COVER SHEET

***Lead Agency*:** U.S. Department of Energy, Western Area Power Administration

***Cooperating Agencies*:** U.S. Department of Agriculture, Rural Utilities Service
U.S. Department of Defense, Army Corps of Engineers

***Title*:** Big Stone II Power Plant and Transmission Project Supplemental Draft Environmental Impact Statement

***Location*:** Proposed Big Stone II Plant: Big Stone City, South Dakota
Proposed Transmission Facilities: Northeastern South Dakota and Southwestern Minnesota

***Contacts*:** For additional information on this Supplemental Draft Environmental Impact Statement, or to receive a copy, contact:

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Abstract: Otter Tail Power Company, Central Minnesota Municipal Power Agency, Great River Energy (GRE), Heartland Consumers Power District (HCPD), Montana-Dakota Utilities Co., Southern Minnesota Municipal Power Agency and Western Minnesota Municipal Power Agency (dba Missouri River Energy Services (MRES)) (collectively referred to as the project Co-owners[1]) propose to construct a 600-megawatt net capability coal-fired electric power generating station named Big Stone II. The proposed Big Stone II plant would be located adjacent to the existing Big Stone plant in Grant County, near Milbank and Big Stone City, South Dakota. Substation modifications and associated transmission lines would also be constructed in South Dakota and Minnesota and interconnect to the southwestern Minnesota utility grid. MRES, on behalf of the Co-owners, applied to interconnect the proposed Project to Western Area Power Administration's (Western) power transmission system at its Morris and Granite Falls substations. MRES and HCPD also requested transmission service contract modifications to deliver power from the proposed Big Stone II plant to their service territories on Western's transmission system. Western must consider approving the interconnection and contract modification requests. Western and the cooperating agencies prepared and distributed for public review and comment a Draft EIS in May 2006. Based on public comments received on the Draft EIS concerning wetland impacts, and additional cost estimates for construction of components of the proposed Project, the Co-owners proposed additional alternatives for the proposed Big Stone II plant cooling which use groundwater as the source of back-up water supply. Western and the cooperating agencies have prepared this Supplemental Draft EIS to address the environmental review requirements of the National Environmental Policy Act for the revisions to the proposed Project.

Western will hold a public hearing at 7 p.m. on: Tuesday, November 13, 2007 at the Milbank Area Chamber of Commerce, 1001 E. 4th Avenue, Milbank, South Dakota.

Oral comments on the Supplemental Draft EIS will be accepted only during the public hearing scheduled for the date and location provided above. Oral comments will be recorded by a court reporter at the hearing and will become part of the public hearing record. Written comments on this Supplemental Draft EIS should be delivered at the hearing or sent to Ms. Nancy Werdel at the address above. Comments must be postmarked no later than **Monday, December 10, 2007**.

[1] Great River Energy and Southern Minnesota Municipal Power Agency have recently announced their withdrawal from the Big Stone II Project. Should the Project size change, Western will comply with applicable DOE regulations implementing the National Environmental Policy Act.

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INTRODUCTION

1.0 Introduction

In May 2006, Western Area Power Administration (Western) issued the Big Stone II Power Plant and Transmission Project Draft Environmental Impact Statement (Draft EIS, DOE/EIS-0377). The Draft EIS described the details of the Proposed Action to construct a nominal 600-megawatt (MW), coal-fired, baseload electric generating facility and associated transmission line and substation upgrades, known as the Big Stone II Project (proposed Project). Approval of the interconnection of the proposed Project to Western's electric utility grid requires compliance with the National Environmental Policy Act (NEPA, 42 United States Code § 4321 et sec (1969)) and the preparation of an EIS. Western is a Federal power-marketing agency within the U.S. Department of Energy (DOE) that sells and delivers Federal electric power to municipalities, public utilities, Federal, and State agencies, and Native American tribes in 15 western and central states. The proposed Project is located within Western's Upper Great Plains Region (UGP), which operates and maintains nearly 90 substations and more than 8,000 miles of Federal transmission lines in Minnesota, South Dakota, North Dakota, Montana, Nebraska, and Iowa. The Rural Utilities Service (RUS, U.S. Department of Agriculture) and U.S. Army Corps of Engineers (USACE, U.S. Department of Defense) are participating as cooperating agencies in the EIS process.

The proposed Project would be constructed by Otter Tail Corporation (dba Otter Tail Power Company (OTP)), Central Minnesota Municipal Power Agency, Great River Energy, Heartland Consumers Power District, Montana-Dakota Utilities Co., Southern Minnesota Municipal Power Agency, and Western Minnesota Municipal Power Agency (dba Missouri River Energy Services (MRES)), collectively referred to as the Co-owners[1]. The proposed Big Stone II plant (shown in Figure 1.1-1 of the Draft EIS) would be located adjacent to the existing Big Stone plant in Grant County, South Dakota, about eight miles northeast of Milbank and two miles northwest of Big Stone City, South Dakota.

1.1 Why This Document Has Been Prepared

The purpose of this Supplemental Draft EIS is to present and analyze the environmental impacts of revisions to the Proposed Action presented in the Draft EIS. The Supplemental Draft EIS also analyzes alternative cooling system technologies for the proposed Project that use groundwater instead of surface water for the proposed Big Stone II power plant's back-up water supply. Revisions to the Proposed Action are based on comments received on the Draft EIS concerning wetland impacts from construction of the make-up water storage pond and additional construction costs associated with the pond. The alternatives studied in the Supplemental Draft EIS are briefly described in Section 1.3. The Council on Environmental Quality NEPA regulations (40 Code of Federal Regulations (CFR) 1502.9) and DOE NEPA regulations (10 CFR 1021.314) require that a supplement to a draft environmental impact statement be prepared if there are substantial changes to the Proposed Action or

[1] Great River Energy and Southern Minnesota Municipal Power Agency have recently announced their withdrawal from the Big Stone II Project. Should the project size change, Western will comply with applicable DOE regulations implementing the National Environmental Policy Act.

significant new circumstances or information relevant to environmental concerns, which contribute to the impacts of the Proposed Action. Western determined that the use of groundwater as the back-up water supply would significantly change the environmental impacts of the Proposed Action as presented in the Draft EIS and requires the preparation of a Supplemental Draft EIS.

NEPA regulations require that the Supplemental Draft EIS be circulated for public, agency, and Native American review and a hearing be held to receive comments. Western will respond to all substantive comments received on the Supplemental Draft EIS, as well as all substantive comments on the Draft EIS, in the Final EIS.

1.2 Scope of This Document

This Supplemental Draft EIS addresses the environmental impacts (and associated indirect impacts) for the alternatives presented – i.e., different cooling system technologies for the proposed Project that would use groundwater as the back-up water supply.

1.3 Introduction to the Alternatives

The alternatives are fully described in Chapter 2 of this Supplemental Draft EIS. Several alternatives are being considered that use groundwater as the back-up water supply for the proposed Big Stone II plant with different cooling system technologies. All alternatives use surface water from Big Stone Lake as the primary water source for cooling. Analysis of the proposed Project's primary water source was included in the Draft EIS. Back-up water would be used in the event of a drought, when sufficient quantities of surface water could not be pumped from Big Stone Lake, the proposed Project's primary water source. Alternatives studied in this Supplemental Draft EIS include:

- Alternative 1: Wet cooling using surface water as the back-up water supply (this alternative was previously analyzed in the Draft EIS).
- Alternative 2: Wet cooling using groundwater as the back-up water supply.
- Alternative 3: Wet/Dry cooling using groundwater as the back-up water supply.
- Alternative 4: Dry cooling using groundwater as the back-up water supply.

1.4 Authorizing Actions

Federal and State permitting processes are the same as described in Section 1.4 of the Draft EIS. In addition to the permit requirements in Table 1.4-1 of the Draft EIS, the following permits are required for activities associated with the use of groundwater for the proposed Project.

Table 1.4-1. Environmental Regulatory Requirements

Agency	Permit/Approval/Consultation
Federal	
U.S. Army Corps of Engineers	Clean Water Act Section 404 permit Rivers and Harbors Act Section 10 Permit
State of South Dakota	
Department of Environment and Natural Resources	Water Appropriations Permit National Pollutant Discharge Elimination System Stormwater Permit for Construction of Pipeline Temporary Discharges of Groundwater
Department of Transportation	Utility Permit for Construction and Maintenance of a Utility Facility on Public Right-of-Way
Local, South Dakota	
County highways	Occupancy Permit on the Right-of-Way of County Highways
Township highways	Township Approval for Occupancy on Township Right-of-Way

Source: OTP, 2007d.

1.5 Reader's Guide to This Document and the EIS Process

Information in this document can be located in the following ways:

- Review the Table of Contents to find the page numbers for broad subjects of interest.
- Refer to the Draft EIS (where referenced) for discussion of issues that are also applicable to this Supplemental Draft EIS.

Chapter 1.0, Introduction —presents background information needed to understand this supplemental document in the context of the overall NEPA process for the proposed Project.

Chapter 2.0, Revised Proposed Action and Alternatives — presents new information regarding revisions to the Proposed Action that were not known at the time the Draft EIS was prepared.

Chapter 3.0, Affected Environment — presents new information regarding existing environmental conditions within the area where the proposed changes to the proposed Project would occur.

Chapter 4.0, Environmental Consequences — analyzes potential impacts related to the alternatives. There is a discussion of mitigation measures to reduce or eliminate environmental effects. This section also presents a discussion of cumulative impacts; i.e., the incremental impacts of the revisions to the Proposed Action when added to other past, present, and reasonably foreseeable future actions.

Chapter 5.0, Other Required Considerations — describes any irreversible and irretrievable commitments of resources which would occur for each cooling alternative if it were implemented, and the relationship between local short-term uses of the environment and the maintenance and enhancement of long-term productivity.

Chapter 6.0, Consultation and Coordination — describes the past and planned agency consultation and public involvement activities. A list of agencies, organizations, and individuals who received this Supplemental Draft EIS is presented.

Chapter 7.0, List of Preparers — presents the names and qualifications of the persons responsible for preparing this Supplemental Draft EIS.

Chapter 8.0, References — provides full citation information for all references cited within this Supplemental Draft EIS. Most cited documents are reasonably available from other sources. Copies of the Supplemental Draft EIS and Draft EIS are available for public review at public reading room(s) and libraries listed in Chapter 6 of this document.

The following additional features have been incorporated into this document to aid the reader:

- A list of the many abbreviations and acronyms used is included in the front of the document.
- A list of tables and figures within the document follows the Table of Contents.
- A glossary and an index of key terminology are included in the back of the document.

The Draft EIS prepared for the proposed Project was issued in May 2006 and is needed to fully understand this Supplemental Draft EIS. Most information presented in the Draft EIS has not changed and is not repeated in this document; therefore, the Supplemental Draft EIS will contain multiple references to sections in the Draft EIS. Copies of the Draft EIS and the Supplemental Draft EIS are available at the local libraries and DOE offices identified in Chapter 6 of this document, or by contacting:

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REVISED PROPOSED ACTION AND ALTERNATIVES

CHAPTER 2

CHAPTER 2
REVISED PROPOSED ACTION AND ALTERNATIVES

2.0 Revised Proposed Action and Alternatives

This chapter identifies the decisions to be made by Western Area Power Administration (Western), Rural Utilities Service (RUS), and the U.S. Army Corps of Engineers (USACE) associated with the proposed changes made by the Co-owners to the proposed Big Stone II Project. Revisions to the Proposed Action are described in this chapter, as well as a description of other alternatives that are being considered by the Co-owners for the back-up water supply and associated cooling system technologies for the proposed Big Stone II plant. This chapter also describes the screening process used to evaluate the alternatives and to determine the selection of the preferred alternative for the Revised Proposed Action. Finally, Section 2.7 provides a summary of impacts that result from the changes to the Revised Proposed Action and the mitigation measures determined to reduce those impacts.

2.1 Federal Agency Decisions

The Federal agency decisions being considered with respect to this EIS were described in Section 2.1.1 of the Draft EIS. The Proposed Action evaluated in this EIS involves the decisions associated with the proposed Project for each Federal agency, as follows:

Western: Consider allowing the Applicant an interconnection to Western's transmission system at Morris and Granite Falls substations, including required modifications to these substations and other Western facilities.

RUS: Consider providing a loan to Great River Energy to finance its portion of the proposed Project.

USACE: Consider issuing a permit for Section 10 of the Rivers and Harbors Act and for Section 404 of the Clean Water Act to the Co-owners for construction of the proposed Project within or across navigable waters and waters of the United States.

As noted in the Draft EIS, these Federal actions are part of the Proposed Action as they would, if approved, result in constructing, operating, maintaining, and, where applicable, de-commissioning of the proposed Big Stone II power plant and ancillary facilities, associated transmission lines and the transmission system interconnection, additions, and upgrades. Since these are all connected actions to the Federal actions, they are all included in the scope of the EIS.

However, as noted in the Draft EIS, several decisions not evaluated in this EIS are related to, but not directly connected with the proposed Project. As described in Section 2.1.2 of the Draft EIS, other agencies making significant decisions with regard to the proposed Project include the South Dakota Public Utilities Commission (SDPUC) and the Minnesota Public Utilities Commission (MnPUC).

SDPUC: Has jurisdiction over siting power plants and transmission line routes within the State of South Dakota. The SDPUC approved the Energy Conversion Facility Permit (plant siting) for the proposed Big Stone II Power Plant in accordance with South Dakota law on July 21, 2006 (SDPUC, 2006), and issued a permit to construct transmission lines on January 16, 2007 (SDPUC, 2007).

MnPUC: Has jurisdiction over permitting and location of the transmission lines within the State of Minnesota. The MnPUC has not issued a decision as of publication of this document (MnPUC, 2007).

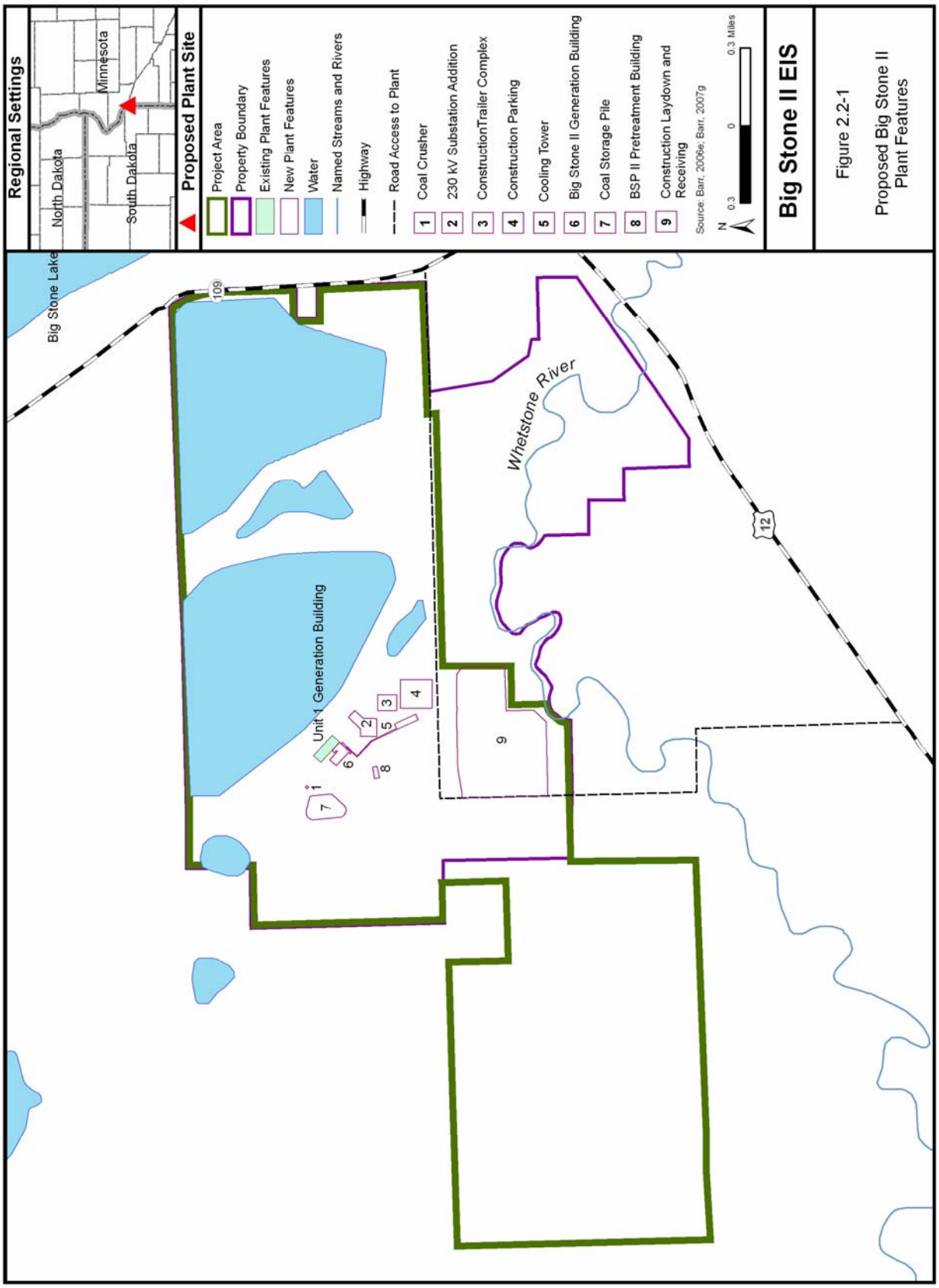
2.2 Revised Proposed Action

The details of the Co-owners' Proposed Action, as initially described in Section 2.2 of the Draft EIS included constructing and operating the proposed Big Stone II coal-fired power plant and ancillary facilities, transmission additions and modifications, and substation modifications. The Co-owners have proposed certain changes to the Proposed Action which includes changes to the plant water supply, plant cooling system, plant water usage, water treatment, and wastewater management. The Revised Proposed Action includes a wet cooling system using surface water as the primary water supply and groundwater as the back-up water supply. Changes to the Proposed Action also include installation of groundwater wells and a pipeline system to convey groundwater to the proposed plant site. These revisions require an assessment of the environmental impacts under National Environmental Policy Act (NEPA) regulations. The proposed changes are described in detail in this section.

The revisions to the proposed plant layout are shown in Figure 2.2-1. Compared with Figure 2.2-3 of the Draft EIS, the substantial changes include elimination of the 450-acre make-up water storage pond, elimination of the 25-acre cooling tower blowdown pond, elimination of a new brine concentrator, relocation of the cooling tower, and a new water pretreatment building. There are no other substantial changes to the Proposed Action as described in Section 2.2 of the Draft EIS.

2.2.1 Changes to the Plant Water Supply

As described in the Draft EIS, the primary source of water for the existing plant and the proposed Big Stone II plant would be withdrawals from Big Stone Lake in accordance with a permit issued by the South Dakota Department of Environment and Natural Resources (SDDENR). If water is unavailable from Big Stone Lake, such as withdrawal restrictions imposed by the permit, a back-up water source would be used for operation of the proposed plant. The Draft EIS described the back-up water source as the 450-acre surface water pond, which would be filled with water from Big Stone Lake in accordance with permit conditions. New cost information for the 450-acre make-up water storage pond received after the Draft EIS was issued and agency comments on the Draft EIS regarding impacts to wetlands due to construction of the pond prompted the Co-owners to review and develop additional alternatives to provide a back-up supply of water for plant use. The proposed changes would eliminate the 450-acre pond and use groundwater for the back-up water supply. The proposed plant would still use Big Stone Lake as the primary water supply source. The use of groundwater would require the Co-owners to operate under a water appropriations permit from the SDDENR.


Regional Settings
North Dakota
South Dakota
Minnesota
Proposed Plant Site
Project Area
Property Boundary
Existing Plant Features
New Plant Features
Water
Named Streams and Rivers
Highway
Road Access to Plant
1 Coal Crusher
2 230 kV Substation Addition
3 ConstructionTrailer Complex
4 Construction Parking
5 Cooling Tower
6 Big Stone II Generation Building
7 Coal Storage Pile
8 BSP II Pretreatment Building
9 Construction Laydown and Receiving
Source: Barr, 2006e; Barr, 2007g
N
0.3
0
0.3 Miles
Big Stone II EIS
Figure 2.2-1
Proposed Big Stone II
Plant Features
Big Stone Lake
109
Whetstone River
12
Unit 1 Generation Building
1
2
3
4
5
6
7
8
9

Groundwater Supply System

Groundwater used for the proposed plant back-up water supply would be produced from the Veblen Aquifer, which is further described in Section 3.2.2. Groundwater modeling and groundwater exploration activities conducted by the Co-owners indicate that 7 to 14 wells would be needed to supply the proposed Big Stone II plant with adequate make-up water.

