immediate vicinity of the proposed SHINE facility to increase slightly above current levels during operation but not to an appreciable extent when compared with the average daily and annual traffic flow of roads in the immediate vicinity of the Stevens Point site, as presented in Tables 5–12 and 5–13.

Similar to the activities that would occur at the Janesville site, SHINE would transport radioactive waste from the Stevens Point site to an offsite storage, treatment, or disposal facility. A common-carrier truck would likely transport the waste. SHINE and the common-carrier trucks would be required to adhere to the applicable regulatory packaging and transportation requirements for radioactive material in NRC's regulations (10 CFR Parts 20 and 71); the State of Wisconsin's Administrative Code, Chapter 326, "Transportation"; and DOT requirements (49 CFR Parts 172 and 173) (SHINE 2013a). These regulations help ensure public health and safety on roadways.

Based on the relatively small increase in traffic compared to the average daily and annual traffic flows near the Stevens Point site, and because SHINE and common-carrier trucks would be required to adhere to the applicable NRC, DOT, and the State of Wisconsin regulatory packaging and transportation requirements for radioactive material, the NRC staff concludes that the impact on transportation infrastructure during operations would be SMALL.

<u>Decommissioning</u>

Given that decommissioning the SHINE facility at the Stevens Point site would be very similar to that described for the Janesville site, SHINE estimates that an average of 72 truck deliveries and 191 offsite waste shipments per month, (a total of approximately nine heavy-vehicle shipments per day) would be required (SHINE 2013a, 2014). Peak worker traffic volume during decommissioning would add an estimated 261 vehicles per day (SHINE 2013a, 2014). Therefore, the NRC staff estimates that there could be an increase of approximately 580 trips a day on local roads during the decommissioning phase, increasing average daily traffic on roads in the immediate vicinity of the Stevens Point site from what was being experienced during the operations phase.

Peak decommissioning-related traffic could noticeably alter existing transportation conditions, but these delays would not be sufficient to destabilize the transportation infrastructure. SHINE could use a staggered work shift schedule, similar to that employed during construction, to reduce the hourly traffic flow onto new site access roads and schedule truck deliveries early in the day to help reduce traffic congestion (SHINE 2013b). However, the change in average daily traffic flows in the immediate vicinity of the Stevens Point site and an increase in commuter, truck delivery, and waste traffic directly related to decommissioning activities, could affect local commuting patterns. Therefore, the impact on transportation infrastructure during the decommissioning phase would be MODERATE.

5.2.3.11 Accidents

SHINE stated, in its ER, that no conditions have been identified for the Stevens Point site that would significantly affect the radiological or nonradiological impacts from postulated accidents differently than at the proposed facility at the Janesville site (SHINE 2013a). The NRC staff considers this assumption reasonable, because the construction, operations, and decommissioning of the SHINE facility at the Stevens Point site would be essentially the same as at the Janesville site since the design, construction, operations, and decommissioning are similar. In addition, the same radiological and nonradiological safety regulations applicable to the Janesville site would apply to the Stevens Point site (SHINE 2013a).

In Section 4.11 of this EIS, the NRC concluded that the impacts from radiological and nonradiological accidents at the proposed SHINE facility at the Janesville site would be SMALL. Given that no significant differences exist between the two sites or their facility design and operations, the NRC staff concludes the impacts from potential accidents at the proposed SHINE facility at the Stevens Point site would be SMALL.

5.2.3.12 Environmental Justice

This section describes the potential human health and environmental effects from the construction, operations, and decommissioning of the proposed SHINE facility on minority and low-income populations living in the vicinity of the Stevens Point site. The NRC staff addresses environmental justice issues and concerns by first identifying potentially affected minority and low-income populations, and then determining whether there would be any potential human health or environmental effects and whether these effects may be disproportionately high and adverse.

Minority-population data were available for Census block groups within a 5-mi (8-km) radius around the Stevens Point site. Low-income population data were only available at the Census tract level because of the limited availability of poverty data at the block group level. To protect confidentiality, USCB does not publish information about small geographic areas if the population size is too small. Race and ethnicity and poverty Census data were used to identify the location of minority and low-income populations near the Stevens Point site. If the Census tract and block group boundaries crossed the 5-mi (8-km) radius boundary, the entire Census tract or Census block group data were used. Geographic information system software was used to create the maps.

<u>Minority Populations</u>

According to 2010 Census information, approximately 11 percent of the population in the City of Stevens Point identified themselves as a minority. The largest minority population was Asian, comprising approximately 5 percent of the total population, followed by Hispanic or Latino (of any race) comprising approximately 2 percent of the total population. In Portage County, 7.3 percent of the total population identified themselves as minority (USCB 2014e).

Table 5–14 lists minority populations within the 5-mi (8-km) radius of the Stevens Point site. Within this radius, 7.2 percent of the total population identified as a minority (UCSB 2014c). The largest minority group was Asian (3.3 percent), followed by Hispanic or Latino (of any race) (2.2 percent) (USCB 2014e).

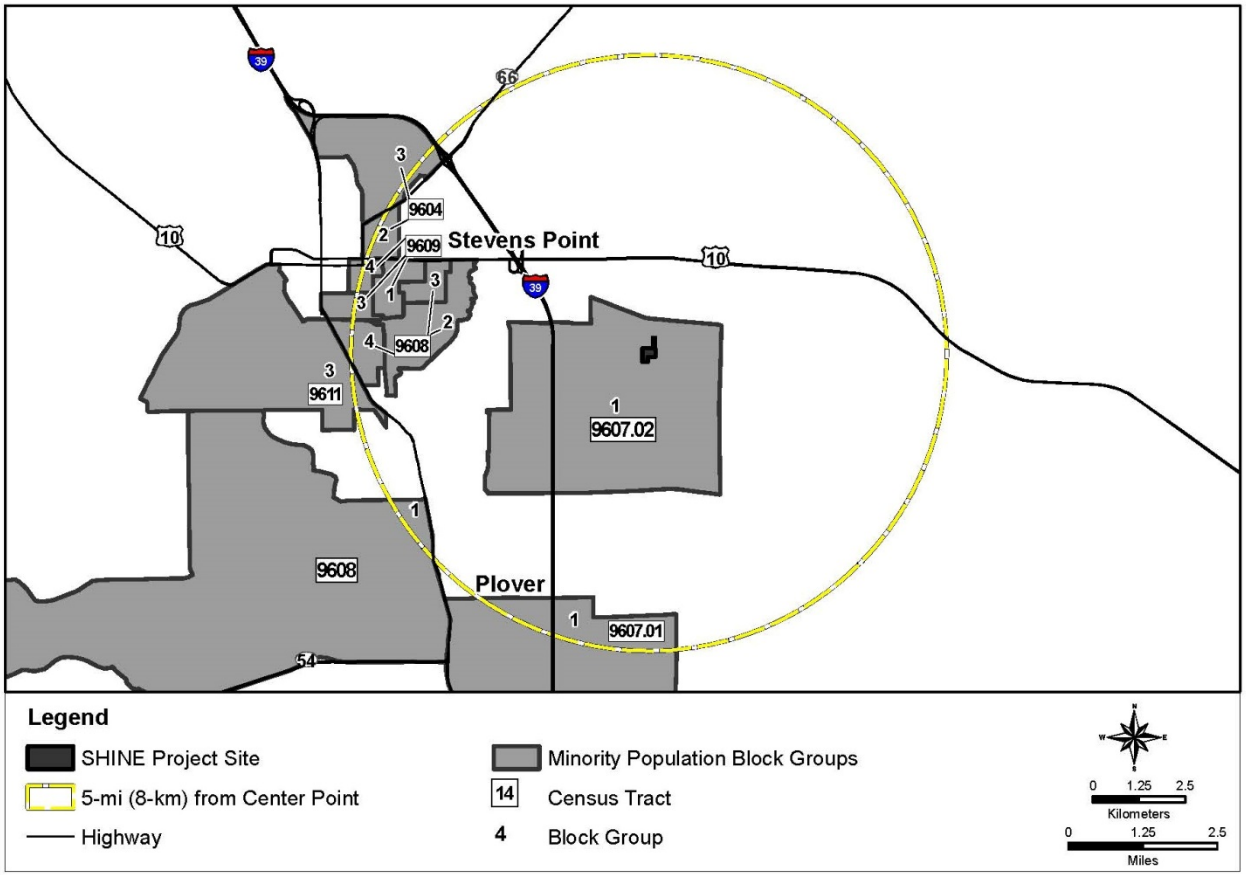
Figure 5–7 shows minority populations within the 5-mi (8-km) radius of the Stevens Point site. Census block groups were considered minority population block groups if the percentage of the minority population within any block group exceeded 7.2 percent. Twelve of the 23 Census block groups were found to have meaningfully greater minority populations. The Stevens Point site is located in Census Tract 9607.2, Block Group 1, a minority population block group with a minority population of 8.3 percent.

Table 5–14. Minority Populations Within 5 mi (8 km) of the Stevens Point Site

Census Tract	Block Group	Total Population	Percent of Minority	Total Minority Population	Hispanic or Latino	Black or African American	American Indian or Alaska Native	Asian	Native Hawaiian and Other Pacific Islander	Two or More Races
9601	3	1,557	2.9	46	31	0	6	0	0	9
9604	2	828	9.0	75	33	6	0	31	0	5
9604	3	1,609	7.5	121	31	17	3	62	0	8
9604	4	1,264	6.0	77	20	0	9	38	0	10
9605	1	967	4.9	48	14	0	1	23	0	10
9605	2	1,597	3.0	49	12	5	4	21	0	7
9605	4	2,914	5.9	173	44	14	15	83	0	17
9606	1	1,647	2.7	45	21	2	4	11	0	7
9607.01	1	1,291	12.4	161	77	6	4	54	0	20
9607.01	2	2,629	5.4	144	38	7	6	73	0	20
9607.01	3	1,465	6.6	97	34	4	3	40	0	16
9607.02	1	2,261	8.3	189	41	18	5	100	1	24
9607.02	2	1,099	5.9	65	18	4	0	37	0	6
9608	1	2,217	6.2	139	44	13	0	63	0	19
9608	2	1,608	11.7	189	39	21	6	95	0	28
9608	3	629	8.7	55	6	9	2	30	0	8
9608	4	858	12.3	106	26	8	2	44	0	26
9609	1	823	9.1	75	24	11	4	28	0	8
9609	3	838	10.0	84	29	2	0	35	0	18
9609	4	911	11.4	104	38	13	5	30	0	18
9611	1	2,429	8.0	196	64	5	3	94	1	29
9611	3	2,211	10.5	233	55	10	10	140	1	17
9611	4	870	4.3	38	18	2	2	5	0	11

Source: USCB 2014e, 2010 Census Summary File 1. Table P9. Hispanic or Latino or Not Hispanic or Latino by Race.

Figure 5–7. Minority Populations Within 5 mi (8 km) of the Stevens Point Site



Source: USCB 2014e, 2010 Census Summary File 1. Table P9. Hispanic or Latino or Not Hispanic or Latino by Race

Low-Income Population

According to 2006–2010 American Community Survey estimates, 6 percent of families residing within Portage County were identified as living below the Federal poverty threshold. Within the City of Stevens Point, 7.6 percent of families and 22.8 percent of all people were identified as living below the Federal poverty threshold. The 2010 Federal poverty threshold was $22,314 for a family of four (USCB 2014f).

Table 5–15 lists low-income population Census tracts within a 5-mi (8-km) radius of the Stevens Point site; 10.9 percent of the total population within that radius was identified as living below the Federal poverty level (UCSB 2014f).

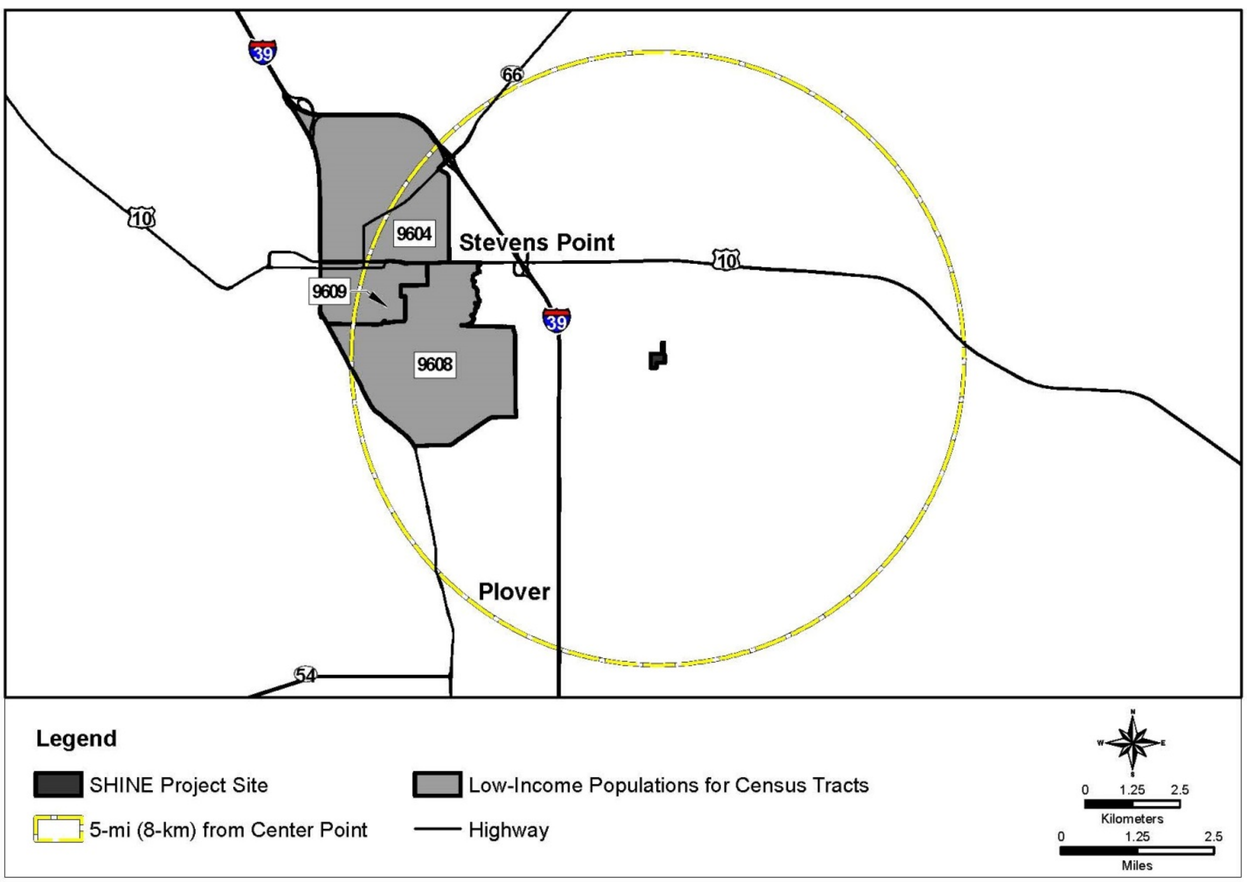
Census tracts groups were considered low-income population tracts if the percentage of individuals living below the Federal poverty level exceeded 10.9 percent. Figure 5–8 shows low-income population Census tracts within a 5-mi (8-km) radius of the Stevens Point site. Three of the nine Census tracts were found to have meaningfully greater low-income populations. The Stevens Point site is located within Census Tract 9607.02, with 7 percent of people living below the Federal poverty level, which is not considered a low-income Census tract.

Table 5–15. Low-Income Populations Within 5 mi (8 km) of the Stevens Point Site

Census Tract	Percentage of Below Poverty Level for All People (Estimates)
9601	6.5
9604	36.1
9605	5.3
9606	6.6
9607.01	7.8
9607.02	7.0
9608	12.3
9609	12.8
9611	5.9

Source: USCB 2014f, 2006–2010, American FactFinder, American Community Survey 5-Year Estimates.

Figure 5–8. Low-Income Populations Within 5 mi (8 km) of the Stevens Point Site



Source: USCB 2014f, 2006–2010 American Community Survey 5-Year Estimates. Table DP03 Selected Economic Characteristics

<u>Analysis of Impacts</u>

As previously discussed, the environmental justice impact analysis evaluates the potential for disproportionately high and adverse human health and environmental effects on minority and low-income populations from the construction, operations, and decommissioning of the proposed SHINE facility. Some of these potential effects have been described in the other resource areas discussed in this EIS. Chapter 5 presents the assessment of environmental and human health impacts for each environmental resource area.

In the impact analysis, the NRC first identified all potential human health and environmental effects and then determined the significance of the impact and whether or not minority or low-income populations would experience disproportionately high and adverse effects. The NRC then considered whether the radiological or other health effects were significant or above generally accepted norms, whether the risk or rate of the hazard was significant and appreciably in excess of that of the general population, and whether the radiological or other health effects would occur in populations affected by cumulative or multiple adverse exposures from environmental hazards. The NRC determined whether the following human health and environmental effects have the potential to disproportionately affect minority and low-income populations living in close proximity to the proposed SHINE facility site:

- radiological and nonradiological human health impacts (Section 5.2.3.8),
- noise impacts (Section 5.2.3.2), and
- traffic impacts (Section 5.2.3.10).

The NRC also considered whether there would be an impact on the natural or physical environment that would significantly and adversely affect a particular group, whether there would be any significant adverse impacts on a group that appreciably exceed or are likely to appreciably exceed those on the general population, and whether environmental effects would occur in populations affected by cumulative or multiple adverse exposures from an environmental hazard.

Construction

Similar to constructing the proposed SHINE facility at the Janesville location, potential impacts on minority and low-income populations residing near the Stevens Point site would mostly consist of environmental effects during construction (e.g., noise, dust, traffic, employment, and housing impacts). Noise and dust impacts during construction would be short term and primarily limited to onsite activities. Minority populations residing along site access roads, particularly in Census Tract 9607.2, Block Group 1, could be disproportionately affected by increased commuter vehicle and truck traffic and noise and dust from construction. However, because of the temporary nature of construction, these effects are not likely to be high and adverse and would be contained within a limited period during certain hours of the day. Increased demand for temporary housing during construction could cause rental housing costs to rise, disproportionately affecting low-income populations within the ROI (Portage County), who rely on inexpensive housing. However, given the small number of construction workers and the likelihood that most workers would already reside within the ROI, workers could commute to the construction site, thereby reducing the need for rental housing.

Operations

Potential impacts to minority and low-income populations during SHINE facility operations at the Stevens Point site would mostly consist of radiological and nonradiological human health and environmental (e.g., noise and traffic) effects. Everyone living near the Stevens Point site would be exposed to the same potential operational effects, and any impacts would depend on the magnitude of the change in current environmental conditions.

As discussed in the Human Health section of this EIS (Section 5.2.3.8), the level of potential radiological doses to the public from SHINE facility operations would be well below the annual dose limit and well within the NRC and the State of Wisconsin's regulatory limits. As a result, minority or low-income populations, as well as the general population living in close proximity to the proposed SHINE facility site, would not be adversely affected by radiation exposure during facility operations. Permitted nonradiological air emissions are expected to remain within regulatory standards.

As discussed in the Noise section of this EIS (Section 5.2.3.2), noise emissions from commuter traffic during SHINE facility operations would increase. Noise from operating equipment would be contained inside buildings and would not be audible outside the proposed SHINE facility buildings at the site. However, additional noise emissions from worker vehicles would be minor (1 dBA), and noise emissions from shipments are not anticipated to increase noise levels beyond current levels.

Minority and low-income populations residing along site access roads would be directly affected by increased commuter vehicle and truck traffic during facility operations. However, as discussed in the Transportation section of this EIS (Section 5.2.3.10), the only appreciable impact would be a “slight degradation of service” (i.e., traffic delays) at intersections during the morning peak hour. The overall daily traffic flow in the immediate vicinity of the proposed SHINE facility would increase slightly during facility operations but would not be of an appreciable nature when compared with the average daily and annual traffic flow of roads in the immediate vicinity of the Stevens Point site.

Therefore, offsite noise and traffic impacts caused by the proposed SHINE facility operations would be SMALL for both of these resource areas. Nevertheless, given the fact that the Stevens Point site is located in a designated minority block group, minority populations living in close proximity to the proposed SHINE facility during operations could be disproportionately affected. However, based on the analyses of impacts conducted for other resource areas discussed in this EIS, impacts on minority or low-income populations, as well as on the general population living in close proximity to the Stevens Point site, would not be considered high and adverse.

Decommissioning

Similar to construction impacts, potential impacts to minority and low-income populations residing near the Stevens Point site would mostly consist of environmental and socioeconomic effects during decommissioning (e.g., noise, dust, traffic, employment, and housing impacts). Noise and dust impacts during the decommissioning of the proposed SHINE facility at the Stevens Point site would be short term and primarily limited to onsite activities. Minority and low-income populations residing along site access roads, particularly in Census Tract 9607.2, Block Group 1, could be disproportionately affected by increased commuter vehicle and truck traffic and noise and dust during decommissioning. However, because of the temporary nature of decommissioning, these effects are not likely to be high and adverse and would be contained within a limited period during certain hours of the day. Increased demand for rental housing during decommissioning could cause rental costs to rise, disproportionately affecting low-income populations who rely on inexpensive housing. However, given the small number of decommissioning workers and the likelihood that most of the workers would already reside within the ROI, workers could commute to the Stevens Point site, thereby reducing the need for rental housing.

In addition, the environmental impacts from decommissioning the proposed SHINE facility would be SMALL for all resource areas. There is no evidence that impacts from decommissioning would be disproportionately high and adverse to minority or low-income populations.

Subsistence and Special Conditions

As discussed in Section 4.12, the special pathway receptors analysis is an important part of the environmental justice analysis, because consumption patterns may reflect the traditional or cultural practices of minority and low-income populations in the area, such as migrant workers or Native Americans. Based on the air and water quality discussions and the discussion of human health effects in this EIS, it is unlikely that there would be any disproportionately high and adverse human health impacts in special pathway receptor populations in the region as a result of subsistence consumption of water, local food, fish, or wildlife. The operation of the SHINE facility at the Stevens Point site would not have disproportionately high and adverse human health and environmental effects on these populations.

Summary

The Steven's Point site is located in a minority population block group. Similar to the Janesville site, any minority and low-income populations residing along site access roads or near the site could be disproportionately affected by noise and dust and increased commuter and vehicular traffic during construction, operations, and decommissioning. However, during construction and decommissioning, these impacts would be short term and primarily limited to onsite activities. Facility operations at the Stevens Point site would not adversely affect minority and low-income populations living near the existing industrial park. The level of potential radiological doses to the public from SHINE facility operations would be well below the annual dose limit and well within the NRC and the State of Wisconsin's regulatory limits. Permitted air emissions are expected to remain within regulatory standards. As a result, minority and low-income populations residing near the Stevens Point site could experience short-term disproportionate, but not high and adverse, environmental effects during construction and decommissioning. In addition, based on the discussions of air and water quality and human health effects for this alternative, SHINE facility operations at the Stevens Point site would not likely cause high and adverse human health or environmental effects for minority and low-income populations.

5.2.3.13 Cumulative Impacts

The past, present, and reasonably foreseeable future development projects and other actions that could result in cumulative impacts at the Stevens Point site were identified by reviewing published and unpublished data, including economic development plans, permit lists, news releases, and similar sources of information. An effort was made to identify all relevant activities conducted, regulated, or approved by a Federal agency or non-Federal entity within 5 mi (8 km) of the Stevens Point site. Available information about the projects and other activities identified is provided in Table 5–16.

Table 5–16. Past, Present, and Reasonably Foreseeable Future Projects and Other Actions Retained for the Cumulative Impacts Analysis Within a 5-mi (8-km) ROI of the Stevens Point Site

Project/ Company Name	Project Description	Location	Distance from Location	Status	Reference
Central Wisconsin Alcohol, Inc.	Ethanol plant based on whey fermentation	Plover	1 mi (1.6 km)	Operational	WDNR 2015e
NAPA Distribution Center	Replacing current parking lot with a new lot with 105 stalls; also planning a 25,000-sq.-ft (2,300-sq.-m) addition to distribution center	Stevens Point	1 mi (1.6 km)	Plans approved in April 2012	City of Stevens Point 2012a
Donaldson Company Inc.	Filter manufacturing facility	Stevens Point	1 mi (1.6 km)	Operating air permit renewed July 2014	WDNR 2015f
Municipal Transit Center	Development of a 35,070-sq.-ft (3,260-sq.-m) vacant lot for a parking lot with 57 parking spaces	Stevens Point	1 mi (1.6 km)	Plans approved in January 2012	City of Stevens Point 2012b
Focus on Energy Methane/ Natural-Gas-Fueled Electric Generator	New generator to be installed at existing Wastewater Treatment Facility; will burn digester gas (methane) produced there	Stevens Point	3 mi (4.8 km)	Plans approved in April 2013	City of Stevens Point 2012c, 2013a
Columbia Energy Center (455 MW baseload, coal fired)	Operating power plant with potential air pollution control projects for compliance with future regulatory requirements	Portage	3 mi (4.8 km)	Operating; additional air pollution control equipment installed July 2014 and more planned by 2018	Jerde 2011, 2014
Copps Food Center	Construction of a 70,000-sq.-ft (6,500-sq.-m) store with 385 stall parking lot	Stevens Point	3 mi (4.8 km)	Plans approved in December 2011; Operating	City of Stevens Point 2011a, Copps 2014
Schmeeckle Trails Housing Development	Existing residential development east of Stevens Point	Stevens Point	3.5 mi (5.6 km)	Features designs to reduce environmental impacts	Revelations Architects/ Builders 2013; SPJ 2008
WIMME Sand & Gravel	Sand and gravel plant	Plover (Portage County)	5 mi (8.0 km)	Operating	WDNR 2015g

Project/ Company Name	Project Description	Location	Distance from Location	Status	Reference
Marshfield/Rapids Connection Corridor	60-mi (97-km) corridor upgrade from Abbotsford to Stevens Point	Stevens Point	5 mi (8.0 km) at nearest point	Construction started in 2007; scheduled for completion in 2030	WDOT 2012
Water and Sewer Reconstruction Project	Michigan Avenue and Fourth Avenue mains to be reconstructed	Stevens Point	4 mi (6.4 km) 5 mi (8.0 km)	Substantially completed in 2012	City of Stevens Point 2011b, 2012d, 2012e
Lake Dredging (several locations)	Several areas dredged and fill material hauled off site	McDill Lake District (Portage County)	5 mi (8.0 km)	Completed January 2013	City of Stevens Point 2011a, Olson 2013
Ministry Saint Michael's Hospital	Hospital that performs radiological procedures	Stevens Point	3.6 mi (5.7 km)	Operating	MSMH 2014
Portage County Business Park	420-ac (170-ha) mixed-use business park	Stevens Point	Adjacent to western border of SHINE Stevens Point site	Partially Developed	PCBC 2014

Land Use and Visual Resources

This section addresses the direct and indirect effects of the construction, operations, and decommissioning of the SHINE facility at the Stevens Point site on land use and visual resources, when added to the aggregate effects of other past, present, and reasonably foreseeable future actions. The description of the affected environment in Section 5.2.3.1 serves as baseline conditions for the cumulative impact assessment of land use and visual resources. The incremental impacts from construction, operations, and decommissioning of the proposed SHINE facility on land use and visual resources would be SMALL, as described in Section 5.2.3.1.

Land Use

The projects and activities described in Table 5–16 would result in minimal changes to existing land uses, because new construction would occur either within or adjacent to existing facilities, or within areas that are currently zoned for industrial or residential use. Future urbanization and global climate change could contribute to additional decreases in agricultural lands, forests, grasslands, and wetlands. Urbanization in the vicinity of the Stevens Point site would alter important attributes of land use. Urbanization would reduce natural vegetation and agricultural fields, resulting in an overall decline in the extent and connectivity of wetlands, forests, grasslands, and wildlife habitat. Global climate change could reduce crop yields and livestock productivity (USGCRP 2014), which might change portions of agricultural land uses. However, existing parks, reserves, and managed areas would help preserve wetlands and forested areas. In addition, zoning laws and comprehensive land use plans would help ensure a proper balance of development (City of Stevens Point 2006).