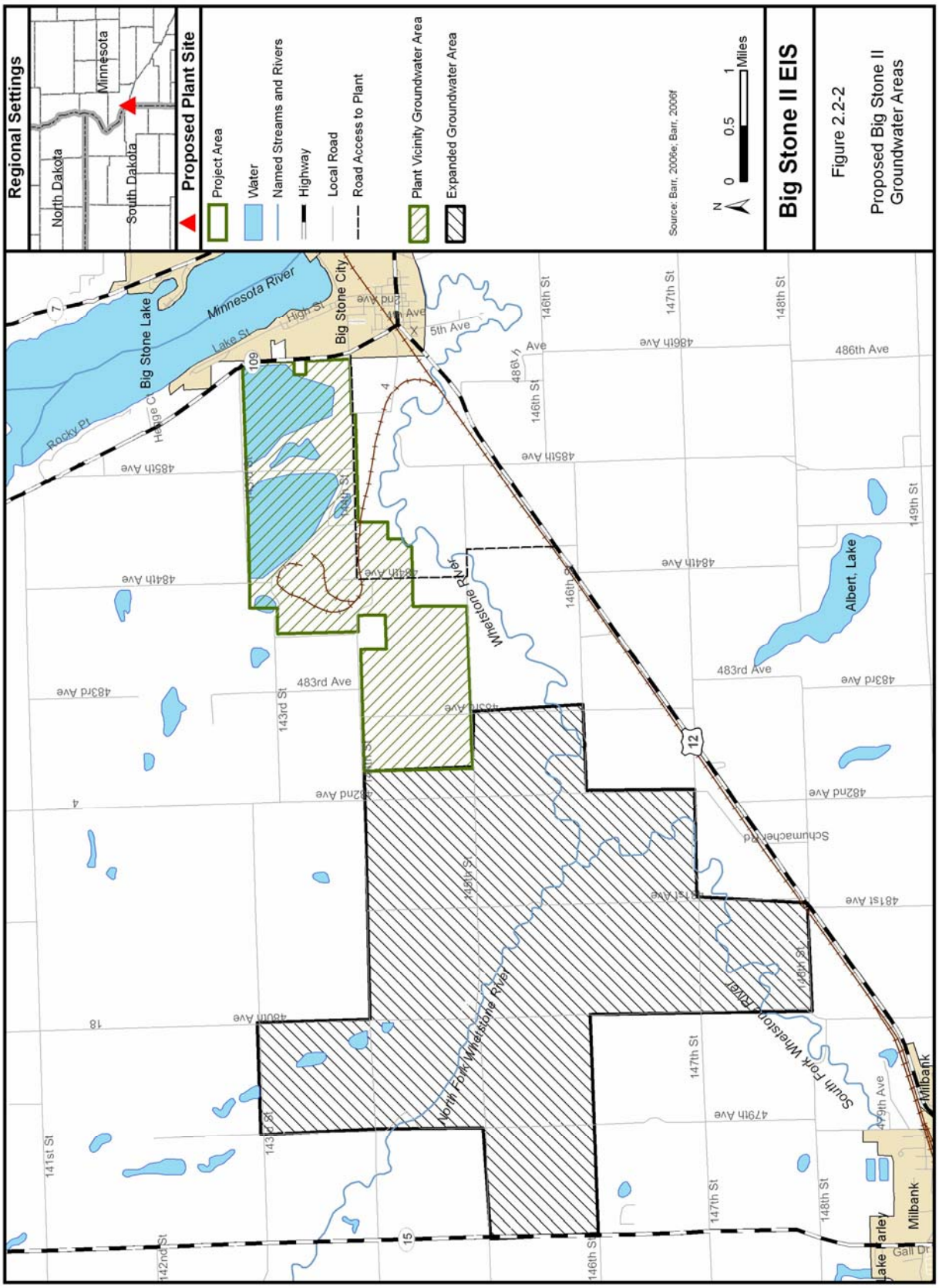
Equipment required for well drilling and installation activities would include a Rotosonic drilling rig for the exploratory pilot test holes and observation wells, a mud rotary drilling rig for drilling of groundwater production wells and between two to five support vehicles (automobile or pick-up size) on a daily basis for drilling personnel and other support staff. The drilling rigs would be approximately the size of semi-trailer trucks. A truck-sized vehicle would be needed to deliver up to 300 feet of piping to each groundwater well for installation of the wells. A portable, trailer-mounted electrical generator would be used for pumping tests at the wells.

Each production well site area would consist of a well and a small pump building within a 2,500 square-foot fenced area. Each well would likely be constructed using 12-inch steel casing from the surface to approximately the top of the aquifer and a 10-inch diameter stainless steel screen over the aquifer zone. Observation wells (installed using two-inch diameter polyvinyl chloride (PVC) casing) would be installed at selected locations to monitor groundwater levels of the aquifer during pumping operations. Any observation wells installed would be approximately 400 to 500 feet away from the corresponding production well, and both wells would be drilled to approximately 100 feet to 300 feet below ground level.

Permanent facilities installed at production wells would include a small pre-engineered building (pumphouse) on a concrete slab surrounding the well. The building (approximately 10 by 15 feet) would be weathertight and heated and ventilated, if appropriate. The building would house the water pump, power supply terminal, and disconnect for the equipment, local controls and instrumentation, lighting, and enough free floor space to allow normal maintenance of the pumps. Electrical service to the pumphouse would be provided by the local electric distribution system provider. Each well site would require an access road approximately 50-feet long by 12-feet wide. Two potential well sites are located further out in agricultural fields and would require access roads approximately 1,500-feet long.

The wells would be installed within two designated areas depicted in Figure 2.2-2: (1) the "plant vicinity" groundwater area within approximately two miles of the proposed plant site and (2) the "expanded" groundwater area between approximately two to six miles west and southwest of the proposed plant site, located within an approximately 7,694-acre, 12-section area. Fourteen potential well sites were identified during groundwater investigations; two within the plant vicinity groundwater area and 12 within the expanded groundwater area. These 14 well sites were used for the groundwater modeling and impact analysis in this Supplemental Draft EIS. The final locations of the proposed well sites would be determined based on hydrogeologic information and environmental sensitivities.

Construction of the groundwater pipelines and electrical distribution lines would require stream and river crossings. Depending upon the point of stream crossing, stream flow may be low enough to go through the stream with minimal impacts. Alternatively, crossing a stream using directional boring technology (i.e., under the stream) would also be considered. At those locations where it is necessary to cross wetlands, streams, or tributaries, crossing would be in compliance with the applicable USACE and SDDENR permit requirements following procedures typical of utility line installations. Any


Regional Settings
Minnesota
North Dakota
South Dakota
Proposed Plant Site
Project Area
Water
Named Streams and Rivers
Highway
Local Road
Road Access to Plant
Plant Vicinity Groundwater Area
Expanded Groundwater Area
Source: Barr, 2006e; Barr, 2006f
N
0
0.5
1
Miles
Big Stone II EIS
Figure 2.2-2
Proposed Big Stone II
Groundwater Areas
Big Stone Lake
Minnesota River
Big Stone City
Rocky Pt
Lake St
High St
2nd Ave
5th Ave
Albert, Lake
Whetstone River
North Fork Whetstone River
South Fork Whetstone River
Schumacher Rd
Milbank
Lake Farley
Gall Dr
483rd Ave
485th Ave
486th Ave
484th Ave
482nd Ave
481st Ave
480th Ave
479th Ave
146th St
147th St
148th St
149th St
143rd St
141st St
142nd St
109
12
15
7

disturbances would be temporary, and any area disturbed would be restored shortly after construction in accordance with permit requirements.

Groundwater Pipeline

A pipeline system would be required to convey the produced groundwater from the production wells to the proposed plant. The pipeline would be constructed of either high-density polyethylene (HDPE) or PVC materials. The pipeline would be buried approximately 7.5 feet deep to prevent the line from freezing. The pipeline would vary in diameter depending on the number of production wells connected to it. Based on anticipated flow rates, the pipe size would increase in diameter as each production well is added to the main pipeline. Pipes from individual production wells are expected to be eight to 10 inches in diameter, and the main pipeline at its maximum diameter would be approximately 20 to 30 inches. The groundwater pipeline system is still in the design phase; therefore, the exact pipe diameters and routes of pipelines connecting the groundwater production wells to the plant are not yet known. The pipeline system, with a linear requirement of up to 80,000 feet (approximately 15 miles), is planned to be installed along existing road rights of way.

2.2.2 Changes to the Plant Cooling System

Under the Proposed Action described in the Draft EIS, the proposed plant's boiler would provide steam to a single steam turbine generator that would convert mechanical energy of the steam turbine to electrical energy. A water-cooled steam condenser would accept the steam exhausted from the turbine, and a circulating water system would supply cooling water from a wet cooling tower to the water-cooled steam condenser to dissipate the energy (heat) in the condensing steam. Changes to the Proposed Action would eliminate the cooling tower blowdown pond that would have been located approximately 1,500 feet west of the proposed plant site, and the cooling tower would be moved approximately 3,600 feet to the east (see Figure 2.2-1). No other change to the Proposed Action for the plant's cooling tower system is proposed by the Co-owners.

2.2.3 Changes to Plant Water Usage

With the plan to use groundwater as a back-up source of water supply for the proposed Big Stone II plant, the water management plan for the proposed Project would change from what was described in the Draft EIS. Under typical plant operations, it is proposed that surface water from Big Stone Lake would be the primary source of water for the plant. Big Stone Lake water contains lower concentrations of minerals than the available groundwater, so it is a preferred water source. Water from Big Stone Lake would be used to meet the immediate water needs of the proposed plant and to keep the cooling pond at near maximum capacity. The existing plant currently uses about 4,200 acre-feet per year (afy) of fresh water. Operation of the proposed Big Stone II plant would require an additional 8,800 afy (up from 7,500 afy in the Draft EIS). The total combined maximum water consumption would be about 13,000 afy for both the existing Big Stone plant and proposed Big Stone II plant, with the proposed wet tower cooling system. This increase of about 1,300 afy from the 11,700 afy stated in the Draft EIS is the result of design information for the proposed Big Stone II plant and the revised water management and water treatment plans for the proposed Project. Based on the current water use model estimates (and anticipated permit restrictions for Big Stone Lake), approximately 3,720 afy of groundwater would be needed annually (on average) to supplement combined plant water needs. On occasion (e.g., during extreme drought), when groundwater is the sole source of water supply, the maximum annual groundwater appropriation required to operate both

plants at full output would be 10,000 acre feet (af), at a pumping rate of about 6,200 gallons per minute (gpm).

2.2.4 Changes in Water Treatment

Figure 2.2-3 provides the preliminary water and wastewater mass balance developed for the proposed Project by the Co-owners, assuming a groundwater back-up water supply (Black & Veatch, 2006). Groundwater would be pretreated in a new softening process, referred to as the BSP II Pretreatment System. The softening process would reduce scaling and cooling tower blowdown wastewater. The softening process adds lime, soda ash, coagulant (alum), and polymer to produce a settleable solid. The solids would be used in the Wet Flue Gas Desulfurization (WFGD) system. To the extent that the WFGD could not accept the waste solids from the softening process, such waste would be disposed in the on-site landfill. As shown in Figure 2.2-1, the new softening process would be located within a new 96-foot by 240-foot proposed BSP II Pretreatment building, with associated storage silos and water storage tanks located adjacent to the building. It would also be used to pre-treat Big Stone Lake water from the existing cooling pond for the existing and proposed plants.

The original design described in the Draft EIS included a cooling tower blowdown pond which served as the source of water for the WFGD. The WFGD purge wastewater stream would have been routed back to a lined portion of the blowdown pond and then to the brine concentrator for treatment. The cooling tower blowdown pond is no longer included in the design. As shown in Figure 2.2-3, cooling tower blowdown water would now be directed to the common WFGD system for reuse. The purge stream wastewater from the WFGD system would be routed to the existing plant's brine sludge pond, an eight-acre lined pond, for settling of suspended solids. The wastewater remaining after the solids have settled would be routed to a new pond for natural evaporation. The settled solids would remain in the brine sludge pond, which periodically may require removal and disposal in the existing on-site landfill. This new WFGD blowdown pond would be constructed by lining 70 acres of the existing 140-acre evaporation pond at the existing plant.

Changes in the Proposed Action from the Draft EIS would include the proposed BSP II Pretreatment System to provide softened water for the existing and new plants. Softened water would be fed to a new filtration and reverse osmosis (RO) unit serving both the existing and proposed Big Stone II plants, which would remove approximately 98 percent of the dissolved solids. Additional reduction of dissolved solids would occur by ion exchange within demineralizers that follow the RO units in order to produce water suitable for use in the proposed plant's steam cycle. The existing plant would use the demineralizer currently used for treating water, and a new mixed bed demineralizer would be used by the proposed Big Stone II plant. Neutralized wastewater streams from the demineralizers and RO reject streams would be routed back to the cooling pond for reuse.

2.2.5 Changes in Wastewater Management

Under the Proposed Action described in the Draft EIS, wastewater management included a zero liquid discharge (ZLD) for the proposed Big Stone II plant by balancing the wastewater production with wastewater reuse. No changes to the Proposed Action are being considered for the ZLD system.

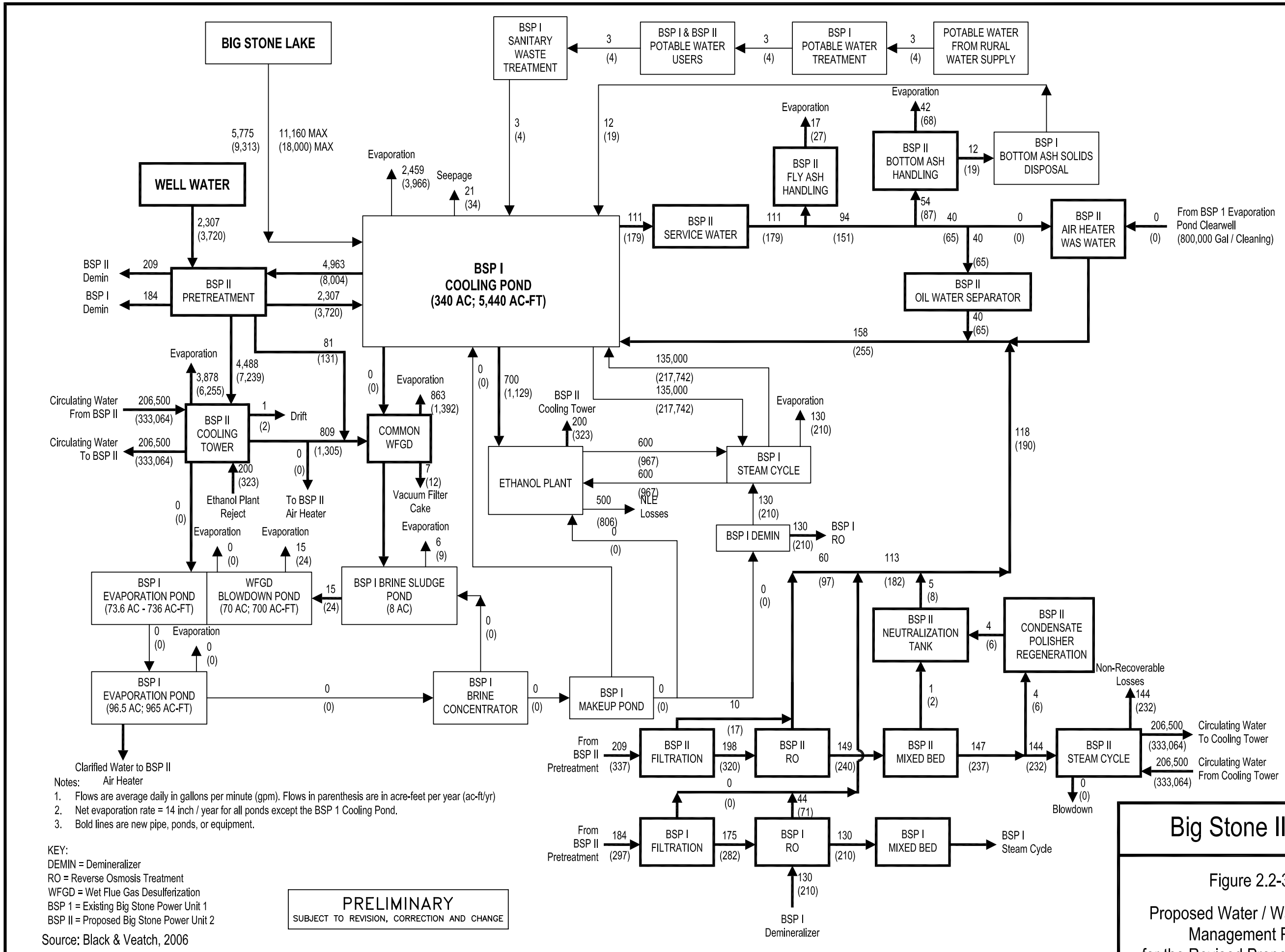
Under the Proposed Action described in the Draft EIS, a new (i.e., additional) brine concentrator would have been installed adjacent to the existing brine concentrator to handle the additional cooling tower blowdown stream flow from the proposed Big Stone II plant. Recovered water from the existing

and the proposed brine concentrators would have been used to supply boiler process water or would have been pumped to the existing Northern Lights Ethanol plant with excess brine concentrator product returned to the existing Big Stone cooling pond. The Revised Proposed Action requires that the existing holding pond, a portion of the existing evaporation pond, and the existing brine concentrator remain as wastewater treatment facilities. However, it is not anticipated that a new brine concentrator would be needed in proposed plant operation, and would not be constructed; therefore, the cooling tower blowdown pond and the brine concentrator are no longer included in the design.

2.2.6 Actions Incorporated into the Revised Proposed Action to Reduce Impacts

The actions incorporated into the Proposed Action to reduce impacts were described in Section 2.2.4 of the Draft EIS. These measures are applicable to the Revised Proposed Action and are considered in the impact analysis in Chapter 4 of this Supplemental Draft EIS. Table 2.2-1 describes the standard mitigation measures (SMMs) applicable to the Revised Proposed Action. In Table 2.2-1, supplementary text and SMMs Land-11 and Land-12 were added to Table 2.2-9 from the Draft EIS, and are in bolded font. Additionally, some minor, non-technical edits were made. A column has been added to Table 2.2-1 to define the measures applicable to construction and operation of the well sites, pipelines, and electrical distribution lines.

Additional measures to mitigate impacts caused by changes to the Revised Proposed Action or Alternative 3 are described in Chapter 4.



Notes:
1. Flows are average daily in gallons per minute (gpm). Flows in parenthesis are in acre-feet per year (ac-ft/yr)
2. Net evaporation rate = 14 inch / year for all ponds except the BSP 1 Cooling Pond.
3. Bold lines are new pipe, ponds, or equipment.

KEY:
DEMIN = Demineralizer
RO = Reverse Osmosis Treatment
WFGD = Wet Flue Gas Desulferization
BSP 1 = Existing Big Stone Power Unit 1
BSP II = Proposed Big Stone Power Unit 2

PRELIMINARY
SUBJECT TO REVISION, CORRECTION AND CHANGE

Source: Black & Veatch, 2006

Big Stone II EIS

Figure 2.2-3

Proposed Water / Wastewater Management Plan for the Revised Proposed Action

Table 2.2-1. Standard Mitigation Measures for the Proposed Big Stone II Project

No.	Standard Mitigation Measure	Power Plant	Groundwater	Transmission	Substation Modifications
General					
Gen-1	All Federal, State, and local environmental laws, orders, and regulations would be met during construction and operation of the proposed Project.	X	X	X	X
Gen-2	All permit conditions would be adhered to for construction and operation of the proposed Project.	X	X	X	X
Gen-3	Prior to construction, all construction personnel and heavy equipment operators would be instructed on the protection of cultural, paleontological, and ecological resources, and all applicable permit requirements. To assist in this effort, the construction contracts would address: (a) Federal, State, and local laws regarding antiquities, fossils, plants, and wildlife; including collection and removal; (b) the importance and necessity of protecting such resources, and (c) all applicable permit requirements.	X	X	X	X
Air Quality					
Air-1	The emission of dust into the atmosphere during construction would be minimized to the extent practical during the manufacture, handling, and storage of concrete aggregate. Methods and equipment would be used as necessary to collect and dispose, or prevent dust during these operations. The methods of storing and handling cement and pozzolans (cement additives) would also include means of eliminating atmospheric discharges of dust.	X	X	X	X
Air-2	Construction equipment and vehicles that show excessive emissions of exhaust gases due to poor engine adjustments, or other inefficient operating conditions, would not be operated until repairs or adjustments are made.	X	X	X	X
Air-3	Burning or burying waste materials on the rights of way (ROW) and plant construction areas would not be permitted. All waste materials shall be disposed at permitted waste disposal areas or landfills. Tree and grubbing residue may be buried on the plant site or in the ROW with landowner approval.	X	X	X	X
Air-4	Nuisance to persons or damage to crops, cultivated fields and dwellings from dust originating from construction would be minimized. Oil and other petroleum derivatives would not be used for dust control. Speed limits would be enforced, based on road conditions, to reduce dust problems.	X	X	X	X
Water Resources					
Water-1	Withdrawals from Big Stone Lake would be within State withdrawal requirements.	X			
Water-2	Construction activities would comply with the requirements of the South Dakota Department of Environmental and Natural Resources (SDDENR) General Permit for Stormwater Discharges from Construction Activities which specify appropriate best management practices (BMPs), erosion and sediment control measures, and disposal practices. Construction activities that are adjacent to or encroaching on streams or watercourses, including work within ROW, construction of access roads on hillsides, and dewatering work for structure foundations or earthwork operations would be conducted to prevent disturbed soils, muddy water, and eroded materials from entering the streams or watercourses by construction of intercepting ditches, bypass channels, barriers, settling ponds, or by other approved means.	X	X	X	X
Water-3	Construction activities would be performed to prevent entrance or accidental spillage of solid matter contaminants, debris, hazardous liquids, or other objectionable pollutants and wastes into streams, flowing or dry watercourses, lakes, land, and underground water sources. Such pollutants and waste include, but are not restricted to: refuse, garbage, cement, concrete, sanitary waste, industrial waste, oil, and other petroleum products, aggregate processing tailing, mineral salts, and thermal pollution.	X	X	X	X
Water-4	Excavated material or other construction materials would not be stockpiled or deposited near or on stream banks, lake shorelines, or other watercourse perimeters where they can be washed away by high water or storm runoff or can in any way encroach upon the actual watercourse itself.	X	X	X	X
Water-5	Waste water discharge from concrete batching or other construction operations would not enter streams, watercourses, or other surface waters without the appropriate permit.	X	X	X	X

Table 2.2-1 (continued)

No.	Standard Mitigation Measure	Power Plant	Groundwater	Transmission	Substation Modifications
Water-6	Equipment washing, the storage of petroleum products, lubricants, solvents, and hazardous materials, structure sites and other disturbed areas would be located at least 100 feet, where practical, from rivers, streams (including ephemeral streams), ponds, lakes, and reservoirs. This includes construction vehicles and heavy equipment when parked overnight or longer.	X	X	X	
Water-7	New access ways would be located at least 100 feet, where practical, from rivers, ponds, lakes, and reservoirs.		X	X	
Water-8	All perennial stream crossings for new access ways would be by permit. Where required, culverts of adequate size to accommodate the estimated peak flow of the stream would be installed. Disturbance of the stream banks and beds during construction would be minimized. Disturbed areas would be regraded and revegetated in accordance with mitigation measures listed for soil/vegetation resources.		X	X	
Water-9	If the banks of ephemeral stream crossings are sufficiently high and steep that breaking them down for a crossing would cause excessive disturbance, culverts would be installed using the same measures as for culverts on perennial streams.		X	X	
Water-10	Heavy equipment movement near streams and other surface waters would be minimized, to the extent practical.		X	X	X
Water-11	Narrow flood prone areas would be spanned.			X	
Water-12	Proposed plant operation would comply with the SDDENR General Permit for Stormwater Discharges Associated with Industrial Activity and the associated stormwater pollution prevention plan, which requires use of appropriate BMPs, sediment control measures, and disposal practices. Proposed plant operations, including coal and combustion by-product storage piles that could introduce contaminants to stormwater, would be controlled and mitigated using BMPs. Operations would be conducted in a manner to prevent contamination of stormwater runoff water that may leave the plant site and to prevent disturbed soils, muddy water, and eroded materials from entering the streams or watercourses. BMPs would include intercepting ditches, bypass channels, barriers, settling ponds, or by other approved means.	X			
	Also See Measures: Bio-3, Bio-5, Bio-7, Bio-8, and Land-3				
Geology and Minerals, Paleontology and Soils					
Geo-1	Structures would not be sited on any potentially active documented faults.	X	X	X	X
Geo-2	Removed topsoil would be used for landscaping and as engineered fill, as appropriate, or stockpiled and re-spread subsequent to construction.	X	X	X	X
Geo-3	During construction, if any paleontological resources are discovered, work would cease within a 50-foot radius of the discovery. Any artifacts or fossils discovered would not be disturbed and the Co-owners would notify Western of the discovery immediately.	X	X	X	X
Geo-4	Access roads would generally follow the contour of the land to the greatest extent practical rather than a straight line along the ROW where steep features would result in a higher erosion potential.		X	X	
Geo-5	To the extent practical, excavated areas would be re-contoured so that large volumes of water would not collect and stand therein. Before being abandoned, the sides of excavations would be brought to stable slopes, giving a natural appearance and revegetated. Waste soil piles would be shaped to provide a natural appearance.	X	X	X	X
	Also See Measures: Gen-3, Land-5, Land-10, Bio-4, Bio-5, Water-2, and Water 3				
Biological Resources					
Bio-1	The Co-owners would consult with the applicable State and Federal agencies concerning all species of concern and, based on that consultation, develop appropriate survey protocols and an action plan to minimize impacts (e.g., buffer zones, construction windows, animal relocations) in the event species of concern are found during surveys. The survey protocols and action plan would be approved by Western and the applicable State and Federal agencies. Surveys would then be conducted in accordance with approved protocols during final design of the proposed plant, **groundwater areas,** transmission lines, and substation modifications.	X	X	X	X
Bio-2	Reasonable and prudent alternatives developed during Section 7 consultations, as specified in the USFWS Biological Opinion would be adhered to with the same force and effect as the mitigation measures included here.	X	X	X	X

Table 2.2-1 (continued)

No.	Standard Mitigation Measure	Power Plant	Groundwater	Transmission	Substation Modifications
Bio-3	All wetland and riparian areas would be avoided to the extent practical. If wetland or riparian areas are unavoidable, impacts would be minimized or mitigated. Navigable waters and waters of the United States that are impacted as a result of implementing the proposed Project would be mitigated in accordance with USACE requirements. Non-jurisdictional wetlands in Minnesota that are impacted as a result of implementing the proposed Project would be mitigated in accordance with Minnesota Wetland Conservation Act stipulations.	X	X	X	X
Bio-4	Care would be used to preserve the natural landscape and vegetation. Construction operations would be conducted to prevent, to the extent practical, any unnecessary destruction, scarring, or defacing of the natural surroundings, vegetation, trees, and native shrubbery in the vicinity of the work. Vegetation would be replaced at landowner request providing mitigation complies with North American Electric Reliability Council (NERC) reliability requirements.	X	X	X	X
Bio-5	On completion of the work, all non-agricultural disturbed areas and construction staging areas not needed for maintenance access would be regraded so that all surfaces drain naturally, blend with the natural terrain and reseeded to blend with vegetation native to the area with a seed mixture certified as free of noxious or invasive weeds. All destruction, scarring, damage, or defacing of the landscape resulting from the construction would be repaired.	X	X	X	X
Bio-6	Construction staging areas would be located and arranged in a manner to preserve trees and vegetation to the maximum practicable extent. Unless otherwise agreed upon by the landowner, all storage and construction buildings, including concrete footings and slabs, and all construction materials and debris would be removed from the construction staging areas once construction is complete, and the areas returned to original use or regraded and seeded as for non-agricultural disturbed areas.		X	X	
Bio-7	Structures and ROW would be located to avoid game production areas, State Wildlife Management Areas, Minnesota County Biological Survey Sites of Biodiversity Significance, National Wildlife Refuges, Waterfowl Protection Areas, Scientific and Natural Areas, State identified rock outcrops, and high priority ecological areas to the extent possible. Approval for changes in these areas must be done in coordination with the appropriate agency.		X	X	
Bio-8	Removal of vegetation would be done according to North American Electric Reliability Council safety and reliability requirements. Clearing for access roads would be limited to only those trees necessary to permit the passage of equipment. All vegetative materials resulting from clearing operations would either be chipped on site or stacked in the ROW in accordance with landowner's request.		X	X	
Bio-9	Native shrubs that would not interfere with access or the safe operation of the transmission line would be allowed to reestablish in the ROW. Areas with native shrubs that would be disturbed would be replanted following the disturbance.			X	
Bio-10	The Co-owners would develop an Avian Protection Plan (APP) to minimize impacts to nesting birds, as well as to minimize the electrocution and collision of migratory and resident bird species. The APP would include provisions for adequate distance between conductors and distances between conductors and grounded surfaces. It would identify time frames for construction and routine maintenance to avoid the nesting period of breeding birds. It would also include methods for minimizing bird collisions during line routing as well as methods for minimizing collisions following construction. The APP would follow guidelines described at <www.aplic.org>. The Co-owners, in coordination with State and Federal resource management agencies and after reviewing the final route alignments, would decide where and what kind of line marking devices (i.e., visibility enhancing devices) need to be applied. The Co-owners would provide a copy of the APP to the applicable USFWS offices.			X	
Bio-11	Holes drilled or excavated for pole placement or foundation construction and left unattended overnight would be marked and secured with temporary fencing to reduce the potential for livestock and wildlife entering the holes and for public safety.	X	X	X	X
	Also See Measures: Gen-3, Water-1, Water-8, Water-9, Land-3, and Land-5				

Table 2.2-1 (continued)

No.	Standard Mitigation Measure	Power Plant	Groundwater	Transmission	Substation Modifications
Cultural Resources					
Cult-1	A Class III Cultural Survey would be performed for the areas of potential effect in accordance with the Programmatic Agreement developed for the proposed Project. Surveys would be coordinated with the appropriate landowner or land management agency. As lead Federal Agency, Western would make a determination of eligibility for any findings of cultural or historical properties. These findings would be reviewed with the State Historic Preservation Offices and other appropriate agencies. Specific mitigation measures necessary for each site or resource would be determined, and may include relocation of access roads, structures, and other disturbed areas to avoid cultural sites that should not be disturbed, or data recovery if a site cannot be avoided.	X	X	X	X
Cult-2	Provisions of the Programmatic Agreement would be adhered to by all parties, including: - Construction crews would be informed of the need to cease work in the location if cultural resource items are discovered. - Construction activities would be monitored or sites flagged to prevent inadvertent destruction of any cultural resource for which the agreed mitigation was avoidance. - Construction crews would be monitored to the extent possible to prevent vandalism or unauthorized removal or disturbance of cultural artifacts or materials from sites where the agreed mitigation was avoidance. - Should any cultural resources not identified during the Class III Cultural Survey be encountered during construction, ground disturbance activities at that location would be suspended until the provisions of the National Historic Preservation Act and enabling legislation have been carried out.	X	X	X	X
	Also See Measures: Gen-3				
Land Use					
Land-1	The minimum area necessary would be used for access roads to the transmission line.			X	
Land-2	When practical, structures would be located and designed to conform to the terrain. Leveling and benching of the structure sites would be the minimum necessary to allow structure assembly and erection.			X	
Land-3	Power line structures would be located, where practical, to span sensitive land uses. Where practical, construction access roads would be located to avoid sensitive conditions.			X	
Land-4	The precise location of all structure sites, ROW, and other disturbed areas would be determined with landowners' or land management agencies' input.		X	X	
Land-5	The movement of crews and equipment would be limited to the ROW and areas surveyed for cultural, historical, and biological resources, including access routes. The contractor would limit movement on the ROW to minimize damage to grazing land, crops, or property and would avoid marring the land.		X	X	X
Land-6	Where practical, construction activities would be scheduled during periods when agricultural activities would be minimally affected or the landowner would be compensated accordingly.		X	X	
Land-7	Fences, gates, and similar improvements that are removed or damaged would be promptly repaired or replaced.		X	X	X
Land-8	Structure design and placement would be selected to reduce potential conflicts with agricultural practices and to reduce the amount of land required for transmission lines.			X	
Land-9	ROW would be purchased through negotiations with each landowner affected by the proposed project. Payment would be made of full value for crop damages or other property damage during construction or maintenance.		X	X	
Land-10	When weather and ground conditions permit, all deep ruts that are hazardous to farming operations and equipment movement would be eliminated or compensation would be provided as an alternative if the landowner desires. Such ruts would be leveled, filled and graded, or otherwise eliminated in an approved manner. Ruts, scars, and compacted soils from construction activities in hay meadows, alfalfa fields, pastures, and cultivated productive lands would be loosened and leveled by scarifying, harrowing, discing, or other appropriate method. Damage to ditches, tile drains, terraces, roads, and other land features would be corrected. Land and facilities would be restored as nearly as practical to their original conditions.		X	X	X

Table 2.2-1 (continued)

No.	Standard Mitigation Measure	Power Plant	Groundwater	Transmission	Substation Modifications
Land-11	**Where practical all well drilling and installation would be completed in agricultural areas or uncultivated pastureland at the edge of farm fields. Installations of groundwater associated facilities would be constructed to not impact the operation of center-pivot irrigation operations. During pump testing, precautions would be taken to prevent erosion due to discharges of groundwater.**		X		
Land-12	**To the extent possible, pipeline routing would occur along the rights of ways of county roads and roads along section lines, and along well access roads.**		X		
	Also See Measures: Air-4, Geo-2, Geo-4, Geo-5, Bio-4, Bio-5, Bio-6, and Water-3				
Infrastructure, Public Health and Safety, and Waste Management					
Inf-1	Delays to railroad operations due to construction vehicles or equipment crossing tracks would be avoided. Construction would be coordinated with railroad operators. Conductor and overhead wire stringing operations would use guard structures to eliminate delays.	X		X	
Inf-2	When appropriate, pilot vehicles would accompany the movement of heavy equipment. Traffic control barriers and warning devices would be used when appropriate.	X	X	X	X
Inf-3	All necessary provisions would be made to conform to safety requirements for maintaining the flow of public traffic. Construction operations would be conducted to offer the least possible obstruction and inconvenience to public traffic.	X	X	X	X
Inf-4	Fly ash and gypsum would be recycled in accordance with prevailing market conditions.	X			
Inf-5	Design would include reasonable mitigation measures to reduce problems of induced currents into conductive objects within the ROW. Problems of induced currents during construction and operation would be resolved, to the mutual satisfaction of the parties involved.			X	X
Inf-6	Complaints of radio or television interference generated by the facility and related transmission lines would be investigated and appropriate mitigation measures would be implemented (i.e., adjusting or using filtering devices).			X	X
Inf-7	Audible noise and electric and magnetic fields during construction and operation of the Project would be addressed as necessary on a case-by-case basis.			X	X
Inf-8	Transmission line materials would be designed to minimize corona. Tension would be maintained on all insulator assemblies to assure positive contact between insulators, thereby avoiding sparking. Caution would be exercised during construction to avoid nicking the conductor surface, which may provide points for corona to occur.			X	
PH-1	The construction contractor would establish a health and safety program that incorporates OSHA standards such as requirements for hearing protection, personal protective equipment, site access, chemical exposure limits, safe work practices, training program, and emergency procedures. The program would be reviewed with plant officials, fire department personnel, and emergency services personnel to reduce risk of construction and operation activities interfering with emergency response or evacuation plans and procedures.	X	X	X	X
PH-2	At the end of every work day, contractors will secure all construction areas to protect equipment and materials and discourage public access. Fueling of vehicles would be conducted in compliance with established procedures designed to minimize fire risks and fuel spills.	X	X	X	X
PH-3	Construction contractors will provide adequate notice to the public for all high-risk operations such as blasting. Only trained personnel would be permitted to conduct such high-risk operations. All other personnel would be required to maintain a safe distance from such operations.	X	X	X	X
	Also See Measures: Air-3, Water 3, and Noise-2				

Table 2.2-1 (continued)

No.	Standard Mitigation Measure	Power Plant	Groundwater	Transmission	Substation Modifications
Noise					
Noise-1	An adequate buffer would be maintained around the plant site to minimize construction and operational noise impacts on area residents.	X			
Noise-2	Power lines would be designed to minimize noise and other effects from energized conductors.			X	X
Noise-3	To avoid nuisance conditions due to construction noise, all internal combustion engines used in connection with construction activity would be fitted with an approved muffler and spark arrester.	X	X	X	X
Noise -4	To avoid nuisance noise conditions, transmission line construction would be limited to daytime hours whenever practical.			X	X
	Also See Measures: Inf-7				
Visual Resources					
Vis-1	Major Big Stone II components would be painted to blend into the surrounding environment. Lighting would be minimized, to the extent practical. Lights would be shielded to minimize output to the surrounding environment and impacts to the night sky.	X	X		
Vis-2	Transmission line materials would be designed to minimize corona. To reduce potential visual impacts at highway and trail crossings, structures would be placed at the maximum feasible distance from the crossing, within limits of structure design.			X	X
Vis-3	Structure types (designs) would be uniform, to the extent practical.			X	
	Also See Measures: Bio-8				

2.3 Description of Alternatives

After receiving new cost information on the make-up water storage pond and reviewing comments on the Draft EIS, as described in Chapter 1, the Co-owners decided to evaluate alternatives that would use groundwater as a source for cooling and make-up water during periods when withdrawals from Big Stone Lake are not permitted. In addition to the original scenario proposed in the Draft EIS (i.e., the 450-acre pond for back-up water storage, sourced from Big Stone Lake), the Co-owners developed three alternatives that use groundwater as the source of back-up water for the proposed Big Stone II plant. The alternatives were then evaluated with respect to operational and economic factors and environmental impacts, in order to identify the reasonable alternatives that Western analyzed in the Supplemental Draft EIS.

2.3.1 Alternatives

Alternate supply scenarios using groundwater sources, either alone or in combination with new process technologies, were developed to eliminate dependence on surface water storage for back-up water supply for the proposed plant. Additional cooling technologies that would use groundwater as a back-up water supply source were developed as alternatives for the Supplemental Draft EIS (Black & Veatch, 2007) and are described in this section. Each alternative uses surface water as the primary water supply. Alternative 1 is the alternative described in the Draft EIS. The Revised Proposed Action and Alternatives 3 and 4 use groundwater as the back-up water supply.

Alternative 1: Wet Cooling with Surface Storage Pond for Back-Up Water Supply

Alternative 1 is described in detail in the Draft EIS, Section 2.2. Water from Big Stone Lake would be the primary source of make-up water for the proposed plant and would be pumped to the existing Big Stone plant cooling pond. The existing cooling pond would be kept at near maximum capacity and has adequate storage volume to serve as a make-up water storage pond for both the existing and proposed plants under normal operating conditions.

The proposed Big Stone II plant, as described in the Draft EIS, included a back-up water supply in the event of curtailment of Big Stone Lake water use. Water from Big Stone Lake would be pumped to three on-site storage ponds: (1) a new 450-acre back-up water storage pond, (2) the existing cooling pond, and (3) the wastewater evaporation and holding ponds from the existing Big Stone plant converted to a single make-up water (fresh water) storage pond. The design would provide sufficient water storage for up to one year of water consumption by the proposed plant in the event that the primary water supply from Big Stone Lake was not available. Section 2.2.1.4 in the Draft EIS describes the complete water supply system and the wastewater treatment system for this alternative.

Revised Proposed Action (Alternative 2): Wet Cooling with Groundwater Back-Up Water Supply

Alternative 2 is described in detail under the Revised Proposed Action in Section 2.2 of this document. This alternative would use groundwater as the sole back-up water supply in the event that pumping water from Big Stone Lake was not permitted, while retaining the original wet cooling system technology identified in Alternative 1. However, the chemical treatment systems would be changed to treat the make-up water (Big Stone Lake water or groundwater back-up) rather than the wastewater.

Alternative 3: Wet/Dry Cooling with Groundwater Back-Up Water Supply

Alternative 3 is designed to release heat from the plant steam cycle via a combined wet/dry cooling system. The dry portion would use an air-cooled condenser (i.e., air blown over tubes filled with hot steam) as a heat transfer mechanism and the wet portion of the system would be used in parallel to the dry system, as needed, to achieve full unit output on warmer days. The make-up water pretreatment system would be the same as described for Alternative 2. However, water consumption would be reduced since there would be less water loss due to evaporation.

Alternative 4: Dry Cooling with Groundwater Back-Up Water Supply

Alternative 4 would use an air-cooled condenser as the sole heat transfer mechanism to cool process water for the proposed Big Stone II plant. For this alternative, the air-cooled condenser equipment would be sized to provide the required heat rejection on a hot summer day (95° Fahrenheit). Groundwater would be used as the back-up water source for the other plant uses (i.e. boiler water makeup, WFGD system makeup, plant service water, and miscellaneous uses) in this alternative. Makeup water would be treated rather than the wastewater. Water consumption would be reduced for this alternative since the make-up water demand for the site is reduced significantly by using air cooling technology.