Under the Farmland Protection Policy Act and its implementing regulations, the presence of important farmland soils (7 CFR 657.5), including prime farmland, was included in the cumulative impacts analysis. Development projects listed in Table 5–16 would incrementally and cumulatively add to the loss of important farmland soils, including prime farmland soils, in the region surrounding the proposed site. Otherwise qualifying farm lands in or already committed to urban development; lands acquired for a project on or before August 4, 1984; and lands acquired or used by a Federal agency for national defense purposes are exempt from the Act's provisions (7 CFR 658.2 and 658.3). Because many of the proposed projects have been committed to development, those sites do not have qualifying important farmland soils subject to the Act. The conversion of otherwise qualifying soils by projects within 5 mi (8 km) of the Stevens Point site would have a relatively minor impact on the inventory of important farmland soils within Portage County, as much of the northern and eastern sections of the county have lands mapped as prime farmland and prime farmland, if drained, in addition to farmland of statewide importance (Portage County 2006).

Given that reasonably foreseeable new construction activities would occur within or adjacent to existing facilities or within areas zoned for industrial or residential use, cumulative impacts on land use resources would be SMALL.

Visual Resources

The projects and activities described in Table 5–16 could result in changes to the existing viewshed, because the viewshed is varied and includes both aesthetically altered landscapes (agricultural fields, building, and warehouses) and natural wooded areas. New construction would occur either within or adjacent to existing facilities, or within areas that are currently zoned for industrial or residential use and, therefore, would have minimal impacts on visual resources. However, some could occur within wooded areas. Construction and operation of facilities within these areas would alter onsite conditions, and the contrast between the surrounding landscape and the new facility would be greater. Currently existing trees and buildings could partially obstruct views of the modified landscape.

Given that reasonably foreseeable new construction activities could occur within or adjacent to existing facilities or within areas zoned for industrial or residential use and of low scenic quality, or could occur within naturally wooded areas where there would be a noticeable contrast between the new facility and the forested viewshed, the NRC staff determined that cumulative impacts on visual resources would be SMALL to MODERATE.

<u>Air Quality and Noise</u>

This section addresses the direct and indirect effects of the construction, operations, and decommissioning of the SHINE facility at the Stevens Point site on air quality and noise, when added to the aggregate effects of other past, present, and reasonably foreseeable future actions. The incremental impacts from the construction, operations, and decommissioning of the proposed SHINE facility on air quality would be SMALL, as described in Section 5.2.3.2. The incremental impacts from the construction, operations, and decommissioning of the proposed SHINE facility on noise would be SMALL to MODERATE, as described in Section 5.2.3.3.

Air Quality

The ROI considered for the air quality analysis for a facility located in Stevens Point is Portage County, since air quality designations for criteria air pollutants are generally made at the county level.

As shown in Table 5–16, the ongoing and future projects located within 5 mi (8 km) of the Stevens Point site involve air permits. While these projects increase air-emission concentrations within the county, the activities would need to comply with the requirements stipulated in the permit. Therefore, these activities and projects are not expected to have significant impacts on air quality. Climate changes can affect air quality, as a result of changes in meteorological conditions. The combination of higher temperatures, stagnant air masses, sunlight, and emissions of precursors may make it difficult to meet NAAQS (USGCRP 2014). States, however, must continue to comply with the Clean Air Act and ensure air quality standards are met.

The NRC staff determined that the potential cumulative air quality impact associated with SHINE operations, in conjunction with other reasonably foreseeable projects, would be SMALL, primarily because projects that have overlapping impacts with the proposed SHINE facility would need to comply with requirements stipulated in air permits and would have relatively low emissions.

Noise

The ROI considered for noise is a 1-mi (1.6-km) radius from the site boundary of the SHINE facility at the Stevens Point site. Noise levels attenuate rapidly with distance. When distance is doubled from a point source, noise levels decrease by 6 dBA (MPCA 2014). For example, at half-a-mile distance from construction equipment with noise levels in the range of 85-90 dBA, noise levels can drop to 51–61 dBA and at a 1-mi (1.6-km) distance, levels drop further to 45-55 dBA. Generally, a 3-dBA change over existing noise levels is considered to be a “just noticeable” difference, and a 10-dBA increase is subjectively perceived as a doubling in loudness and almost always causes an adverse community response (NWCC 2002). To account for noise near the site boundary during construction and decommissioning, the ROI considered is a 1-mi (1.6-km) radius from the boundary of the proposed facility.

Some of the projects in Table 5–16 could produce increases in ambient noise that might affect some of the same areas at the Stevens Point site, since they involve construction activities. However, most of these projects are located 1 to 5 mi (1.6 to 8 km) from the Stevens Points site and noise impacts are not expected to be significant. For those projects that are within the 1-mi (1.6-km) radius ROI, construction equipment can result in noise levels in the range of 85-90 dBA; however, noise levels attenuate rapidly with distance, such that at half-a-mile distance from construction equipment, noise levels can drop to 51–61 dBA (NRC 2002). Therefore, these projects would not be expected to have significant overlapping noise impacts if construction occurred at the Stevens Point site. Given the distance of the nearest resident to the Stevens Point site and noise levels from construction and decommissioning activities, the NRC staff concludes that cumulative impacts on noise levels would be SMALL to MODERATE.

<u>Geologic Environment</u>

This section addresses the direct and indirect effects of the construction, operations, and decommissioning of the SHINE facility at the Stevens Point site on the geologic environment, when added to the aggregate effects of other past, present, and reasonably foreseeable future actions. The cumulative impacts on the geologic environment primarily relate to land disturbance and the potential for soil erosion and loss, as well as the projected consumption of geologic resources. The description of the affected environment in Section 5.2.3.3 serves as the baseline for the cumulative impact assessment of the geologic environment. The geographic area of analysis for evaluating cumulative impacts on soil resources includes the 5-mi (8-km) vicinity surrounding the proposed site. For geologic resources, the extent of the geologic area of analysis has been expanded to all of Portage County to encompass potential commercial sources of rock and mineral resources to support construction activities at the proposed site and vicinity. As the aspects of land disturbance and conversion are addressed separately in the Land Use section above, the cumulative impacts analysis here will focus on soil loss and consumption of geologic resources.

The NRC staff concludes that the incremental impacts from construction, operations, and decommissioning of the proposed SHINE facility on the geologic environment, including geologic and soil resources, would be SMALL, as described in Section 5.2.3.3.

New development and expansion projects listed in Table 5–16 would consume or extract geologic resources, including rock and mineral resources, or would require materials derived from such geologic resources (e.g., concrete). However, common construction materials such as sand and gravel and crushed stone are available and widely abundant in the county (Section 5.2.3.3) or are available regionally. Neither the geologic resource requirements to construct the proposed SHINE facility nor the resource requirements of any of the other identified facility expansion, development, or transportation projects are on a scale that would be likely to affect the regional sources and supplies of the identified resources. In conclusion, the NRC staff finds that cumulative impacts on geologic and soil resources would be SMALL.

Water Resources

This section addresses the direct and indirect effects of the construction, operations, and decommissioning of the SHINE facility at the Stevens Point site on water resources, when added to the aggregate effects of other past, present, and reasonably foreseeable future actions. The cumulative impacts on surface-water resources relate to issues concerning water use, water quality, and potential climate change. This further encompasses water withdrawal, effluent discharges, accidental spills and releases, and stormwater drainage and runoff. The description of the affected environment in Section 5.2.3.4 serves as a baseline for the cumulative impact assessment of water resources. For surface-water resources, the extent of the geolographic area of analysis has been expanded to include McDill Pond, an impoundment on the Plover River. For groundwater resources, the area considered encompasses the local groundwater basin in which groundwater is recharged and flows to discharge points and those aquifers from which groundwater is withdrawn through wells. Specifically, the cumulative impacts analysis focuses on those projects and activities that, when combined with the proposed action, would: (1) withdraw water from or discharge wastewater to McDill Pond and the Plover River downstream of the proposed site or (2) would use groundwater or could otherwise affect the same aquifers that would supply water to the proposed site. As discussed in Section 5.2.3.4, impacts on water resources at the Stevens Point site would be SMALL.

In addition to the proposed SHINE facility, new development and expansion projects listed in Table 5–16 and disturbing greater than 1 ac (0.4 ha) of land would have to obtain and comply with the provisions of the Wisconsin General Permit (WPDES Permit No. WI-S067831-4). This permit requires the development and implementation of a site-specific construction site erosion control plan, including specific BMPs, and a stormwater management plan (for postconstruction stormwater management).

Permits issued to all new stormwater and industrial wastewater dischargers would include provisions as part of Wisconsin-issued NPDES permits to comply with applicable water-quality-based effluent limitations and wasteload allocations established for downstream receiving waters. The proposed SHINE facility would have no direct sanitary or other wastewater discharges to surface water or groundwater. The SHINE facility would be served by the City of Stevens Point WTP, which has excess treatment capacity (Section 5.2.3.4).

The protection of groundwater quality in surficial aquifers and conservation of local groundwater supplies is a concern across Wisconsin. The City of Stevens Point's groundwater supply system is considered adequate to meet water supply needs over the short term. However, it has long-term plans to assure future supply while addressing issues with poor performing supply wells and wells with poor quality water (City of Stevens Point 2006). As a result of climate change, the Midwest may continue to experience an increase in annual precipitation, along with an increase in annual and seasonal temperatures. Increased precipitation, particularly during the spring and winter months, could increase groundwater recharge (USGCRP 2014). Regardless, the proposed SHINE facility would be served by the City of Stevens Point municipal water system (Section 5.2.3.4). Furthermore, neither the proposed SHINE facility nor each of the projects identified in Table 5–16 would be expected to require exorbitant volumes of groundwater or surface water that would affect water availability for other potential uses or users.

Based on the above, the NRC staff concludes that the cumulative impacts on water resources would be SMALL.

Ecological Resources

This section addresses the direct and indirect effects of the construction, operations, and decommissioning of the SHINE facility at the Stevens Point site on ecological resources, when added to the aggregate effects of other past, present, and reasonably foreseeable future actions. The description of the affected environment in Section 5.2.3.5 serves as a baseline for the cumulative impact assessment of ecological resources. The geographic area of analysis for evaluating cumulative impacts on ecological resources includes the area surrounding the Stevens Point site that is ecologically connected to the onsite ecological resources (e.g., the watershed surrounding the Stevens Point site). The incremental impacts from construction, operations, and decommissioning of the proposed SHINE facility would be SMALL, as described in Section 5.2.3.5.

Since European settlement, prairies, forests, and wetlands have been greatly reduced by at least 50 to 80 percent and converted into agricultural fields, industrial uses, and residential and commercial areas. Remaining tracts of grasslands, forests, and wetlands tend to be relatively small and isolated, which results in lower quality habitat than large tracts of habitat because of the different biological and physical characteristics along the edge of a habitat patch (WDNR 2013c).

Current threats to terrestrial and aquatic habitats include increased soil, nutrients, and other pollutants washing into streams and lakes from urban and agricultural stormwater runoff; continued conversion and fragmentation of wildlife habitat from development (Table 5–16); introduction of invasive species; and climate change (WDNR 2013c; USGCRP 2014). These activities will likely decrease the overall availability and quality of forested, grassland, and wetland habitats. Species with threatened, endangered, or declining populations are likely to be more sensitive to declines in habitat availability and quality and the introduction of invasive species.

As environmental stressors, such as future development and climate change, continue over the next few decades, certain attributes of the terrestrial and aquatic environment (such as habitat quality) are likely to change noticeably. The NRC staff does not expect these impacts to destabilize any important attributes of the terrestrial and aquatic environment, because such impacts will cause gradual change, which should allow most terrestrial and aquatic resources to adapt appropriately. The staff concludes that the cumulative impacts of the proposed construction and operation of the SHINE facility, plus other past, present, and reasonably foreseeable future projects or actions, would result in MODERATE impacts to terrestrial and aquatic resources.

Historic and Cultural Resources

This section addresses the direct and indirect contributory effects on historic and cultural resources from the construction, operations, and decommissioning of the proposed SHINE facility at the Stevens Point site, when added to the aggregate effects of other past, present, and reasonably foreseeable future actions. The geographic area considered in this analysis is the APE associated with the proposed SHINE facility, the proposed SHINE site, and its immediate vicinity. As discussed in Section 5.2.3.6, the impacts on historic and cultural resources from the construction, operations, and decommissioning of the SHINE facility would be SMALL.

The archaeological record for the region indicates prehistoric and historic occupation. Historic land development and prolonged agricultural use of the APE resulted in impacts on, and the loss of, cultural resources in the APE and its immediate vicinity. As described in Section 5.2.3.6, no known historic or cultural resources or historic properties are present within the APE. However, there remains the possibility for inadvertent discovery of historic or cultural resources within the APE. Direct impacts would occur if historic and cultural resources in the APE were to be physically removed or disturbed. Indirect visual or noise impacts could occur from new construction or maintenance. The only foreseeable project within the APE is the SHINE facility and the potential discovery of cultural resources on the proposed site. Should they be discovered, any cultural resources would be managed using SHINE BMPs developed for the proposed Janesville site (e.g., cultural resource management procedures and training) (SHINE 2013b). Therefore, the cumulative impact on historic and cultural resources of the proposed SHINE facility, when combined with other past, present, and reasonable foreseeable future activities, would be SMALL.

Socioeconomics

This section addresses the direct and indirect contributory effects on current socioeconomic conditions within the ROI from the construction, operations, and decommissioning of the SHINE facility at the Stevens Point site, when added to the effects from other past, present, and reasonably foreseeable future actions. The description of the affected environment in Section 5.2.3.7 serves as a baseline for the cumulative socioeconomic impact assessment. The geographic area of analysis is the ROI, Portage County. Section 5.2.3.7 found that socioeconomic impacts from construction, operations, and decommissioning of the proposed SHINE facility would be SMALL.

Table 5–16 identifies past, present, and reasonably foreseeable future actions within the ROI that could contribute to cumulative socioeconomic impacts. Relevant “other actions” that are considered in this cumulative impacts analysis are future construction projects that would bring new business and people to the ROI.

Depending on the number of workers needed to support the operation of the Central Wisconsin Alcohol Inc. and the Copps Food Center, there is the potential for increased population, employment, tax revenue, and demand for public services in the ROI. However, a majority of the workers would likely already reside within the ROI and are currently using public services. As discussed in Section 5.2.3.7, Portage County has adequate public services and water utilities capable of accommodating any population changes. Therefore, the contributory effects from the construction, operations, and decommissioning of the SHINE facility at the Stevens Point site, when added to other past, present, and reasonably foreseeable actions, would be SMALL.

Human Health

This section addresses the radiological and nonradiological direct and indirect effects on human health of the construction, operations, and decommissioning of the SHINE facility at the Stevens Point site, when added to the aggregate effects of other past, present, and reasonably foreseeable future actions. The geographic area of analysis for evaluating cumulative impacts on human health is the 5-mi (8-km) region surrounding the proposed Stevens Point site.

The Ministry Saint Michael's Hospital, which conducts radiological procedures, is 3.5 mi (5.7 km) from the Stevens Point site (SHINE 2013a). The use of radioactive materials for medical diagnosis and treatment is regulated by the State of Wisconsin. The NRC and the Governor of Wisconsin signed an agreement transferring regulatory authority over byproduct, source, and special nuclear materials to the State of Wisconsin, which became the 33rd Agreement State, effective August 11, 2003. As an Agreement State, the Wisconsin Department of Health Services is responsible for licensing and inspecting the above-named materials, except at nuclear power plants and Federal facilities (WDHS 2014).

No nuclear fuel cycle facilities occur within the 5-mi (8-km) region surrounding the proposed Stevens Point site that would contribute to the cumulative radiological impacts. Therefore, the NRC staff assessed the potential cumulative radiological impacts from the proposed SHINE facility at the Stevens Point site and the potential impacts from the use of radioactive materials at the Ministry Saint Michael's Hospital. Both facilities are or would be licensed and regulated, SHINE by the NRC and the Ministry Saint Michael's Hospital by the State, and both are or would be required to maintain radiation doses to their workers and members of the public within Federal and State dose limits. Also, given that SHINE would be 3.54 mi (5.69 km) from the Ministry Saint Michael's Hospital, radioactive emissions that are within regulatory limits would be reduced through the processes of dispersion and dilution as they travel in the atmosphere. Based on the regulatory controls that are and would be in place to control radiation exposure, the distance between the facilities, and the dilution of the radioactive materials, the NRC staff concludes that the cumulative radiological impacts to human health would be SMALL.

Table 5–16 identifies past, present, and reasonably foreseeable future actions within the ROI that could contribute to cumulative nonradiological impacts. The State of Wisconsin regulates the use of nonradioactive materials (i.e., chemicals and hazardous materials) at the Ministry Saint Michael's Hospital and would regulate their use at the proposed SHINE facility at the Stevens Point site. As discussed in Section 4.9 of this EIS, the State of Wisconsin has regulations for the safe use, storage, and disposal of nonradioactive materials. Wisconsin Administrative Code NR 460 addresses the identification; generation; minimization; transportation; and final treatment, storage, or disposal of hazardous and nonhazardous waste (SHINE 2013a). Both SHINE and the Ministry Saint Michaels's Hospital are or would be regulated by the State and are or would be required to maintain chemical exposure to their workers and members of the public within State limits. Also, based on the distance between each facility, nonradioactive emissions that are within regulatory limits are or would be reduced through the processes of dispersion and dilution as they travel in the atmosphere. Based on the regulatory controls that are or would be in place to control chemical exposure, the distance between the facilities listed in Table 5–16, and the dilution of the nonradioactive materials, the NRC staff concludes that the cumulative nonradiological impacts to human health would be SMALL.

Waste Management

This section addresses the radiological and nonradiological direct and indirect effects of the construction, operations, and decommissioning of the SHINE facility at the Stevens Point site from radioactive and nonradioactive wastes, when added to the aggregate effects of other past, present, and reasonably foreseeable future actions. The geographic area of analysis for evaluating cumulative impacts on human health is the 5-mi (8-km) region surrounding the proposed Stevens Point site.

In Section 5.2.2.9, the NRC staff concluded that the impacts from types and volumes of radioactive and nonradioactive wastes from the construction, operations, and decommissioning of the proposed SHINE facility at the Stevens Point site would be SMALL. There are no nuclear fuel cycle facilities located within the 5-mi (8-km) region surrounding the proposed Stevens Point site that would contribute to the cumulative impacts from radioactive wastes. Therefore, the NRC staff assessed the potential cumulative impacts from radioactive waste from the proposed SHINE facility at the Stevens Point site and the potential impacts from the disposal of radioactive waste at the Ministry Saint Michael's Hospital. Radioactive waste at both facilities will be regulated, SHINE by the NRC and the Ministry Saint Michael's Hospital by the State. The facilities will be required to store, process, and dispose of radioactive wastes in accordance with Federal and State requirements. As discussed in Section 4.9 of this EIS, radioactive wastes generated by the proposed SHINE facility will be packaged and transported off site to a licensed low-level radioactive waste facility for disposal (SHINE 2013a). In Section 4.9 of this EIS, the NRC staff concluded that the impacts from radioactive wastes generated and disposed of from the proposed SHINE facility would be SMALL. Radioactive waste generated at the Ministry Saint Michael's Hospital would also be packaged and transported off site to a licensed low-level radioactive waste facility for disposal. Based on the regulatory controls on packaging and transporting radioactive wastes, the NRC staff concludes that the cumulative impacts from radioactive waste would be SMALL.

Table 5–16 identifies past, present, and reasonably foreseeable future actions within the ROI that could contribute to cumulative nonradiological impacts. The State of Wisconsin regulates the use and disposal of nonradioactive waste (i.e., chemicals and hazardous materials) at the Ministry Saint Michael's Hospital and will regulate their use and disposal at the proposed SHINE facility at the Stevens Point site. As discussed in Section 4.9 of this EIS, the State of Wisconsin has regulations for the safe use, storage, and disposal of nonradioactive materials. Wisconsin Administrative Code NR 460 addresses the identification; generation; minimization; transportation; and final treatment, storage, or disposal of hazardous and nonhazardous waste (SHINE 2013a). SHINE and the facilities listed in Table 5–16 will be regulated by the State and will be required to safely store, package, transport, and dispose of nonradioactive wastes in accordance with State requirements. Based on the State's regulatory controls that will be in place to control nonradioactive wastes, the NRC staff concludes that the cumulative impacts from nonradioactive wastes would be SMALL.

Also, the projects and activities identified in Table 5–16 that are near the Stevens Point site generally are relatively small and would not be expected to have significant impacts from nonradioactive waste in the same areas affected by the proposed SHINE facility (SHINE 2013a).

Therefore, the NRC staff concludes that the potential cumulative impacts from radioactive and nonradioactive wastes from the proposed SHINE facility at the Stevens Point site in conjunction with other reasonably foreseeable future projects would be SMALL.

<u>Transportation</u>

This section addresses the direct and indirect effects on transportation from the construction, operations, and decommissioning of the SHINE facility at the Stevens Point site, when added to the aggregate effects of other past, present, and reasonably foreseeable future actions. The geographic area of analysis for evaluating cumulative impacts on transportation includes the site boundary and the 5-mi (8-km) region surrounding the proposed Stevens Point site. However, the roads for routes that could be used for delivery of medical isotopes (if air transport is not possible) or disposal of wastes were also considered. Transportation infrastructure includes roadways, rail lines, airports, and traffic-control devices. As discussed in Section 5.2.3.10, transportation impacts would be SMALL to MODERATE.

Construction projects in Table 5–16 could produce an increase in vehicular traffic on roads within the 5-mi (8-km) radius of the Stevens Point site. For example, construction of new or expanded businesses could add construction-related vehicles or employees commuting on roads near the Stevens Point site. Depending on the number of workers required and whether construction projects within the vicinity of the Stevens Point site were occurring at the same time as the SHINE facility's construction, operations, or decommissioning, traffic on access roads would increase. Most existing roads would be sufficient to handle the construction project transportation activities, and alternative routes could be used to minimize transportation impacts. In some cases, however, a noticeable increase in traffic could occur, especially if construction timeframes overlapped and construction workers and vehicles used the same roads. Therefore, depending on whether other construction projects overlapped with construction, operations, or decommissioning of the SHINE facility, or whether increased vehicular activity from workers or residents on roads near the Stevens Point site had a noticeable impact on traffic, the NRC staff concludes that cumulative transportation impacts would be SMALL to MODERATE.

Environmental Justice

The environmental justice cumulative impact analysis evaluates the potential contributory human health and environmental effects from the construction, operations, and decommissioning of the SHINE facility at the Stevens Point site, when added to the effects from other past, present, and reasonably foreseeable future actions on minority and low-income populations, and whether these effects might be disproportionately high and adverse. Minority and low-income populations are subsets of the general public residing near the Stevens Point site, and everyone would be exposed to the same environmental effects generated by the construction, operations, and decommissioning of the SHINE facility.

As discussed in Section 5.2.3.12, the Stevens Point site is located in a block group that exceeds the geographic area average for minority populations. The geographic area of analysis is the 5-mi (8-km) region surrounding the proposed SHINE facility at the Stevens Point site. Minority and low-income populations residing along site access roads could be disproportionately affected by noise and dust and increased commuter and other vehicular traffic during construction, operations, and decommissioning. However, during construction and decommissioning, these would be short term and primarily limited to onsite activities. Facility operations at the Stevens Point site would not have high and adverse human health and environmental effects on minority and low-income populations.

Table 5–16 identifies past, present, and reasonably foreseeable future actions within the geographic area of analysis that could contribute cumulative human health and environmental effects. Potential impacts on minority and low-income populations would mostly consist of environmental effects from construction (e.g., noise, dust, traffic, employment, and housing impacts). However, noise and dust impacts during construction and decommissioning would be short term and primarily limited to onsite activities. Minority and low-income populations residing along site access roads could be disproportionately affected by noise and dust and increased commuter and other vehicular traffic during construction. However, these effects are not likely to be high and adverse and would be contained within a limited period during certain hours of the day. Increased demand for temporary housing during construction could cause rental housing costs to rise, disproportionately affecting low-income populations who rely on inexpensive housing. However, given the availability of workers and the likelihood of workers commuting to the construction site, the need for rental housing could be reduced.

Operational emissions from manufacturing or industrial facilities within the 5-mi (8-km) radius of the Stevens Point site could disproportionately affect minority and low-income populations living in the vicinity of the proposed SHINE facility. However, everyone would be exposed to the same potential contributory effects, and any impacts would depend on the magnitude of the change in current environmental conditions. Permitted air emissions from all manufacturing and industrial facilities, including the contributory effects from the proposed SHINE facility, would be expected to remain within regulatory standards.

Based on this information and the analysis of human health and other environmental impacts presented in this section of the EIS, the contributory effects of constructing, operating, and decommissioning the SHINE facility are not likely to create high and adverse human health and environmental effects on minority and low-income populations living in the vicinity of the Stevens Point site.

5.3 Alternative Technologies

5.3.1 Identification of Reasonable Alternatives

The purpose of the SHINE facility is to use low-enriched uranium fission technology to domestically produce three medical isotopes: molybdenum-99, iodine-131, and xenon-133 (Section 2.0). Other alternative medical radioisotope production technologies exist that could be used to create these isotopes (e.g., *Making Medical Isotopes: Report of the Task Force on Alternatives for Medical-Isotope Production* (TRIUMF 2008) and *Homogeneous Aqueous Solution Nuclear Reactors for the Production of Mo-99 [molybdenum-99] and other Short Lived Radioisotopes* (IAEA 2008)).

While various publications have described a broad range of other technologies, the NRC staff considered three technologies for the purposes of this alternatives analysis.

These three alternative technologies are the following:

(1) neutron capture technology,

(2) aqueous homogenous reactor technology, and

(3) linear-accelerator-based technology.

These three technologies were chosen for the alternatives analysis, because they appear to be technologically reasonable. For example, the Department of Energy's (DOE's) National Nuclear Security Administration (NNSA), through the Office of Nuclear Nonproliferation's Global Threat Reduction Initiative, awarded cooperative agreements to commercial entities proposing a new technology to accelerate the dual objectives of eliminating the use of proliferation-sensitive highly enriched uranium in the production of medical radioisotopes and establishing reliable domestic supplies of molybdenum-99 to meet U.S. medical needs. In awarding these cooperative agreements, NNSA based its decision, in part, on an evaluation of the technical feasibility. The NRC staff notes that this alternatives analysis is not an endorsement of any type of technology but rather is an analysis of three alternatives that appear to be technologically reasonable. Further, the NRC staff notes that several commercial entities have proposed other methods to produce molybdenum-99, such as heterogeneous reactors. For the purposes of this EIS, the NRC staff has limited the alternatives analysis to the three technologies that NNSA is supporting through its cooperative agreements (as of February 2015) because when there are potentially a large number of alternatives, NEPA only requires that an agency analyze a reasonable number of examples, covering the full spectrum of alternatives, in the EIS (46 FR 18026).

In this analysis of the alternative technologies, the NRC staff evaluated the potential environmental impacts if a commercial entity were to construct and operate a facility on the proposed SHINE site in Janesville, Wisconsin, using alternative technology. The NRC staff notes that no commercial entity (other than SHINE) has proposed building or operating a facility at the proposed SHINE site. For the purposes of this analysis, the NRC staff reviewed environmental documents and technological descriptions related to the three alternative technologies, as described in further detail below.

5.3.2 Neutron Capture Alternative

For the neutron capture alternative, molybdenum-99 would be produced by neutron irradiation of raw molybdenum in a boiling water reactor (GE Hitachi 2011). However, the proposed Janesville site does not contain a boiling water reactor. The NRC staff does not consider construction of a new boiling water reactor to support the neutron capture technology to be considered reasonable, as the currently proposed site has insufficient space and other resources to support a power reactor. Alternatively, a research reactor could be used to produce molybdenum-99 using neutron capture technology. Sufficient space likely occurs on the proposed Janesville site to construct a new research reactor as part of the neutron capture alternative.

No commercial entity, however, has submitted an application to construct or operate a reactor using neutron capture, as of February 2015. Given the conceptual stage of the neutron capture technology and the lack of environmental data regarding the potential impacts from construction, operations, and decommissioning, the NRC staff determined that insufficient environmental information exists to meaningfully analyze the environmental impacts of this technology in detail. For these reasons, the NRC staff does not consider the neutron capture technology a reasonable alternative and has excluded it from further consideration.

5.3.3 Aqueous Homogenous Reactor Alternative

For the low-enriched uranium aqueous homogenous reactor alternative, molybdenum-99 would be produced using an aqueous homogenous reactor fueled by a uranium salt solution, followed by a series of chemical processes to extract the molybdenum-99 (IAEA 2008; B&W 2012). The size of each reactor would be approximately 200 to 240 kilowatts, and it would be capable of producing about 1,100 6-day curies (Ci) on a weekly basis (IAEA 2008). The reactor fuel solution would contain low-enriched uranium salt dissolved in water and acid. This solution would also be the target material for molybdenum-99 production, as fissioning the uranium-235 would produce molybdenum-99 and other isotopes. The reactor would be operated until a sufficient amount of molybdenum-99 occurred in the fuel solution. The fuel solution would be removed and processed using chemical purification to extract the molybdenum-99 (IAEA 2013). Afterwards, the molybdenum-99 would be transported to an end-user medical facility.

During operations, the aqueous homogenous reactors would produce radiolytic and other off-gases such as nitrogen oxides (IAEA 2008). The production process would also generate liquid waste from both the reactors and the processing of molybdenum-99 within the hot cells (IAEA 2008, 2013).

Several technical documents have been published that describe conceptual aqueous homogenous reactors to produce molybdenum-99 (e.g., IAEA 2008, 2013; B&W 2012). No commercial entity, however, has submitted an application to construct or operate an aqueous homogenous reactor, as of February 2015. Given the conceptual stage of the aqueous homogenous reactor technology and the lack of environmental data regarding the potential impacts from construction, operations, and decommissioning, the NRC staff determined that insufficient environmental information exists to meaningfully analyze the environmental impacts of this technology in detail. For these reasons, the NRC staff does not consider the aqueous homogenous reactor technology a reasonable alternative and has excluded it from further consideration.

5.3.4 Linear-Accelerator-Based Alternative

For the linear-accelerator-based alternative, molybdenum-99 would be produced by irradiating natural molybdenum (molybdenum enriched in the radioisotope molybdenum-100) in an accelerator. For the purpose of this analysis, the NRC staff assumed the facility would be similar to the facility described in NNSA's *Environmental Assessment for NorthStar Medical Technologies LLC Commercial Domestic Production of the Medical Isotope Molybdenum-99* (DOE 2012). The NRC acknowledges that other commercial entities have proposed methods of producing molybdenum-99 using linear-accelerator-based technology, such as Niowave, Inc. (Niowave 2015). However, for the purpose of this analysis, the NRC staff used the environmental parameters included in NNSA's environmental assessment for the NorthStar Medical Radioisotope facility because this commercial entity was awarded a cooperative agreement by NNSA and because sufficient environmental data exist regarding this proposed technology.

The facility for the linear-accelerator-based alternative would have the capacity to produce approximately 3,000 6-day Ci per week. To produce molybdenum-99, the operator would use a target made of molybdenum enriched in the radioisotope molybdenum-100 and would irradiate (or bombard) the targets using a pair of accelerators. Up to 16 accelerators would be constructed and used during operations (DOE 2012). After bombardment, the targets would be removed and chemically processed in hot cells to produce the molybdenum-99 radiochemical. The operator would then ship the molybdenum-99 radiochemical from the facility to an end-user medical facility. After further processing at the end-user medical facility, the spent or unusable portion of the radiochemical from the end-user facility would be returned.

During operations, the facility would produce radiolytic and other off-gases such as nitrogen oxides (DOE 2012). The production process would also generate radioactive and nonradioactive liquid waste (DOE 2012).

The NRC staff assumed that the operator would construct a containment building for the accelerators and radioactive waste facility (DOE 2012). In addition, a separate building or parts of the building would contain the processing facility (e.g., hot cells and chemical laboratories), areas for shipping and receiving, and a waste management center. Support facilities, such as administration buildings, parking lots, and holding tanks, would be similar to those for the SHINE facility.

The sections below evaluate the environmental impacts of the linear-accelerator-based alternative. For the purpose of this analysis, the NRC staff used the same environmental and engineering parameters described in NNSA's *Environmental Assessment for NorthStar Medical Technologies LLC Commercial Domestic Production of the Medical Isotope Molybdenum-99* (DOE 2012). However, the NRC staff assumed the linear-accelerator-based facility would be constructed at the Janesville site. The NRC staff notes that, if a linear-accelerator-based facility were constructed at the Janesville site, similar to NorthStar's facility, the State of Wisconsin could maintain authority over byproduct material, as described in 10 CFR Part 30. Therefore, the facility operator would not need to apply to the NRC for a construction permit or operating license. The purpose of the assessment below is to evaluate the environmental consequences of an alternative technology to the proposed technology at the Janesville site.

5.3.4.1 Land Use and Visual Resources Impacts

Constructing, operating, and decommissioning the linear-accelerator-based alternative at the Janesville site would disturb approximately 13 ac (5.3 ha) of agricultural land to build and operate areas for irradiation, processing facilities, waste management facilities, administration buildings, parking lots, and other support structures (DOE 2012). The highest structure would be the emissions stack for chemical processing, which would extend approximately 18 m (60 ft) in height, with a diameter of 0.6 m (2 ft) (DOE 2012). Therefore, the size, height, and footprint of the buildings for the accelerator-based alternative would be bounded by the parameters analyzed for the SHINE facility in Section 4.1. As described in Section 4.1, land use impacts during construction, operations, and decommissioning would be SMALL, because the entire site is currently zoned for industrial use, and the permanently converted agricultural land would be a small portion of available agricultural land within the vicinity. As described in Section 4.1, aesthetic impacts during construction, operations, and decommissioning would be SMALL at the Janesville site, given that a light industrial development landscape surrounds part of the site and the visual setting is generally flat and has a uniform landform with low vegetation diversity and a low visual-quality rating. Based on a similar or smaller footprint, building size, and building height for the linear-accelerator-based alternative, land use and visual impacts would be SMALL during construction, operations, and decommissioning.

5.3.4.2 Air Quality and Noise Impacts

Air quality and noise impacts during construction, operations, and decommissioning of the linear-accelerator-based alternative at the Janesville site would be very similar to those described in Section 4.2, based on the similar period of construction (18 months), construction methods, and operational activities (DOE 2012). The primary impacts would be from dust, vehicular emissions, and noise. For example, construction activities would generate air pollutant emissions from site-disturbing activities, such as grading, filling, compacting, trenching, and operating construction equipment. However, the NRC staff assumed that the operator would meet State and local regulations and ordinances. Additionally, given that less land would be disturbed and the footprint of the facility would be less for the linear-accelerator-based alternative, air quality and noise impacts are bounded by what is described in Section 4.2. Given the similar construction duration (18 months), construction methods, and operational and decommissioning activities, the NRC staff concludes that air quality and noise impacts would be SMALL during construction, operations, and decommissioning.

5.3.4.3 Geologic Environment

Direct impacts on the geologic environment, including the consumption of geologic resources, from the construction, operations, and decommissioning of the linear-accelerator-based alternative at the Janesville site would likely be similar to or less than those described in Section 4.3. This is because the area of disturbance would be the same or less than that described for the SHINE facility (DOE 2012). In particular, the potential for soil erosion and loss would likely be much less, as the area of land disturbance, associated earthwork, and overall need for geologic resources would be somewhat less, compared to the proposed action. During construction, grading activities would likely affect the upper 1.5 m (5 ft) of surface soil and would not result in net removal of soil or additions of fill material (DOE 2012). Excavation of the subgrade portions of buildings would remove up to approximately 21,000 m^3 (28,000 cubic yards (yd^3)) of soil and rock material (DOE 2012). Given that the area of disturbance and the potential for soil erosion and loss would be the same or less than those described for the SHINE facility, the NRC staff concludes that impacts on the geologic environment would be SMALL during construction, operations, and decommissioning.

5.3.4.4 Water Resources

Construction, operations, and decommissioning of the linear-accelerator-based alternative at the Janesville site would not entail direct impacts on natural surface-water drainages or on groundwater hydrology. The impacts of construction would be similar to or somewhat less than those from the proposed action, as presented in Section 4.4, because of similar construction methods and the size of the facilities (DOE 2012). Facility construction would have to be conducted in accordance with the provisions of the Wisconsin General Permit (WPDES Permit No. WI-S067831-4). This permit requires the development and implementation of a site-specific construction erosion control plan, including specific BMPs to minimize water-quality impacts, and a stormwater management plan (for postconstruction stormwater management).

Makeup water requirements for potable and process use to support facility operations would likely be the same or less than those for the proposed alternative, and water would be supplied from municipal sources (DOE 2012). Likewise, there would be no direct impact on water resources during operations and no direct discharge of liquid effluent (including sanitary or industrial wastewater) to surface water or groundwater. All wastewater would be conveyed to the City of Janesville WTP and would be subject to the city’s influent acceptance requirements for industrial users and in accordance with the Federal Clean Water Act.

Given that there would be no direct impact on natural surface-water drainages or on groundwater hydrology and that water would be supplied from municipal sources, the NRC staff concludes that the impact on water resources would be SMALL during construction, operations, and decommissioning.

5.3.4.5 Ecological Resources

As described in Section 5.3.4.1, the linear-accelerator-based alternative would disturb less land at the Janesville site than the proposed SHINE facility. Directly affected vegetation would be limited to cultivated crops and weedy species, both of which are abundant within the region and provide relatively low-quality habitat for birds and wildlife in comparison to forests, grasslands, and wetland habitats. In addition to a loss of habitat, noise from construction activities could disturb birds and wildlife. In response to such disturbances and loss of habitat, birds and wildlife could move out of the immediate area and find adequate, similar habitat (agricultural fields) within the vicinity. All other impacts on ecological resources, such as bird collisions, disturbance during maintenance activities, and potential runoff to offsite aquatic resources, are expected to be similar to those described for the proposed SHINE facility in Section 4.5 because of similar construction methods, similar or smaller building size and footprint, and similar operating and decommissioning activities. Therefore, the NRC staff concludes that the impacts on ecological resources would be SMALL during construction, operations, and decommissioning.

5.3.4.6 Historic and Cultural Resources

As described in Section 4.6, no historic or cultural resources were identified within the proposed Janesville site, and therefore, historic and cultural resources would not be affected by the linear-accelerator-based technology. Additionally, as described in Section 5.3.4.1, the linear-accelerator-based alternative would disturb less land at the Janesville site than the proposed SHINE facility, which reduces the likelihood of disturbing undocumented remains. During construction, operations, and decommissioning, the operator would use the same cultural resource management plan to manage and protect unidentified cultural resources as discussed in Section 4.6, regardless of which technology was chosen. Therefore, impacts on historic and cultural resources would be SMALL during construction, operations, and decommissioning.

5.3.4.7 Socioeconomics

Socioeconomic impacts from the linear-accelerator-based alternative would be similar to those described for the proposed SHINE facility in Section 4.7. For example, the linear accelerator workforce during construction, operations, and decommissioning would be similar to or less than the number of workers needed for the proposed SHINE facility discussed in Section 4.7 (DOE 2012). Some workers would need to relocate (temporarily or permanently) to the ROI. This would lead to an increase in tax revenue and an increased demand for temporary and permanent housing. As described in Section 4.7, the ROI has sufficient housing available to support any increase in population and has sufficient capacity to accommodate any increased demand for public services. Given the similar size of the estimated workforce for the proposed SHINE facility and the linear-accelerator-based alternative, socioeconomic impacts would be SMALL during construction, operations, and decommissioning.

5.3.4.8 Human Health

Impacts on human health from the linear-accelerator-based alternative are expected to be similar to those described in Section 4.8 for the proposed SHINE facility, based on the similar construction methods; radiological controls; and other policies, procedures, and regulations that protect public health and safety. For example, the NRC staff assumed that access controls during construction would allow only authorized personnel access to the site and prevent members of the public from coming on site. During construction, operations, and decommissioning, the NRC staff further assumed that the facility operator would implement normal safety practices contained in Occupational Safety and Health Administration regulations and that limits for toxic chemicals stored or used at the site would be below the threshold amounts listed in the Wisconsin Administrative Code (DOE 2012). Further, the design of the facility would likely incorporate measures to minimize radiation exposure to workers and members of the public (DOE 2012). Given the radiological controls and other policies, procedures, and regulations that the operator would follow to protect public health and safety, the NRC staff concludes that the impacts on human health would be SMALL during construction, operations, and decommissioning.

5.3.4.9 Waste Management

Construction activities would generate approximately 160 metric tons (175 tons) of solid waste in the form of wood, metal, concrete, or other miscellaneous construction debris (DOE 2012). This amount of waste would likely be similar to that produced for the SHINE facility, given the similar construction activities and size of buildings that would be constructed. Operation of the linear-accelerator-based alternative would generate about 10.4 m^3 (14 yd^3) of low-level radioactive waste, 2.4 m^3 (3.1 yd^3) of hazardous waste, and 45 m^3 (59 yd^3) of solid waste annually (DOE 2012). The NRC staff determined that existing commercial or municipal treatment and disposal facilities would be able to accommodate all projected quantities of waste generated by the linear-accelerator-based facility. During construction, operations, and decommissioning, the operator would likely implement waste management systems to protect the workers and the public from radiological exposures and processes to minimize chemical contamination. The operator would also be required to comply with NRC, DOT, and State of Wisconsin radiation protection requirements, as applicable. Therefore, the NRC staff concludes that impacts would be SMALL during construction, operations, and decommissioning.

5.3.4.10 Transportation

Transportation impacts during construction and decommissioning would come, for example, from the removal of excavated materials, shipment of construction materials or dismantled buildings to or from the site, transport of worker personnel, and movement of heavy equipment for onsite construction or decommissioning activities. Transportation impacts would be similar to those described for the SHINE facility in Section 4.10, because construction and decommissioning activities would be very similar and operate over a similar time span at the same location. Therefore, the increased level of traffic during construction and decommissioning could have a noticeable impact on traffic.

Transportation impacts during operation would come from shipments of hazardous and radioactive waste to treatment and disposal facilities; receipt of processing materials (e.g., acids and other chemicals); receipt of target materials; shipment of the molybdenum-99 and other medical radioisotopes; and, potentially, the return of technetium-99m generators. The operator of the facility and transportation vehicles would be required to adhere to the applicable NRC, DOT, and State of Wisconsin regulatory packaging and transportation requirements for radioactive material. Based on the similar transportation impacts that are expected for the SHINE facility and the linear-accelerator-based facility, the NRC staff concludes that impacts to transportation would be MODERATE during construction and decommissioning and SMALL during operations.

5.3.4.11 Accidents

DOE (2012) assessed a range of accidents involving radioactive molybdenum-99 or chemicals that would be used during the production process for a linear-accelerator-based facility. Accident scenarios included a severe accident from the release of the entire helium inventory from the accelerator cooling system, a severe accident to a member of the public from direct exposure to a freshly irradiated molybdenum target, and an accident resulting from an intentional destructive act involving the release of a significant portion of a freshly irradiated target (DOE 2012). Given the radiological controls and other policies, procedures, and Federal and State regulations that the operator would follow to protect public health and safety, the NRC staff concludes that the impacts to a member of the public from a potential accident would be SMALL.

5.3.4.12 Environmental Justice

The environmental justice impacts from a linear-accelerator-based alternative would be the same as those discussed for the SHINE facility in Section 4.12. Minority and low-income populations residing along site access roads or near the site could be disproportionately affected by noise and dust and increased commuter and other vehicular traffic during the construction, operations, and decommissioning of either technology. However, during construction and decommissioning, these impacts would be short term and primarily limited to onsite activities. Operation of either technology would not adversely affect minority and low-income populations living near the Janesville site. The level of potential radiological doses to the public from SHINE facility operations would be well below the annual dose limit and well within the NRC and the State of Wisconsin's regulatory limits. Permitted air emissions are expected to remain within regulatory standards. As a result, minority and low-income populations residing near the existing industrial park and the proposed SHINE facility could experience short-term disproportionate, but not high and adverse, human health and environmental effects from the linear-accelerator-based alternative.

5.3.4.13 Cumulative Impacts

Cumulative impacts for the linear-accelerator-based alternative would be similar to those described in Chapter 4 for the SHINE facility at the Janesville site, because the direct contributory effects from construction, operations, and decommissioning for the two technologies would be similar.

5.4 Cost-Benefit Comparison

NEPA and CEQ require that all agencies of the Federal government prepare detailed environmental statements on proposed major Federal actions significantly affecting the quality of the human environment. One of NEPA's principal objectives is to require each Federal agency to consider, in its decisionmaking process, the environmental impacts of each proposed major action. In particular, as stated below, Section 102 of NEPA requires all Federal agencies to the fullest extent possible to:

> (B) identify and develop methods and procedures, in consultation with the Council on Environmental Quality established by Title II of this Act, which will insure that presently unquantified environmental amenities and values may be given appropriate consideration in decision-making along with economic and technical considerations. (42 U.S.C. 4321)

However, neither NEPA nor CEQ requires the benefits and costs of a proposed action to be quantified in dollars or any other common metric. The intent of this section is not to identify and quantify all potential societal benefits of the proposed action and compare them to potential costs. Instead, it focuses only on those benefits and costs of such magnitude or importance that including them in this analysis can inform the decisionmaking process.

This section compiles the expected impacts from operations of the proposed SHINE facility and aggregates them into two final categories: (1) the expected costs and (2) the expected benefits derived from approving the proposed action. Table 5–17 describes the following information on major environmental costs and benefits, including:

- average annual production of commercial products,
- expected increase in tax payments to State and local tax jurisdictions during construction and operations,
- other benefits,
- environmental degradation, which includes impacts on: land use and visual resources, air quality, geologic environment, water resources, ecological resources, historic and cultural resources, socioeconomics, noise, traffic congestion, environmental justice, and increased demand for public services,
- effects on human health, and
- other costs, which include lost tax revenues, decreased recreational value, and transportation (as appropriate).

General issues related to SHINE's commercial financial viability are outside the NRC's mission and authority.

1 **Table 5–17. Costs and Benefits of Constructing, Operating, and Decommissioning the**
2 **Proposed SHINE Facility at the Janesville, Wisconsin, Site**

Cost Benefit Category	Description	Impact Assessment
Benefits		
Domestic Production of Molybdenum-99	SHINE would produce a domestic supply of molybdenum-99; no domestic producers of this widely used medical radioisotope currently exist in the U.S. and the U.S. currently imports all of its supply.	–
Use of Low-enriched Uranium Target Solution	SHINE would use low-enriched uranium target solution for production of medical radioisotopes, contributing to the Federal nonproliferation objective to phase out U.S. exports of highly enriched uranium, as identified in the Energy Policy Act of 1992.	–
Tax Revenues	The estimated total construction dollars spent in the local community associated with the SHINE facility are expected to be approximately $20 to $30 million for labor, electrical equipment, cabling, and concrete, spread over the construction period. SHINE intends to enter into a TIF agreement during the first 10 years of the proposed project, covering the entirety of the construction period, allowing them to make payments in lieu of taxes at an estimated payments total of $600,000 per year. SHINE would pay property taxes estimated to be $35,000 per year based on the assessed property before improvements during this 10-year period.	–
Local Economy	Increased jobs would benefit the area economically and increase the economic diversity of the region. (Section 4.7)	–
Costs		
Land Use	The site would include 91.1 ac (36.9 ha) of agricultural land and 0.18 ac (0.07 ha) of undeveloped open areas, which is a small portion of the agricultural land within a 5-mi (8-km) radius of the site (Section 4.1.1). The location of the proposed facility is within an area zoned for light industrial use. No additional land would be disturbed during operations or decommissioning.	SMALL
Visual Resources	The proposed SHINE facility would not noticeably alter visual resources, based on the low scenic quality, low scenic value, and light industrial viewshed within the vicinity of the proposed site. (Section 4.1.2)	SMALL
Air Quality	Air quality impacts during construction, operations, and decommissioning, would be negligible, given the relatively low emissions and the pollution control measures that would be required in air permits from WDNR. (Section 4.2)	SMALL

Cost Benefit Category	Description	Impact Assessment
Noise	During construction, operations, and decommissioning, noise would be minimal, given the minor (1 to 2 dBA) expected increases in noise levels. (Section 4.2)	SMALL
Geologic Environment	Construction of the proposed SHINE facility would consume geologic resources and have the potential to increase soil erosion, but the overall impact would be minor, given that the geologic resources are widely available within the region and erosion would be managed with the implementation of BMPs. (Section 4.3)	SMALL
Water Resources	Water-resource impacts during construction, operations, and decommissioning would be negligible, because of the lack of surface-water features on site and the use of municipal water. (Section 4.4)	SMALL
Ecological Resources	Terrestrial and aquatic ecology impacts are expected to be SMALL, based on the limited amount of land that would be disturbed and because the entire site includes previously disturbed habitat. (Section 4.5)	SMALL
Historic and Cultural Resources	SHINE could inadvertently discover previously unidentified cultural resources caused by land disturbance during construction, operations, or decommissioning. However, impacts would be SMALL based on (1) no known NRHP-eligible historic properties or historic and cultural resources on the proposed SHINE facility site, (2) tribal input, (3) SHINE's CRMP procedures, and (4) cultural resource assessment and consultations performed by the NRC staff. (Section 4.6)	SMALL
Socioeconomic	Socioeconomic impacts are expected to be SMALL, based on the size of the workforce required to construct, operate and decommission the SHINE facility. (Section 4.7)	SMALL
Human Health	Human health impacts would be minimized because access to the site would be restricted, SHINE would implement normal safety practices contained in OSHA regulations, and SHINE would operate the proposed SHINE facility in accordance with all applicable Federal and State of Wisconsin regulatory requirements. (Section 4.8)	SMALL

Cost Benefit Category	Description	Impact Assessment
Waste Management	Based on the availability of waste disposal pathways for radiological and nonradiological waste; SHINE's proposed waste management systems; engineered design features to minimize radioactive and nonradioactive contamination; and NRC, DOT, and State of Wisconsin radiation protection requirements, the NRC staff concludes that radioactive waste is expected to be managed in accordance with applicable regulatory requirements. (Section 4.9)	SMALL
Transportation	Traffic would noticeably increase on local roads during construction and decommissioning because of the overall increase in average daily traffic flow and because of construction- and decommissioning-related truck traffic. (Section 4.10) During operations, the increase in traffic would be minor because of the lower number of employees commuting to and from the site. SHINE and common-carrier trucks would be required to adhere to the applicable NRC, DOT, and State of Wisconsin regulatory packaging and transportation requirements for radioactive material. However, because the additional traffic attributable to SHINE worker vehicles would result in morning peak-hour traffic delays sufficient to reduce the existing level of service (traffic flow) at a key intersection near the SHINE facility, impacts could temporarily be MODERATE. (Section 4.10)	SMALL to MODERATE
Accidents	The NRC staff is conducting a thorough independent review of the potential dose to the public from chemical and radiological accidents in the NRC staff's safety evaluation report (SER). Assuming that the NRC staff determines in its SER that the hypothetical accident dose is within the dose limits in 10 CFR 70.61 and 10 CFR 20.1301, the NRC staff concludes that the impacts from potential chemical and radiological accidents would be SMALL.	SMALL

Cost Benefit Category	Description	Impact Assessment
Environmental Justice	Minority and low-income populations residing along site access roads or near the proposed site could be affected by noise and dust and increased commuter and other vehicular traffic during construction and decommissioning. However, these would be short term and primarily limited to onsite activities. Operation of the proposed SHINE facility is not expected to disproportionately affect minority and low-income populations, as everyone living near the proposed SHINE facility and the existing industrial park would be exposed to the same potential effects from operations, and any impacts would depend on the magnitude of the change in ambient conditions. Permitted nonradiological air emissions are expected to remain within regulatory standards. (Section 4.12).	Minority and low-income populations would not be expected to experience any high and adverse effects

5.4.1 Benefit and Costs of Alternatives

This section compares the environmental impacts for the alternative sites and alternative technology with the proposed SHINE facility in Janesville. Table 5–18 provides a tabular comparison of the potential environmental impacts of constructing, operating, and decommissioning the proposed SHINE facility in Janesville, Wisconsin, with each of the alternative sites (Chippewa Falls and Stevens Point) and the no-action alternative. Both Chippewa Falls and Stevens Point alternative sites would have some resource areas with MODERATE impacts. For example, these alternative sites would have MODERATE noise and transportation impacts during construction and decommissioning. In addition, the Stevens Point alternative site would have a MODERATE visual impact during construction. The no-action alternative would have SMALL impacts for every resource area, because there would be no change in current environmental conditions at the proposed site.

Table 5–19 provides a tabular comparison of the potential environmental impacts of constructing, operating, and decommissioning a linear-accelerator-based alternative with the proposed SHINE facility, both in Janesville, Wisconsin. Both the proposed SHINE facility and the linear-accelerator-based alternative would have SMALL to MODERATE transportation impacts as a result of traffic. The impacts would be SMALL for all other resource areas.

Construction and operation of the proposed facility at an alternative site or using an alternative technology would not reduce or avoid adverse effects, compared with constructing and operating the proposed SHINE facility in Janesville, Wisconsin. The adverse environmental impacts from the no-action alternative would be SMALL. However, the no-action alternative would not fulfill the purpose and need for the proposed action.

Table 5–18. Comparison of Impacts for the Proposed SHINE Facility, Proposed Alternative Sites, and No-Action

Impacts on Resource or Other Area Evaluation	Janesville	Chippewa Falls	Stevens Point	No-Action
Land Use	SMALL	SMALL	SMALL	SMALL
Visual Resources	SMALL	SMALL	SMALL to MODERATE	SMALL
Air Quality	SMALL	SMALL	SMALL	SMALL
Noise	SMALL	SMALL to MODERATE	SMALL to MODERATE	SMALL
Geology	SMALL	SMALL	SMALL	SMALL
Water Resources	SMALL	SMALL	SMALL	SMALL
Ecological Resources	SMALL	SMALL	SMALL	SMALL
Historical and Cultural Resources	SMALL	SMALL	SMALL	SMALL
Socioeconomic	SMALL	SMALL	SMALL	SMALL
Human Health	SMALL	SMALL	SMALL	SMALL
Waste Management	SMALL	SMALL	SMALL	SMALL
Transportation	SMALL to MODERATE	SMALL to MODERATE	SMALL to MODERATE	SMALL
Environmental Justice	No high and adverse human health and environmental effects on minority and low-income populations			

Table 5–19. Comparison of Technologies at the Proposed SHINE Facility in Janesville

Impacts on Resource or Other Area Evaluation	SHINE Technology	Linear-Accelerator-based Technology
Land Use	SMALL	SMALL
Visual Resources	SMALL	SMALL
Air Quality	SMALL	SMALL
Noise	SMALL	SMALL
Geology	SMALL	SMALL
Water Resources	SMALL	SMALL
Ecological Resources	SMALL	SMALL
Historical and Cultural Resources	SMALL	SMALL
Socioeconomic	SMALL	SMALL
Human Health	SMALL	SMALL
Waste Management	SMALL	SMALL
Transportation	SMALL to MODERATE	SMALL to MODERATE
Environmental Justice	No high and adverse human health and environmental effects on minority and low-income populations	

5.4.2 Cost Benefit Conclusions

In Chapter 4 and the preceding sections of Chapter 5, the NRC staff described the costs and benefits of the proposed action as well as alternatives to the proposed action. In weighing the costs and benefits, the NRC staff concludes that the overall benefits of constructing, operating, and decommissioning the proposed SHINE facility at the Janesville site outweigh the disadvantages and costs based upon the following considerations:

- U.S. policy is to ensure a reliable supply of medical radioisotopes while minimizing the use of highly enriched uranium for civilian purposes (NNSA 2011; White House 2012),
- the small environmental impact, including radiological impacts and risk to human health, which would be caused by constructing, operating, and decommissioning the proposed SHINE facility at the Janesville site,
- the economic benefit of constructing and operating the proposed SHINE facility to communities located near the Janesville site, and
- the increased availability of medical isotopes for U.S. public health needs.

Constructing, operating, and decommissioning the SHINE facility at the Janesville site would have slightly less environmental costs than at either alternative site because impacts from noise would be SMALL to MODERATE at both the Chippewa Falls and the Stevens Point sites, in part because the nearest resident would be closer, and the noise more audible to the closest resident, than at the Janesville site. In addition, the impacts to visual resources would also be greater at the Stevens Point site (SMALL to MODERATE), if SHINE clears the majority of the onsite wooded areas, which would increase the visibility of the new facility. However, the overall benefits of constructing and operating the proposed SHINE facility at any of the sites would outweigh the environmental disadvantages and costs for the reasons outlined above.

Installation of an alternative technology (e.g., linear-accelerator-based) would not result in any greater economic advantages or disadvantages over the proposed SHINE technology and the environmental costs and benefits would be similar to those described for the proposed SHINE facility at the Janesville site. Therefore, the overall benefits and costs of utilizing an alternative technology at the Janesville site would be the same and would outweigh the environmental disadvantages and costs for the reasons outlined above.