2.3.2 Alternative Comparison

The alternatives were compared using operating, economic, and environmental screening criteria. Comparisons of operating criteria included net power output, efficiency improvement, and auxiliary power uses. Economic criteria included capital and operating cost differences. Environmental criteria included comparisons of water consumption, air emissions, land use, and impact to wetlands. Appendix A describes the screening comparison criteria. Table 2.3-1 summarizes the results of the comparison of the four alternatives considered. A more detailed comparison table is included in Appendix A.

Table 2.3-1. Comparison of Cooling Alternatives and Water Supply Sources

Screening Criteria	Units	Alternative 1	Alternative 2	Alternative 3	Alternative 4
		Wet Cooling with Surface Water Back-up	Wet Cooling with Groundwater Back-up	Wet/Dry Cooling with Groundwater Back-up	Dry Cooling with Groundwater Back-up
Capital Cost	Dollars ($)	$84 million more than Base	Lowest – Base Case	$53 million more than Base	$72 million more than Base
Operating Cost, including fuel		Highest	Lowest – Base Case	Higher	Higher
Efficiency		Slightly Lower	Highest- Base Case	Lowest	Lower
Average Water Consumption (Surface Water and Groundwater)	afy	13,817	13,033	7,291	7,065
New Land Use Impact (permanent)	Acres	532	39	39	39
Wetland Impacts (permanent)	Acres	65	0	0	0
Air Impacts		0.15% Higher	Lowest- Base Case	2 % Higher	2% Higher

Source: Black & Veatch, 2007, see Appendix A.

Economic Comparison

The alternative with the lowest capital cost is the Revised Proposed Action (wet cooling with groundwater back-up). Capital costs are approximately $53 million to $84 million higher for the other three alternatives. The Revised Proposed Action also has the lowest operating cost. Since it has the highest efficiency (i.e., less fuel is burned per kilowatt-hour produced), it therefore has the lowest overall operating cost (including fuel). Alternatives 3 and 4, with wet/dry and dry cooling respectively, would have higher auxiliary power requirements and thus more non-fuel operating costs due to the size and number of fans that are associated with dry cooling. Alternative 1 would have higher operating costs, compared to the Revised Proposed Action, primarily due to the wastewater treatment plan, which would require evaporation of wastewater to achieve the proposed Project's required zero wastewater discharge operation.

Water Consumption Comparison

The Revised Proposed Action and Alternative 1 would require a supply of about 13,000 afy of surface and groundwater to the existing and proposed plants to make up for the evaporative losses associated with the wet cooling design for these alternatives. Alternatives 3 and 4 would require less surface and groundwater (about 6,000 afy less for each) compared to the Revised Proposed Action and Alternative 1. This reduction is the result of the inclusion of the dry cooling concept into these alternatives.

Environmental Comparison

Air emission impacts would be highest for Alternatives 3 and 4 due to the lower efficiency associated with these alternatives compared to the Revised Proposed Action. Land use impacts were significantly higher for Alternative 1 due to the construction of the 450-acre make-up water storage pond and the 25-acre cooling tower blowdown pond, which would not be part of the Revised Proposed Action or Alternatives 3 or 4. Under Alternative 1, 65 acres of wetlands would be lost compared to no losses from construction of the proposed plant facilities under the Revised Proposed Action or Alternatives 3 or 4.

2.3.3 Alternatives Carried Forward

Based on the alternative comparison results described in Section 2.3.2, the Revised Proposed Action and Alternative 3 are carried forward for further analysis of environmental impacts, which are presented in Chapter 4. The Revised Proposed Action is preferred, as it offers the best performance coupled with the lowest capital cost and has the least total annual air emissions.

Alternative 3 provides a substitute for plant cooling in the event that the projected groundwater supplies prove to be inadequate following completion of all hydrogeological investigations. Alternative 3 is the alternative to the Revised Proposed Action. The changes to the Proposed Action associated with Alternative 3 are described in Section 2.5.

2.4 Alternatives Considered but Eliminated from Detailed Analysis

Two alternatives were eliminated from consideration during the evaluation for this Supplemental Draft EIS. The alternatives not being carried forward for further analysis include Alternative 1 (the original Proposed Action of the Draft EIS) and Alternative 4.

Alternative 1: Wet Cooling with Surface Storage Pond for Back-Up Water Supply

Alternative 1 would require a significant capital cost for construction of the 450-acre make-up water storage pond. The capital cost is the highest of all alternatives and is estimated to be more than $84 million dollars above the cost of using wet cooling in combination with groundwater for the back-up water supply (the Revised Proposed Action). Significant energy would be lost through auxiliary power for evaporation of the wastewater stream (i.e., proposed new brine concentrator). Operating costs associated with the proposed new brine concentrator would be significantly higher than the operating costs associated with the new water treatment systems for the Revised Proposed Action and Alternatives 3 and 4.

New land use impacts are estimated to be higher for Alternative 1 than all other alternatives due to the required 450-acres for construction of the new pond and 25-acre cooling tower blowdown pond. Construction would impact 65-acres of wetlands, including approximately 58-acres of jurisdictional wetland areas. Air emission impacts for priority pollutants would be slightly higher due to a lower efficiency compared to using a sole groundwater back-up supply with wet cooling technology. This alternative was eliminated due to the high capital costs and environmental impacts.

Alternative 4: Dry Cooling with Groundwater Back-Up Water Supply

Similar to the Revised Proposed Action and Alternative 3, there would be no requirements for additional land use with Alternative 4 for water storage ponds. Land requirements for the groundwater well sites would be less than the Revised Proposed Action or Alternative 3, as fewer wells would be needed. Similar to Alternative 3, this dry cooling alternative would have a lower efficiency, compared to the Revised Proposed Action, resulting in increased air emissions of uncontrolled pollutants on an annual basis. The increased emissions, the lower efficiency, and the higher capital costs relative to the Revised Proposed Action and Alternative 3 were the basis for eliminating this alternative.

2.5 Alternative to the Revised Proposed Action

Alternative 3 (wet/dry cooling with groundwater back-up) may be selected if the projected groundwater supplies prove to be inadequate following completion of all hydrogeological investigations. Under Alternative 3, the footprint of the proposed plant would include a smaller wet cooling tower than proposed in the Revised Proposed Action and the addition of a dry cooling system using an air-cooled condenser.

2.5.1 Changes to the Plant Water Supply

Under Alternative 3, Big Stone Lake would be the primary water supply and groundwater would be used for the back-up water supply. The proposed plant water supply system would be operated the same as the Revised Proposed Action.

Groundwater Supply System

There would be no differences in the description of the groundwater supply system described in Section 2.2.1. Alternative 3 would also require 7 to 14 groundwater supply wells.

Groundwater Pipeline

There would be no differences in the description of the pipeline gathering system described in Section 2.2.1.

2.5.2 Changes to the Plant Cooling System

Alternative 3 would have a smaller wet cooling tower than the Revised Proposed Action that would be used in combination with a dry cooling system. The footprints of the smaller cooling tower and the air-cooled condensers would be part of final plant design and are not known at this time. However, the combined footprint of the smaller cooling tower plus the air-cooled condensers would be larger than the footprint of the cooling tower for the Revised Proposed Action.

2.5.3 Changes to Plant Water Usage

Based on the current water-use model estimates for Alternative 3, approximately 5,236 afy of surface water and 2,036 afy of groundwater would be needed for the existing and proposed plant operations. Maximum short-term groundwater use would typically be approximately 6,200 gpm.

2.5.4 Changes in Water Treatment

There would be no differences in the description of water treatment described in Section 2.2.4 for Alternative 3, except that fewer chemicals would be required, since less water would be treated.

2.5.5 Changes in Wastewater Management

There would be no differences in the description of wastewater management described in Section 2.2.5 for Alternative 3. However, there would be less wastewater to manage.

2.5.6 Actions Incorporated into Alternative 3 to Reduce Impacts

There are no differences to the actions that would be incorporated into Alternative 3 to reduce impacts from those described in Section 2.2.6 for the Revised Proposed Action.

2.6 No Action Alternative

There are no changes to the No Action Alternative described in Section 2.4 of the Draft EIS. If Western would reject the application to interconnect to Western's transmission system and the Big Stone II plant was not built, the groundwater wells and the associated interconnection pipelines would not be required. Likewise the associated environmental impacts discussed in this SDEIS would not occur.

2.7 Summary of Impacts and Mitigation Measures

The Supplemental Draft EIS addresses the impacts of changes to the proposed Project relative to cooling alternatives and the use of groundwater as the back-up water source. Impacts of the remaining portions of the proposed Project are addressed in the Draft EIS. For clarity, a complete summary of impacts for the power plant portion of the proposed Project for each alternative and the No Action Alternative is provided in Table 2.7-1. New impacts from the changes to the proposed Project have been bolded in Table 2.7-1. Impacts from the Draft EIS that are no longer applicable to the proposed Project are shown in the table as strikethroughs. Impacts from constructing and operating the transmission portion of the proposed project are unchanged and are summarized in Table 2.6-1 of the Draft EIS.

A number of mitigation measures and standard mitigative practices are proposed by the Co-owners as part of the Revised Proposed Action and area described in Section 2.2.6. The mitigation measures will reduce impacts; however, some adverse impacts may still occur.

Table 2.7-1. Summary of Impacts

Resource	Revised Proposed Action Alternative 2 – Wet Cooling with Groundwater Supply Back-Up	Alternative 3 – Wet/Dry Cooling with Groundwater Supply Back-Up	No Action Alternative
Air Quality	▪ **Projected carbon dioxide emissions from the proposed plant would be approximately 0.15 percent less than the Proposed Action described in the Draft EIS and would average approximately 4.7 million tons/year.**	▪ **Projected carbon dioxide emissions would be 2.28 percent higher than the Revised Proposed Action and would average approximately 4.8 million tons/year.**	▪ The existing Big Stone Plant would continue to operate in accordance with its current air permit. ▪ There would be no reduction in mercury, SO_2, or NO_X, emissions for the existing Big Stone Plant.
	▪ Short-term construction impacts resulting from vehicle emissions and dust would be less than significant. ▪ No increase in sulfur dioxide (SO_2) and oxides of nitrogen (NO_X) emissions increases would occur over the existing Big Stone plant emissions. ▪ Mercury emissions from coal combustion would comply with the Clean Air Mercury Rule (CAMR) and would be less than or equal to historic levels from Year 1994. ▪ ~~Projected carbon dioxide (CO2) emissions from the proposed plant would average approximately 4.7 million tons/year~~. ▪ Impacts upon views of Class I areas from proposed plant emissions would be less than significant. ▪ Projected total emissions of all hazardous air pollutants from the existing and proposed plants would be reduced by approximately 41 tons/year (from approximately 63 tons/year by the existing plant to approximately 22 tons/year by the combined existing and proposed plant operations). ▪ The proposed Big Stone II plant would operate under an air emission permit from the South Dakota Department of Environmental and Natural Resources (SDDENR) and would comply with National Ambient Air Quality Standards (NAAQS) and Prevention of Significant Deterioration (PSD) increments. Any short-term and long-term residual impacts would meet regulatory requirements and would be less than significant.		
Groundwater Resources	▪ **Up to 14 permanent wells would be constructed in the groundwater areas. Average annual groundwater production would be approximately 3,720 af.**	▪ **Up to 14 permanent wells would be constructed in the groundwater areas. Average annual groundwater production would be approximately 2,036 af.**	▪ Use of groundwater resources during construction **or operation** would not occur.
	▪ ~~Although a short-term groundwater supply may be needed during construction, these limited construction demands would have less than significant impacts on groundwater supplies.~~ ▪ ~~The proposed plant would not use groundwater during operations.~~ ▪ ~~The cooling tower blowdown pond would be constructed with an engineered liner and monitored by a system of groundwater monitoring wells, minimizing impacts to groundwater.~~		

Table 2.7-1. Summary of Impacts

Resource	Revised Proposed Action Alternative 2 – Wet Cooling with Groundwater Supply Back-Up	Alternative 3 – Wet/Dry Cooling with Groundwater Supply Back-Up	No Action Alternative
	~~▪ Impacts to groundwater from constructing and operating the proposed plant would be less than significant.~~ ▪ **Groundwater pumping from the Veblen Aquifer would not cause significant impacts to beneficial uses of the aquifer.** ▪ **Impacts to groundwater from construction of the wells and pipeline facilities would be less than significant.**		
Floodplains	▪ Small isolated flood hazard zones at the proposed plant site would be lost due to construction activities. ▪ Construction and operation of the proposed plant facilities would not constrict or modify flow conveyances, or measurably add to flood flows. ▪ Impacts to floodplains from construction or operation of the proposed plant, **groundwater wells, and pipelines** would be less than significant.		▪ Impacts to floodplains and isolated flood hazard zones would not occur.
Surface Water Resources	▪ **The existing plant and proposed Big Stone II plant combined annual consumptive water use would be about 13,000 af, which includes an annual average surface water appropriation of about 9,300 af from Big Stone Lake and an average annual groundwater appropriation of about 3,700 af.** ▪ **Big Stone Lake elevation would decrease by 0.15 feet on average. The most significant impact would be a lake elevation reduction of 0.83 feet in two non-consecutive weeks.** ▪ **Minor episodic decreases in base flow to the Whetstone River would occur due to groundwater pumping. However, the pumping would not cause a substantial extension in the period of naturally occurring seasonal reduction of flow in surface water that results in insufficient quantities of water for downstream users. These impacts would be less than significant.**	▪ **The existing plant and proposed Big Stone II plant combined annual consumptive water use would be about 7,300 af, which includes an average annual groundwater appropriation of about 2,036 af.** ▪ **Big Stone Lake elevation would decrease by 0.14 feet on average. The most significant impact would be a lake elevation reduction of 0.58 feet in two non-consecutive weeks.** ▪ **The impacts to surface water from operation of the groundwater wells would be less than those described in the Revised Proposed Action, since less water would be required.**	▪ Withdrawals from Big Stone Lake would continue at current levels. ▪ Existing water features would not be impacted.

Table 2.7-1. Summary of Impacts

Resource	Revised Proposed Action Alternative 2 – Wet Cooling with Groundwater Supply Back-Up	Alternative 3 – Wet/Dry Cooling with Groundwater Supply Back-Up	No Action Alternative
	▪ Short-term runoff and erosion impacts would occur during construction. ▪ Drainage configuration and watershed features at the proposed plant site would be rerouted around project features or changed. ~~Creation of a make-up water storage pond would remove 0.8 square miles of contributing watershed area.~~ ~~▪ The proposed plant would require an additional 7,500 acre-feet per year of fresh water from Big Stone Lake. Increased surface water withdrawals from Big Stone Lake could lower the lake level by 1.0 feet during one year out of 70 years of operation. On average over a 70-year period, lake levels would decrease between 0.1 and 0.2 feet.~~ ▪ Due to varying river and lake conditions and the possibility of storage withdrawals at other times, reductions in flow releases from Big Stone Lake would be expected, but would be infrequent. ▪ ~~Evaporative water losses related to plant cooling would increase by 1,350 afy.~~ ▪ Impacts of acid rain, mercury, and nitrogen contribution to area lakes are expected to be less than significant. ▪ Impacts to surface water resources from constructing or operating the proposed plant would be less than significant.		
Geology and Minerals	▪ No unique geologic features are located within the proposed project area. Potential geologic hazards such as seismicity, landslides, and sinkhole development associated with karst formation are not present within the proposed project area. Therefore, there would be no significant impacts to unique geological features or impacts associated with geologic hazards as a result of construction or operation of the proposed plant. ▪ Mineral resources would not be precluded from development. Therefore, there would be no significant impacts to mineral resources from constructing or operating of the proposed plant.		▪ Impacts to commercial minerals mining would not occur.
Paleontological Resources	▪ Paleontological resources are either not exposed or do not exist beneath surficial glacial deposits at the proposed plant site. There would be no significant impacts to paleontological resources from the construction or operation of the proposed plant.		▪ Potential paleontological resources would remain undisturbed and undiscovered.
Soils	▪ ~~Approximately~~ **150.1** ~~80~~ acres of soils would be temporarily disturbed during construction activities. ▪ Project components would disturb a total of **189.4** ~~612~~ acres of soils, of which **2.4** ~~414~~ acres would be permanently removed from potential agricultural use. ▪ The long-term loss of soils would not be a significant impact, due to the stockpiling of topsoil and the extensive similar resources present in the vicinity of the proposed plant.		▪ Soil disturbance would not occur, and agricultural acreage would not be lost.
Vegetation Resources	▪ Following implementation of standard and additional mitigation measures, no significant impacts to rare plants, native plant communities, or other sensitive features identified by a State or Federal resource agency are expected as a result of construction and operation activities. Residual impacts would include the long-term net loss of approximately **4.4** ~~96.4~~		▪ Vegetation losses would not occur. ▪ Project-related introduction

Table 2.7-1. Summary of Impacts

Resource	Revised Proposed Action Alternative 2 – Wet Cooling with Groundwater Supply Back-Up	Alternative 3 – Wet/Dry Cooling with Groundwater Supply Back-Up	No Action Alternative
	acres of ~~wetland-riparian,~~ forest and prairie type vegetation. **There would be no losses of wetland/riparian areas.** ▪ Mitigation measures would be implemented to prevent the introduction and spread of noxious weeds.		of invasive and noxious weeds would not occur.
Wildlife	▪ Direct impacts to wildlife would include limited direct mortality from construction activities, habitat loss, alteration or fragmentation, animal displacement, and disturbance of breeding, nesting, and foraging habitat for small game and birds. These impacts would not be sufficient to cause a species to become listed or proposed for listing as threatened or endangered. Since species compatible with the existing use would likely be compatible with the proposed use, there would not be a significant long-term impact to wildlife due to habitat alteration. ▪ Residual impacts would include the long-term net loss of approximately **39.3** ~~532~~ acres of wildlife habitat.		▪ Loss of wildlife habitat would not occur. .
Fisheries	▪ There would not be a loss of a population of aquatic species that would result in the species being listed or proposed for listing as threatened or endangered. Water intake would not result in a significant impact on fish populations. ▪ No long-term impacts to fisheries are expected.		▪ No impacts to fish habitat would occur.
Special Status Species	▪ Habitat for special status species has been identified on the proposed plant site; **however, no individuals were present during surveys.** ▪ Impacts to special status plants would include the long-term net loss of approximately **4.4** ~~96.4~~ acres of suitable special status plant species habitat (~~wetlands,~~ prairie and forest). Following the implementation of standard and additional mitigation measures, no significant residual impacts to special status plant species are expected as a result of construction and operational activities. ▪ Sixteen terrestrial wildlife species (six special status species and 10 species of concern) may occur within the proposed plant site. Direct impacts from constructing and operating of the proposed plant would include the loss or alteration of breeding and foraging habitats and increased habitat fragmentation. Mortality could also occur to less mobile or burrowing species. Abandonment of a nest site and the loss of eggs and/or young may also occur. ▪ ~~Direct impacts to the northern river otter could result from a long-term loss of approximately 65 acres of wetland/riparian habitat within the proposed plant site.~~ ▪ One Federal special status bird species, the bald eagle, is known to occur in the vicinity of the proposed plant site. **With elimination of the 450-acre make-up water storage pond, there would be no direct impacts to bald eagle foraging habitat, since there would be no loss of wetland/riparian areas.** ~~Direct impacts to bald eagle foraging habitat would result in a long-term loss of approximately 65 acres of foraging habitat (i.e., wetland/riparian areas) within the proposed plant site, but foraging habitat would be created or enhanced in other locales to offset habitat losses.~~ ▪ No federally-listed aquatic species or designated critical habitat occur in water bodies within or downstream of the proposed plant site. ▪ **Special status species that use the Whetstone River would not be adversely affected by minor episodic flow**		▪ No impacts to special status species would occur.