5.5 Alternatives Summary

In this chapter, the NRC staff considered the following alternatives to construction, operations, and decommissioning of the SHINE facility at the proposed site in Janesville, Wisconsin:

- the no-action alternative;
- construction, operations, and decommissioning of the SHINE facility at the Chippewa Falls site (Alternative Site No. 1);
- construction, operations, and decommissioning of the SHINE facility at the Stevens Point site (Alternative Site No. 2); and
- construction, operations, and decommissioning of a linear-accelerator-based facility at the SHINE site (alternative technology).

The impacts for the proposed action, the no-action alternative, the two alternative sites, and the alternative technology are summarized in Tables 5–18 and 5–19.

In conclusion, the NRC staff notes that the no-action alternative would result in SMALL impacts to all resource areas. The no-action alternative, however, does not fulfill the purpose and need of the project. The environmentally preferred alternatives are the construction, operations, and decommissioning of the SHINE facility and the linear-accelerator-based facility at the Janesville, Wisconsin, site. The impacts associated with the proposed action and the alternative technology would be SMALL for all resource areas, except for traffic, which would incur MODERATE impacts during construction and decommissioning. The other alternatives capable of meeting the purpose and need of the project would entail potentially greater impacts than the proposed action of constructing the SHINE facility. For example, the impacts at both alternative sites would be SMALL for most resource areas; however, the NRC staff determined that impacts from noise would be SMALL to MODERATE at both the Chippewa Falls and the Stevens Point sites and the impacts to visual resources would be SMALL to MODERATE at the Stevens Point site. Similar to the proposed Janesville site, the impacts at both the Chippewa Falls and the Stevens Points site would be SMALL to MODERATE for traffic.

5.6 References

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6.0 CONCLUSIONS

This environmental impact statement (EIS) contains the environmental review of the SHINE Medical Technologies, Inc. (SHINE), application for a construction permit under Title10 of the *Code of Federal Regulations* (10 CFR) Part 50 that would allow construction of a medical radioisotope production facility(SHINE facility) in Janesville, Wisconsin. This EIS follows the requirements in 10 CFR Part 51, which are the U.S. Nuclear Regulatory Commission's (NRC's) regulations that implement the National Environmental Policy Act of 1969. This chapter presents conclusions and recommendations from the environmental review of the SHINE facility. Section 6.1 summarizes the environmental impacts of construction, operations, and decommissioning. Section 6.2 compares the environmental impacts of the proposed action, the construction of the SHINE facility at two alternative sites, and the construction of an alternative technology at the proposed site at Janesville, Wisconsin. Section 6.3 discusses unavoidable impacts of the proposed action and alternatives to the proposed action and identifies resource commitments. Section 6.4 presents conclusions and staff recommendations. Finally, Section 6.5 provides a list of references.

6.1 Environmental Impacts of the Proposed Action

The NRC staff concludes that issuing a construction permit for the SHINE facility would have SMALL impacts for all resource areas with the exception of transportation. The impacts to transportation would be SMALL to MODERATE because of the noticeable increase in average daily traffic flow. The addition of up to 465 vehicles per day (or approximately 1,000 trips per day) from construction activities and 261 vehicles per day (or approximately 580 trips a day) from decommissioning activities at the proposed SHINE facility would result in an increased traffic volume on U.S. Highway 51. This increase in traffic would not likely destabilize traffic conditions near the SHINE site because traffic analyses indicate that the level of construction- and decommissioning-related traffic would not affect the level of service anywhere in the transportation infrastructure; therefore, the transportation infrastructure would not require any modifications (SHINE 2013a). During operations, a "slight degradation of service" (i.e., traffic delays) would occur at the intersection of westbound State Trunk Highway 11 onto southbound U.S. Highway 51 during the morning during peak hours of commuting. The NRC staff expects the overall daily traffic flow in the immediate vicinity of the proposed SHINE facility to increase slightly during the operation phase, but it would not be appreciable when compared with the average daily and annual traffic flow of roads in the immediate vicinity of the proposed SHINE facility. Table 6–1 summarizes the potential impacts.

The staff also considered cumulative impacts of past, present, and reasonably foreseeable future actions regardless of which agency (Federal or non-Federal) or person undertakes them. In Section 4.13, the staff concluded that the cumulative impacts would be SMALL for all areas with the exception of ecological resources and transportation. For ecological resources, the NRC staff concluded that the cumulative impacts would be MODERATE. For transportation, the NRC staff concluded that the cumulative impacts would be SMALL to MODERATE.

Table 6–1. Summary of Environmental Impacts from Construction, Operations, and Decommissioning of the Proposed SHINE Facility at the Janesville Site

Resource Area	Summary of Impact	Impact Level
Land Use	The site would include 91.1 acres (ac) (36.9 hectares (ha)) of agricultural land and 0.18 ac (0.07 ha) of undeveloped open areas, which is a small portion of the agricultural land within a 5-mi (8-km) radius of the site (Section 4.1.1). The location of the proposed facility is within an area zoned for light industrial use. No additional land would be disturbed during operations or decommissioning.	SMALL
Visual Resources	The proposed SHINE facility would not noticeably alter visual resources, based on the low scenic quality, low scenic value, and light industrial viewshed within the vicinity of the proposed site. (Section 4.1.2)	SMALL
Air Quality	Construction, operations, and decommissioning of the proposed SHINE facility would result in additional air emissions. Given the relatively low emissions and the pollution control measures that air permits from the Wisconsin Department of Natural Resources would require (Section 4.2), the proposed SHINE facility would not noticeably alter air quality in Rock County.	SMALL
Noise	During construction, operations, and decommissioning, noise would be minimal given the minor (1 to 3 dBA) expected increases in noise levels. (Section 4.2)	SMALL
Geologic Environment	Construction of the proposed SHINE facility would consume geologic resources and have the potential to increase soil erosion, but the overall impact would be minor, given that the geologic resources are widely available within the region and erosion would be managed with the implementation of best management practices (BMPs). (Section 4.3)	SMALL
Water Resources	Water-resource impacts during construction, operations, and decommissioning would be negligible, because of the lack of surface-water features on site and the use of municipal water. (Section 4.4)	SMALL
Ecological Resources	Terrestrial and aquatic ecology impacts are expected to be SMALL, based on the limited amount of land that would be disturbed and because the entire site includes previously disturbed habitat. (Section 4.5)	SMALL
Historic and Cultural Resources	SHINE could inadvertently discover previously unidentified cultural resources caused by land disturbance during construction, operations, or decommissioning. However, impacts would be SMALL based on (1) no known historic properties eligible for listing in the National Register of Historic Places, or historic and cultural resources on the proposed SHINE facility site, (2) tribal input, (3) SHINE's cultural resource management plan procedures, and (4) cultural resource assessment and consultations performed by the NRC staff. (Section 4.6)	SMALL
Socioeconomic	Socioeconomic impacts would be SMALL based on the size of the workforce required to construct, operate, and decommission the SHINE facility. (Section 4.7)	SMALL

Resource Area	Summary of Impact	Impact Level
Human Health	Human health impacts would be minimized because access to the site would be restricted, SHINE would implement normal safety practices contained in Occupational Safety and Health Administration regulations, and SHINE would operate the proposed SHINE facility in accordance with all applicable Federal and State of Wisconsin regulatory requirements. (Section 4.8)	SMALL
Waste Management	Based on the availability of waste disposal pathways for radiological and nonradiological waste; SHINE's proposed waste management systems; engineered design features to minimize radioactive and nonradioactive contamination; and NRC, U.S. Department of Transportation (DOT), and State of Wisconsin radiation protection requirements, the NRC staff concludes that radioactive waste is expected to be managed in accordance with applicable regulatory requirements. (Section 4.9)	SMALL
Transportation	Traffic would noticeably increase on local roads during construction and decommissioning from commuting workers; the use of construction vehicles; and transportation of construction materials, goods, and other materials to and from the proposed sites (Section 4.10). During operations, the increase in traffic would be minor because of the lower number of employees commuting to and from the site. SHINE and common-carrier trucks would be required to adhere to the applicable NRC, DOT, and State of Wisconsin regulatory packaging and transportation requirements for radioactive material. (Section 4.10)	SMALL to MODERATE
Accidents	The NRC staff is conducting a thorough independent review of the potential dose to the public from chemical and radiological accidents in its safety evaluation report (SER). Assuming that the NRC staff determines in its SER that the hypothetical accident dose is within the dose limits in 10 CFR 70.61 and 10 CFR 20.1301, the NRC staff concludes that the impacts from potential chemical and radiological accidents would be SMALL. (Section 4.11)	SMALL

Resource Area	Summary of Impact	Impact Level
Environmental Justice	Minority and low-income populations residing along site access roads or near the proposed site could be affected by noise and dust and increased commuter and other vehicular traffic during construction and decommissioning. However, these would be short term and primarily limited to onsite activities. Operation of the proposed SHINE facility is not expected to disproportionately affect minority and low-income populations, as everyone living near the proposed SHINE facility and the existing industrial park would be exposed to the same potential human health and environmental effects from operations, and any impacts would depend on the magnitude of the change in ambient conditions. Permitted nonradiological air emissions are expected to remain within regulatory standards. (Section 4.12)	Minority and low-income populations would not be expected to experience any high and adverse human health and environmental effects.

6.2 Comparison of Alternatives

In Chapter 5, the NRC staff considered the following alternatives to construction, operations, and decommissioning of the SHINE facility at the proposed site in Janesville, Wisconsin:

- the no-action alternative;
- construction, operations, and decommissioning of the SHINE facility at the Chippewa Falls site (Alternative Site No. 1);
- construction, operations, and decommissioning of the SHINE facility at the Stevens Point site (Alternative Site No. 2); and
- construction, operations, and decommissioning of a linear-accelerator-based facility at the SHINE site (alternative technology).

Tables 5–18 and 5–19 summarize the impacts for the proposed action, the no-action alternative, the two alternative sites, and the alternative technology.

In conclusion, the NRC staff notes that the no-action alternative would result in SMALL impacts to all resource areas. However, the no-action alternative does not fulfill the purpose and need of the project. The environmentally preferred alternatives are the construction, operations, and decommissioning of the SHINE facility and the linear-accelerator-based facility at the Janesville site. The impacts associated with the proposed action and the alternative technology would be SMALL for all resource areas with the exception of traffic, which would incur SMALL to MODERATE impacts. The other alternatives capable of meeting the purpose and need of the project would entail potentially greater impacts than the proposed action of constructing the SHINE facility. For example, the impacts at both alternative sites would be SMALL for most resource areas; however, the NRC staff determined that impacts from noise would be MODERATE at both the Chippewa Falls and Stevens Point sites and that the impacts to visual resources would be SMALL to MODERATE at the Stevens Point site. Similar to those at the proposed Janesville site, the impacts at both the Chippewa Falls and Stevens Point sites would be SMALL to MODERATE for traffic.

6.3 Resource Commitments

6.3.1 Unavoidable Adverse Environmental Impacts

Section 102(2)(C)(ii) of the National Environmental Policy Act of 1969 requires that an EIS include information on any adverse environmental effect that cannot be avoided should the proposal be implemented. Unavoidable adverse impacts are predicted adverse environmental impacts that cannot be avoided and that have no practical means of further mitigation. Table 6–2 presents the unavoidable adverse impacts from construction, operations, and decommissioning of the proposed SHINE facility and presents mitigations and controls intended to lessen the adverse impact. Unless noted otherwise, mitigation measures were from SHINE's Environmental Report (SHINE 2013a) or from responses to requests for additional information (SHINE 2013b, 2014, 2015).

As described above, impacts to all resource areas would be SMALL with the exception of transportation. For those resource areas that would have SMALL impacts, the environmental effects would not be detectable or would be so minor that they would neither destabilize nor noticeably alter any important attribute of the resource. For transportation, the NRC staff determined that the proposed action could noticeably alter traffic conditions on U.S. Highway 51 as described above in Section 6.1. To mitigate the increase in traffic and to help reduce traffic congestion, SHINE plans to use a staggered construction work-shift schedule to reduce the hourly traffic flow onto U.S. Highway 51 and to schedule truck deliveries early in the day. In addition, SHINE would ensure that delivery routes would avoid residential and sensitive areas.

Table 6–2. Unavoidable Adverse Environmental Impacts

Resource Area	Mitigation Measures	Unavoidable Adverse Impact
Land Use and Visual Resources	The facility would be built and operated in compliance with all local zoning requirements. Once SHINE completes construction activities, it may vegetate open areas with crops, native prairie grasses, or cool-season grasses to offset loss of agricultural lands. Vegetated areas could also mitigate impacts to visual resources given that the majority of the surrounding viewshed is cultivated fields or grasses. SHINE would also mitigate impacts by landscaping or planting shrubs along U.S. Highway 51 and bordering access roads.	Up to 91.1 ac (36.9 ha) of agricultural land could be converted to industrial land use. Partial obstruction of views of the existing landscape as a result of the new facility and the steam plume during operations.

Resource Area	Mitigation Measures	Unavoidable Adverse Impact
Air Quality	Air quality permits from the Wisconsin Department of Natural Resources would set emission limits and would establish monitoring, recordkeeping, and reporting requirements with which SHINE would be required to comply. SHINE would control emissions of nitrogen oxide from the natural-gas-fired boiler using low nitrogen oxide burners and emissions from gas-fired heaters using combustion controls and properly designed and tuned burners. SHINE would use BMPs and dust control plans for controlling fugitive dust and other emissions. Furthermore, SHINE plans on developing programs, as appropriate, to encourage carpooling to minimize worker vehicle emissions.	Short-term, localized increases in fugitive dust and air emissions would primarily occur at and near the proposed SHINE facility.
Noise	The facility design (e.g., wall thickness and other physical barriers) and distance to the sensitive receptors would limit offsite noise levels. In addition, during construction, noise from traffic would be mitigated through posted speed limits, traffic control, and administrative measures (e.g., staggered work-shift hours).	Additional, short-term, localized noise. Offsite noise levels are not expected to exceed existing ambient noise levels.
Geologic Resources	SHINE would adhere to standard industry BMPs to minimize soil erosion and sediment control. SHINE must conduct construction activities in accordance with the provisions of the Wisconsin General Permit to Discharge Construction Site Storm Water Runoff, which would require measures to minimize soil compaction and to preserve topsoil; a site-specific construction site erosion control plan, including specific BMPs or pollution control measures to reduce the discharge of pollutants in stormwater runoff; and a stormwater management plan (e.g., vegetated drainage swales to control runoff). Temporarily disturbed areas during construction activities may be revegetated with crops, cool-season grasses, or native prairie grasses.	Construction would consume geologic resources and have the potential to increase soil erosion.

Resource Area	Mitigation Measures	Unavoidable Adverse Impact
Water Resources	See the information above for mitigation measures associated with the Wisconsin General Permit to Discharge Construction Site Storm Water Runoff and the stormwater management plan. The permit also would require the development of spill prevention and response procedures, such as measures to avoid and respond to spills and leaks of fuels and other materials from construction equipment and activities. Wastewater must meet the acceptance requirements of the Janesville Wastewater Treatment Plant before it leaves the SHINE facility.	Stormwater runoff could potentially affect offsite surface-water quality. No onsite groundwater would be used.
Ecological Resources	Once SHINE completes construction activities, it may vegetate open areas with crops, native prairie grasses, or cool-season grasses. BMPs, such as shielding or appropriate directional lighting, or both, would be used to mitigate the hazard to birds from artificial nighttime illumination. SHINE would apply herbicides according to an integrated pest management plan, which would include applicable BMPs or related permit requirements. See mitigation measures described above to minimize impacts to aquatic habitats.	Loss of low-quality habitat (agricultural fields), the potential for wildlife avoidance displacement caused by noise and other activities, and increased risk of bird collisions with building facilities could occur.
Historic and Cultural Resources	SHINE has developed a sitewide cultural resource management plan to manage and protect as-yet unidentified cultural resources.	No known historic properties eligible for listing in the National Register of Historic Places or historic and cultural resources are on the proposed site. Previously unidentified cultural resources could be inadvertently discovered during land-moving activities associated with construction.
Socioeconomics	The availability of construction workers and housing within the region of influence and the short duration of construction (18 months) would minimize any socioeconomic impacts within the region of influence. New operations jobs would help maintain employment levels and would generate a small amount of additional property and sales tax revenue.	The increase in the local population resulting from the operation of the proposed SHINE facility would cause an associated increase in demand for public services and housing.

Resource Area	Mitigation Measures	Unavoidable Adverse Impact
Human Health	Radiological: SHINE would construct and operate the proposed facility in accordance with all applicable Federal and State of Wisconsin regulatory requirements. SHINE must limit radiological doses to the public and workers within the occupational dose limits in 10 CFR Part 20. SHINE designed buildings containing radioactive material to include shielding that will minimize direct radiation outside the facility and to ensure that radiation will be within 10 CFR Part 20 dose limits at the site boundary. Radiation exposure to workers within the proposed facility will be minimized using shielding, shielded hot cells, shielded transport containers, access control to radiation areas, ventilation, filters, training, protective clothing, and administrative controls. Nonradiological: SHINE would implement normal construction and operational safety practices contained in Occupational Safety and Health Administration regulations. In addition, SHINE would limit toxic chemicals stored or used at the construction site to be within the threshold amounts listed in the Wisconsin Administrative Code. SHINE would have a Chemical Hygiene Plan to minimize chemical exposure to the workforce and a Chemical Hygiene Officer to administer the plan.	Radiological: Workers and members of the public could be exposed to radiation, such as gaseous radioactive effluents that contain krypton, xenon, iodine, and tritium. Nonradiological: Air pollution impacts from fossil-fueled vehicles and equipment, worker hazards typical of any industrial facility, and potential chemical exposures to workers.
Waste Management	SHINE would operate the proposed facility in accordance with all applicable Federal and State of Wisconsin regulatory requirements. For example, public and worker exposure, radioactive material within the facility, and radioactive effluents released into the environment must meet the radiation protection dose-based limits in 10 CFR Part 20. Wastes generated during plant operations would be collected, stored, and shipped for suitable treatment, recycling, or disposal in accordance with applicable Federal and State regulations. In addition, SHINE would implement waste management systems to minimize waste and pollution. Engineered design features would also minimize contamination and exposures.	The generation of radiological and nonradiological waste material, including low-level radioactive waste, hazardous waste, and nonhazardous waste, also would be unavoidable.

Resource Area	Mitigation Measures	Unavoidable Adverse Impact
Transportation	SHINE would stagger construction work-shift schedules to reduce the hourly traffic flow onto U.S. Highway 51 and schedule truck deliveries early in the day to help reduce traffic congestion. Optimizing the signal timing for vehicles turning from U.S. Highway 51 into the site would mitigate traffic delays. SHINE and the common-carrier trucks would be required to adhere to the applicable regulatory packaging and transportation requirements for radioactive material in NRC regulations (10 CFR Parts 20 and 71); the State of Wisconsin Administrative Code Chapter 326, "Transportation"; and DOT requirements (49 CFR Parts 172 and 173). In addition, SHINE would follow delivery routes that avoid residential and sensitive areas.	During construction and decommissioning, traffic at the site access point on U.S. Highway 51, especially during shift changes, would noticeably increase. No noticeable increases in traffic are expected during operations.
Accidents	The radiological hypothetical accident dose must be within the dose limits in 10 CFR 20.1301. The chemical hypothetical accident dose must be within the dose limits in 10 CFR 70.61, and SHINE must meet the performance requirements in 10 CFR 70.61. SHINE incorporated engineering and administrative controls into the facility design to ensure that exposure from accidents would be within regulatory limits.	Very minimal environmental impacts are anticipated.
Environmental Justice	See the discussions above on mitigation measures for human health and environmental effects, such as noise, traffic, and air quality.	Construction and decommissioning impacts are expected to be short term, would be primarily limited to onsite activities that are temporary in nature, and human health and environmental effects would not be high or adverse.

6.3.2 Relationship Between Local Short-Term Uses of the Environment and the Maintenance and Enhancement of Long-Term Productivity

The construction, operations, and decommissioning of the SHINE facility and alternatives to the proposed action would result in short-term uses of the environment, as described in Chapters 4 and 5. "Short-term" is the period of time during which construction, operations, and decommissioning activities would take place.

The construction, operations, and decommissioning of the SHINE facility would require short-term use of the environment and commitment of resources and would commit certain resources (e.g., land and energy), indefinitely or permanently. Short-term resource commitments would be similar at the two alternative sites and for the alternative technology if it were to be developed at the proposed Janesville site. These alternatives and the proposed action would result in similar relationships between local short-term uses of the environment and the maintenance and enhancement of long-term productivity. However, the no-action alternative would not result in resource commitments because no new facilities would be constructed or operated.

Construction, operations, and decommissioning would require up to 91.1 ac (36.9 ha) of agricultural land and 0.18 ac (0.07 ha) of undeveloped open areas that would be committed to industrial land use during the short term. In addition, the facility would partially obstruct the current viewshed. Construction, operations, and decommissioning could also displace wildlife through destruction of habitat or noise. However, after decommissioning the SHINE facility and restoring the area, the land could be available for other future productive uses, and the onsite viewshed could be restored to the current condition. In addition, wildlife may return to the site once construction or decommissioning is completed if it is restored to suitable habitat.

Air emissions from construction, operations, and decommissioning would introduce small amounts of radiological and nonradiological constituents at the facility site. Over time, these emissions would result in increased concentrations and exposure; however, such emissions are not expected to affect air quality or radiation exposure to the extent that they would impair public health and long-term productivity of the environment.

Noise emitted by construction, operations, and decommissioning activities would increase the ambient noise levels on site and in adjacent offsite areas. However, once decommissioning activities were completed, noise would return to ambient levels, and no effects would have an impact on the long-term productivity of the proposed SHINE facility.

Construction, operations, and decommissioning activities could affect up to 91 ac (37 ha) of onsite soils that are considered prime farmland (when they are not committed to developed uses) or farmland of statewide importance at the proposed SHINE facility. The majority of the soils on site, however, would not likely be affected from construction, operations, and decommissioning. Affected soils could affect the long-term productivity of the site if construction, operations, or decommissioning activities damage such soils in a manner that would degrade the soil properties associated with prime farmland or farmland of statewide importance designation.

Increased employment, expenditures, and tax revenues generated during construction, operations, and decommissioning activities directly benefit local, regional, and State economies over the short term. Local governments investing project-generated tax revenues into infrastructure and other required services could enhance economic productivity over the long term.

The management and disposal of low-level radioactive waste, hazardous waste, and nonhazardous waste requires an increase in energy and consumes space at treatment, storage, or disposal facilities. Regardless of the location, the use of land to meet waste disposal needs would reduce the long-term productivity of the land.

Worker vehicles and the delivery and shipment of materials would increase the volume of traffic on local roads. Worker and delivery vehicles would cease once decommissioning is completed and, therefore, would not affect long-term productivity.

Installation of water and sewer lines during construction of the proposed SHINE facility would connect the facility to the City of Janesville water supply system. This additional infrastructure would be available and beneficial for any future use of the proposed SHINE facility after its decommissioning.

6.3.3 Irreversible and Irretrievable Commitment of Resources

This section describes the irreversible and irretrievable commitment of resources that have been noted in this EIS. Resources are irreversible when primary or secondary impacts limit future options for a resource. An irretrievable commitment refers to the use or consumption of resources that are neither renewable nor recoverable for future use. Irreversible and irretrievable commitments of resources for construction, operations, and decommissioning of a medical isotope facility include the commitment of water, energy, raw materials, and other natural and man-made resources. In general, the commitment of capital, energy, labor, and material resources are also irreversible.

The implementation of the alternative sites or the alternative technology considered in this EIS would entail the irreversible and irretrievable commitment of energy, water, chemicals, fossil fuels, and other natural and man-made resources. These resources would be unrecoverable. For example, SHINE would consume materials during the construction, as described in Chapter 2. These materials would be irretrievable unless SHINE recycles them during decommissioning (e.g., finds another facility to use such materials). During operations, uranium used as the source for the molybdenum isotope would be the main resource that would be irreversibly and irretrievably committed.

Up to 91 ac (37 ha) of soils that are considered prime farmland (when they are not committed to developed uses) or farmland of statewide importance on the proposed SHINE facility could be irreversibly damaged such that the soil properties associated with the prime farmland designation would be irreversibly damaged. Mineral and other geologic resources, such as concrete, granular road base, pavement aggregate, and asphalt necessary for construction of the facility, would be irreversibly committed for construction of the SHINE facility. In addition, a small amount of soils and sediments would be lost to wind and water erosion during construction, operations, and decommissioning.

A negligible increase in the mortality of birds could occur because of their collisions with facility structures. The loss of these birds would be irreversible and irretrievable.

Nonradiological irreversible commitments to occupational human health resources may occur. Such impacts would be similar to potential hazards that occur at any industrial construction site.

Energy expended would be in the form of fuel for equipment, vehicles, and facility operations and electricity for equipment and facility operations. Electricity and fuel would be acquired from offsite commercial sources. Water would be obtained from existing water supply systems. These resources are readily available, and the amounts required are not expected to deplete available supplies or exceed available system capacities.

6.4 Recommendation

After weighing the environmental, economic, technical, and other benefits against environmental and other costs, and considering reasonable alternatives, the NRC staff recommends, unless safety issues mandate otherwise, the issuance of the proposed construction permit to SHINE. The NRC staff based its recommendation on the following factors:

- SHINE’s Environmental Report;
- the NRC staff’s consultation with Federal, State, and local agencies;
- the NRC staff’s independent environmental review; and
- the NRC staff’s consideration of public comments received.

6.5 References

10 CFR Part 20. *Code of Federal Regulations*, Title 10, *Energy*, Part 20, “Standards for protection against radiation.”

10 CFR Part 50. *Code of Federal Regulations*, Title 10, *Energy*, Part 50, “Domestic licensing of production and utilization facilities.”

10 CFR Part 70. *Code of Federal Regulations*, Title 10, *Energy*, Part 70, “Domestic licensing of special nuclear material.”

10 CFR Part 71. *Code of Federal Regulations*, Title 10, *Energy*, Part 71, “Packaging and transportation of radioactive material.”

49 CFR Part 172. *Code of Federal Regulations*, Title 49, *Transportation*, Part 172, “Hazardous materials table, special provisions, hazardous materials communications, emergency response information, training requirements, and security plans.”

49 CFR Part 173. *Code of Federal Regulations*, Title 49, *Transportation*, Part 173, “Shippers—general requirements for shipments and packaging.”

National Environmental Policy Act of 1969, as amended. 42 U.S.C. §4321 et seq.

[SHINE] SHINE Medical Technologies, Inc. 2013a. *Preliminary Safety Analysis Report (PSAR), Chapter 13, “Accident Analysis,” and Chapter 19, “Environmental Report.”* Monona, WI: SHINE. March 26, 2013 and May 31, 2013. ADAMS No. ML13172A324.

[SHINE] SHINE Medical Technologies, Inc. 2013b. *SHINE Medical Technologies, Inc., Application for Construction Permit Response to Environmental Requests for Additional Information.* November 19, 2013. ADAMS No. ML13303A887.

[SHINE] SHINE Medical Technologies, Inc. 2014. *SHINE Medical Technologies, Inc. Application for Construction Permit Response to Request for Additional Information.* October 15, 2014. ADAMS No. ML14296A189.

[SHINE] SHINE Medical Technologies, Inc. 2015. *SHINE Medical Technologies, Inc. Application for Construction Permit Response to Request for Additional Information.* February 6, 2015. ADAMS No. ML15043A404.

[WAC] Wisconsin Administrative Code Chapter 326. Motor Carrier Safety Requirements for Transportation of Hazardous Materials. Available at <https://docs.legis.wisconsin.gov/code/admin_code/trans/326> (accessed 17 November 2014).

7.0 LIST OF PREPARERS

Members of the U.S. Nuclear Regulatory Commission's (NRC's) Office of Nuclear Reactor Regulation (NRR) prepared this environmental impact statement with support from other NRC organizations, the U.S. Department of Energy (DOE) National Nuclear Security Administration (NNSA), Los Alamos Technical Associates (LATA), and Idoneous Consulting. Idoneous Consulting provided support for technical editing reviews. Table 7–1 identifies each contributor's name, affiliation, and function or expertise.

Table 7–1. List of Preparers

(in alphabetical order)

Name	Affiliation	Function or Expertise
U.S. Nuclear Regulatory Commission		
Alexander Adams, Jr.	NRR	Branch Chief
Kevin Folk	NRR	Water Resources; Geologic Environment
Robert Hoffman	NRR	Historic and Cultural Resources; Transportation; Cumulative Impacts
Stephen Klementowicz	NRR	Human Health; Waste Management; Transportation; Accidents
Emily Larson	NRR	Historic and Cultural Resources; Transportation; Cumulative Impacts; Socioeconomic Impacts; Environmental Justice
Steven Lynch	NRR	Project Manager
Nancy Martinez	NRR	Air Quality and Noise; Water Resources
Michelle Moser	NRR	Project Manager; Ecological Resources; Land Use and Visual Resources; Alternatives
Jeffrey Rikhoff	NRR	Environmental Justice; Socioeconomic Impacts; Cost-Benefit Analysis
Allison Travers	NRR	Alternatives
Michael Wentzel	NRR	Land Use and Visual Resources
David Wrona	NRR	Branch Chief
U.S. Department of Energy National Nuclear Security Administration		
Joanie Dix	NNSA	Project Manager
Rilla Hamilton	NNSA	Project Manager
Randy Howell	NNSA	Project Manager
Contract Support		
Robert Hull	LATA	Project Manager; Alternatives
Vicki Kraus	LATA	Socioeconomic Impacts; Environmental Justice
Joe Molter	LATA	Transportation
George Pratt	LATA	Cumulative
Mike Stafford	LATA	Air Quality and Noise
Mitch Strain	LATA	Land Use and Visual Resources

8.0 INDEX

9.0 LIST OF AGENCIES, ORGANIZATIONS, AND PERSONS TO WHOM COPIES OF THIS ENVIRONMENTAL IMPACT STATEMENT ARE SENT

Table 9–1. List of Agencies, Organizations, and Persons to Whom Copies of This Environmental Impact Statement Are Sent

Name and Title	Affiliation and Address
Andrew Anselmi	Riverfront, Inc. 1107 Barberry Drive Janesville, WI 53545
John Barrett, Chairman	Citizen Potawatomi Nation 1601 South Gordon Cooper Drive Shawnee, OK 74801
Stuart Bearheart, Chairman	St. Croix Chippewa Indians of Wisconsin St. Croix Tribal Center 24663 Angeline Avenue Webster, WI 54893
John Blackhawk, Chairman	Winnebago Tribe of Nebraska 100 Bluff Street P.O. Box 687 Winnebago, NE 68071
Gary Besaw, Chairman	Menominee Indian Tribe of Wisconsin P.O. Box 910 Keshena, WI 54135
Mr. Ellsworth Brown, Society Director	State Historic Preservation Office Division of Historic Preservation and Public History Wisconsin Historical Society 816 State Street, Room 305 Madison, WI 53706
Gerald and Muriel Bumgarner	None given
Richard Vann Bynum, Ph.D., Chief Operating Officer	SHINE Medical Technologies, Inc. 2555 Industrial Drive Monona, WI 53713
Duane Cherek, Manager of Planning Services	Community Development Department 18 North Jackson Street P.O. Box 5005 Janesville, WI 53547-5005
Melissa Cook, Tribal Historic Preservation Officer	Forest County Potawatomi Community 8130 Mish Ko Swen Drive P.O. Box 340 Crandon, WI 54520
Jim Costedio, Licensing Manager	SHINE Medical Technologies, Inc. 2555 Industrial Drive Monona, WI 53713
Dan Cunningham	Forward Janesville 14 South Jackson Street, Suite 200 Janesville, WI 53548
Kristen Cutler, Ph.D., National Security and International Affairs	Office of Science and Technology Policy Executive Office Building 1650 Pennsylvania Avenue, NW Washington, DC 20503

Name and Title	Affiliation and Address
Dave Dobson	Friends of Welty Environmental Center P.O. Box 131 Beloit, WI 53512
Environmental Impact Statement Filing Section	U.S. Environmental Protection Agency 1200 Pennsylvania Avenue, NW Washington, DC 20004
Peter J. Fasbender, Field Supervisor	U.S. Fish and Wildlife Service 2661 Scott Tower Drive New Franken, WI 54229
Sharon Fitzpatrick	Riverfront, Inc. 1107 Barberry Drive Janesville, WI 53545
Harold Frank, Chairman	Forest County Potawatomi Community 5416 Everybody's Road Crandon, WI 54520
Mark Freitag, Janesville City Manager	City Manager Janesville City Hall P.O. Box 5005 Janesville, WI 53547-5005
John P. Froman, Chief	Peoria Tribe of Indians of Oklahoma 118 South Eight Tribes Trail P.O. Box 1527 Miami, OK 74355
Andrew Fox	None given
Jim Jensen, Chief	Janesville Fire Department 303 Milton Avenue Janesville, WI 53545-3151
Kevin Jensvold, Chairman	Upper Sioux Community P.O. Box 147 5722 Travelers Lane Granite Falls, MN 56241
Ronald Johnson, President	Prairie Island Indian Community 5636 Sturgeon Lake Road Welch, MN 55089
Jon Greendeer, President	Ho-Chunk Nation of Wisconsin P.O. Box 667 W9814 Airport Road Black River Falls, WI 54615
Richard Gruber	Mercy Health System P.O. Box 5003 Janesville, WI 53547-5003
Eric P. Heggelund, Environmental Analysis and Review Specialist	State of Wisconsin Department of Natural Resources 3911 Fish Hatchery Road Fitchburg, WI 53711
Richard T. Henning	None given
Rilla Hamilton	National Nuclear Security Administration, NA-212 U.S. Department of Energy 1000 Independence Avenue, SW Washington, DC 20585

Name and Title	Affiliation and Address
Randy Howell	National Nuclear Security Administration, NA-212 U.S. Department of Energy 1000 Independence Avenue, SW Washington, DC 20585
Joe Kopacz, Student	Iowa State University 4721 Greenbrier Drive Davenport, IA 52807
Alfred Lembrich	None given
Jim Leute	Janesville Gazette 1 South Parker Drive P.O. Box 5001 Janesville, WI 53547
Douglas Marklein, Janesville City Council	City Council City Hall P.O. Box 5005 Janesville, WI 53547-5005
Bill McCoy	None given
Tom Melius, Midwest Regional Director	U.S. Fish and Wildlife Service American Boulevard West, Suite 990 Bloomington, MN 55437-1458
Kenneth Meshigaud, Chairperson	Hannahville Indian Community N14911 Hannahville B-1 Road Wilson, MI 49896
Richard Miller	None given
Joan Neeno	St. Mary’s Janesville Hospital 3400 East Racine Street Janesville, WI 53546
Reid Nelson, Director	Advisory Council on Historic Preservation Office of Federal Agency Programs 1100 Pennsylvania Avenue, NW, Suite 803 Washington, DC 20004
Raymond New	None given
Liana Onnen, Chairperson	Prairie Band of Potawatomi Nation 16281 Q Road Mayetta, KS 66509
Myra Pearson, Tribal Chairperson	Spirit Lake Tribe P.O. Box 359 Fort Totten, ND 58335
Cindy Pederson, Regional Administrator	U.S. Nuclear Regulatory Commission Region III 2443 Warrenville Road Lisle, IL 60532
Janet Piraino	District Director at U.S. Representative Mark Pocan Madison District Office 10 East Doty Street Suite 405 Madison, WI 53703
Elizabeth Poole, Environmental Scientist	NEPA Implementation Section U.S. Environmental Protection Agency 77 West Jackson Boulevard, E-19J Chicago, IL 60604

Name and Title	Affiliation and Address
Gary Pratt, Chairman	Iowa Tribe of Oklahoma 335588 East 750 Road Perkins, OK 74059
Denny Prescott, President	Lower Sioux Indian Community 39527 Reservation Highway 1 P.O. Box 308 Morton, MN 56270
Gale S. Price, Manager of Building and Development Services	Economic Development Department 18 North Jackson Street P.O. Box 5005 Janesville, WI 53547-5005
Anthony Reider, President	Flandreau Santee Sioux Tribe of South Dakota P.O. Box 238 Flandreau, SD 57208
Bruce Renville, Tribal Chairman	Sisseton-Wahpeton Oyate of the Lake Traverse Reservation PO Box 509 Agency Village, SD 57262
Paul Schmidt, Manager	Radiation Protection Section Wisconsin Department of Health Services P.O. Box 2659 Madison, WI 53701-2659
Joshua Smith, Administrator	Rock County, Wisconsin Rock County Courthouse 51 South Main Street Janesville, WI 53545
Robert D. Spoden, Sheriff	Rock County, Wisconsin 200 E US Highway 14 Janesville, WI 53545
George Thurman, Principal Chief	Sac and Fox Nation Administration Building 920883 South Highway 99, Building A Stroud, OK 74079
The National Organization of Test, Research, and Training Reactors (TRTR) Newsletter	TRTR Newsletter University of Florida Department of Nuclear Engineering Sciences 202 Nuclear Sciences Center Gainesville, FL 32611
Roger Trudell, Tribal Chairman	Santee Sioux Nation 425 Frazier Avenue North, Suite 2 Niobrara, NE 68760
Judy Roberts Vaugh	None given
Tim Weber	Webco, Inc., General Contractors and Forward Janesville 14 South Jackson Street, Suite 200 Janesville, WI 53548
Kenneth Westlake	U.S. Environmental Protection Agency 77 West Jackson Boulevard, E-19J Chicago, IL 60604
Mike Wiggins, Jr., Chairman	Bad River Band of Lake Superior Chippewa Indians P.O. Box 39 Odanah, WI 54861

Name and Title	Affiliation and Address
Bob Winding	Mortenson Construction 10 East Doty Street Madison, WI 53703
Michael Wolff	Paxton and Vierling Steel 501 Avenue H Carter Lake, IA 51510
Jeff Zuelke	None given

APPENDIX A
COMMENTS RECEIVED ON THE SHINE MEDICAL RADIOISOTOPE PRODUCTION FACILITY ENVIRONMENTAL REVIEW

A. COMMENTS RECEIVED ON THE SHINE MEDICAL RADIOISOTOPE PRODUCTION FACILITY ENVIRONMENTAL REVIEW

A.1 Comments Received During the Scoping Period

The scoping process for the environmental review of the construction permit application for the SHINE Medical Technologies, Inc. (SHINE), medical radioisotope production facility (SHINE facility) began on July 1, 2013, with the publication of the U.S. Nuclear Regulatory Commission's (NRC's) Notice of Intent to conduct scoping in the *Federal Register* (78 FR 39343). The scoping process included two public meetings held in Janesville, Wisconsin, on July 17, 2013. Approximately 60 people attended the meetings. After the NRC presented its prepared statements on the construction permit review process, the meetings were open for public comments. Attendees provided oral statements that were recorded and transcribed by a certified court reporter. A summary and transcripts of the scoping meetings are available through the NRC's Agencywide Documents Access and Management System (ADAMS). The ADAMS Public Electronic Reading Room is accessible at http://www.nrc.gov/reading-rm/adams.html. The scoping meetings summary can be found under ADAMS No. ML13260A294. Transcripts for the afternoon and evening meetings can be found under ADAMS Nos. ML13260A280 and ML13260A281, respectively. In addition to comments that the NRC received during the public meetings, the agency also received comments electronically and through the mail.

Each commenter was given a unique identifier to allow every comment to be traced back to its author. Table A–1 identifies the individuals who provided comments and an ADAMS No. to identify the source document of the comments.

Specific comments were categorized and consolidated by topic. Comments with similar specific objectives were combined to capture the common essential issues raised by commenters. Comments have been grouped into the following general categories:

- Specific comments that address environmental issues within the purview of the NRC environmental regulations related to a construction permit. These comments address issues related to the construction, operations, and decommissioning of the SHINE facility. The comments also address alternatives to proposed action and related Federal actions.
- General comments in support of, or opposed to, the SHINE facility or comments regarding the construction permit process, the NRC's regulations, and the regulatory process.
- Comments that address issues that do not fall within, or are specifically excluded from, the purview of NRC environmental regulations related to the construction permit process. These comments may address issues, such as emergency preparedness, security, and safety.

Table A–1. Individuals Providing Comments During the Scoping Comment Period

Each commenter is identified, along with an affiliation, if any, and the source of the comment.

Commenter	Affiliation (if stated)	ID	Comment Source	ADAMS No.
Dave Dobson	None given	01	Afternoon Transcript	ML13260A280
Melissa Cook	Forest County Potawatomi Community	02	Letter	ML13224A164
Eric Heggelund	Wisconsin Department of Natural Resources	03	Letter	ML14045A298
Richard Henning	None given	04	Letter	ML13233A023
Al Lembrich	None given	05	Letter	ML13233A022
Douglas Marklein	Janesville City Council	06	Afternoon Transcript	ML13260A280
Bill McCoy	None given	07	Afternoon Transcript	ML13260A280
Richard Miller	None given	08	Afternoon Transcript	ML13260A280
Janet Piraino	Congressman Mark Pocan	09	Afternoon Transcript	ML13260A280
Jamie Stout	None given	10	Letter	ML13263A012
Kenneth Westlake	U.S. Environmental Protection Agency	11	Letter	ML13238A121

Comments that are general or outside the scope of the SHINE facility environmental review are not included here but appear in the Scoping Summary Report (ADAMS No. ML15062A111). To maintain consistency with the Scoping Summary Report, Appendix A retains the unique identifiers used in that report for each comment. The Scoping Summary Report provides the comments addressed in this Appendix A in their original form at the end of the report.

The NRC staff placed comments received during the scoping comment period applicable to this environmental review into categories based on topics in the environmental impact statement. These categories are listed in Table A–2.

Table A–2. Issue Categories

Technical Issues
Accidents
Air Quality
Alternatives
Ecological Resources
Geologic Environment
Historic and Cultural Resources
Human Health
Land Use
Transportation
Water Resources
Waste Management

The following pages contain the comments, identified by the commenter's identification and comment number, and the NRC staff's response. Comments are presented in the same order as listed in Table A–2.

A.1.1 **Accidents**

<u>Comments:</u>

01-2: My only other concern would have to do with the issue of aircraft landing because the site is very close to the airport, planes coming in to land at Rock County airport. It is important to make sure that the facility is built in such a way that nothing serious would happen in terms of any kind of radioactive release if the largest airplane that's going to land at the airport were to crash right into the building. So that is one of the important considerations there.

05-3: There is a matter that the FFA [FAA] may have concerns with the proximity, size, type & use of this proposed Shine building, considering the Southern Wisconsin Regional Airport and its runways being right across the street. Even though its runways may not be directly in line with the proposed building, many airport crashes occur where the airplanes veer off the runway to either left or right of the runway. Additional concerns would be the height of the proposed building possibly impeding line of sight for pilots. Would the proposed building withstand a large cargo or other large plane that could crash into it due to some malfunction, and cause release of contaminated material and cause environmental dangers?

05-13: The local citizens have concerns and possibly the FFA [FAA] with the Shine building location, height and its uranium content being right across the street from the Southern Wisconsin Regional Airport and its runways. There are possibilities of an airplane crash and potential uranium exposure or contamination from a demolished building and its contents. Could there be an impediment to pilot's line of sight in evaluating their approach to land? Is the height of Shine's building too high and raise the risk of a plane strike when something goes wrong with the resulting environmental concerns?

05-15: The large Seneca Foods canning company and its processing of vegetables is located just to the North/East, down-wind of the Shine site. There are hundreds of acres of farm crops that they harvest from this entire nearby area for their plant. Any accident, leakages, or contaminations to air, water, land could be very harmful to the editable crops, the entire food chain and to this business. The present environment could be greatly threatened.

07-1: Number one, the airport issue that was just brought up is how the building is going to be done, what protection are we going to have. What if we have some idiot wants to fly into it like we've had in other places, you know. I mean I've done helicopters when I was in Vietnam. Anything could happen. Anything. So even a plane motor can fall off and land into it and bust it all to pieces. What protection are we going to have from a leakage with that uranium because we've also got the farms out there. We also got Seneca right down the road here, which is less than a mile and a half from where we are sitting right now. They have fields across the highway. They've got fields out towards the Blackhawk Tech and all this over here that if the fumes that would go over that would destroy those crops from being put in that particular time of need. So we've got to think about it. Seneca also wants the addition over here. Right, City Council members? So we're going to have to worry about that because that is one thing that we are very concerned about.

11-7: The Draft EIS should discuss facility and system features to ensure safety and minimize off-site releases in the event of an accident or other unanticipated event.

<u>Response:</u>

These comments express concerns regarding potential accidents from aircraft or other radiological exposures caused by accidents or leaks. One comment also expressed concern on the potential impact from the facility on pilots and aircraft coming to and from the Southern Wisconsin Regional Airport.

Section 4.11 of the environmental impact statement (EIS) discusses the environmental impacts associated with potential radiological and hazardous chemical accidents that might occur at the proposed SHINE facility. The term "accident," as used in this EIS, refers to any off-normal event that releases radioactive or hazardous chemicals into the environment that may affect facility workers and members of the public.

Potential initiating events and credible operational accidents for the proposed SHINE facility constitute the design-basis accidents. In its Environmental Report, SHINE considered the impacts of an aircraft collision as a design-basis accident. In Section 4.11, however, the NRC staff considers the potential impacts from the maximum hypothetical accident as the basis for the analysis of environmental impact from potential accidents at the proposed SHINE facility. The maximum hypothetical accident considers a potential accident that would result in the same or higher radiological exposures as a credible design-basis accident, such as an aircraft collision with the SHINE facility or another accident that could result in radioactive releases. Therefore, the analysis in this EIS considers the potential exposures from accidents that would result in the same or higher exposures as that from an aircraft collision.

SHINE determined that the calculated doses for the maximum hypothetical accident at the proposed SHINE facility would be within the annual dose limits of 100 millirem (1.0 millisievert) in Title 10 of the Code of Federal Regulations *(10 CFR) 20.1301 to a member of the public. Section 4.11 describes various ways in which SHINE would minimize radioactive releases in case of an accident. As described in Section 4.11, the NRC staff is conducting a thorough independent review of the potential dose to the public from the maximum hypothetical accident. The NRC staff's safety evaluation report (SER) will document this independent evaluation. Assuming that the NRC staff determines in its SER that the hypothetical accident dose is within the dose limits in 10 CFR 20.1301, the NRC staff concludes that the impacts from potential radiological accidents, including aircraft collisions, would be SMALL.*

In addition, see A.1.7, Human Health, for a discussion of potential radiological exposures to the public during normal operations.

As described in Appendix B of the EIS, SHINE must meet the requirements of several other Federal agencies, such as the Federal Aviation Administration (FAA). The NRC staff notes that the FAA's review of the SHINE project is outside the scope of the NRC's environmental review. However, for the purpose of responding to this comment, the NRC staff provides the following information. As described in the Environmental Report, SHINE submitted structure evaluation requests to the FAA on October 26, 2011. The purpose of this request was to ensure that the building heights and other facility components met FAA's regulations and requirements, given the proximity of the proposed SHINE site to the Southern Wisconsin Regional Airport. The FAA issued "Determinations of No Hazard to Air Navigation to SHINE" *on November 9 and 15, 2011.*

A.1.2 **Air Quality**

Comment:

03-3: A review regarding an air permit should be thoroughly examined by the project proponents. The project involves the addition of at least one stationary source (the stand-by emergency diesel generator). SHINE is evaluating the eligibility of this stationary source for a Type A Registration Permit. At this time, further review regarding the air permit applicability is required, per s. NR 405, 406, and 407 Wisconsin Administrative Code.

Response:

This comment describes the types of air permits that SHINE could require from the Wisconsin Department of Natural Resources (WDNR). As described in Section 4.2, SHINE would be *required to comply with any Federal and State air quality requirements and operate within the limitations stipulated within any Federal or State permits.*

Comment:

11-1:

- EPA notes that both diesel and natural gas are identified as fuel sources in the ER. The draft EIS should include why two sources are necessary. Further, we recommend SHINE consider the use of renewable energy sources either in lieu of or to supplement the proposed diesel and natural gas sources. If SHINE or NRC dismisses the use of alternative energy sources, the draft EIS should state why.

Response:

The comment suggests that the draft EIS should discuss why diesel and natural gas sources are necessary and for SHINE to consider the use of renewable energy sources. As discussed in Section 4.2 of the EIS, during construction and decommissioning of the proposed SHINE facility, diesel equipment is needed for construction and decommissioning; furthermore, natural-gas-fired heaters and one boiler would be needed to meet heating and hot water requirements for the proposed SHINE facility. The NRC staff notes that it is beyond the agency's regulatory authority to require SHINE to utilize alternative energy sources. Nonetheless, as discussed in Section 4.2 of the EIS and the Environmental Report, SHINE plans to implement programs, where practical, to promote energy efficiency and conservation at the SHINE facility, install solar panels and/or purchase electricity generated from renewable energy sources (SHINE 2013a), and implement diesel emissions reduction techniques.

Comment:

11-5:

- The draft EIS should describe how diesel emissions will be minimized throughout construction and decommissioning of the facility. EPA suggests the following diesel emission reduction techniques be employed to further minimize impacts:
  - Using low-sulfur diesel fuel (15 parts per million sulfur maximum) in construction vehicles and equipment.
  - Retrofitting engines with an exhaust filtration device to capture diesel particulate matter before it enters the construction site.
  - Positioning the exhaust pipe so that diesel fumes are directed away from the operator and nearby workers, thereby reducing the fume concentration to which personnel are exposed.
  - Using catalytic converters to reduce carbon monoxide, aldehydes, and hydrocarbons in diesel fumes. These devices must be used with low sulfur fuels.
  - Ventilating wherever diesel equipment operates indoors at the Meredosia and injection well sites. Roof vents, open doors and windows, roof fans, or other mechanical systems help move fresh air through work areas. As buildings under construction are gradually enclosed, remember that fumes from diesel equipment operating indoors can build up to dangerous levels without adequate ventilation.

- Attaching a hose to the tailpipe of diesel vehicles running indoors and exhaust the fumes outside, where they cannot re-enter the workplace. Inspect hoses regularly for defects and damage.
- Using enclosed, climate-controlled cabs pressurized and equipped with high efficiency particulate air (HEPA) filters to reduce the operators' exposure to diesel fumes. Pressurization ensures that air moves from inside to outside. HEPA filters ensure that any incoming air is filtered first.
- Regularly maintaining diesel engines, which is essential to keep exhaust emissions low. Follow the manufacturer's recommended maintenance schedule and procedures. Smoke color can signal the need for maintenance. For example, blue/black smoke indicates that an engine requires servicing or tuning.
- Reducing exposure through work practices and training, such as turning off engines when vehicles are stopped for more than a few minutes, training diesel equipment operators to perform routine inspection, and maintaining filtration devices.
- Purchasing new vehicles that are equipped with the most advanced emission control systems available.
- Using electric starting aids, such as block heaters, with older vehicles to warm the engine reduces diesel emissions.
- Using respirators, which are only an interim measure to control exposure to diesel emissions. In most cases, an N95 respirator is adequate. Workers must be trained and fit-tested before they wear respirators. Depending on work being conducted, and if oil is present, concentrations of particulates present will determine the efficiency and type of mask and respirator. Personnel familiar with the selection, care, and use of respirators must perform the fit testing. Respirators must bear a National Institute of Occupational Safety and Health (NIOSH) approval number. Never use paper masks or surgical masks without NIOSH approval numbers.

<u>Response:</u>

The comment suggests that the draft EIS should describe how diesel emissions would be minimized throughout construction and decommissioning of the facility and provides suggestions on how SHINE could minimize diesel emissions.

The NRC staff notes that it is beyond the agency's regulatory authority to require or implement mitigation measures to minimize diesel emissions. Nonetheless, as described in Section 4.2 of the EIS and in SHINE's request for additional information response (SHINE 2013b), SHINE plans to implement the following diesel emissions reduction techniques, where practical:

(1) Ultra-low sulfur diesel fuel (15 parts per million sulfur maximum) will be used in the diesel equipment.

(2) Exhaust filtration devices (diesel oxidation catalyst, diesel particulate matter filters, and/or catalytic converters) will be used.

(3) Diesel fumes from exhaust pipes will be directed away from workers and operators of equipment.

(4) New diesel equipment that is purchased will have the required emission control systems.

(5) Engine idling time will be minimized.

(6) Diesel equipment inspection and necessary maintenance will be performed to ensure proper condition of the exhaust filtration devices.

(7) Contractor(s) will be responsible for implementing diesel equipment recommended maintenance, procedures, and periodic checks to ensure that emissions are kept low.

(8) Diesel equipment that operates indoors will be vented to the outside using fitted hoses or portable ductwork.

A.1.3 **Alternatives**

<u>Comments:</u>

05-9: In British Columbia, engineers and other experts have successfully developed medical isotopes using a cyclotron. These isotopes for scans can be created by in hospital run cyclotrons, eliminating transportation dangers and the rush to hospital due to short use life. Would not that be safer and healthier from production, to transportation, and to actual use on a patient and even for disposal? Why would not the NRC curtail the unnecessary use of uranium for a better, cleaner, and healthier environment? Why would you even grant any medical isotope licenses to any who would use uranium processed isotopes without fail safe methods and procedures all through the process?

The North Star isotope facility in Beloit, Wi., 12 miles from Janesville, will be producing medical isotopes with a different process within a year of two, from what I read. Would it not make more sense to regionalize as to site locations of the four companies planning to produce isotopes in the U.S.? To not bunch them up? Transportation and timing would be much more efficient. So why would the NRC approve an already outdated process that Shine proposes? The North Star site is ahead of Shine. In my opinion, Shine took the wrong course in going the current uranium route. The Arizona proven process and North Star took the better route. Don’t feel sorry for Shine Medical Technologies, some technologies succeed, some do not.

05-19: Why have two medical isotope places (North star & Shine) within 12 miles of each other? With the processed products short life and needed short transportation times, would it not make more sense to allow four regional sites, spaced across the country, because I understand there are four isotope companies planning sites and operations now? Other sites that Shine had looked at would be much better & safer in my opinion.

07-7: They’ve got other sites they have looked at. Now why didn’t they take one of those other sites?

08-1: Actually, I was coming across a comment on—I saw an article in Popular Science. They were talking about using, in Canada, where they use these isotopes and make it [in] a hospital. And I thought is this going to be effective somewhere down the line, but when Mr. Mackey actually explained to us, well, it’s completely different, but it’s just a point that is this facility, five years down the road, going to go bust. In other words, technologies change.

<u>Response:</u>

These comments suggest alternative technologies or alternative sites to produce molybdenum-99.

Chapter 5 of the EIS describes alternatives to granting a construction permit for the proposed SHINE facility, including alternative sites (Chippewa Falls and Stevens Point) and an alternative technology (linear-accelerator-based), and the environmental impacts of those alternatives. The need to compare the proposed action with alternatives arises from the requirements in the National Environmental Policy Act of 1969 (NEPA), as amended (42 U.S.C. 4321 et seq.); the NRC regulations implementing NEPA (10 CFR Part 50); and the final interim staff guidance in NUREG–1537 (NRC 2012), which states that the EIS will include an analysis that considers and weighs 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.

The decision to produce radioisotopes is at the discretion of applicants (NRC 2012), such as SHINE. Similarly, the NRC does not have a role in the planning decisions as to whether a particular medical radioisotope production facility should be constructed and operated. Therefore, it is beyond the NRC's regulatory authority to require an applicant to construct a facility at a specific location or to use a specified technology.

The U.S. Department of Energy (DOE) is a cooperating agency on the EIS (NRC 2015). If the NRC issues the required permits and licenses, the proposed Federal action for the DOE National Nuclear Security Administration is to decide whether to provide additional cost-sharing financial support to SHINE under a cooperative agreement to accelerate the commercial production of medical radioisotopes without the use of highly enriched uranium. The funding would help accelerate activities such as construction, purchase of equipment, and initial operation using a subcritical fission process.

A.1.4 **Ecological Resources**

<u>Comment:</u>

03-1: SHINE submitted an Endangered Resources Review (ER Log #12-020) request on January 19, 2012, to the WDNR Bureau of Natural Heritage Conservation (formerly known as the Bureau of Endangered Resources) for their proposed facility location in Janesville. The purpose of the review is to obtain information on rare plants and animals, including state and federally listed species, high quality natural communities, and other endangered resources that may be impacted by the project. The review also includes recommendations to help projects comply with Wisconsin's Endangered Species Law (Wis. Stats. 29.604), the Federal Endangered Species Act, and other laws and regulations protecting endangered resources. The review concluded that no action would be needed to avoid impacts to rare or sensitive species or communities. The current condition of the property as an active agricultural field far from any wetlands, water, or buffer areas makes it unsuitable habitat for any listed species or natural communities located in the area.