Table 2.7-1. Summary of Impacts

Resource	Revised Proposed Action Alternative 2 – Wet Cooling with Groundwater Supply Back-Up	Alternative 3 – Wet/Dry Cooling with Groundwater Supply Back-Up	No Action Alternative
	reductions caused by groundwater pumping. ▪ None of the anticipated impacts to special status species would result in an unpermitted violation of statutes or regulations pertaining to special status fish or mussel species. No impacts to special status fish and mussel species would occur. ▪ Western would complete Endangered Species Act (ESA) Section 7 consultation prior to initiating construction activities and any reasonable and prudent measures issued by the (U.S. Fish and Wildlife Service (USFWS) in its Biological Opinion would be adhered to by Western and the Co-owners.		
Wetlands	▪ **No long-term losses of wetlands are anticipated. Short-term impacts could occur; however, these impacts would be mitigated under a nationwide permit or a Section 404 permit issued by the USACE. Impacts to non-jurisdictional wetlands would be mitigated in accordance with applicable State or Federal requirements.** ▪ ~~Construction would result in the loss of 65 acres of wetland/riparian areas. A significant impact would not occur as a result of any loss or degradation of any jurisdictional wetland, since these impacts would be mitigated under a Section 404 permit issued by the U.S. Army Corps of Engineers (USACE). Impacts to non-jurisdictional wetlands are also included in the Section 404 permit. Residual impacts would include the long-term net loss of 65 acres of wetland/riparian areas.~~		▪ No indirect loss of wetlands would occur.
Archaeological Resources Historical Resources	▪ It is anticipated that by following the procedures outlined in Section 106 of the National Historic Preservation Act (NHPA) and the Programmatic Agreement (PA), adverse impacts to archaeological and historic resources eligible for inclusion to the National Register of Historic Places (NRHP) would be avoided or mitigated. Unavoidable impacts to NRHP-eligible sites would be mitigated through implementation of a treatment plan in accordance with the PA. ▪ Impacts to NRHP-eligible sites would not be significant with implementation of the PA and standard mitigation measures. ▪ **Any traditional cultural properties (TCP) identified within the proposed Project area would receive the appropriate level of protection or recovery by implementing mitigation measures, treatment plans, or compliance actions (e.g., protection of burial sites) in accordance with the PA. Impacts to these resources would not be significant with implementation of the PA.**		▪ Potential archaeological resources would remain undisturbed and undiscovered. ▪ No cultural or historical resources would be affected
Native American Concerns	**Note: Native American concerns have been combined with archaeological and historical resources.** ▪ ~~Any traditional cultural property (TCP) identified within the project area would receive the appropriate level of protection or recovery by implementing mitigation measures, treatment plans or compliance actions (e.g., protection of burial sites) in accordance with the proposed PA. Impacts to these resources would not be significant with implementing the proposed PA.~~		▪ ~~Cultural environmental conditions and trends would continue.~~
Land Use Resources	▪ The proposed plant would require various permits, land use approvals, or zoning changes for construction and operation. With approval of zoning changes, there would be no conflicts with land use plans, zoning, or with special use areas. ▪ Increased growth and temporary increase in workforce would not overburden existing recreation resources nor would air		▪ Zoning changes would not be needed. ▪ No changes in existing land

Table 2.7-1. Summary of Impacts

Resource	Revised Proposed Action Alternative 2 – Wet Cooling with Groundwater Supply Back-Up	Alternative 3 – Wet/Dry Cooling with Groundwater Supply Back-Up	No Action Alternative
	pollutant emissions reduce recreational opportunities. No significant impacts from the construction and operation of the proposed plant are anticipated in terms of increased demand for recreation. ▪ Total new land required for construction of the proposed plant would be **189.4** ~~612~~ acres, of which **150.1** ~~80~~ acres is a short-term impact due to construction. ▪ Total long-term impacts to land use from the proposed power plant construction and operation would be **39.3** ~~532~~ acres.		uses or recreation use. Land use and recreation use trends would continue.
Agricultural Practices	▪ The permanent conversion of **2.1** ~~328~~ acres of prime farmland for the proposed plant would be a long-term and residual impact. This amount is only a small portion of the prime farmland in Grant County, and there would be no adverse affect on agriculture in the region. Therefore, it would not be a significant impact to prime farmland in the region. ▪ No pivot irrigation facilities would be affected by constructing the proposed plant.		▪ No prime and unique farmlands would be lost. Current agricultural uses and trends would continue.
Public Facilities	▪ No public facilities would be affected by construction of the proposed plant.		▪ Current public facility conditions and trends would continue
Infrastructure, Public Health and Safety, and Waste Management	▪ Construction of the proposed plant would occur over four years and would require approximately 1,400 workers at the peak of construction, causing a short-term increase in daily traffic counts. ▪ The existing local roads and rail system would be able to handle the increase in road traffic and train numbers during operation of the existing plant and the proposed Big Stone II plant. Damage to roads due to construction activities would be repaired. ▪ Construction and operation of the proposed plant would not cause a significant impact to public health and safety. Implementing a facility health and safety plan would ensure there would be no interference with local emergency response capabilities or resources and prevent serious injuries to workers. Controlling access to the proposed plant facilities and construction sites would prevent injury to the public and local land users. ▪ Since no sensitive receptors or land use are located near the proposed plant site, there would be no impacts from electric and magnetic fields from the proposed plant. Because the plant is isolated, there would be no substantial interference or disruption of any emergency or health and safety communication system. ▪ By implementing standard and additional mitigation measures, impacts from hazardous materials and waste management during construction and operation of the proposed plant would not be significant. Disposal of wastes would be conducted following State and Federal regulations and would not impact public health. Procedures to control spills or releases of hazardous materials or regulated substances would be established in the Co-owners' health and safety program, and the program would not interfere with any locally adopted emergency or response plan. Impacts from hazardous materials and waste management activities for constructing and operating the proposed Big Stone II plant would be less than significant.		▪ Temporary impacts to traffic due to construction would not occur. ▪ Increased transport of hazardous materials for plant operations would not occur.

Visual Resources	▪ Construction activities would result in temporary, short-term impacts from lighting. ▪ Constructing and operating the proposed plant would result in additive long-term low to moderate visual impacts due to addition of stack, power plant building, and coal silos. ▪ Additive sources of light or glare are expected as a result of operation of the proposed plant structures. ▪ Residual visual impacts would be less than significant due to the influence of the existing Big Stone plant.	▪ There would be no temporary or additive impacts due to lighting, glare, or additional structures.
Noise	▪ Noise levels would increase during construction of the proposed plant, but are considered to be short-term impacts. ▪ The addition of the proposed plant would result in a slightly noticeable increase over existing nighttime noise levels **that are** generated from the existing plant. There would be no incremental noise increases above 5 decibels on the A-weighted scale (dBA). **Minnesota residential noise standards may be exceeded at one residence due to increased construction traffic from construction traffic.** By implementing the additional mitigation measure for construction noise impacts to the nearest residence, this impact would be less than significant.	▪ There would be no increases in noise due to construction or operation of the plant.
Social and Economic Values, and Environmental Justice	▪ Short-term impacts on housing and public services would be significant. The direct and indirect economic benefits from construction costs to the surrounding four-county region and the State of South Dakota are a significant beneficial impact. The creation of temporary and permanent jobs in the community is also a beneficial impact. ▪ Based on the social and economic analysis, no significant short-term or long-term negative impacts are anticipated from uncompensated losses to existing businesses or residences, loss of economic viability of a farm or other business, permanent and irreversible loss of work for a major sector of the community, or the physical division of an established community. ▪ The poverty rate for the census tracts affected by the proposed plant site is 10.4 percent, while minorities comprise 1.2 percent of the population in the census block groups in which the proposed plant site is located. This poverty rate is less than the State of South Dakota's poverty rate of 13.2 percent and comparable to Grant County's poverty rate of 9.9 percent. The minority population for the affected area is lower than the State of South Dakota (11.3 percent) and comparable to Grant County (1.4 percent). The proposed plant would not have a disproportionate negative effect on minority or low-income populations in the area.	▪ Impacts to local housing and community services would not occur. ▪ No economic benefit to the community from additional jobs or the additional taxes that would be paid by the proposed Project.

AFFECTED ENVIRONMENT

CHAPTER 3

3.0 Affected Environment

Chapter 3 of the Draft EIS describes the affected environment for the proposed Big Stone II power plant site, which includes those portions of the Revised Proposed Action and Alternative 3 related to construction of the proposed power plant. A description of the plant site and expanded groundwater areas where groundwater wells, access roads, and pipelines are proposed to support using groundwater as the source of back-up water is provided in Section 2.2.1 of this Supplemental Draft EIS. This chapter describes the affected environment within these areas. Existing conditions for the plant vicinity groundwater area are generally the same as resource descriptions for the proposed plant site, and information is added only for those resource areas where additional information was useful for the analysis. In most cases, the existing conditions for the expanded groundwater area are the same as the resource descriptions in Chapter 3 of the Draft EIS.

The existing environmental conditions are described in this chapter for the two alternatives carried forward for analysis: (1) the Revised Proposed Action, wet cooling with groundwater backup water supply and (2) Alternative 3, wet/dry cooling with groundwater backup water supply. The intent of the chapter is to provide the reader with an understanding of the affected environment for human, physical, and biological resourcs. Federal, State, and local regulations that are applicable to managing these resources are also discussed in the context of the existing environment. Specific impacts from construction and operation of the Revised Proposed Action are discussed in Chapter 4. Except where noted below, there has been no change to the introductory remarks or general descriptions for the resource areas that were discussed in Chapter 3 of the Draft EIS.

3.1 Air Quality

The climate, meteorology, and air quality standards associated with the groundwater areas are the same as those described for the proposed Big Stone II plant site within Section 3.1.2 of the Draft EIS.

3.2 Water Resources

3.2.1 Introduction

This section describes the occurrence, characteristics, and existing uses of water within the areas where groundwater wells are proposed. Water resources that may be affected by use of groundwater include surface resources such as lakes, rivers, floodplains, and wetlands, and groundwater resources such as aquifers. This section also provides details for conditions related to impact and mitigation assessments.

Related resources and their uses (e.g., wetlands or irrigation systems) are primarily described in other sections of Chapter 3; however, some overlap between sections is needed to describe existing water-related resources. Consequently, Chapter 4 presents additional information about regulatory programs as they affect potential water resource impacts and mitigation.

3.2.2 Groundwater

The discussion of groundwater in Section 3.2.2.1 of the Draft EIS for the proposed Project area applies to this Supplemental Draft EIS. As discussed in the Draft EIS, groundwater under the proposed plant site comes from the Veblen Aquifer. This section provides additional information for the Veblen Aquifer in the proposed Project area.

Aquifer Characteristics

Otter Tail Power (OTP) drilled exploratory and groundwater production test wells between November 2006 and June 2007 to assess the use of groundwater as a source of back-up water supply. Figure 3.2-1 shows the location of the exploratory pilot test holes drilled within the proposed Project area. Wells PW1-2 and PW1-4 were drilled and installed during January 2007 as production test wells, which are also shown on Figure 3.2-1. Information from the exploratory wells and pump tests at the production test wells were used to characterize the groundwater resources in the proposed Project area (Barr, 2007a).

Well PW1-2 encountered an 81-foot thick, water-bearing sand, between 97 to 178 feet below the ground surface (bgs). The Veblen Aquifer in the area surrounding this well is overlain by 97 feet of clay, containing layers of silty sand (up to five feet thick) and lenses of gravel, sand, and silt. The overlying clay serves to confine the aquifer in this area. The potentiometric water level encountered in the well was 74 feet bgs (i.e., 23 feet above the top of the aquifer), and is indicative of a confined aquifer. The potentiometric water level is the level to which water will rise in a tightly cased well.

Well PW1-4 encountered a 64-foot thick, water-bearing sand, between 121 to 185 feet bgs. The aquifer in the area surrounding this well is overlain by 121 feet of clay, containing layers of sand (up to eight feet thick) and silt (up to four feet thick) and lenses of cobbles, gravel, sand, and silt. The overlying clay serves to confine the aquifer in this area. The water level of 117 feet bgs encountered in the well (i.e., four feet above the top of the aquifer) is indicative of a confined aquifer.

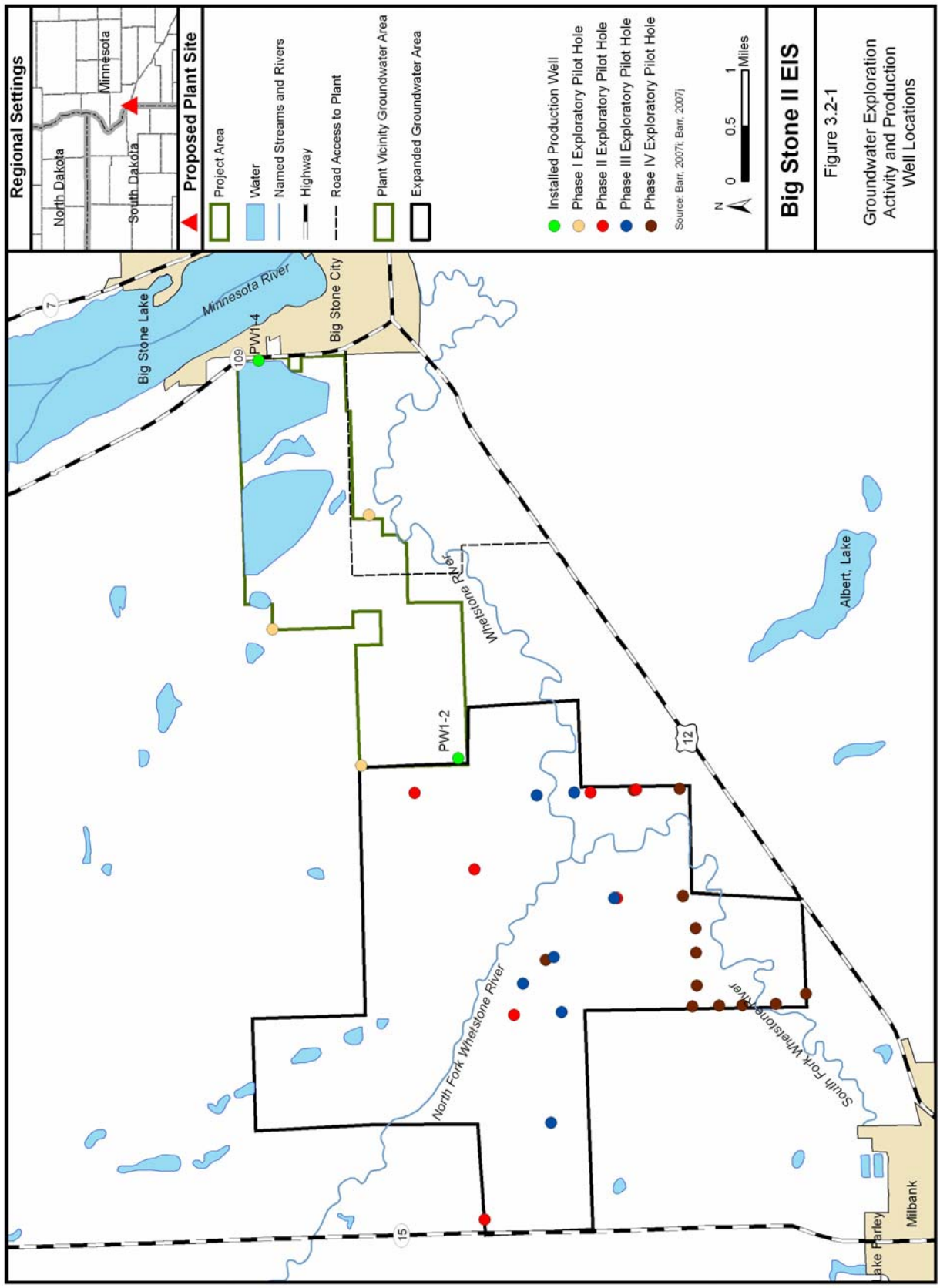
Recharge to the Veblen Aquifer in Grant County occurs through direct infiltration of precipitation where the aquifer is at land surface and possibly through leakage from overlying glacial till. Average annual recharge has not been quantified for the aquifer (SDDENR, 2007b).

Groundwater Quality

The discussion on groundwater quality contained within Section 3.2.2.1 of the Draft EIS also applies to this Supplemental Draft EIS. Water samples collected during exploratory well drilling indicate that the Veblen Aquifer meets South Dakota water quality standards and would provide good water quality as a supply source for the proposed Big Stone II plant (OTP, 2007a).

Groundwater Uses

Several Water Rights and Appropriation Permits for water from the Veblen Aquifer in Grant County have been issued by the South Dakota Water Management Board. The SDDENR reports 33 water permits/rights appropriating water from the Veblen aquifer in Grant County. Water permit uses in the vicinity of the proposed expanded groundwater area include: industrial (one permit); commercial (two permits); municipal (one permit - Big Stone City); and irrigation (12 permits) (SDDENR, 2007b). Domestic wells do not require permits from the State of South Dakota; therefore, the number of domestic wells drawing water from the Veblen Aquifer is unknown. Domestic water in the area


Regional Settings
North Dakota
Minnesota
South Dakota
Proposed Plant Site
Project Area
Water
Named Streams and Rivers
Highway
Road Access to Plant
Plant Vicinity Groundwater Area
Expanded Groundwater Area
Installed Production Well
Phase I Exploratory Pilot Hole
Phase II Exploratory Pilot Hole
Phase III Exploratory Pilot Hole
Phase IV Exploratory Pilot Hole
Source: Barr, 2007i, Barr, 2007j
N
0
0.5
1
Miles
Big Stone II EIS
Figure 3.2-1
Groundwater Exploration Activity and Production Well Locations
Big Stone Lake
Minnesota River
Big Stone City
PW1-4
PW1-2
Whetstone River
Albert, Lake
North Fork Whetstone River
South Fork Whetstone River
Lake Farley
Millbank
7
109
12
15

surrounding the existing Big Stone plant is served by Big Stone City or the Grant-Roberts Rural Water System. Big Stone City's source of water is from the City of Ortonville which secures its water from wells located on the south end of Big Stone Lake between the Whetstone River and the Minnesota River, and north of Highway 12. Grant-Roberts Rural Water System's source of water is from groundwater from the Antelope Valley aquifer, which is west-south-west of Milbank, approximately 14 miles or more.

Grant County indicates that from 1979 through 2005, the average groundwater permitted for irrigation from the Veblen Aquifer was 6,389 acre-feet annually. The reported average annual groundwater pumped from the aquifer for irrigation during that time period was 819.3 acre-feet. The total average withdrawal from all uses of the Veblen aquifer in Grant County is expected to be less than 1,000 acre-feet annually (SDDENR, 2007b). Records on actual water use for the municipal, industrial, and commercial users are not available.

3.2.3 Floodplains

The discussion of floodplains for the proposed plant site in Section 3.2.2 of the Draft EIS also applies to this Supplemental Draft EIS. Additional information is provided for floodplains in the expanded groundwater area.

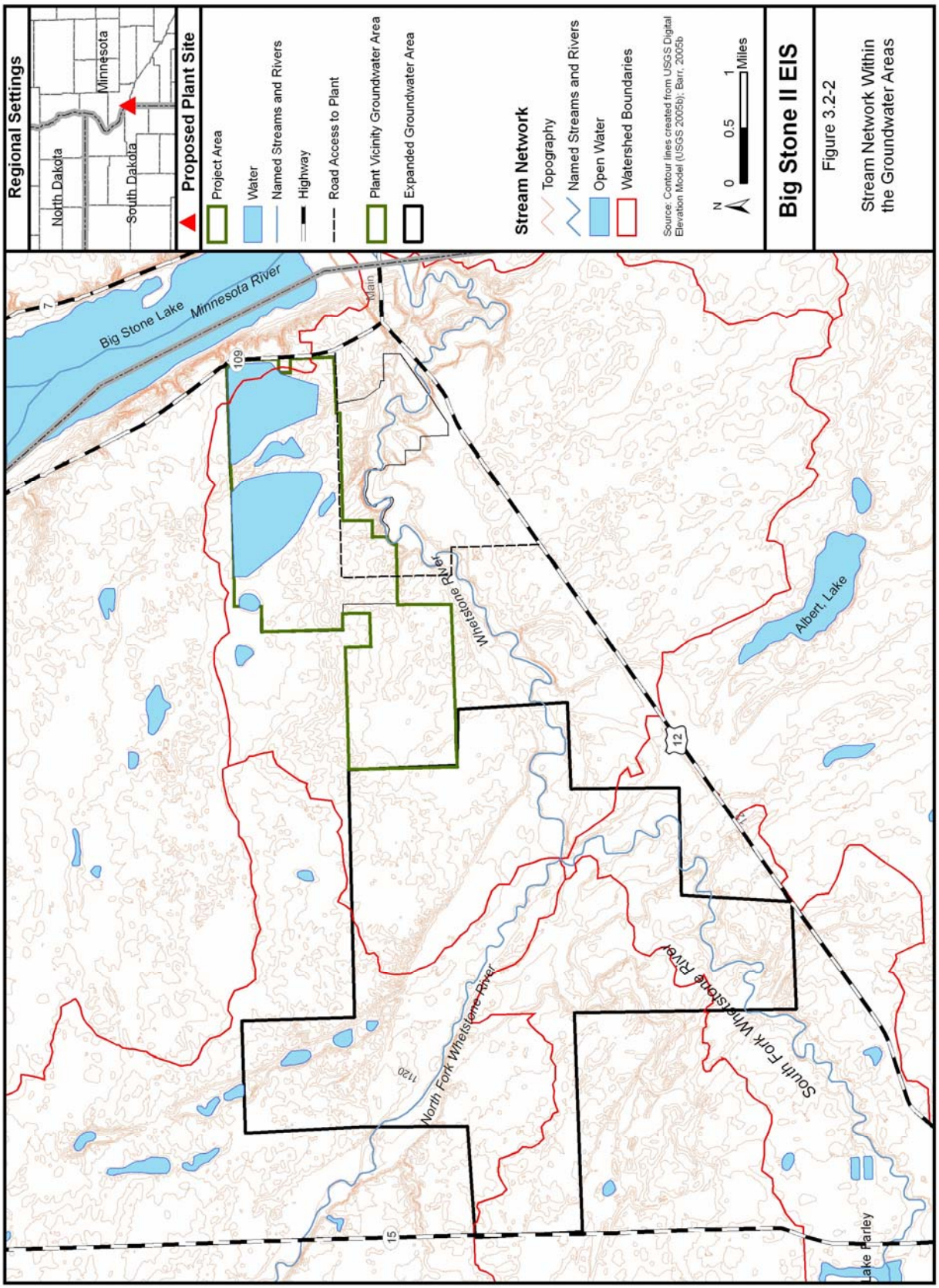
Federal Emergency Management Agency (FEMA) maps indicate that contiguous Zone A (100 year) floodplains exist within the North Fork and South Fork of the Whetstone River drainages and within other associated tributary drainages of the Whetstone River within the expanded groundwater area. A few, isolated floodplain delineations, which appear to be ponded areas and not connected to any mapped river or stream, also occur in scattered areas. Zone A areas have not been determined by hydraulic analysis and were located by "approximate methods" (FEMA, 2007).

3.2.4 Surface Water

The general discussion of surface water for the proposed plant site in Section 3.2.2 of the Draft EIS applies to this Supplemental Draft EIS. This section provides additional surface water information for the expanded groundwater area.

Figure 3.2-2 illustrates the stream network within the proposed Project area. The North Fork and South Fork of the Whetstone River and their associated smaller tributaries traverse the expanded groundwater area. The North Fork Whetstone and South Fork Whetstone rivers join within the eastern portion of the expanded area. From this point, the Whetstone River flows about six miles east and northeast to its confluence with the Minnesota River. Section 3.2.2.3 of the Draft EIS describes additional characteristics of the Whetstone River. Several small ponds are located in the expanded groundwater area, primarily in the north and northwest portions. Scattered wetlands also exist within the area and are discussed in Section 3.4-6.

Rainfall runoff and snowmelt dominate the flows in the Whetstone River. Over the past 70 years, the months of April through July have typically had the highest flows in the Whetstone River, averaging 110 cfs. Only a very small portion of flow in the Whetstone River (about 1.8 percent of average flow) originates as groundwater inflows (i.e., a base flow of approximately two cfs). The Veblen Aquifer is


Regional Settings
North Dakota
Minnesota
South Dakota
Proposed Plant Site
Project Area
Water
Named Streams and Rivers
Highway
Road Access to Plant
Plant Vicinity Groundwater Area
Expanded Groundwater Area
Stream Network
Topography
Named Streams and Rivers
Open Water
Watershed Boundaries
Source: Contour lines created from USGS Digital Elevation Model (USGS 2005b); Barr, 2005b
N
0
0.5
1
Miles
Big Stone II EIS
Figure 3.2-2
Stream Network Within the Groundwater Areas
Big Stone Lake
Minnesota River
Main
7
109
Whetstone River
Albert Lake
12
North Fork Whetstone River
South Fork Whetstone River
1120
15
Lake Parley

separated from most of the stream reaches of the Whetstone River either by low-permeability clay on top of the aquifer or an unsaturated zone where the elevation of the water table is below the Whetstone River. January and February are low-flow periods when surface-water runoff contributions are small and groundwater inflows dominate. During this period, the Whetstone River's flow is about two cfs, or less. Several times over the past 70 years, extended dry conditions with low precipitation caused the water table to drop below the elevation of the Whetstone River, and there was no flow in the river.

3.3 Geology, Minerals, Paleontological Resources, and Soils

The general discussion of geology, minerals, paleontological resources, and soils in Section 3.3.2 of the Draft EIS also applies to this Supplemental Draft EIS. Additional information for these resources is provided in this section for the expanded groundwater area.

3.3.1 Geology, Minerals, and Paleontological Resources

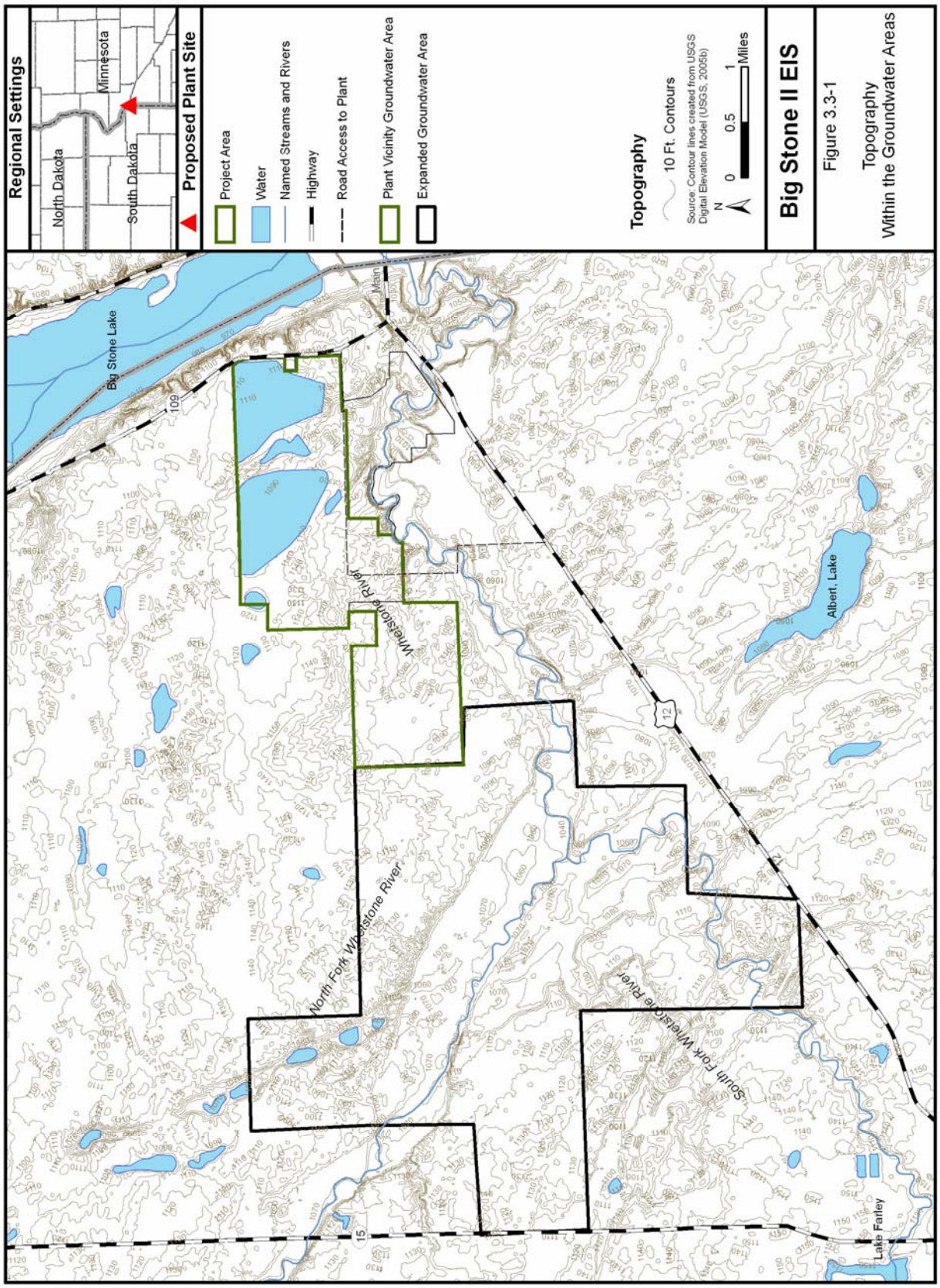
As shown by Figure 3.3-1, the topography within the proposed Project area is hummocky, reflecting surficial glacial till deposits. The areas proposed for groundwater wells are at an elevation of approximately 1,000 to 1,150 feet above mean sea level and the ground slopes generally towards the Whetstone River. There are no changes to the description of the area with respect to paleontological resources, surficial geology, or bedrock geology presented in the Draft EIS. The bedrock and surficial geology within the areas proposed for groundwater wells are illustrated in Figures 3.3-2 and 3.3-3, respectively.

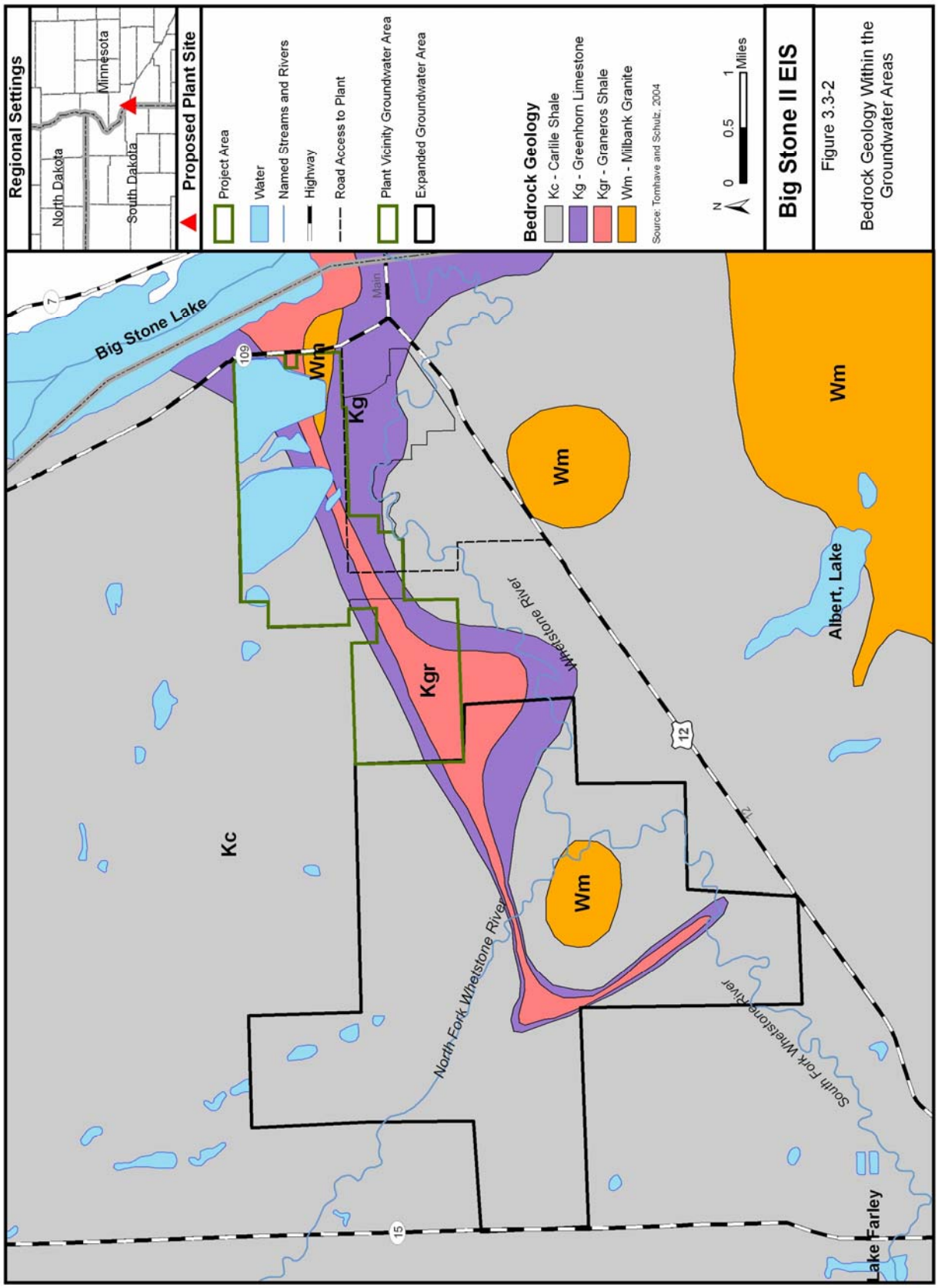
3.3.2 Soils

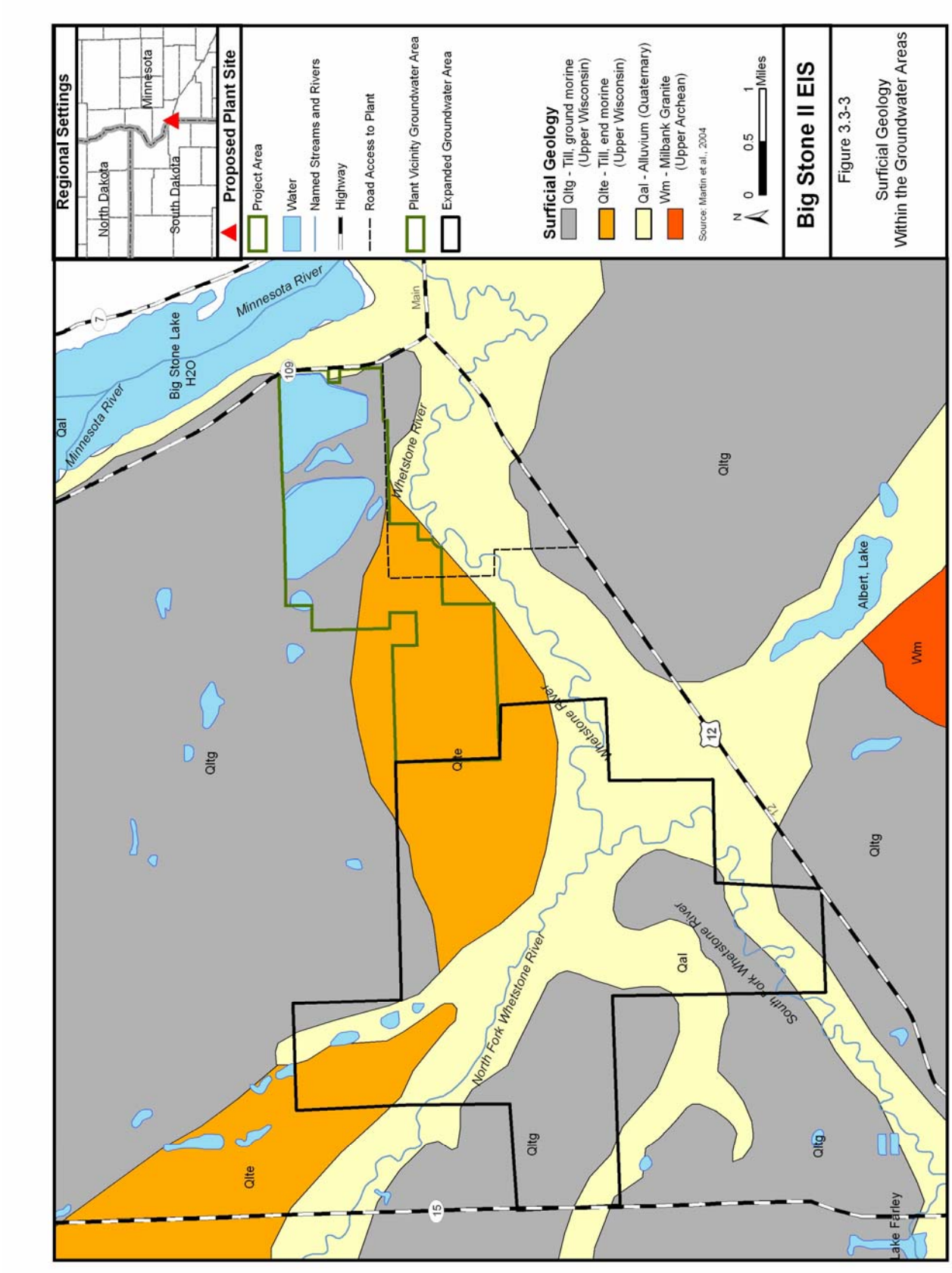
The soils descriptions for the expanded groundwater area are similar to the description of soils within the proposed plant site. The following differences occur:

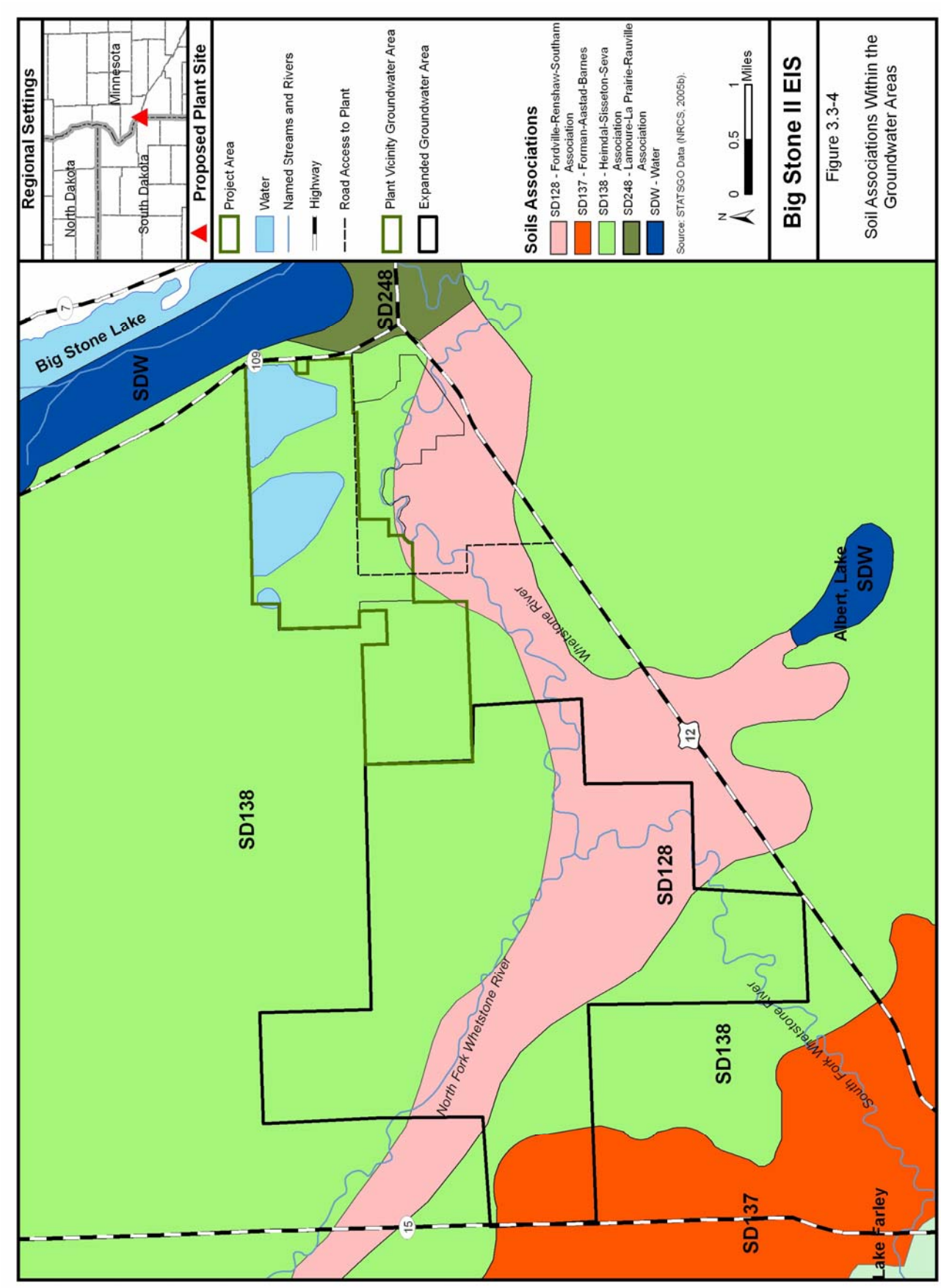
As shown in Figure 3.3-4, the Heimdal-Sisseton-Svea association (described in Section 3.3.2.3 of the Draft EIS) still dominates the landscape, but a large swath of Fordville-Renshaw-Southam association cuts through the expanded groundwater area. Fordville soils are very deep, well-drained soils formed in loamy sediments that are moderately deep over sand and gravel on outwash plains and terraces. Renshaw soils consist of very deep, somewhat excessively-drained soils formed in loamy sediments and the underlying sand and gravel on outwash plains and terraces. Southam soils are very deep, very poorly-drained, slowly permeable soils that formed in local alluvium from glacial drift. These soils are in basins and depressions on till plains, moraines, and lake plains.