<u>Response:</u>

This comment describes the rare plants and animals, including State and Federally listed species, high-quality natural communities, and other endangered resources, that could occur on the proposed SHINE site. As described in the comment and in Section 4.5 of the EIS, the proposed SHINE site is an active agricultural field and provides unsuitable habitat for any State or Federally listed animals.

A.1.5 **Geologic Environment**

Comment:

05-7: How deep will the building excavation be? How much of the building be below ground level?

Response:

This comment is asking how deep SHINE would excavate and what portion of the building would occur below ground. As described in Section 4.3.1 and based on the preliminary design, construction of the Production Facility Building would require excavation to a depth of 39 feet (12 meters). Utility routings and other foundation slabs and footings would require excavation to a depth of about 5 feet (1.5 meters). A portion of the Production Facility Building would be located below ground.

A.1.6 **Historic and Cultural Resources**

Comment:

02-1: As this project occurs within Potawatomi ancestral and previously occupied lands, we would like to express our concerns with any impacts to historic and cultural properties located within the project area of potential effect for the project mentioned above.

We appreciate receiving results of an archival review, cultural resource investigation studies, and archaeological reports. Should there be an impact or effect to cultural or historic properties as a result of this project, we will request consultation pursuant to Section 106 of the National Historic Preservation Act, as amended.

Response:

This comment expresses concerns regarding impacts to historic and cultural properties located within the project area. The comment also asks to be kept informed of any related reports or studies.

As described in Section 4.6 of the EIS, there are no known historic properties under 36 CFR 800.4(d)(1) or historic and cultural resources located within the area of potential effect on the proposed SHINE site. The NRC staff has attempted to contact representatives of the Forest County Potawatomi to discuss the undertaking. The last attempt to contact the Forest County Potawatomi was in February 2015.

A.1.7 **Human Health**

Comments:

05-2: This proposed site is less than ,06 [.06] of a mile South of a Trailer Court. Potential Environmental risks causes those residents concern about any planned or unplanned release of any dangerous or contaminated airborne emissions from the site, and being carried by normal Southerly or S/W winds directly over the nearby trailer court. There is also the potential risk of fire or explosion or other accidents that could pose a danger to the nearby residents at the Trailer Court. This location appears contrary to NRC desires that uranium facilities of all kinds be located outside of cities and in more remote areas to reduce dangers, hazardous exposures, and protect the public from such exposures and more easily protect the environment and humans.

05-4: There are a number of other environmental concerns. One involves nearby high quality agriculture land and its following food chain. There is the large Macfarlane Pheasant farm and meat processing facility approximately less than a mile to the North. Any releases of hazardous materials, particles, or radiation emissions could cause great harm to his business and to those who may eat contaminated products before receiving knowledge of it.

There is also much high quality farm land to the East of the proposed Shine site, where hundreds of acres of corn and other crops are raised and harvested for & by the canning company Senica Foods. They have a large nearby processing plant in town, just to the North/East, down wind of the proposed site. Any leak of hazardous material or waste like uranium contaminated material or air particles could be a disaster to important food production, for who knows how long. There could also be ground and ground water contamination from hidden or undiscovered leakage of hazardous materials, like radiation or uranium products or waste.

05-12: The occupied Trailer Court, is less than .06 of a mile down-wind from the Shine site. If there should be any fire, explosion, leaks or accident's with dangerous or contaminated airborne emission releases or other waste from the site, that could pose potential dangers and risks to those residing downwind in this nearby Trailer Court. That's a potential environmental risk.

05-14: Other environmental concerns involve risks to the food chain. There is a large pheasant farm and it's meat processing plant less than a mile to the North and downwind of the Shine site. Release of hazardous materials, airborne harmful particles or radiation emissions could cause great harm to feed, pheasants, their business and loss of jobs, and potential contamination of the food supply for human consumption.

07-4: That's another thing we've got to worry about folks, our food chain. We also got the pheasant farm right across the road from there. That stuff gets on feathers. You think that man is going to be able to sell his pheasants? I don't think so. How do we know how much contamination? What does this give us, 72 hours? Well, how do we know it's not already in their system? Now, I did have a hard thing up in Madison at the VA. I don't know what it was, but I know I was allergic to it. It caused me problems. But I didn't ask what it was. They told me it's similar to what this was and I said that's close to what this is and he says well, it's similar. I said well, you know something, if I'm allergic, how many more of these other people might be allergic to it accidentally?

Response:

These comments express concerns regarding radiological and nonradiological exposures to workers and the public as a result of operations of the SHINE facility. Section 4.8 of the EIS provides the NRC's assessment of the potential radiological and nonradiological effects from the proposed SHINE facility.

As described in Section 4.8 of the EIS, radiological exposures from the proposed SHINE facility would include offsite doses to members of the public and onsite doses to facility workers. SHINE determined that the maximum dose to a member of the public would be within the annual dose limits of 100 millirem (1.0 millisievert) in 10 CFR 20.1301. Further, the NRC staff is conducting a thorough independent review of the potential dose to the public from operations of the SHINE facility. The NRC staff's SER will document this independent evaluation. Assuming that the NRC staff determines in its SER that the maximum dose to workers and the public is within the dose limits in 10 CFR Part 20, the NRC staff concludes that the impacts from potential radiological exposures would be SMALL. In addition, the design of the facility incorporates measures to minimize radiation exposure to workers and members of the public by limiting the release of radioactive gaseous effluents; SHINE would operate the proposed facility in *accordance with all applicable Federal and State of Wisconsin regulatory requirements; and the NRC has the authority to issue, inspect, and enforce radiation protection standards.*

Nonradiological exposures from the proposed SHINE facility to workers and members of the public would be regulated by the State of Wisconsin in accordance with the Wisconsin Administrative Code. In addition, SHINE would manage and minimize nonradiological exposures by complying with Occupational Safety and Health Administration and State of Wisconsin regulations and by using multiple planned features (e.g., facility design, Chemical Hygiene Plan, supervision, training, and protective equipment). Therefore, the NRC staff concludes, in Section 4.8 of this EIS, that nonradiological impacts to workers and members of the public during routine facility operations would be SMALL.

In addition, see Section A.1.1, Accidents, for a discussion of potential impacts to the public during a maximum hypothetical accident and Section A.1.8, Land Use, for a discussion of potential impacts to land use, such as agricultural lands.

A.1.8 **Land Use**

Comments:

05-1: First, in your material on this, the NRC presented incorrect important information, on page 4, by stating the proposed Shine facility would be located approximately four miles south of Janesville, Wisconsin. This site is within the Janesville city limits, on land purchased by the city and connected to other city tax incremental financing district land.

05-11: The NRC information mailed out was incorrect by stating the proposed Shine site would be located approximately 4 miles South of Janesville, WI. The fact is, it will be within the city limits of Janesville. I understood the NRC preferred sites that were away from population, animal, crops and food chain sources and operations, was I wrong?

07-8: How close is it? Now there’s a pamphlet that we received from the NRC which I’ve already discussed with an individual here, that was this thing that said this thing was four miles outside of the City of Janesville. Well, it’s not. It might be from the center of town four miles.

Response:

The comments express concern regarding the correct distance between the proposed SHINE site and the City of Janesville. As described in the EIS, the proposed SHINE site is approximately 4 miles (6.4 kilometers) from the center of the City of Janesville.

In addition, see A.1.7, Human Health, and Section 4.8 of the EIS, for a discussion of potential radiological exposures to the public and regulatory protections that limit radiological exposures to the public. Also, see Section A.1.3, Alternatives, and Chapter 5 of this EIS for a discussion of alternatives considered.

A.1.9 **Transportation**

Comment:

11-6: The Draft EIS should identify any traffic management or infrastructure improvements to US Highway 51 that will be required to handle increased capacity of truck and employee traffic. Any improvements and resultant impacts should be considered connected actions.

The Draft EIS should indicate whether SHINE intends to use the adjacent Southern Wisconsin Regional Airport as a means of shipping and receiving materials. If yes, any improvements to the airport should be disclosed and considered connected actions.

Response:

The comments express concern regarding potential environmental impacts from traffic management or infrastructure improvements on U.S. Highway 51 and at the Southern Wisconsin Regional Airport. As described in Section 4.10 of the EIS, SHINE plans to use staggered work shift schedules to reduce the hourly traffic flow onto U.S. Highway 51 and to schedule truck deliveries early in the day to help reduce traffic congestion. Although traffic signal timing could be optimized to further enhance traffic flow, no modifications to the transportation infrastructure would be required.

Section 4.10 of the EIS also describes SHINE's estimate to transport up to 39 monthly medical isotope shipments. Most of these shipments would be by air through the Southern Wisconsin Regional Airport.

A.1.10 **Water Resources**

Comments:

05-5: Water use concerns: Senica [Seneca] Foods is in the process of enlarging and already using a very large unknown amount of water in million of gallons and will be using much more after enlarging their processing of vegetables production. Now Shine alone, indicates it will use about 6600 gallons per day or 2,409,000 gallons per year. Both of these businesses may threaten our well water & pumping resources in the summer. We have at least two city wells that have high levels of nitrates that can't be used for drinking alone and in recent news Rock County has just experienced a huge increase of nitrate in wells throughout the County. Where will we get good drinking water? Last year many area wells went dry according to news reports. We must preserve our water and other natural resources and address environmental concerns.

05-16: There are water use concerns. Shines indicates it would use approximately 6,600 gallons of water per day, that amounts to 2,409,000 gallons per year. The nearby Seneca Foods uses even much higher amounts of water as well, and will be expanding and using more water yet. The large water use may threaten our water resources and even pumping capacities during the hot summer. We need to preserve our drinking water resources.

07-2: Now our water. All the wells that we have here in this community are drinking water in this community. This is something that's also in here with Al's. We've got a well right across the little bit of a pond right here. We've got another one across the road. We've got another one right over here on the corner. And we've already had some problems with some nitrogen problems and everything with some of our water wells around here. Well, you know, we don't want no uranium problems because you don't know how far that thing is going to seep down in our ground.

The gentleman said where he was at said that 21 something that's supposed to have a water well up there. Well, wait a minute. Last we was told, there is no water well is now to be drilled up there. That would contaminate our water. Enough is enough is said about that. You want to contaminate our water?

Response: *These comments express concern regarding groundwater use, drinking water availability, and groundwater quality. One comment also expresses concern regarding SHINE's drilling of onsite wells.*

Section 4.4 of the EIS describes the potential impacts to water use and quality and Section 4.13.4 of the EIS describes the potential cumulative impacts from other water users on water use and quality. In section 4.4.2, the NRC staff concludes that the impacts on groundwater hydrology, quality, and use from construction, operations, and decommissioning of the proposed

SHINE facility would be SMALL. SHINE would not use onsite groundwater during construction, operations, and decommissioning. Instead, SHINE would obtain water from the City of Janesville Water Utility water treatment plant. Total water use during operations is projected to be 6,073 gallons per day (22,990 liters per day), or 0.006 million gallons per day (23 cubic meters per day). The water treatment plant has a treatment capacity of 19.1 mgd (72,290 m^3/day) with an average peak treatment flow of 14.5 mgd (54,900 m^3/day). Thus, the incremental contribution of influent from the proposed SHINE facility is a very small percentage (i.e., 0.13 percent) of the available treatment capacity and would not affect the water treatment plant's ability to provide for the treatment of other current or reasonably foreseeable residential, commercial, and industrial dischargers to the water treatment plant.

As also described in Section 4.4.2, the NRC staff expects that construction, operations, and decommissioning would not have any impact on local groundwater quality because of the depth of groundwater and provisions for proper design and construction of the facility site's stormwater management and drainage system. SHINE has stated that all equipment and material storage areas would comply with appropriate regulations requiring secondary containment of stored liquids and materials to prevent their release where such materials could contaminate site soils or stormwater runoff, or infiltrate to contaminate groundwater. There would be no discharge of effluents to the subsurface at the site. SHINE installed onsite groundwater monitoring wells to determine the depth to groundwater, and onsite groundwater wells would not be used to withdraw groundwater.

Comments:

03-2: Wisconsin Department of Natural Resources Construction Site and Industrial Storm Water Discharge Permitting, NR 216, Wisconsin Administrative Code:

As described in Subchapter III of NR 216, Wis. Adm. Code, landowners of construction projects where one or more acres of land will be disturbed must obtain a WPDES [Wisconsin Pollutant Discharge Elimination System] Construction Site Storm Water Discharge Permit. A Water Resources Application for Project Permits (WRAPP) (http://dnr.wi.gov/topic/stormwater/construction/forms.html) and applicable fee must be submitted to the Wisconsin Department of Natural Resources at least 14 working days before construction will begin. Permittees must develop an Erosion and Sediment Control Plan and a Storm Water Management Plan describing the best management practices that will be implemented on-site. Weekly on-site inspections throughout the duration of the project and after storm water events are also required.

Additionally, industrial facilities that must obtain industrial storm water discharge permit coverage are listed in NR 216, Wis. Adm. Code, Subchapter II. The determination of whether an industrial facility must obtain storm water discharge permit coverage is based both on the facility's Standards Industrial Classification (SIC) code and whether or not the facility has the potential to contaminate storm water. Permitted facilities must develop a site-specific Storm Water Pollution Prevention Plan (SWPPP). The goal of this plan is to encourage source-area control through identification of a storm water pollution prevention individual, site-specific best management practices, and implementation schedules to help decrease the amount of contaminated storm water runoff from a facility. Some industrial facilities may also be required to conduct annual chemical monitoring for pollutants in runoff from their sites. Facilities with discharges composed entirely of storm water and at which there is no exposure of industrial materials and activities to storm water, may qualify for a Conditional No Exposure Exclusion, as detailed in s. NR 216.21(3). Industrial Notice of Intent and No Exposure Certification forms can be found online at http://dnr.wi.gov/topic/stormwater/industrial/forms.html and shall be submitted to the Wisconsin Department of Natural Resources at the same time as the construction site WRAPP (at least 14 working days prior to expected start of construction).

07-6: Our water, our environmental. They say that they're not going to have to use our stormwater sewage. Well, where is that stuff going to go to if it's on their property, it's going to have to run somewhere? It's sure not going to run and stay on their land. You're going to have roads there. It's going to be running down the roads right down through everything, right? How do we know they ain't going to leak?

Response:

The first comment describes the types of construction and industrial stormwater discharge permits that SHINE must obtain. The second comment expresses concern regarding the potential environmental impacts from stormwater sewage and other runoff. As described in Section 4.4 of the EIS, SHINE would be required to perform all activities in accordance with the Wisconsin General Permit to Discharge Construction Site Storm Water Runoff (WPDES Permit No. WI-S067831-4) (WDNR 2013). SHINE would be required to prepare a site-specific plan that details stormwater pollution prevention measures. In accordance with this permit, these measures would be required to include proper management of all construction materials and chemicals to prevent them from being exposed to, and conveyed by, stormwater to waters of the State. The permit would explicitly require the development of spill prevention and response procedures, such as measures to avoid and respond to spills and leaks of fuels and other materials from construction equipment and activities. Wastewater from the SHINE facility would be conveyed to the City of Janesville Wastewater Treatment Plant through a sanitary sewer line.

A.1.11 **Waste Management**

Comments:

05-6: Now the second part, where will Shine's hazardous waste and all those 2,409,000 gallons of salt brine/uranium waste water go, much of it contaminated water? What kind of monitoring systems will be required for leaks and waste filtering and radon levels in all areas, including all waste products, as well as incoming uranium sources? How can they filter out all the salt brine and the trace uranium from the waste water? We can't drain all this inferior water into the Rock River and contaminate our sewage disposal system and underground water supplies. Has a study been down on the depth and capacities of our underground water supply and aquifer levels? How far down beneath the building site does one reach the first water table? How far down to the second water table?

Who is responsible for site clean up, should an accident take place and contaminate the entire site? What if Shine would just pick up and leave? Can the site be cleaned up say after ten years use, so that the site can safely be used for any other purpose? How much contaminated waste water or material can be accepted and stored on site and for how long? Shine has said it will be using a salt brine in their accelerators in conjunction with uranium. There is great concern that this will quickly cause great dangerous erosion/corrosion to all elements and cause further damage disposing waste salt water with uranium contaminated water. These two products together presents and accelerates all the dangers resulting from corrosion caused by salt brine.

05-17: Shine's use of salt brine within the accelerators with uranium appears very risky, with the increased corrosion dangers of salt brine and expected leaks. Shine says they clean them every 5 ½ days. How do they clean them and what products can they use to clean them? Where does all the waste water and salt brine water go? How is that water safely cleaned or filtered?

07-3: What are we going to do with the water which is the—this stuff is put into the accelerators which is done by a salt brine. They're going to have tanks there to haul this stuff away. It's my understanding they had some tanks similar to that up in Pennsylvania or Connecticut or somewhere just recently that NRC had to go and check on something about them leaking. Well, these things will have to be hauled out of here. They've got to be hauled down to Arizona and Texas. Wait a minute here, folks. We got not only changes to worry about, we've got this stuff being hauled all over across the country and where did it come from? Janesville, Wisconsin.

Response:

These comments express concern regarding the disposal of nonradiological and radiological waste that would be generated at the SHINE facility and potential exposure from the generation of nonradiological and radiological waste. Section 4.9 of the EIS describes the waste management programs for radiological waste. In this section, the NRC staff concludes that nonradiological and radioactive waste is expected to be managed in accordance with applicable Federal and State regulatory requirements based on SHINE's proposed waste management systems; engineered designs features to minimize radioactive contamination; and the NRC's, the Department of Transportation's, and State of Wisconsin's radiation protection requirements. Therefore, the NRC staff concludes that impacts from radiological waste would be SMALL during construction, operations, and decommissioning.

As described in Section 2.7 of the EIS, in accordance with 10 CFR Part 50, a licensed production or utilization facility that permanently ceases operations shall submit a decommissioning report. The regulation at 10 CFR 50.33(k) requires that a report indicate how reasonable assurance will be provided that funds will be available to decommission the facility.

In addition, see A.1.7, Human Health, and Section 4.8 of the EIS for a discussion of potential radiological exposures to the public during construction, operations, and decommissioning. In addition, see Section 4.8 of the EIS for a discussion of water use and discharges during construction, operations, and decommissioning.

Comment:

03-4: SHINE has indicated that they will submit a notification of exemption from State regulations regarding treatment, storage and disposal of hazardous waste under Wis. Stats. 291, Wis. Admin. NR 660 and Wis. Admin. NR 662 for waste generated and managed under an NRC license.

Response:

The comment suggests that SHINE will submit a notification of exemption from the State regarding the treatment, storage, and disposal of hazardous waste. In Section 2.7.2 of the EIS, the NRC staff states that SHINE does not intend to treat or permanently store hazardous wastes on site. SHINE would dispose of hazardous wastes generated at the facility at a licensed hazardous waste disposal site. Because SHINE will not store or treat hazardous wastes on site, it will not require a hazardous waste treatment or storage permit under the Resource Conservation and Recovery Act of 1976 (42 U.S.C. 6901 et seq.).

Comment:**11-2:**

- The Draft EIS should describe how the facility will comply with Underground Storage Tanks (UST) regulations under the Resource Conservation and Recovery Act (RCRA) for underground storage of fuel.

Response:

This comment questions how SHINE will comply with underground storage tank regulations under RCRA for underground storage of fuel. As described in Sections 2.7 and 4.9.2 of the EIS, SHINE would implement management systems to control, handle, process, store, and transport nonradioactive materials and waste generated during construction, operations, and decommissioning. The NRC staff expects that these management systems would ensure that the nonradioactive materials and wastes generated at the proposed SHINE facility would be managed in accordance with all Federal and State regulatory requirements, including those under RCRA.

Comments:

11-4:

- The Draft EIS should describe the disposal facility options available in the event that an anticipated disposal or storage facility is no longer available. Waste stream and disposal facility availability should be reviewed on an annual basis to confirm knowledge of the waste streams relative to the disposal options available and to avoid a situation of accumulating waste without a disposal path. The availability of options for each solid and liquid waste stream should also be discussed.
- Section 19.2.5.3.1 (Solid Radioactive Waste Handling System) discusses the generation and management of a used resin classified as Greater than Class C (GTCC) waste that would be shipped to Waste Control Specialists (WCS) of Texas for long-term storage.
- The Draft EIS should acknowledge that currently there is not a permanent disposal option available for commercially-generated GTCC waste, hence the need for long-term storage at WCS. The Draft EIS should evaluate whether it is possible to modify the system so that the used resin is generated as either Class A, B, or C low-level radioactive waste, which currently have available disposal options.
- The Draft EIS should provide information on the radionuclide inventory anticipated at the site during typical operations, with information on what would be considered process material, waste material temporarily stored on site for eventual off-site transport and disposal, or other site-specific material/product/waste designations. Radionuclide inventory limits under the NRC license should also be described.

Response:

These comments express concerns regarding the accumulation of waste and radionuclides on site, as well as disposal facility options. Section 2.7 of the EIS describes the storage, treatment, and transportation of radioactive and nonradioactive waste. Section 2.7 states that construction, operations, and decommissioning would result in the accumulation of radioactive and nonradioactive wastes. SHINE does not anticipate any long-term storage of radioactive or nonradioactive materials, such as medical radioisotope products, target solution, reagents, or resulting wastes. SHINE would treat and temporarily store the solid radioactive and nonradioactive waste generated as part of the radioisotope production process within the facility until it could ship the waste off site for disposal. While temporarily stored on site, NRC regulations require that radioactive material within the facility and radioactive effluents released into the environment meet the radiation protection dose-based limits in 10 CFR Part 20. NRC *regulations also require occupational and public exposure to radioactive material be as low as is reasonably achievable, as required by 10 CFR 20.1101(b).*

Section 2.7 of the EIS further describes the waste disposal options for radiological and nonradiological waste. In addition, a provision of the American Medical Isotopes Production Act of 2012 (42 U.S.C. 2065(c)(3)(A)(ii)) states that the U.S. Department of Energy (DOE) would take title to, and be responsible for, the final disposition of radioactive waste created by the irradiation, processing, or purification of uranium leased from DOE if it determines that the producer (e.g., SHINE) does not have access to a disposal path. For example, if a disposal pathway for GTCC waste does not exist, DOE will be responsible for its safe storage and disposal.

A.2 References

10 CFR Part 20. *Code of Federal Regulations*, Title 10, *Energy*, Part 20, "Standards for protection against radiation."

10 CFR Part 50. *Code of Federal Regulations*, Title 10, *Energy*, Part 50, "Domestic licensing of production and utilization facilities."

36 CFR Part 800. *Code of Federal Regulations*, Title 36, *Parks, Forests, and Public Property*, Part 800, "Protection of historic properties."

78 FR 39343. U.S. Nuclear Regulatory Commission. "SHINE Medical Technologies, Inc.—intent to prepare environmental impact statement and conduct scoping process; public meeting." *Federal Register* 78(126):39343–39344. July 1, 2013.

American Medical Isotopes Production Act of 2012. 42 U.S.C. §3171 et seq.

Forest County Potawatomi. 2013. Letter from Cook M, Tribal Historic Preservation Officer, to Wong MC, NRC. Subject: Request for scoping comments concerning the SHINE Medical Technologies radioisotope production facility. July 31, 2013. ADAMS No. ML13224A164.

National Environmental Policy Act of 1969, as amended. 42 U.S.C. §4321 et seq.

National Historic Preservation Act of 1966. 16 U.S.C. §470 et seq.

Resource Conservation and Recovery Act of 1976. 42 U.S.C. §6901 et seq.

[NRC] U.S. Nuclear Regulatory Commission. 2012. *Final Interim Staff Guidance Augmenting NUREG-1537, Part 1, "Guidelines for Preparing and Reviewing Applications for the Licensing of Non-Power Reactors: Format and Content," and Part 2, "Guidelines for Preparing and Reviewing Applications for the Licensing of Non-Power Reactors: Standard Review Plan and Acceptance Criteria," for Licensing Radioisotope Production Facilities and Aqueous Homogeneous Reactors.* Washington, DC: NRC. October 17, 2012. ADAMS No. ML12156A069 and ML12156A075.

[NRC] U.S. Nuclear Regulatory Commission. 2015. "Approval of Memorandum of Agreement between DOE and NRC on the Environmental Review Related to the Issuance of Authorizations to Construct Build and Operate SHINE Medical Technologies, Inc." Washington, DC: NRC. February 3, 2015. ADAMS No. ML13304B666.

[SHINE] SHINE Medical Technologies, Inc. 2013a. *Preliminary Safety Analysis Report (PSAR): Chapter 13, "Accident Analysis," and Chapter 19, "Environmental Review*." Monona, WI: SHINE. March 26, 2013, and May 31, 2013. ADAMS No. ML13172A324.

[SHINE] SHINE Medical Technologies, Inc. 2013b. *SHINE Medical Technologies, Inc. Application for Construction Permit Response to Environmental Requests for Additional Information.* November 19, 2013. ADAMS No. ML13303A887.

[WAC] Wisconsin Administrative Code NR 216. Environmental Protection, Wisconsin Pollutant Discharge Elimination System Chapter NR 216. *Storm Water Discharge Requirements*. Revised April 2013. Available at <https://docs.legis.wisconsin.gov/code/toc/nr> (accessed 3 January 2013).

[WAC] Wisconsin Administrative Code NR 405. *Prevention of Significant Deterioration*. July 2014. Available at <http://docs.legis.wisconsin.gov/code/admin_code/nr/400/405.pdf>.

[WAC] Wisconsin Administrative Code NR 406. *Construction Permits*. March 2014. Available at <http://docs.legis.wisconsin.gov/code/admin_code/nr/400/406.pdf>.

[WAC] Wisconsin Administrative Code NR 407. *Operation Permits*. February 2014. Available at <http://docs.legis.wisconsin.gov/code/admin_code/nr/400/407.pdf>.

[WDNR] Wisconsin Department of Natural Resources. 2013. *Construction Site Storm Water Permit Overview*. Web page updated November 12, 2013. Available at <http://dnr.wi.gov/topic/Stormwater/construction/overview.html> (accessed 3 January 2013).

[WDNR] Wisconsin Department of Natural Resources. 2014a. Letter from Heggelund E, WDNR Environmental Analysis and Review Specialist, to Moser M, NRC Environmental Project Manager. Subject: WDNR Comments for the National Environmental Policy Act Environmental Impact Statement and Scoping for SHINE Medical Technologies Radioisotope Production Facility. February 7, 2014. ADAMS No. ML14045A298.

APPENDIX B
APPLICABLE LAWS, REGULATIONS, AND OTHER REQUIREMENTS

B. APPLICABLE LAWS, REGULATIONS, AND OTHER REQUIREMENTS

A number of Federal laws and regulations affect environmental protection, health, safety, compliance, and consultation at U.S. Nuclear Regulatory Commission (NRC)-licensed facilities. Certain Federal environmental requirements have been delegated to State authorities for enforcement and implementation. Furthermore, States have enacted laws to protect public health and safety and the environment. It is the agency's policy to ensure that NRC-licensed facilities are operated in a manner that provides adequate protection of public health and safety and of the environment through compliance with applicable Federal and State laws, regulations, and other requirements.

The requirements that may be applicable to the operation of NRC-licensed facilities encompass a broad range of Federal laws and regulations that address environmental, historical and cultural, health and safety, transportation, and other concerns. Generally, these laws and regulations relate to how a facility would conduct the work involved in performing a proposed action to protect workers, the public, and environmental resources. Some of these laws and regulations require permits or consultation with other Federal agencies or State, Tribal, or local governments.

The Atomic Energy Act of 1954, as amended (AEA) (42 U.S.C. 2011 et seq.), authorizes the NRC to enter into agreement with any State to assume regulatory authority for certain activities (42 U.S.C. 2021). The NRC and the Governor of Wisconsin signed an agreement transferring NRC regulatory authority over byproduct, source, and special nuclear materials (in quantities not sufficient to form a critical mass) to the State of Wisconsin, which became the 33rd Agreement State, effective August 11, 2003. As an Agreement State, the Wisconsin Department of Health Services is responsible for licensing and inspecting the above-named materials, except at nuclear power plants and Federal facilities (WDHS 2014).

In addition to carrying out some Federal programs, State legislatures develop their own laws. State statutes supplement, as well as implement, Federal laws for the protection of air, water quality, and groundwater. State legislation may address solid waste management programs, locally rare or endangered species, and historical and cultural resources.