In addition, an association of Forman-Aastad-Barnes soils dominates the area in the far western portion of the expanded groundwater area. Forman soils are very deep, well-drained, moderately slowly permeable soils formed in calcareous till. These soils are on till plains and moraines. Aastad soils consist of very deep, moderately well-drained soils that formed in calcareous till on moraines and till plains. Barnes soils consist of very deep, well-drained, moderately or moderately slowly permeable soils that formed in loamy till. These soils are on till plains and moraines.


Regional Settings
North Dakota
Minnesota
South Dakota
Proposed Plant Site
Project Area
Water
Named Streams and Rivers
Highway
Road Access to Plant
Plant Vicinity Groundwater Area
Expanded Groundwater Area
Topography
10 Ft. Contours
Source: Contour lines created from USGS Digital Elevation Model (USGS, 2005b)
N
0
0.5
1
Miles
Big Stone II EIS
Figure 3.3-1
Topography
Within the Groundwater Areas
Big Stone Lake
Main
109
Whetstone River
North Fork Whetstone River
South Fork Whetstone River
Albert, Lake
12
15
Lake Farley


Regional Settings
North Dakota
Minnesota
South Dakota
Proposed Plant Site
Project Area
Water
Named Streams and Rivers
Highway
Road Access to Plant
Plant Vicinity Groundwater Area
Expanded Groundwater Area
Bedrock Geology
Kc - Carlile Shale
Kg - Greenhorn Limestone
Kgr - Graneros Shale
Wm - Milbank Granite
Source: Tomhave and Schulz, 2004
N
0
0.5
1
Miles
Big Stone II EIS
Figure 3.3-2
Bedrock Geology Within the Groundwater Areas
Big Stone Lake
Main
7
109
Wm
Kg
Kgr
Kc
Wm
Wm
Wm
Whetstone River
Albert, Lake
12
72
North Fork Whetstone River
South Fork Whetstone River
15
Lake Farley


Regional Settings
North Dakota
Minnesota
South Dakota
Proposed Plant Site
Project Area
Water
Named Streams and Rivers
Highway
Road Access to Plant
Plant Vicinity Groundwater Area
Expanded Groundwater Area
Surficial Geology
Qltg - Till, ground morine (Upper Wisconsin)
Qlte - Till, end morine (Upper Wisconsin)
Qal - Alluvium (Quaternary)
Wm - Milbank Granite (Upper Archean)
Source: Martin et al., 2004
N
0
0.5
1
Miles
Big Stone II EIS
Figure 3.3-3
Surficial Geology
Within the Groundwater Areas
Minnesota River
Big Stone Lake
H2O
Qal
Minnesota River
Main
Whetstone River
Qltg
Albert, Lake
Wm
Qlte
Whetstone River
12
Qltg
Qltg
South Fork Whetstone River
Qal
North Fork Whetstone River
Qltg
Qltg
Qlte
15
Lake Farley


Regional Settings
Minnesota
North Dakota
South Dakota
Proposed Plant Site
Project Area
Water
Named Streams and Rivers
Highway
Road Access to Plant
Plant Vicinity Groundwater Area
Expanded Groundwater Area
Soils Associations
SD128 - Fordville-Renshaw-Southam Association
SD137 - Forman-Aastad-Barnes
SD138 - Heimdal-Sisseton-Seva Association
SD248 - Lamoure-La Prairie-Rauville Association
SDW - Water
Source: STATSGO Data (NRCS, 2005b).
N
0
0.5
1
Miles
Big Stone II EIS
Figure 3.3-4
Soil Associations Within the Groundwater Areas
Big Stone Lake
SDW
SD248
109
7
SD138
SD128
SD137
SD138
12
15
Albert, Lake
SDW
Whetstone River
North Fork Whetstone River
South Fork Whetstone River
Lake Farley

3.4 Biological Resources

3.4.1 Introduction

Biological resources discussed for the groundwater areas in this chapter include vegetation, wildlife, fisheries, special status species, and wetlands or riparian areas. The discussion of these resources in Section 3.4.2 of the Draft EIS for the proposed plant vicinity also applies to this Supplemental Draft EIS. Additional information for these biological resources is provided in this section for the expanded groundwater area. Appendix F of the Draft EIS discusses species that may occur within the proposed plant site. That discussion also pertains to the areas proposed for groundwater wells and is referred to several times in this section.

3.4.2 Vegetation

The expanded groundwater area is located within the Northern Glaciated Plains/Minnesota River Prairie ecoregion (USEPA, 2003). Vegetation cover types were delineated within the expanded groundwater area by OTP in October 2006 and are illustrated on Figure 3.4-1 (Barr, 2006a). The area consists primarily of a fragmented patchwork of tallgrass and shortgrass prairie remnants, deciduous forests, wetland/riparian and open water habitats, agriculture, and developed areas.

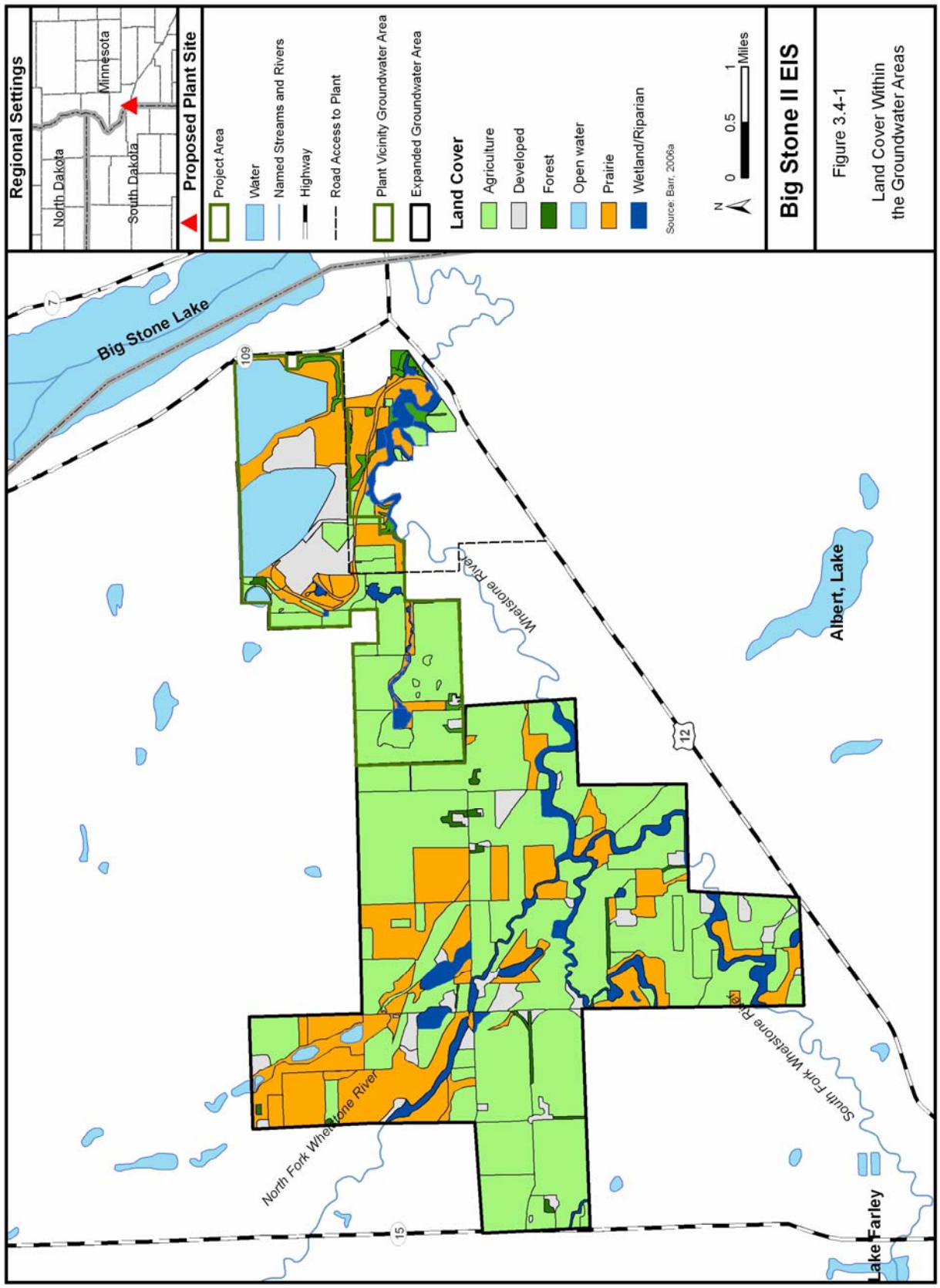
Table 3.4-1. Land Cover Types – Expanded Groundwater Area

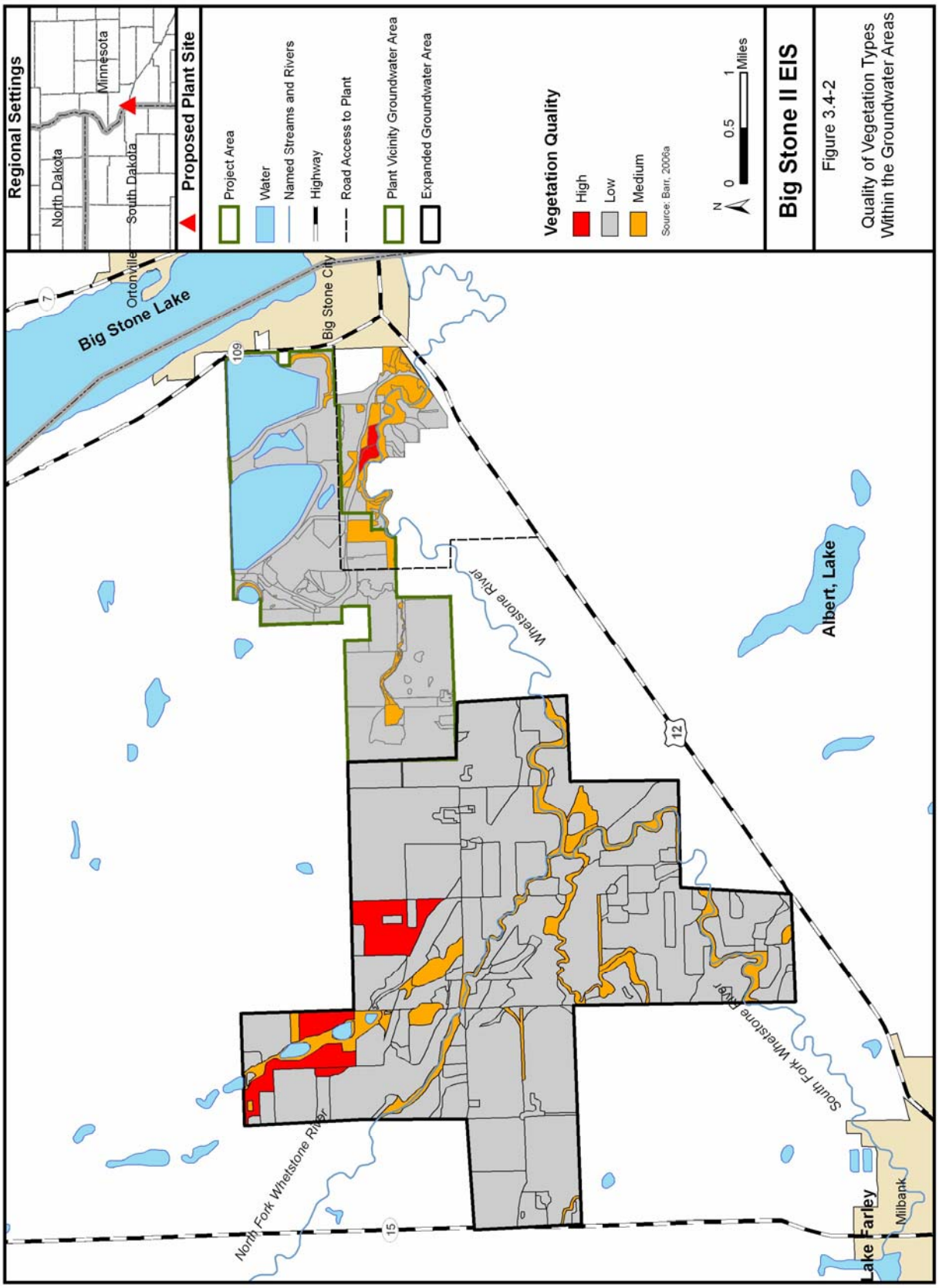
	Cover Types	Acres[a]	Percent
Vegetation Cover	Agriculture	4,920	63.9
	Wetland/Riparian	537	7.0
	Forest	72	0.9
	Shrubland	0	0.0
	Prairie	1,807	23.5
Non-vegetation Cover	Open Water	34	0.4
	Developed	325	4.2
Total		7,695	100.0

[a]Values are approximate due to rounding.
Source: Barr, 2006a

Figure 3.4-2 illustrates the various quality categories of the vegetation cover types present within the expanded groundwater area.

Most of the land within the expanded groundwater area includes disturbed or degraded vegetation cover types, with perennial row crops and non-native grasslands accounting for over half of the total area. Over 86 percent (6,622 acres) of the total vegetative cover is rated as low ecological quality based on vegetation type. Low ecological quality areas are widespread throughout the area and consist of farmsteads, hayfields, industrial areas (quarries), row crops, disturbed grasslands, and roadways. Noxious and invasive species contribute approximately 40 to 100 percent of vegetative cover in those low ecological quality areas not devoted to agricultural production. Noxious and invasive species (see Draft EIS, Appendix F, Table 5) contribute less than 10 percent cover in agricultural areas; however, the presence of single species in agricultural areas creates greatly reduced ecological quality. Overall, natural processes and human disturbances have altered the landscape, and the present plant communities do not resemble typical naturally occurring communities.


Regional Settings
North Dakota
South Dakota
Minnesota
Proposed Plant Site
Project Area
Water
Named Streams and Rivers
Highway
Road Access to Plant
Plant Vicinity Groundwater Area
Expanded Groundwater Area
Land Cover
Agriculture
Developed
Forest
Open water
Prairie
Wetland/Riparian
Source: Barr, 2006a
N
0
0.5
1
Miles
Big Stone II EIS
Figure 3.4-1
Land Cover Within
the Groundwater Areas
Big Stone Lake
7
109
12
15
Whetstone River
Albert, Lake
South Fork Whetstone River
North Fork Whetstone River
Lake Farley


Regional Settings
Minnesota
North Dakota
South Dakota
Proposed Plant Site
Project Area
Water
Named Streams and Rivers
Highway
Road Access to Plant
Plant Vicinity Groundwater Area
Expanded Groundwater Area
Vegetation Quality
High
Low
Medium
Source: Barr, 2006a
N
0
0.5
1
Miles
Big Stone II EIS
Figure 3.4-2
Quality of Vegetation Types
Within the Groundwater Areas
Ortonville
Big Stone Lake
Big Stone City
7
109
12
15
Whetstone River
Albert, Lake
South Fork Whetstone River
North Fork Whetstone River
Lake Farley
Milbank

Plant communities with medium ecological quality comprise approximately 727 acres (9.5 percent) of the expanded groundwater area. Medium ecological quality areas consist of hardwood forest stands, pine plantation forest, grassland pasture, mixed deciduous woodlands, wooded pastures, and wetlands. In medium ecological areas, noxious and invasive species contribute 5 to 40 percent of total vegetation cover and do not exceed the vegetation cover provided by native vegetation communities. In general, these plant communities have been affected by human disturbances but the nature of the communities has not been altered beyond recognition.

Areas of high ecological quality total approximately 345 acres (4.5 percent) of the expanded groundwater area. High ecological quality areas are concentrated on the north side of the area and consist of northern plains transitional bluestem prairie. Portions of the 160-acre Federal VanHout Waterfowl Production Area (WPA) are located within the high ecological quality zone. WPAs are public lands managed by the U.S. Fish and Wildlife Service, with an objective to preserve wetlands and grassland nesting areas critical to waterfowl and other wildlife. Noxious and invasive species comprise less than five percent of the total vegetative cover in this area. Little or no evidence of human disturbances, such as logging or livestock grazing, are present within this area.

3.4.3 Wildlife

Moderate to high quality wildlife habitat is present within the expanded groundwater area and provides year-long and seasonal habitat for a number of birds, mammals, fish, reptiles, amphibians, and insects (see Draft EIS, Appendix F, Table 1 and Table 2). Although much of the area is agricultural in nature and of low quality habitat, high quality habitat exists near the Whetstone River with northern bur oak mesic forest and northern plains bluestem prairie species. Moderate quality habitat occurs in the remaining areas and includes mixed hardwood riparian corridors, agricultural areas, deciduous forest and wetlands.

Additionally, the expanded groundwater area is along the western edge of a merging route between the Atlantic and Mississippi migratory flyways. Waterfowl migrating along this route may use the wetlands within the expanded groundwater area as stopovers. Moreover, the expanded groundwater area is within an area used by waterfowl for travel between quality areas in the vicinity, including Marsh and Lac qui Parle Lakes, which are wildlife management areas and public hunting grounds. The nearby Big Stone National Wildlife Refuge consists of wetlands and tallgrass prairie. The Refuge is an important production and migration area for waterfowl, shorebirds, and other waterbirds. There are several state parks located within the Upper Minnesota River watershed. These state parks include Big Stone Lake State Park, with three separate units along Big Stone Lake, and Lac qui Parle State Park, which is located at the lower end of Lac qui Parle Lake.

Big Game Species

White-tailed deer is the only big game animal hunted in the vicinity of the expanded groundwater area. The projected 2006 total harvest estimate for white-tailed deer in Grant County was 739 animals (SDDW, 2007). White-tailed deer inhabit farmlands, forests, and riparian areas (MnDNR, 2005c).

Small Game Species

The discussion of small game species (e.g., pheasant, ducks, geese, rabbits, squirrel, and fox) for the proposed plant site in the Section 3.4.3.2 of the Draft EIS applies to proposed plant site and the expanded groundwater area. The Northern Glaciated Plains Ecoregion is known as one of the most important waterfowl production areas in North America (USEPA, 2003).

The expanded groundwater area provides diverse habitats that promote small game production. These habitats include upland grasslands and row crops for pheasant, marshes that support ducks and geese, and transitional areas between forests and grasslands that support cottontail rabbit, fox squirrels, and red and grey fox. Quail and mourning dove may also find suitable habitat in the expanded groundwater area.

3.4.4 Fisheries

The North Fork of the Whetstone River and the South Fork of the Whetstone River merge into the Whetstone River within the expanded groundwater area. These tributaries provide the same habitat as described in Section 3.4.2.3 of the Draft EIS. Fisheries in the portions of the Whetstone River and its tributaries within the expanded groundwater area are currently dominated by species considered rough fish. These species include rock bass, bullheads, bluegills, carp, sticklebacks, various species of shiners and minnows, largemouth and smallmouth bass, and crappies.