The Clean Water Act of 1977, as amended (33 U.S.C. 1251 et seq., herein referred to as CWA), allows for primary enforcement and administration through State agencies, given that the State program is at least as stringent as the Federal program. The State program must conform to the CWA and to the delegation of authority for the Federal National Pollutant Discharge Elimination System (NPDES) program from the U.S. Environmental Protection Agency (EPA) to the State. The primary mechanism to control water pollution is the requirement for direct dischargers to obtain an NPDES permit or a State Pollutant Discharge Elimination System permit, when the authority has been delegated from the EPA, under the CWA, as is the case for Wisconsin.

One important difference between Federal regulations and certain State regulations is the definition of waters regulated by the State. Certain State regulations may include underground waters, whereas the CWA only regulates surface waters.

B.1 Federal, State, and Local Requirements

Construction and operation of the SHINE facility would be subject to Federal, State, and local requirements. Tables B–1, B–2, and B–3 identify the principal Federal, State, county, and city environmental regulatory requirements that may be applicable to the proposed SHINE Medical Technologies, Inc. (SHINE), medical radioisotope production facility (SHINE facility) or the alternative sites. Along with each regulatory requirement is a brief description. The requirements are organized into categories, such as general requirements, water resources, and pollution prevention.

Table B–1. Potentially Applicable Federal Statutes, Regulations, and Orders

Statute/Regulation/Order	Description
General Requirements	
Atomic Energy Act, as amended, 42 U.S.C. 2011 et seq.	The 1954 Atomic Energy Act, as amended (AEA), and the Energy Reorganization Act of 1974 (42 U.S.C. 5801 et seq.), give the NRC the licensing and regulatory authority for nuclear energy uses within the commercial sector. The Acts give the NRC responsibility for licensing and regulating commercial uses of atomic energy and research and test reactors, and allow the agency to protect workers and the public by establishing dose and concentration limits for activities under NRC jurisdiction. The NRC implements its responsibilities under the AEA through regulations established in Title 10 of the *Code of Federal Regulations* (CFR).
National Environmental Policy Act of 1969, as amended, 42 U.S.C. 4321 et seq.	The National Environmental Policy Act, as amended (NEPA), requires Federal agencies to integrate environmental values into their decisionmaking process by considering the environmental impacts of proposed Federal actions and reasonable alternatives to those actions. NEPA establishes policy, sets goals (in Section 101), and provides means (in Section 102) for carrying out the policy. Section 102(2) contains action-forcing provisions to ensure that Federal agencies follow the letter and spirit of the Act. For major Federal actions significantly affecting the quality of the human environment, Section 102(2)(C) of NEPA requires Federal agencies to prepare a detailed statement that includes the environmental impacts of the proposed action and other specified information.
10 CFR Part 50	10 CFR Part 50, “Domestic licensing of production and utilization facilities,” contains NRC regulations issued under the AEA, as amended (68 Stat. 919), and Title II of the Energy Reorganization Act of 1974 (88 Stat. 1242) to provide for the licensing of production and utilization facilities. This part also gives notice to all persons who knowingly supply—to any licensee, applicant, contractor, or subcontractor—components, equipment, materials, or other goods or services, that relate to a licensee’s or applicant’s activities subject to this part, that they may be individually subject to NRC enforcement action for violation of 10 CFR 50.5.

Statute/Regulation/Order	Description
Air Quality Protection	
Clean Air Act of 1970, as amended, 42 U.S.C. 7401 et seq.	The Clean Air Act, as amended (CAA), is intended to “protect and enhance the quality of the nation’s air resources so as to promote the public health and welfare and the productive capacity of its population.” The CAA establishes regulations to ensure maintenance of air quality standards and authorizes individual States to manage permits. Section 118 of the CAA requires each Federal agency, with jurisdiction over properties or facilities engaged in any activity that might result in the discharge of air pollutants, to comply with all Federal, State, inter-State, and local requirements with regard to the control and abatement of air pollution. Section 109 of the CAA directs the U.S. Environmental Protection Agency (EPA) to set National Ambient Air Quality Standards for criteria pollutants. EPA has identified these standards and set them for the following criteria pollutants: particulate matter, sulfur dioxide, carbon monoxide, ozone, nitrogen dioxide, and lead. Section 111 of the CAA requires the establishment of national performance standards for new or modified stationary sources of atmospheric pollutants. Section 160 of the CAA requires the evaluation of specific emission increases before permit approval to prevent significant deterioration of air quality. Section 112 requires specific standards for the release of hazardous air pollutants (including radionuclides). These standards are implemented through plans developed by each State and approved by the EPA. The CAA requires sources to meet standards and to obtain permits to satisfy those standards. Nuclear facilities may be required to comply with CAA Title V, Sections 501–507, for sources subject to new source performance standards or sources subject to National Emission Standards for Hazardous Air Pollutants. EPA regulates emissions of air pollutants in 40 CFR Parts 50 to 99.
Environmental Justice and Public Health Protection	
10 CFR Part 20	10 CFR Part 20, “Standards for protection against radiation,” contains NRC regulations that establish standards for protection against ionizing radiation resulting from activities conducted under licenses issued by the NRC. The NRC issued these regulations under the AEA, as amended, and the Energy Reorganization Act of 1974, as amended. The purpose of these regulations is to control the receipt, possession, use, transfer, and disposal of licensed material by any licensee in such a manner that the total dose to an individual (including doses resulting from licensed and unlicensed radioactive material and from radiation sources other than background radiation) does not exceed the standards for protection against radiation prescribed in the regulations in this part.
Executive Order 12898	Executive Order 12898, “Federal actions to address environmental justice in minority populations and low-income populations,” requires Federal agencies to identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority and low-income populations. Amended by Executive Order 12948.
Executive Order 13045	Executive Order 13045, “Protection of children from environmental health risks and safety risks,” prioritizes the identification and assessment of environmental health and safety risks that may disproportionately affect children and ensures that those risks are addressed.
Noise Control Act of 1972, as amended, 42 U.S.C. 4901 et seq.	The Noise Control Act of 1972, as amended, requires facilities to maintain noise levels that do not jeopardize public health or safety.

Statute/Regulation/Order	Description
Occupational Safety and Health Administration occupational noise exposure regulations, 29 CFR 1910.95	Occupational Safety and Health Administration (OSHA) regulations establish workplace standards for noise.
Occupational Safety and Health Act of 1970, 29 U.S.C. 651	The Occupational Safety and Health Act of 1970 requires compliance with all applicable worker safety and health legislation (including guidelines of 29 CFR Part 1960).
Policy Statement on the Treatment of Environmental Justice Matters in NRC Regulatory and Licensing Actions, 69 FR 52040 (2004)	The NRC is committed to the general goals of Executive Order 12898 and to full compliance with the NEPA requirements.
Historic preservation and cultural resources	
National Historic Preservation Act of 1966, as amended, 16 U.S.C. 470 et seq.	The National Historic Preservation Act, as amended (NHPA), was enacted to create a national historic preservation program, including the National Register of Historic Places and the Advisory Council on Historic Preservation. Section 106 of the Act requires Federal agencies to take into account the effects of their undertakings on historic properties. The Advisory Council on Historic Preservation regulations implementing Section 106 of the Act are found in 36 CFR Part 800. The regulations call for public involvement in the Section 106 consultation process, including Indian Tribes and other interested members of the public, as applicable.
Land-Use Protection	
Farmland Protection Policy Act of 1981, 7 U.S.C. 4201 et seq.	The Farmland Protection Policy Act sets guidelines that require all agencies to identify prime farmland proposed to be converted to nonagricultural land use and to evaluate the impact of the conversion.
Protected Species	
Endangered Species Act of 1973, as amended, 16 U.S.C. 1531 et seq.	The Endangered Species Act of 1973, as amended (ESA), was enacted to prevent the further decline of endangered and threatened species and to restore those species and their critical habitats. Section 7 of the Act requires Federal agencies to consult with the U.S. Fish and Wildlife Service or the National Marine Fisheries Service on Federal actions that may affect listed species or designated critical habitats.
Magnuson–Stevens Fishery Conservation and Management Act, as amended, 16 U.S.C. 1801–1884	The Magnuson–Stevens Fishery Conservation and Management Act, as amended (MSA), governs marine fisheries management in U.S. Federal waters. The Act created eight regional fishery management councils and includes measures to rebuild overfished fisheries, protect essential fish habitat, and reduce bycatch. Under Section 305 of the Act, Federal agencies are required to consult with National Marine Fisheries Service for any Federal actions that may adversely affect essential fish habitat.
Fish and Wildlife Coordination Act, 16 U.S.C. 661 et seq.	To minimize adverse impacts of proposed actions on fish and wildlife resources and habitat, the Fish and Wildlife Coordination Act requires that Federal agencies consult Government agencies regarding activities that affect, control, or modify waters of any stream or bodies of water. It also requires that justifiable means and measures be used in modifying plans to protect fish and wildlife in these waters

Statute/Regulation/Order	Description
Waste Management and Pollution Prevention	
Resource Conservation and Recovery Act, 42 U.S.C. 6901 et seq.	The Resource Conservation and Recovery Act (RCRA) requires the EPA to define and identify hazardous waste; establish standards for its transportation, treatment, storage, and disposal; and require permits for persons engaged in hazardous waste activities. Section 3006 (42 U.S.C. 6926) allows States to establish and administer these permit programs with EPA approval. EPA regulations implementing the Act are found in 40 CFR Parts 260 to 299. Regulations imposed on a generator or on a treatment, storage, or disposal facility vary according to the type and quantity of material or waste generated, treated, stored, or disposed of. The method of treatment, storage, and disposal also affects the extent and complexity of the requirements.
Pollution Prevention Act of 1990, 42 U.S.C. 13101 et seq.	The Pollution Prevention Act of 1990 establishes a national policy for waste management and pollution control that focuses first on source reduction and then on environmental issues, safe recycling, treatment, and disposal.
Water Resources Protection	
Clean Water Act of 1977, 33 U.S.C. 1251 et seq. and the NPDES, 40 CFR Part 122	The Clean Water Act of 1977, as amended (CWA), was enacted to “restore and maintain the chemical, physical, and biological integrity of the Nation’s water.” The Act requires all branches of the Federal Government that have jurisdiction over properties or facilities engaged in any activity that might result in a discharge or runoff of pollutants to surface waters to comply with Federal, State, inter-State, and local requirements. As authorized by the CWA, the National Pollutant Discharge Elimination System (NPDES) permit program controls water pollution by regulating point sources that discharge pollutants into U.S. waters. The NPDES program requires all facilities that discharge pollutants from any point source into U.S. waters to obtain an NPDES permit. A nuclear facility may also participate in the NPDES General Permit for Industrial Stormwater due to stormwater runoff from industrial or commercial facilities to U.S. waters. EPA is authorized under the CWA to directly implement the NPDES program; however, EPA has authorized many States to implement all or parts of the national program. The Wisconsin Department of Natural Resources (WDNR) is the responsible State agency for NPDES permitting. Section 401 of the CWA requires States to certify that the permitted discharge would comply with all limitations necessary to meet established State water-quality standards, treatment standards, or schedule of compliance. The U.S. Army Corps of Engineers is the lead agency for enforcement of CWA wetland requirements (33 CFR Part 320). Under Section 401 of the CWA, EPA or a delegated State agency has the authority to review and approve, impose a condition, or deny all permits or licenses that might result in a discharge to State waters, including wetlands.
Coastal Zone Management Act of 1972, as amended, 16 U.S.C. 1451 et seq.	The Coastal Zone Management Act, as amended (CZMA), was enacted by Congress in 1972 to address the increasing pressures of overdevelopment upon the Nation’s coastal resources. The National Oceanic and Atmospheric Administration (NOAA) administers the CZMA. The CZMA encourages States to preserve; protect; develop; and, where possible, restore or enhance valuable natural coastal resources, such as wetlands, floodplains, estuaries, beaches, dunes, barrier islands, and coral reefs, as well as the fish and wildlife using those habitats. Participation by States is voluntary. To encourage States to participate, the CZMA makes Federal financial assistance available to any coastal State or territory, including those on the Great Lakes, which is willing to develop and implement a comprehensive coastal management program.

Statute/Regulation/Order	Description
Wild and Scenic Rivers Act, 16 U.S.C. 1271 et seq.	The Wild and Scenic River Act created the National Wild and Scenic Rivers System, which was established to protect the environmental values of free-flowing streams from degradation by impacting activities, including water resources projects.
Transportation	
Federal Aviation Act of 1958, as amended, 14 CFR Part 77	The Federal Aviation Act of 1958, as amended, refers to construction of structures that may potentially affect air navigation.
Hazardous Material Transportation Act of 1975, as amended, 49 U.S.C. 5101 et seq., 49 CFR Part 107	The Hazardous Material Transportation Act of 1975, as amended, refers to transportation of hazardous materials.
U.S. Department of Transportation, Federal Aviation Administration Advisory Circular, AC 150/5200-33B	The Federal Aviation Administration (FAA) Advisory Circular, AC 150/5200-33B, "Hazardous wildlife attractants on or near airports," provides guidance on certain land uses that have the potential to attract hazardous wildlife on or near public-use airports. It also discusses airport development projects that could affect aircraft movement near hazardous wildlife attractants.

Table B–2. Potentially Applicable Wisconsin State Requirements

Statute/Regulation/Order	Citation	Responsible Agency	Description
Air Quality Protection			
Wisconsin Air Pollution Statutes	Wisconsin Statutes, Chapter 285	WDNR, Air Management Program	Defines air quality standards, permits and fees, and enforcement and penalties.
Wisconsin Air Pollution Control Rules	Wisconsin Administrative Code, Chapters NR 400–499	WDNR, Air Management Program	Contains State air pollution control rules. See NR 406 and NR 407 for construction permit and operation permit rules. Greenhouse gases are covered in NR 407.075.
Land Use and Economic Programs			
Wisconsin Tax Increment District Law	ss.66.1105	Department of Revenue	Allows municipalities a way to encourage economic development within a designated portion of a municipality.
Wisconsin Statute on Migrant Protection	Wisconsin Statutes, Chapters 103.90–103.97	Department of Workforce Development	Provides migrant worker protections.
Wisconsin Statutes on Farmland Preservation	Wisconsin Statutes, Chapter 91	WDNR	Defines prime farmland.

Statute/Regulation/Order	Citation	Responsible Agency	Description
Building Plan Review	Wisconsin Statutes, Chapter 101; Wisconsin Administrative Code, Chapters SPS 361 and 362	Department of Safety and Professional Services	Is required before a local building permit can be issued for a commercial building to ensure compliance with State building codes.
Protected Species			
Wisconsin Statutes on State-Protected Species	Wisconsin Statutes, Chapter 29, and Administrative Rule NR 27	WDNR	Identifies rare species, natural communities, or natural features tracked in the Natural Heritage Inventory database.
Transportation			
State Trunk Highways, Federal Aid	Wisconsin Statutes, Chapter 84	Wisconsin DOT	Advises towns, villages, cities, and counties on construction and maintenance of highways and bridges.
Wisconsin Airport Land Use Guidebook	Guidebook	Bureau of Aeronautics, Wisconsin DOT	Helps communities and airports work cooperatively to plan for and establish compatible land use around airports and to mitigate existing incompatible conditions.
Waste Management and Pollution Prevention			
Wisconsin Statutes on Pollution Prevention	Wisconsin Statutes, Chapter 299.13	WDNR	Establishes pollution prevention policy and includes regulations.
Wisconsin Statutes on Hazardous Waste	Wisconsin Statutes, Chapter 291; Wisconsin Administrative Code, Chapters NR 660 and 662	WDNR	Regulations regarding the treatment, storage, and disposal of hazardous waste.
Water Resources Protection			
Wisconsin Water Resources Statutes	Wisconsin Statutes, Chapter 283; Wisconsin Administrative Code, Chapter NR 216	WDNR	Requirements to protect water quality, including permits and plans to minimize erosion and control stormwater runoff. See above description under the CWA.

Table B–3. City of Janesville and Rock County, Wisconsin, Ordinances and Plans

Ordinance or Plan	Responsible Agency	Description
Land-Use Protection		
Rock County Comprehensive Plan 2035, 2009	Rock County Planning, Economic & Community Development Agency	Guides long-term economic development; sets policies and goals for cultural and historic resource conservation (Rock County Planning, Economic & Community Development Agency, Strategic & Comprehensive Planning Division).
Janesville, Wisconsin's Park Place Development Guide	City of Janesville Community Development Department	Guide for following development processes.
City of Janesville Ordinance 18.24.050A	City of Janesville Community Development Department	Ensures compliance with local ordinances for site layout and plans for parking, lighting, landscaping, etc.
City of Janesville Ordinance 15.01.100A	City of Janesville Community Development Department	Ensures compliance with local ordinances regarding the construction of buildings; installation of plumbing systems; installation of heating, ventilation, and air conditioning (HVAC) systems; and occupancy of completed buildings.
City of Janesville Ordinance 13.16	City of Janesville Community Development Department	Ensures compliance with local ordinances regarding construction, installation, and operation of connections to the municipal sewer and water systems.
City of Janesville Ordinance 18.24.040	City of Janesville Community Development Department	Ensures compliance with local ordinances regarding the construction of multiple buildings on the same site.
Transportation		
Airport Overlay Zoning District Ordinance of the Southern Wisconsin Regional Airport (SWRA)	City of Janesville Community Development Director	Promotes the public health, safety, convenience, and general welfare of the community and residents; protects the SWRA approaches and surrounding airspace from encroachment; and limits exposure of impacts to persons and facilities near the SWRA.
Rock County Hazard Mitigation Plan	Rock County Local Emergency Planning Committee	Ensures compliance with local ordinances regarding the construction, maintenance, and operation of utilities within highway right-of-way. The permit includes risk assessments for all types of hazards.

B.2 Operating permits and other requirements

Table B–4 lists the permits and licenses that SHINE plans to obtain from Federal, State, and local authorities to construct and operate the SHINE facility.

1 **Table B–4. Permits and Approvals Required for Construction and Operation**

Agency	Regulatory Authority	Permit or Approval	Summary of Activities	Expected Timeframe of Receipt	Status
Permits and Approvals from Federal Agencies					
NRC	Atomic Energy Act 10 CFR 50.50 and 10 CFR 50.35	Construction Permit	Construction of the SHINE facility	2015–2016	Preliminary Safety Analysis Report for the construction permit was submitted in 2013.
	Atomic Energy Act 10 CFR 50.57	Operating License	Operation of the SHINE facility	2018	
	Atomic Energy Act 10 CFR Part 40	Source Material License	Possession, use, and transfer of radioactive source material	2018	
	Atomic Energy Act 10 CFR Part 30	By-Product Material License	Possession, use, and transfer of radioactive by-product material	2018	
	Atomic Energy Act 10 CFR Part 70	Special Nuclear Material License	Receipt, possession, use, and transfer of special nuclear material	2018	
FAA	Federal Aviation Act	Construction Notice FAA Form 7460-1	Construction of structures that could affect air navigation	2015	FAA Form 7460-1 was submitted in 2011; Determination of No Hazard was received 11/2011; Determination of No Hazard extension was received 04/2012; Determination of No Hazard expired 11/2014; SHINE plans to resubmit FAA Form 7460-1 in 2015.
		Construction Notice FAA Form 7460-2	Construction of structures that could affect air navigation	2017	SHINE intends to submit FAA Form 7460-2 within 5 days of when construction reaches its greatest height.

Agency	Regulatory Authority	Permit or Approval	Summary of Activities	Expected Timeframe of Receipt	Status
EPA	CWA, 40 CFR Part 112, Appendix F	Spill Prevention, Control and Countermeasure (SPCC) Plan for Construction and Operation	Storage of oil during construction and operation	2015	SHINE intends to develop the SPCC plan in 2015.
DOT	Hazardous Material Transportation Act, 49 CFR Part 107	Certificate of Registration	Transportation of hazardous materials	2018	SHINE intends to submit DOT Form F-5800.2 Q1 in 2018.
Permits and Approvals from State Agencies					
WDNR	Federal CAA; Wisconsin Statutes, Chapter 285; Wisconsin Administrative Code, Chapter NR 406	Air Pollution Control Construction Permit; Air Pollution Control Operation Permit	Construction of an air pollution emissions source that is not specifically exempted	2015	SHINE intends to submit an application for a Type A Registration Construction Permit and Operation Permit in 2015.
	Federal CAA; Wisconsin Statutes, Chapter 285; Wisconsin Administrative Code, Chapter NR 216	Construction Storm Water Discharge Permit	Discharge of stormwater runoff from the construction site	2015	SHINE intends to submit a Water Resource Application for Project Permits to request coverage under a General Permit in 2015 at least 14 working days before construction begins.
	Federal CAA; Wisconsin Statutes, Chapter 285; Wisconsin Administrative Code, Chapter NR 216	Industrial Storm Water Discharge Permit	Discharge of stormwater runoff from the site during facility operation	2018	SHINE intends to submit a No Exposure Certification at least 14 working days before initiation of operations in 2017.
	Wisconsin Statutes, Chapters 280 and 281; Wisconsin Administrative Code, Chapter NR 809	Approval Letters	Construction by the City of Janesville of water and sanitary sewer extensions to the SHINE facility	2015	A permit is to be requested by the City of Janesville.

Agency	Regulatory Authority	Permit or Approval	Summary of Activities	Expected Timeframe of Receipt	Status
	Wisconsin Statutes, Chapter 291; Wisconsin Administrative Code, Chapter NR 660, 662, and/or 666	Compliance with hazardous waste notification, record keeping, and reporting requirements	Generation of hazardous waste	2018	SHINE intends to notify WDNR of Storage and Treatment Conditional Exemption (NR 666, Subchapter N) in 2018 or within 90 days of low-level mixed waste generation.
Wisconsin Department of Safety and Professional Services	Wisconsin Statutes, Chapter 101; Wisconsin Administrative Code, Chapters SPS 361 and 362	Building Plan Review	Compliance with State building codes required before a local building permit can be issued for a commercial building	2015	The Building Plan is complete; SHINE intends to submit the Building Plan in 2015.
Wisconsin DOT	Wisconsin Statutes, Chapter 85; Wisconsin Administrative Code, Chapter Trans 231	Permit for Connection to State Trunk Highway	Construction of driveway connection to U.S. Route 51	2015	SHINE intends to request the permit simultaneously or before the submission of the Site Plan in 2015.
	Wisconsin Statutes, Chapter 85; Wisconsin Administrative Code, Chapter Trans 231	Right-of-Entry Permit	Construction by the City of Janesville of utility extensions across U.S. Route 51	2015	The permit is to be requested by the City of Janesville.
	Wisconsin Statutes, Chapter 114; Wisconsin Administrative Code, Chapter Trans 56	Variance from Height Limitation Zoning Ordinances	Construction of structures that exceed height limitations established for Southern Wisconsin Regional Airport	2015	SHINE does not anticipate that this variance will be needed based on the refined building and stack heights developed during the Preliminary Design.

Agency	Regulatory Authority	Permit or Approval	Summary of Activities	Expected Timeframe of Receipt	Status
Permits and Approvals from Local Agencies					
City of Janesville Community Development Department	City of Janesville Ordinance 18.24.050.A	Site Plan Approval (includes Building Site Permit for the Southern Wisconsin Regional Airport Overlay District)	Administrative approval of the site layout and plans for parking, lighting, landscaping, and similar local issues	2015	The Final Site Plan is complete; SHINE intends to submit Site Plan and building elevations in 2015.
	City of Janesville Ordinance 15.06.070	Stormwater Plan Approval (may be included in Site Plan Approval)	Administrative approval of grading and drainage plans	2015	The Final Stormwater Management Plan is complete; SHINE intends to submit Stormwater Management Plan with Site Plan in 2015.
	City of Janesville Ordinance 15.05.080	Erosion Control Permit (may be included in Site Plan Approval)	Administrative approval of erosion control plans	2015	The Final Erosion Plan is complete; SHINE intends to submit the Erosion Control Plan with the Site Plan in Q2 2015.
	City of Janesville Ordinance 13.16	Sanitary Sewer and Water Supply Facility Approvals	Administrative approval of construction, installation, and operation of connections to the municipal sewer and water supply systems	2015	The final plans are complete; construction and installation were approved in the Plumbing Plan. For operation, SHINE intends to provide baseline monitoring report to wastewater treatment plant at least 90 days before discharge in 2016.
	City of Janesville Ordinance 15.01.100.A	Plumbing Plan Approval	Installation of plumbing systems	2015	The Final Plumbing Plan is complete; SHINE intends to submit the Plumbing Plan with the Building Plan in 2015.

Agency	Regulatory Authority	Permit or Approval	Summary of Activities	Expected Timeframe of Receipt	Status
	City of Janesville Ordinance 15.04.010.A	HVAC Plan Approval	Installation of HVAC systems	2015	The Final HVAC Plan is complete; SHINE intends to submit the HVAC Plan with the Building Plan in 2015.
	City of Janesville Ordinance 8.32.010	Fire Sprinkler and Alarm Permit	Installation of sprinkler and alarm systems	2015	The Final Fire Sprinkler and Alarm Plan is complete; SHINE intends to submit the Fire Sprinkler and Alarm Plan with the Building Plan in 2015.
	City of Janesville Ordinance 15.01.100.A	Building Permit	Construction of buildings	2015	SHINE intends to submit the Building Plan in 2015.
	City of Janesville Ordinance 15.01.190.A	Occupancy Permit	Occupancy of completed buildings	2018	Each building would be inspected after construction to allow occupancy.
Rock County Highway Department	Wisconsin Statutes, Chapter 84; Rock County Utility Accommodation Policy 96.00	Permit to Construct, Maintain, and Operate Utilities within Highway Right-of-Way	Construction by the City of Janesville of utility extensions across County Trunk Highway G	2015	Plans and specifications will be submitted by the City of Janesville once the Site Plan is approved, likely in 2015.

Source: SHINE 2015

B.3 References

10 CFR Part 20. *Code of Federal Regulations*, Title 10, *Energy*, Part 20, “Standards for protection against radiation.”

10 CFR Part 30. *Code of Federal Regulations*, Title 10, *Energy*, Part 30, “Rules of general applicability to domestic licensing of byproduct material.”

10 CFR Part 40. *Code of Federal Regulations*, Title 10, *Energy*, Part 40, “Domestic licensing of source material.”

10 CFR Part 50. *Code of Federal Regulations*, Title 10, *Energy*, Part 50, “Domestic licensing of production and utilization facilities.”

10 CFR Part 70. *Code of Federal Regulations*, Title 10, *Energy*, Part 70, “Domestic licensing of special nuclear material.”

14 CFR Part 77. *Code of Federal Regulations*, Title 14, *Aeronautics and Space*, Part 77, "Safe, efficient use, and preservation of the navigable airspace."

29 CFR Part 1910. *Code of Federal Regulations*, Title 29, *Labor*, Part 1910, "Occupational safety and health standards."

29 CFR Part 1960. *Code of Federal Regulations*, Title 29, *Labor*, Part 1960, "Basic program elements for federal employee occupational safety and health programs and related matters."

33 CFR Part 320. *Code of Federal Regulations*, Title 33, *Navigation and Navigable Waters*, Part 320, "General regulatory policies."

36 CFR Part 800. *Code of Federal Regulations*, Title 36, *Parks, Forests, and Public Property*, Part 800, "Protection of historic properties."

40 CFR Part 50. *Code of Federal Regulations*, Title 40, *Protection of Environment*, Part 50, "National primary and secondary ambient air quality standards."

40 CFR Part 112. *Code of Federal Regulations*, Title 40, *Protection of Environment*, Part 112, "Oil pollution prevention."

40 CFR Part 122. *Code of Federal Regulations*, Title 40, *Protection of Environment*, Part 122, "EPA administered permit programs: The National Pollutant Discharge Elimination System."

40 CFR Part 260. *Code of Federal Regulations*, Title 40, *Protection of Environment*, Part 260, "Hazardous Waste Management System: General."

49 CFR Part 107. *Code of Federal Regulations*, Title 49, *Transportation*, Part 107, "Hazardous materials program procedures."

59 FR 7629. Executive Order No. 12898. "Federal actions to address environmental justice in minority populations and low-income populations." *Federal Register* 59(32):7629–7634. February 16, 1994.

60 FR 6381. Executive Order No. 12948. "Amendment to Executive Order No. 12898." *Federal Register* 60(21):6381. February 1, 1995.

62 FR 19885. Executive Order No. 13045. "Protection of children from environmental health risks and safety risks." *Federal Register* 62(78):19885–19888. April 21, 1997.

69 FR 52040. U.S. Nuclear Regulatory Commission. "Policy statement on the treatment of environmental justice matters in NRC regulatory and licensing actions." Federal Register 69(163):52040–52048. August 24, 2004.

Atomic Energy Act of 1954, as amended. 42 U.S.C. § 2011 et seq.

Clean Air Act of 1970, as amended. 42 U.S.C. §7401 et seq.

Clean Water Act of 1977, as amended. 33 U.S.C. §1251 et seq.

Coastal Zone Management Act of 1972, as amended. 16 U.S.C. §1451 et seq.

Endangered Species Act of 1973, as amended. 16 U.S.C. §1531 et seq.

Energy Reorganization Act of 1974, as amended. 42 U.S.C. §5801 et seq.

[FAA] Federal Aviation Administration Form 7460-1, "Notice of Proposed Construction or alteration." February 1, 2012.

[FAA] Federal Aviation Administration Form 7460-2, "Supplemental Notice." July 1, 1998.

Farmland Protection Policy Act of 1981. 7 U.S.C. §4201 et seq.

Fish and Wildlife Coordination Act of 1934, as amended. 16 U.S.C. §661 et seq.

Hazardous Material Transportation Act of 1975, as amended. 49 U.S.C. §5101 et seq.

Magnuson–Stevens Fishery Conservation and Management Act, as amended. 16 U.S.C. §1801 et seq.

National Environmental Policy Act of 1969, as amended. 42 U.S.C. §4321 et seq.

National Historic Preservation Act of 1966, as amended. 16 U.S.C. §470 et seq.

Noise Control Act of 1972, as amended. 42 U.S.C. §4901 et seq.

Occupational Safety and Health Act of 1970. 29 U.S.C. §651.

Pollution Prevention Act of 1990. 42 U.S.C. §13101 et seq.

Resource Conservation and Recovery Act of 1976, as amended. 42 U.S.C. §6901 et seq.

[SHINE] SHINE Medical Technologies, Inc. 2015. *SHINE Medical Technologies, Inc. Application for Construction Permit Response to Request for Additional Information.* February 6, 2015. ADAMS No. ML15043A404.

[WDHS] Wisconsin Department of Health Services. “Radiation Protection.” 2014. Available at <http://www.dhs.wisconsin.gov/radiation> (accessed 12 August 2014).

Wild and Scenic Rivers Act, as amended. 16 U.S.C. §1271 et seq.

APPENDIX C
CHRONOLOGY OF ENVIRONMENTAL REVIEW CORRESPONDENCE

C. CHRONOLOGY OF ENVIRONMENTAL REVIEW CORRESPONDENCE

This appendix, along with Appendix D, contains a chronological listing of correspondence between the U.S. Nuclear Regulatory Commission (NRC) and external parties as part of its environmental review for the SHINE Medical Technologies, Inc. (SHINE), Medical Radioisotope Production Facility (SHINE facility). Appendix D contains the chronological listing of consultation correspondence associated with the Endangered Species Act of 1973 (16 U.S.C. 1531) and the Magnuson–Stevens Fishery Conservation and Management Act, as amended (16 U.S.C. 1801–1884). Appendix C contains all other correspondence.

All documents, with the exception of those containing proprietary information, are available electronically in the NRC's Library, which is found on the Internet at the following Web address: http://www.nrc.gov/reading-rm.html. From this site, the public can gain access to the NRC's Agencywide Documents Access and Management System (ADAMS), which provides text and image files of the agency's public documents. The following list includes the ADAMS accession number for each document. If you need assistance in accessing or searching in ADAMS, contact the Public Document Room Staff at 1-800-397-4209.

C.1 Environmental Review Correspondence

Table C–1 lists the environmental review correspondence in date order, beginning with the request by SHINE to construct the SHINE facility.

Table C–1. Environmental Review Correspondence

Date	Correspondence Description	ADAMS No.
March 26, 2013	Construction Permit Application, Part 1	ML13088A192
May 8, 2013	NRC *Federal Register* Notice (FRN) of Receipt and Availability of Part 1 of the SHINE Construction Permit Application	ML13119A240
May 8, 2013	NRC letter to SHINE, Notice of Receipt and Availability of Part 1 of the SHINE Construction Permit Application	ML13119A236
May 31, 2013	Construction Permit Application, Part 2	ML13172A361
June 24, 2014	NRC FRN of Intent to Prepare an Environmental Impact Statement and Conduct Scoping	ML13157A350
June 24, 2013	NRC letter to SHINE, Notice of Intent to Prepare an Environmental Impact Statement and Conduct Scoping	ML13157A355
June 25, 2013	NRC FRN of Acceptance for Docketing Part 1 of the SHINE Construction Permit Application	ML13150A389
June 25, 2013	NRC letter to SHINE, Notice of Acceptance for Docketing Part 1 of the SHINE Construction Permit Application	ML13150A280
July 1, 2013	NRC letter to U.S. Fish and Wildlife Service, Request for List of Federally Listed Species and Habitats for the SHINE Radioisotope Production Facility Environmental Review	ML13134A385
July 1, 2013	NRC letter to Wisconsin Department of Natural Resources, Request for Scoping Comments on the SHINE Radioisotope Production Facility Environmental Review	ML13135A304

Date	Correspondence Description	ADAMS No.
July 1, 2013	NRC letter to Advisory Council on Historic Preservation, Request for Scoping Comments and Notification of Section 106 Review on the SHINE Radioisotope Production Facility Environmental Review	ML13136A011
July 1, 2013	NRC letter to Wisconsin Historical Society, Request for Scoping Comments and Notification of Section 106 Review on the SHINE Radioisotope Production Facility Environmental Review	ML13135A635
July 1, 2013	NRC letter to Citizen Potawatomi Nation, Request for Scoping Comments and Notification of Section 106 Review on the SHINE Radioisotope Production Facility Environmental Review	ML13136A014
July 1, 2013	NRC letter to Prairie Island Indian Community, Request for Scoping Comments and Notification of Section 106 Review on the SHINE Radioisotope Production Facility Environmental Review	ML13136A014
July 1, 2013	NRC letter to Bad River Band of Lake Superior Chippewa Indians, Request for Scoping Comments and Notification of Section 106 Review on the SHINE Radioisotope Production Facility Environmental Review	ML13136A014
July 1, 2013	NRC letter to St. Croix Chippewa Indians of Wisconsin, Request for Scoping Comments and Notification of Section 106 Review on the SHINE Radioisotope Production Facility Environmental Review	ML13136A014
July 1, 2013	NRC letter to Menominee Indian Tribe of Wisconsin, Request for Scoping Comments and Notification of Section 106 Review on the SHINE Radioisotope Production Facility Environmental Review	ML13136A014
July 1, 2013	NRC letter to Flandreau Santee Sioux Tribe of South Dakota, Request for Scoping Comments and Notification of Section 106 Review on the SHINE Radioisotope Production Facility Environmental Review	ML13136A014
July 1, 2013	NRC letter to Iowa Tribe, Request for Scoping Comments and Notification of Section 106 Review on the SHINE Radioisotope Production Facility Environmental Review	ML13136A014
July 1, 2013	NRC letter to Forest County Potawatomi Community, Request for Scoping Comments and Notification of Section 106 Review on the SHINE Radioisotope Production Facility Environmental Review	ML13136A014
July 1, 2013	NRC letter to Hannahville Indian Community, Request for Scoping Comments and Notification of Section 106 Review on the SHINE Radioisotope Production Facility Environmental Review	ML13136A014
July 1, 2013	NRC letter to Ho-Chunk Nation of Wisconsin, Request for Scoping Comments and Notification of Section 106 Review on the SHINE Radioisotope Production Facility Environmental Review	ML13136A014
July 1, 2013	NRC letter to Sac and Fox Nation, Request for Scoping Comments and Notification of Section 106 Review on the SHINE Radioisotope Production Facility Environmental Review	ML13136A014

Date	Correspondence Description	ADAMS No.
July 1, 2013	NRC letter to Lower Sioux Indian Community, Request for Scoping Comments and Notification of Section 106 Review on the SHINE Radioisotope Production Facility Environmental Review	ML13136A014
July 1, 2013	NRC letter to Prairie Band of Potawatomi Nation, Request for Scoping Comments and Notification of Section 106 Review on the SHINE Radioisotope Production Facility Environmental Review	ML13136A014
July 1, 2013	NRC letter to Santee Sioux Nation, Request for Scoping Comments and Notification of Section 106 Review on the SHINE Radioisotope Production Facility Environmental Review	ML13136A014
July 1, 2013	NRC letter to Sisseton-Wahpeton Oyate of the Lake Traverse Reservation, Request for Scoping Comments and Notification of Section 106 Review on the SHINE Radioisotope Production Facility Environmental Review	ML13136A014
July 1, 2013	NRC letter to Spirit Lake Tribe, Request for Scoping Comments and Notification of Section 106 Review on the SHINE Radioisotope Production Facility Environmental Review	ML13136A014
July 1, 2013	NRC letter to Upper Sioux Community, Request for Scoping Comments and Notification of Section 106 Review on the SHINE Radioisotope Production Facility Environmental Review	ML13136A014
July 1, 2013	NRC letter to Peoria Tribe of Indians of Oklahoma, Request for Scoping Comments and Notification of Section 106 Review on the SHINE Radioisotope Production Facility Environmental Review	ML13136A014
July 1, 2013	NRC letter to Winnebago Tribe of Nebraska, Request for Scoping Comments and Notification of Section 106 Review on the SHINE Radioisotope Production Facility Environmental Review	ML13136A014
July 3, 2013	NRC letter to SHINE, Environmental Site Audit Regarding the SHINE Radioisotope Production Facility Environmental Review	ML13168A562
July 3, 2013	Scoping Meeting Notice for the SHINE Radioisotope Production Facility	ML13178A314
July 17, 2013	Construction Permit Process and Environmental Scoping Public Meeting Slides for the SHINE Radioisotope Production Facility	ML13190A419
July 17, 2013	Transcript from the SHINE Scoping Meeting—Afternoon Session	ML13260A280
July 17, 2013	Transcript from the SHINE Scoping Meeting—Evening Session	ML13260A281
July 24, 2013	SHINE E-mail to NRC, Tour Route for the Environmental Site Audit	ML13210A003
July 31, 2013	Forest County Potawatomi Community letter to NRC, Response to Request for Scoping Comments	ML13224A164
August 13, 2013	Scoping Comment from Richard T. Henning	ML13233A023
August 13, 2013	Scoping Comment from Al Lembrich	ML13233A022
August 14, 2013	Scoping Comment from U.S. Environmental Protection Agency	ML13238A121

Date	Correspondence Description	ADAMS No.
August 15, 2013	U.S. Fish and Wildlife Service letter to NRC, Response to the Request for a List of Federally Listed Species and Habitats for the SHINE Medical Technologies Environmental Review	ML13234A020
August 30, 2013	SHINE to NRC, Draft Responses to Environmental Site Audit Needs	ML13242A356, ML13242A367
September 3, 2013	Scoping Comment from Jamie Stout	ML13263A012
September 11, 2013	NRC letter to SHINE, Request for Additional Information for the SHINE Radioisotope Production Facility Environmental Review	ML13231A041
September 23, 2013	Meeting Summary of the Environmental Scoping Public Meeting for the SHINE Radioisotope Production Facility	ML13260A294
October 4, 2013	SHINE letter to NRC, Response to Requests for Additional Information for the SHINE Radioisotope Production Facility Environmental Review	ML13303A887
December 2, 2013	NRC FRN of Acceptance for Docketing Part 2 of the SHINE Construction Permit Application	ML13316B349
December 2, 2013	NRC letter to SHINE, Notice of Acceptance for Docketing Part 2 of the SHINE Construction Permit Application	ML13316B387
February 7, 2014	Wisconsin Department of Natural Resources letter to NRC, Scoping Comments for the SHINE Radioisotope Production Facility Environmental Review	ML14045A298
September 19, 2014	NRC letter to SHINE, Request for Additional Information for the SHINE Radioisotope Production Facility Construction Permit Review	ML14195A159
October 15, 2014	SHINE letter to NRC, Response to Requests for Additional Information for the SHINE Radioisotope Production Construction Permit Review	ML14296A189
January 6, 2015	NRC letter to SHINE, Request for Additional Information for the SHINE Radioisotope Production Facility Construction Permit Review	ML15005A407
February 3, 2015	Memorandum of Agreement between the U.S. Department of Energy and the NRC on the Environmental Review Related to the SHINE Radioisotope Production Facility	ML13304B666
February 6, 2015	SHINE letter to NRC, Response to Requests for Additional Information for the SHINE Radioisotope Production Construction Permit Review	ML15043A404
March 3, 2015	NRC letter to SHINE, Proposed Review Schedule, Notice of Hearing, Opportunity to Petition for Leave to Intervene, and Order Imposing Procedures Regarding Application for Construction Permit (TAC NO. MF2307)	ML15037A249
March 4, 2015	NRC FRN for the Notice of Hearing, Opportunity to Intervene, Order Imposing Procedures for the proposed SHINE Radioisotope Production Facility	ML15037A108

APPENDIX D
CONSULTATION CORRESPONDENCE

D. CONSULTATION CORRESPONDENCE

D.1 Section 7 Consultation

D.1.1 Federal Agency Obligations Under ESA Section 7

As a Federal agency, the U.S. Nuclear Regulatory Commission (NRC) must comply with the Endangered Species Act of 1973, as amended (16 *United States Code* (U.S.C.) 1531 et seq.; herein referred to as ESA), as part of any action authorized, funded, or carried out by the agency, such as the proposed agency action that this environmental impact statement (EIS) evaluates: whether to issue a construction permit under 10 CFR Part 50 that would allow construction of a medical radioisotope production facility . Under section 7 of the ESA, the NRC must consult with the U.S. Fish and Wildlife Service (FWS) and the National Marine Fisheries Service (NMFS) (referred to jointly as "the Services" and individually as "Service"), as appropriate, to ensure that the proposed agency action is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of designated critical habitat.

The ESA and the regulations that implement ESA section 7, 50 CFR Part 402, "Interagency cooperation—Endangered Species Act of 1973, as amended," describe the consultation process that Federal agencies must follow in support of agency actions. As part of this process, the Federal agency shall either request that the Services provide a list of any listed or proposed species or designated or proposed critical habitats that may be present in the action area or request that the Services concur with a list of species and critical habitats that the Federal agency has created (50 CFR 402.12(c)). If it is determined that any such species or critical habitats may be present, the Federal agency is to prepare a biological assessment to evaluate the potential effects of the action and determine whether the species or critical habitat are likely to be adversely affected by the action (50 CFR 402.12(a); 16 U.S.C. 1536(c)). Furthermore, biological assessments are required for any agency action that is a "major construction activity" (50 CFR 402.12(b)), which the ESA regulations define to include major Federal actions significantly affecting the quality of the human environment under the National Environmental Policy Act of 1969, as amended (42 U.S.C. 4321 et seq.; herein referred to as NEPA) (50 CFR 402.02).

Federal agencies may fulfill their obligations to consult with the Services under ESA section 7 and to prepare a biological assessment in conjunction with the interagency cooperation procedures required by other statutes, including NEPA (50 CFR 402.06(a)). In such cases, the Federal agency should include the results of the ESA section 7 consultation in the NEPA document (50 CFR 402.06(b)). Accordingly, Section D.1.2 describes the biological assessment prepared for the proposed agency action evaluated in this EIS, and Section D.1.3 describes the chronology and results of the ESA section 7 consultation.

D.1.2 Biological Assessment

The NRC considers this EIS to fulfill its obligation to prepare a biological assessment under ESA section 7. Accordingly, the NRC did not prepare a separate biological assessment for the proposed SHINE facility construction permit.

Although the contents of a biological assessment are at the discretion of the Federal agency (50 CFR 402.12(f)), the ESA regulations suggest information that agencies may consider for inclusion. The NRC has considered this information in the following EIS sections.

Section 3.5 describes the action area and the Federally listed and proposed species and designated and proposed critical habitat that have the potential to be present in the action area. This section includes information pursuant to 50 CFR 402.12(f)(1), (2), and (3).

Section 4.5 provides an assessment of the potential effects of the proposed construction, operations, and decommissioning of the SHINE facility on the species and critical habitat present and the NRC's effect determinations, which are consistent with those identified in Section 3.5 of the *Endangered Species Consultation Handbook* (FWS and NMFS 1998). The NRC also addresses cumulative effects and alternatives to the proposed action. This section includes information under 50 CFR 402.12(f)(4) and (5).

D.1.3 **Chronology of ESA Section 7 Consultation**

Upon receipt of SHINE's construction permit application, the NRC staff considered whether any Federally listed or proposed species or designated or proposed critical habitats may be present in the action area (as defined at 50 CFR 402.02) for the proposed construction, operations, and decommissioning. No species under the NMFS's jurisdiction occur within the action area. Therefore, the NRC staff did not consult with the NMFS. With respect to species under the FWS's jurisdiction, the NRC staff requested information from FWS on Federally listed, proposed, and candidate species and critical habitat that may be in the vicinity of the SHINE site and the two alternative sites, in accordance with the ESA section 7 regulations at 50 CFR 402.12(c) in a letter dated July 1, 2013. The FWS responded to the NRC staff's request in a letter dated August 15, 2013, and stated that "no Federally-listed, proposed, or candidate species would be expected within the project area. No critical habitat is present. If any construction is to take place within these two sites, there is no need for further action as required by the 1973 Endangered Species Act, as amended." In Section 3.5, the NRC staff concludes that no ESA-protected species or critical habitats occur in the action area, and Section 4.5 concludes that the proposed action would have no effect on any ESA-protected species or critical habitats. The FWS (2013) does not typically provide its concurrence with "no effect" determinations by Federal agencies. Thus, the ESA does not require further informal consultation or the initiation of formal consultation with the FWS for the proposed SHINE construction permit. Nonetheless, because this EIS constitutes the NRC's biological assessment, the NRC staff will submit a copy of this EIS, upon its issuance, to the FWS for review in accordance with 50 CFR 402.12(j).

Table D–1 lists the letters, e-mails, and other correspondence related to the NRC's ESA obligations with respect to its review of the SHINE construction permit application. This table will be updated in the final EIS, as applicable, to include correspondence transpiring between the issuance of the draft and final EIS.

Table D–1. Section 7 Consultation Correspondence

Date	Sender and Recipient	Description	ADAMS No.[(a)]
July 1, 2013	M. Wong (NRC) to P. Fasbender (FWS)	Request for a list of Federally listed species and habitats for the SHINE Medical Technologies Environmental Review	ML13134A385
August 15, 2013	P. Fasbender (FWS) to M. Wong (NRC)	Response to the request for a list of Federally listed species and habitats for the SHINE Medical Technologies Environmental Review	ML13234A020

(a) These documents can be accessed through the NRC's Agencywide Documents Access and Management System (ADAMS) at the following URL: http://adams.nrc.gov/wba/.

D.2 Essential Fish Habitat Consultation

The NRC must comply with the Magnuson–Stevens Fishery Conservation and Management Act, as amended (16 U.S.C. 1801 et seq., herein referred to as MSA), for any actions authorized, funded, or undertaken, or proposed to be authorized, funded, or undertaken that may adversely affect any essential fish habitat identified under the MSA.

In Section 3.5 of this EIS, the NRC staff concludes that NMFS has not designated essential fish habitat under the MSA in the Rock River and that the proposed SHINE construction permit would have no effect on essential fish habitat. Thus, the MSA does not require the NRC to consult with NMFS for the proposed SHINE construction permit.

D.3 Section 106 Consultation

D.3.1 National Historic Preservation Act of 1966 Consultation

The National Historic Preservation Act of 1966, as amended (16 U.S.C. 470 et seq., herein referred to as NHPA), requires Federal agencies to consider the effects of their undertakings on historic properties and consult with applicable State and Federal agencies, tribal groups, and individuals and organizations with a demonstrated interest in the undertaking before taking action. Historic properties are defined as resources eligible for listing on the National Register of Historic Places. The historic preservation review process (NHPA, Section 106) is outlined in regulations issued by the Advisory Council on Historic Preservation (ACHP) in 36 CFR Part 800. In accordance with 36 CFR 800.8(c), the NRC has elected to use the NEPA process to comply with its obligations under Section 106 of the NHPA.

Table D–2 lists the chronology of consultations and consultation documents related to the NRC Section 106 review. The NRC staff is required to consult with the noted agencies and organizations in accordance with the statutes listed above.

Table D–2. NHPA Correspondence

Date	Sender and Recipient	Description	ADAMS No.[a]
July 1, 2013	M. Wong (NRC) to E. Brown, Wisconsin Historical Society	Request for scoping comments/notification of Section 106 review	ML13135A635
July 1, 2013	M. Wong (NRC) to R. Nelson (ACHP)	Request for scoping comments/notification of Section 106 review	ML13136A011
July 1, 2013	M. Wong (NRC) to J. Barrett, Citizen Potawatomi Nation	Request for scoping comments/notification of Section 106 review	ML13136A014
July 1, 2013	M. Wong (NRC) to M. Wiggins, Jr., Bad River Band of Lake Superior Chippewa Indians	Request for scoping comments/notification of Section 106 review	ML13136A014
July 1, 2013	M. Wong (NRC) to S. Bearheart, St. Croix Chippewa Indians of Wisconsin	Request for scoping comments/notification of Section 106 review	ML13136A014
July 1, 2013	M. Wong (NRC) to C. Corn, Menominee Indian Tribe of Wisconsin	Request for scoping comments/notification of Section 106 review	ML13136A014
July 1, 2013	M. Wong (NRC) to A. Reider, Flandreau Santee Sioux Tribe of South Dakota	Request for scoping comments/notification of Section 106 review	ML13136A014
July 1, 2013	M. Wong (NRC) to J. Rowe-Kurak, Iowa Tribe	Request for scoping comments/notification of Section 106 review	ML13136A014
July 1, 2013	M. Wong (NRC) to H. Frank, Forest County Potawatomi Community	Request for scoping comments/notification of Section 106 review	ML13136A014
July 1, 2013	M. Wong (NRC) to K. Meshigaud, Hannahville Indian Community	Request for scoping comments/notification of Section 106 review	ML13136A014
July 1, 2013	M. Wong (NRC) to J. Greendeer, Ho-Chunk Nation of Wisconsin	Request for scoping comments/notification of Section 106 review	ML13136A014
July 1, 2013	M. Wong (NRC) to G. Thurman, Sac and Fox Nation	Request for scoping comments/notification of Section 106 review	ML13136A014
July 1, 2013	M. Wong (NRC) to D. Prescott, Lower Sioux Indian Community	Request for scoping comments/notification of Section 106 review	ML13136A014
July 1, 2013	M. Wong (NRC) to S. Ortiz, Prairie Band of Potawatomi Nation	Request for scoping comments/notification of Section 106 review	ML13136A014
July 1, 2013	M. Wong (NRC) to J. Johnson, Prairie Island Indian Community	Request for scoping comments/notification of Section 106 review	ML13136A014
July 1, 2013	M. Wong (NRC) to R. Trudell, Santee Sioux Nation	Response to request for scoping comments/notification of Section 106 review	ML13136A014

Date	Sender and Recipient	Description	ADAMS No.[a]
July 1, 2013	M. Wong (NRC) to R. Shepherd, Sisseton-Wahpeton Oyate of the Lake Traverse Reservation	Request for scoping comments/notification of Section 106 review	ML13136A014
July 1, 2013	M. Wong (NRC) to R. Yankton, Sr., Spirit Lake Tribe	Request for scoping comments/notification of Section 106 review	ML13136A014
July 1, 2013	M. Wong (NRC) to K. Jensvold, Upper Sioux Community	Request for scoping comments/notification of Section 106 review	ML13136A014
July 1, 2013	M. Wong (NRC) to J. Froman, Peoria Tribe of Indians of Oklahoma	Request for scoping comments/notification of Section 106 review	ML13136A014
July 1, 2013	M. Wong (NRC) to J. Blackhawk, Winnebago Tribe of Nebraska	Request for scoping comments/notification of Section 106 review	ML13136A014
July 31, 2013	M. Cook, Forest County Potawatomi Community, to M. Wong (NRC)	Response to request for scoping comments	ML13224A164

[a] These documents can be accessed through ADAMS at http://adams.nrc.gov/wba/.

D.4 References

10 CFR Part 50. *Code of Federal Regulations*, Title 10, *Energy*, Part 50, “Domestic licensing of production and utilization facilities.”

36 CFR Part 800. *Code of Federal Regulations*, Title 36, *Parks, Forests, and Public Property*, Part 800, “Protection of historic properties.”

50 CFR Part 402. *Code of Federal Regulations*, Title 50, *Wildlife and Fisheries*, Part 402, “Interagency cooperation—Endangered Species Act of 1973, as amended.”

[ESA] Endangered Species Act of 1973, as amended. 16 U.S.C. § 1531 et seq.

[FWS] U.S. Fish and Wildlife Service. 2013. “Endangered Species Program: What We Do: Consultations: Frequently Asked Questions.” July 15, 2013. Available at <http://www.fws.gov/endangered/what-we-do/faq.html#8> (accessed 5 June 2014).

[FWS and NMFS] U.S. Fish and Wildlife Service and National Marine Fisheries Service. 1998. *Endangered Species Consultation Handbook: Procedures for Conducting Consultation and Conference Activities Under Section 7 of the Endangered Species Act*. March 1998. 315 p. Available at <http://www.fws.gov/endangered/esa-library/pdf/esa_section7_handbook.pdf> (accessed 8 July 2013).

[MSA] Magnuson–Stevens Fishery Conservation and Management Act, as amended. 16 U.S.C. § 1801 et seq.

[NEPA] National Environmental Policy Act of 1969, as amended. 42 U.S.C. § 4321 et seq.

[NHPA] National Historic Preservation Act of 1966, as amended. 16 U.S.C. § 470 et seq.

NRC FORM 335 (12-2010) NRCMD 3.7 U.S. NUCLEAR REGULATORY COMMISSION **BIBLIOGRAPHIC DATA SHEET** *(See instructions on the reverse)*	1. REPORT NUMBER (Assigned by NRC, Add Vol., Supp., Rev., and Addendum Numbers, if any.) NUREG-2183
2. TITLE AND SUBTITLE Environmental Impact Statement for the Construction Permit for the SHINE Medical Radioisotope Production Facility, Draft Report for Comment	3. DATE REPORT PUBLISHED MONTH: May YEAR: 2015 4. FIN OR GRANT NUMBER
5. AUTHOR(S) See Chapter 7	6. TYPE OF REPORT Technical 7. PERIOD COVERED (Inclusive Dates)

8. PERFORMING ORGANIZATION - NAME AND ADDRESS (If NRC, provide Division, Office or Region, U. S. Nuclear Regulatory Commission, and mailing address; if contractor, provide name and mailing address.)
Division of License Renewal
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001

9. SPONSORING ORGANIZATION - NAME AND ADDRESS (If NRC, type "Same as above", if contractor, provide NRC Division, Office or Region, U. S. Nuclear Regulatory Commission, and mailing address.)
Same as above

10. SUPPLEMENTARY NOTES
Docket No. 50-608

11. ABSTRACT (200 words or less)

The U.S. Nuclear Regulatory Commission (NRC) has prepared this environmental impact statement (EIS) in response to an application submitted by SHINE Medical Technologies, Inc. (SHINE), for a construction permit of a medical radioisotope production facility. The EIS includes the analysis that evaluates the environmental impacts of the proposed action and considers the following three alternatives to the proposed action: (1) the no action alternative (i.e., the construction permit is denied), (2) two alternative sites, and (3) one alternative technology.

After weighing the environmental, economic, technical, and other benefits against environmental and other costs, and considering reasonable alternatives, the NRC staff recommends, unless safety issues mandate otherwise, the issuance of the proposed construction permit to SHINE. The NRC staff based its recommendation on the following factors:

• SHINE's Environmental Report;
• the NRC staff's consultation with Federal, State, and local agencies;
• the NRC staff's independent environmental review; and
• the NRC staff's consideration of public comments.

12. KEY WORDS/DESCRIPTORS (List words or phrases that will assist researchers in locating the report.)	13 AVAILABILITY STATEMENT: unlimited
SHINE Medical Technologies, Inc. (SHINE) SHINE Medical Radioisotope Production Facility (SHINE facility) SHINE Environmental Impact Statement (EIS) National Environmental Policy Act (NEPA)	14 SECURITY CLASSIFICATION *(This Page)* unclassified *(This Report)* unclassified 15. NUMBER OF PAGES 16. PRICE

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, DC 20555-0001

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NUREG-2183
Draft

Environmental Impact Statement for the Construction Permit for the SHINE Medical Radioisotope Production Facility

May 2015