3.4.5 Special Status Species

Plant Species

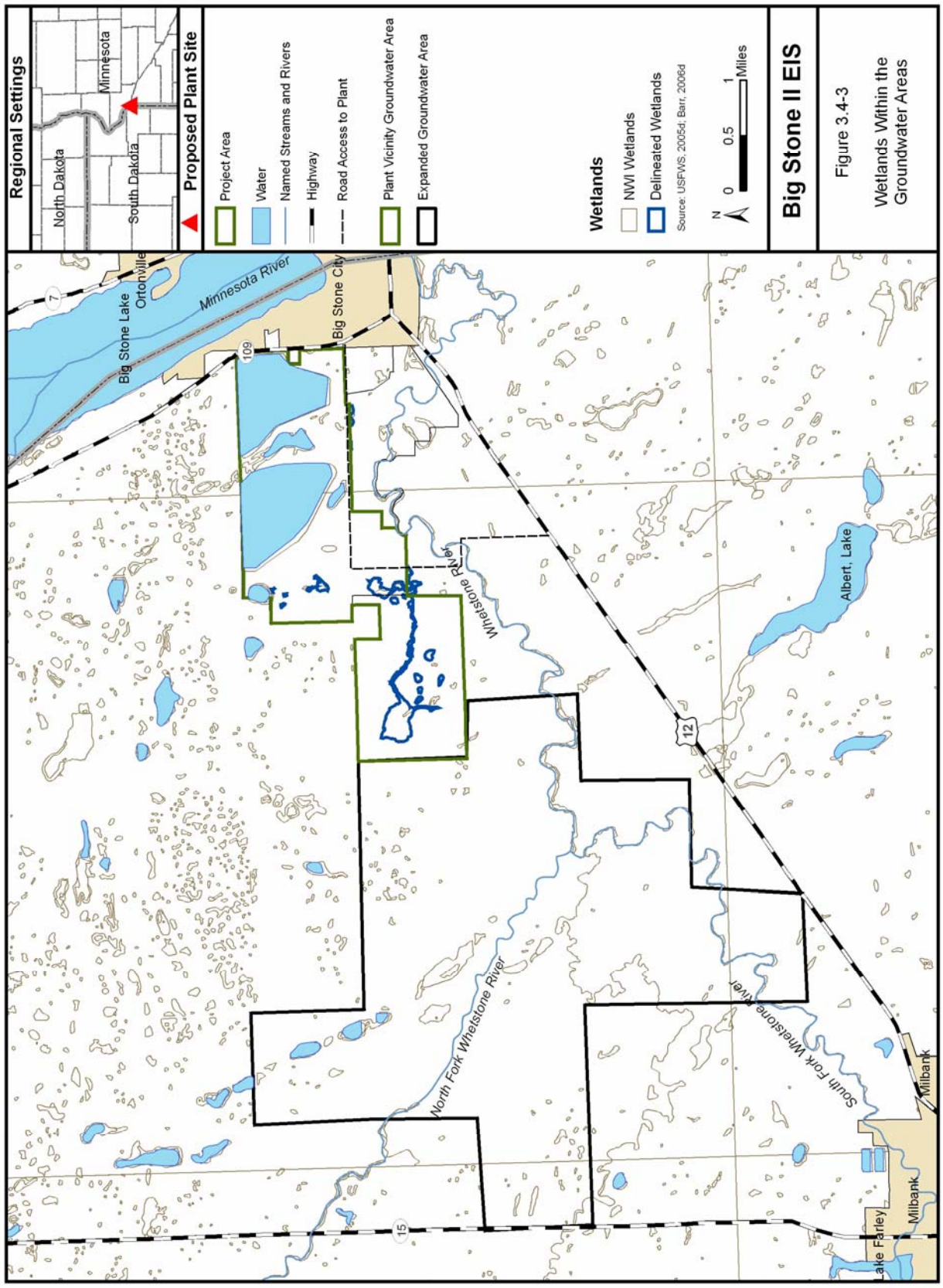
A total of 25 special status plant species may occur within the expanded groundwater area. These special status species are the same as described in Appendix F of the Draft EIS, Table 2.

Terrestrial Species

A total of 16 special status terrestrial species may occur within the expanded groundwater area, including two mammals, five birds, three reptiles, and six invertebrates (see Draft EIS, Appendix F, Table 2). Of these 16 species, the bald eagle, the northern river otter, and the spiny soft-shell turtle are the only special status species documented in the vicinity of the expanded groundwater area. A bald eagle nest north of the existing Big Stone II plant was destroyed during a storm on May 5, 2007. Bald eagles are known to winter in the open water areas in the vicinity of the proposed plant site (SDGFP, 2004a, 2006). A northern river otter was observed in the Whetstone River in July 2006 and in the North Fork of the Whetstone River in 2004. Spiny softshell turtles have been observed in the North Fork of the Whetstone River during summertime surveys.

Aquatic Species

The special status aquatic species known to occur in the expanded groundwater area include four fish (blackside darter, rosyface shiner, hornyhead chub, and golden redhorse) and five mussels (threeridge, cylindrical papershell, Wahbas pigtoe, plain pocketbook, and fatmucket) (see Draft EIS, Appendix F, Table 2).


Regional Settings
North Dakota
Minnesota
South Dakota
Proposed Plant Site
Project Area
Water
Named Streams and Rivers
Highway
Road Access to Plant
Plant Vicinity Groundwater Area
Expanded Groundwater Area
Wetlands
NWI Wetlands
Delineated Wetlands
Source: USFWS, 2006d; Barr, 2006d
N
0
0.5
1
Miles
Big Stone II EIS
Figure 3.4-3
Wetlands Within the Groundwater Areas
Minnesota River
Big Stone Lake
Ortonville
Big Stone City
Whetstone River
Albert, Lake
North Fork Whetstone River
South Fork Whetstone River
Milbank
Lake Farley
7
109
12
15

3.4.6 Wetland/Riparian Areas

Wetlands on the U.S. Fish and Wildlife Service National Wetland Inventory within the proposed project area and USACE delineated wetlands on the proposed plant site are shown in Figure 3.4-3. Wetlands that are part of the tributary systems to the Whetstone River are under the jurisdiction of the USACE. These wetlands are part of a surface water tributary system, which implies that they are connected to surface water that discharges into a lake, pond, river, stream, or other surface water feature. The Co-owners have not completed wetland determinations within the expanded groundwater area, nor has the USACE made any jurisdictional determinations within the area. Other wetlands within the area are isolated, meaning they have no surface hydrologic connection to other wetlands or streams. The regulatory authority of the USACE under Section 404 of the Clean Water Act does not extend Corps' jurisdiction to isolated wetlands. Table 3.5-1 shows a summary of wetland types within the expanded groundwater area.

Table 3.5-1. Wetland Types – Expanded Groundwater Area

Classification[a]	Number of Wetlands	Area (acres)	Percent of Total Wetlands	Percent of Total Area
Palustrine emergent, temporarily flooded	67	56.1	50.3	25.7
Palustrine emergent, seasonally flooded	37	100.3	27.8	45.8
Palustrine emergent, semi permanently flooded	2	13.3	1.5	6.1
Palustrine forested, temporarily flooded	5	8.0	3.8	3.7
Palustrine scrub/shrub, seasonally flooded	5	5.0	3.8	2.3
Palustrine aquatic bed/emergent, semi permanently flooded	4	14.8	3.0	6.8
Palustrine aquatic bed, semi permanently flooded	8	7.0	6.0	3.2
Palustrine aquatic bed, intermittently exposed	1	8.5	0.8	3.9
Palustrine unconsolidated bed, semi permanently flooded	2	0.9	1.5	0.4
Riverine intermittent streambed, semi permanently flooded	2	4.7	1.5	2.2
TOTAL	133	218.6	100.0	100.0

[a] Summary of Cowardin Classifications and Hydrologic Regimes of Potentially Impacted Wetlands within the expanded groundwater area. Palustrine wetlands in the expanded groundwater area are generally marshes that form in depressions on the landscape, with emergent (cattails, sedges), forested (black ash), or scrub-shrub (willows) plants as dominant vegetation. Palustrine wetlands are generally not directly adjacent to a river or lake. Riverine wetlands are directly associated with a river and have varied vegetation types.
Source: Barr, 2007e

3.5 Cultural Resources

3.5.1 Introduction

There are no changes to the cultural resources information presented in Section 3.5.2 of the Draft EIS with respect to the plant vicinity groundwater area. The Co-owners archaeological consultant conducted a Class I cultural resources investigation of the expanded groundwater area, which included literature research and a windshield survey (106 Group, 2006). The objective of the cultural resources investigation was to determine whether the expanded groundwater area contains any historic or archaeological resources and if those resources are eligible for listing on the National Register of Historic Places (NRHP). Additionally, the investigation addressed the effects of activities within the expanded groundwater area to architectural resources recommended as eligible for the NRHP.

The Class I investigation included background research using files at the State Archaeological Research Center (SARC) and South Dakota State Historic Preservation Office (SHPO) for information

on previously identified archaeological sites and architectural and historical properties within one mile of the expanded groundwater area and on cultural resources surveys previously conducted within the expanded groundwater area. Additionally, historical maps and aerial photographs of the area were examined.

A windshield survey of the expanded groundwater area was conducted by the Co-owners' archaeological consultant in October 2006 to identify areas with previous ground disturbance and to identify the extent and type of architectural and historical sites within the area. This section summarizes the findings of the survey.

3.5.2 Archaeological Resources

The Class I literature review identified five archaeological surveys that were previously conducted between 1977 and 2003 within the expanded groundwater area: four by the SARC and one by the Archaeology Laboratory at the University of South Dakota. Two surveys identified prehistoric artifact scatters within the west and south portions of the expanded groundwater area. Further study will be necessary to determine if these sites are eligible for listing on the NRHP.

The Class I literature review did not identify any additional cultural resources that were observed during the windshield survey. The windshield survey performed in October 2006 noted seven gravel pits within the expanded groundwater area that were highly disturbed because of current or historic gravel extraction. The Co-owners' archeological consultant concluded that further archaeological investigation within these areas was not necessary, because any archaeological resources that may have existed have most likely been destroyed.

No traditional cultural properties or areas of significance to the tribes in the expanded groundwater area have been identified through consultations with Native Americans.

3.5.3 Historical Resources

The Class I literature review noted a May 2006 architectural survey prepared by the Louis Berger Group, Inc., for the Historic Preservation Office of the South Dakota State Historical Society. Approximately 1,053 sites were surveyed throughout Grant County, including farmsteads, ranches, late nineteenth century dwellings, early-to-mid twentieth century dwellings, commercial and religious buildings, and cemeteries. Of the 1,053 sites, 32 were identified as potentially significant; none of the sites fell within the expanded groundwater area.

Within the expanded groundwater area, 11 architectural sites have been previously recorded; of these sites, none are listed on or recommended as eligible for listing on the NRHP, nor were they identified as potentially eligible in the Louis Berger Group report.

During the October 2006 windshield survey, 29 architectural sites over the age of 50 years were identified in the expanded groundwater area. Most sites are farmsteads, although other property types included bridges, rural residences, and isolated remnants of farmsteads. Five of these sites have been previously determined not eligible for listing on the NRHP. The remaining sites are unevaluated.

3.6 Land Use

3.6.1 Introduction

There are no changes to the land use presentation in Section 3.7.2 of the Draft EIS with respect to the plant vicinity groundwater area. This section covers additional information on land use for the expanded groundwater area.

3.6.2 Land Use Planning

The approximately 7,694-acre expanded groundwater area (see Figure 2.2-2) is comprised predominately of agricultural property. Other vegetation cover types within the area include wetland/riparian, forest, shrubland, prairie, developed, and open water (see Figure 3.4-1). The North Fork and South Fork of the Whetstone River merge into the Whetstone River within the area.

Irrigation wells are located within the expanded groundwater area; limited areas of center pivot irrigation exist south of the North Fork of the Whetstone River. There are no towns in this area, but there are scattered rural residences with domestic wells. Minimal commercial operations exist, but gravel pits are present within the area.

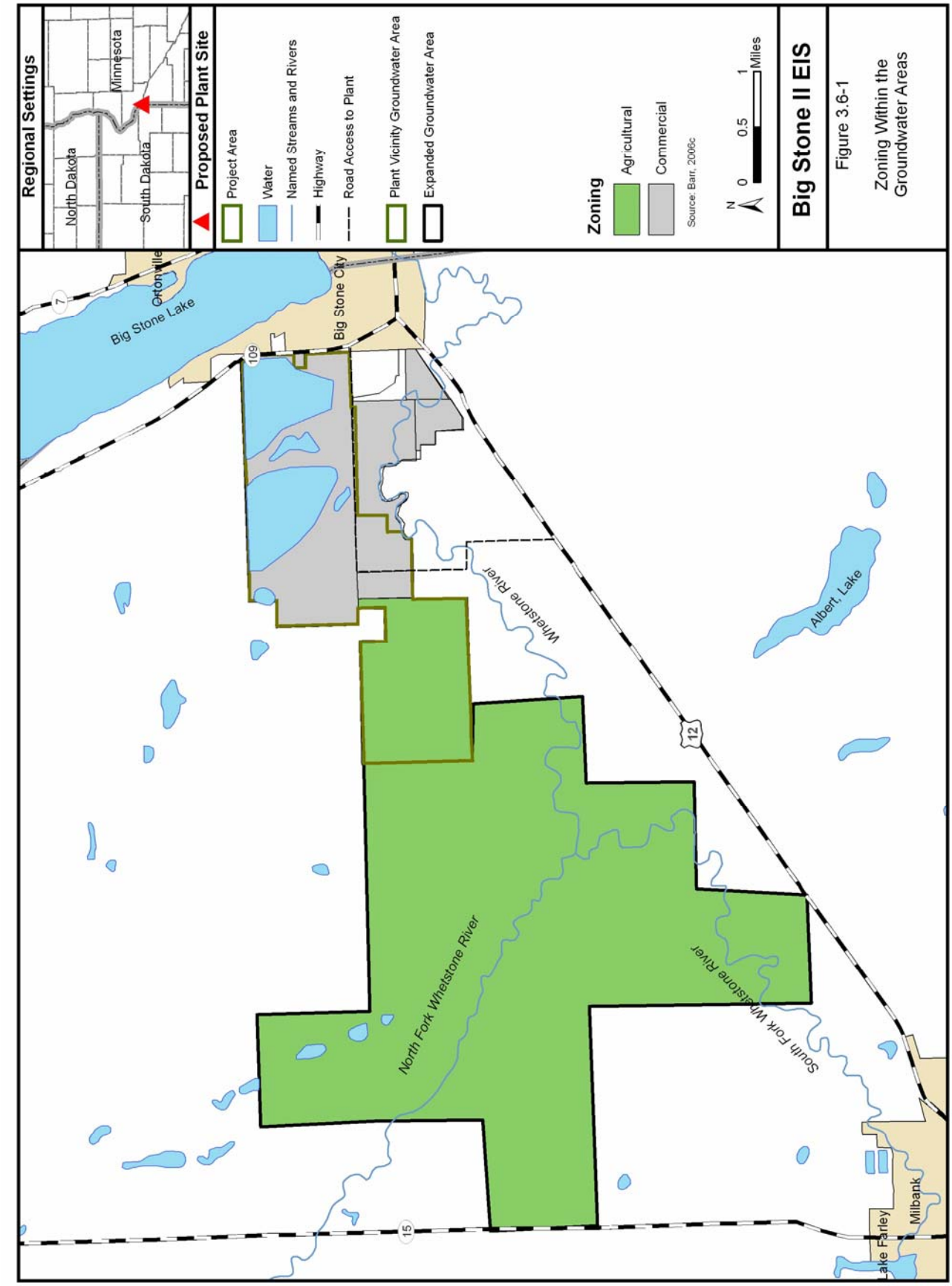
The Co-owners do not own any land within the expanded groundwater area. The vast majority of the land is privately owned. There is no National Wildlife Refuge (NWR), Wildlife Management Area (WMA), State Wildlife Management Area (SWMA), or Scientific and Natural Area (SNA) within the expanded groundwater area. The VanHout WPA is the only known government-owned parcel and is located in the south-east quarter of Section 7, which is the northern most portion of the expanded groundwater area.

Land Use Controls and Compatibility with Existing Land Use and Zoning

The proposed expanded groundwater area is within the boundaries of Grant County. The Grant County Planning Board regulates land use planning in the expanded groundwater area. Grant County has zoned the area for agricultural use, as shown by Figure 3.6-1 (Grant County 2006).

3.6.3 Public Facilities

There are no cemeteries, hospitals, airports, schools, or licensed daycare providers within the expanded groundwater area. Several hospitals or clinics are located in Milbank, South Dakota, approximately three miles southwest of the south border of the area, and the Milbank Municipal Airport is located about one mile southeast of the area's southern border.


Regional Settings
Minnesota
North Dakota
South Dakota
Proposed Plant Site
Project Area
Water
Named Streams and Rivers
Highway
Road Access to Plant
Plant Vicinity Groundwater Area
Expanded Groundwater Area
Zoning
Agricultural
Commercial
Source: Barr, 2006c
N
0
0.5
1
Miles
Big Stone II EIS
Figure 3.6-1
Zoning Within the Groundwater Areas
Ortonville
Big Stone Lake
Big Stone City
109
7
Whetstone River
Albert, Lake
12
North Fork Whetstone River
South Fork Whetstone River
15
Lake Farley
Milbank

3.6.4 Recreation

A portion of the northernmost section of the expanded groundwater area is within the VanHout WPA, which allows hunting and also provides opportunities for waterfowl observation (bird watching). Big Stone Lake is located in the vicinity of the proposed plant site and is used for a variety of recreational purposes including camping, fishing, boating, and wildlife watching. There are no South Dakota Game, Fish and Parks Department walk-in areas within the expanded groundwater area.

3.6.5 Agricultural Practices and Prime and Unique Farmland

The expanded groundwater area is predominately dryland agricultural. Some center pivot irrigation is used south of the South Fork of the Whetstone River, near the center of the expanded groundwater area. Approximately 64 percent (about 5,000 acres) of the area is designated as prime farmland by the U.S. Department of Agriculture, National Resources Conservation Services (NRCS). Prime farmland acreage within the expanded groundwater area is higher than the overall Grant County totals. Countywide, just over 50 percent of the land is designated as prime farmland.

3.7 Infrastructure, Public Health and Safety, and Waste Management

3.7.1 Introduction

There are no changes to the information in Section 3.8.2 of the Draft EIS with respect to the plant vicinity groundwater area. A discussion of underground utilities has been added to the infrastructure discussion, since construction of pipelines to convey water from wells to the plant site could impact existing underground utilities in the expanded groundwater area. Additionally, databases for hazardous materials sites were updated for this Supplemental Draft EIS.

3.7.2 Infrastructure

State and County Roadways

The groundwater areas are located between Big Stone City and Milbank in rural South Dakota. State Highway 109 is located just east of the plant vicinity groundwater area, as shown in Figure 2.2-2. U.S. Highway 12 is immediately southeast of the expanded groundwater area, and State Highway 15 borders a portion of the west side of the expanded groundwater area. County roads traversing the area include 143rd Street to 148th Street (east and west) and 479th Avenue to 482nd Avenue (north and south) as shown by Figure 2.2-2.

Railroads

The Burlington Northern Santa Fe (BNSF) rail line parallels U.S. Highway 12, southeast of the groundwater areas, between Big Stone City and Milbank.

Airports

The airports in the vicinity of the groundwater areas are the same as those described in Section 3.8.2.1 of the Draft EIS.

Underground Utilities

Underground utilities within and adjacent to the groundwater areas include water lines and natural gas lines. Water lines in the groundwater areas are part of the Grant-Roberts Rural Water System. The principal component of this system is a four-inch water main running along 145th Street, traversing or adjoining both groundwater areas. This main serves four residences within or immediately adjacent to the groundwater areas. The line primarily supplies water to residences to the west of the expanded groundwater area. The only other water lines are spurs off of mains to the north and south that serve residences in the far north and far south ends of the expanded groundwater area. The Grant-Roberts Rural Water System reports that the water lines are usually located outside of the road right-of-way but at no set distance. The Co-owners would determine the exact locations of the Grant-Roberts Rural Water System pipes prior to installation of pipelines for groundwater production.

The only natural gas pipeline in the area serves the Northern Lights Ethanol Plant. This pipeline connects to a mainline pipeline that is parallel to U.S. Highway 12, approximately 1.5 miles south of the Big Stone II plant site. The interconnecting pipeline follows 484th Ave. from U.S. Highway 12 to the ethanol plant.

3.7.3 Public Health and Safety

The groundwater areas are rurally located, northwest of U.S. Highway 12 between Big Stone City and Milbank. The location of hospitals, clinics, and emergency services (sheriff, fire, police, and ambulance) are the same as described in Section 3.8.2.1 of the Draft EIS.

3.7.4 Hazardous Materials and Waste Management

In agricultural areas, unregulated dumping is a common occurrence. Small to very large piles of discarded materials, which may contain lubricants, pesticides, paints, batteries, and other potentially hazardous materials can be found in rural areas. Storage tanks (aboveground and underground) containing petroleum products such as gasoline, diesel, and heating oil are common to farms. The presence of contaminated sites that may contain uncontrolled releases of hazardous substances within the groundwater areas is expected to be limited due to the rural nature of the area.

Databases from the SDDENR and U.S. Environmental Protection Agency (USEPA) were reviewed to determine the presence of contaminated sites within the groundwater areas (SDDENR 2006; and USEPA 2005d). The SDDENR's Incident Sites Database summarizes environmental incidents including releases, leaking tanks, and spills. No active sites (undergoing investigation and remediation) were found within the groundwater areas. No USEPA Comprehensive Environmental Response, Compensation Information System (CERCLIS) listed sites were identified in the groundwater areas.

3.8 Visual Resources

3.8.1 Introduction

There are no changes to the information in Section 3.9.2 of the Draft EIS with respect to the plant vicinity groundwater area. This Supplement Draft EIS broadens the discussion of visual resources to include the expanded groundwater area. A discussion of the visual resource classes is found in the Draft EIS, Section 3.9.2.

3.8.2 Setting

The expanded groundwater area is located within an area of rural agricultural landscapes, small lakes, and wetlands, and is traversed by the North Fork and South Fork tributaries to the Whetstone River.

The landscape within the expanded groundwater area is predominantly rural in character. Existing visual conditions are dominated by agriculturally-based landscape modifications. Portions of the area contain croplands and open pasture, occasional wetlands, and tree wind breaks associated with farmsteads. Vegetation within these areas primarily consists of agricultural lands with interspersed hardwood trees, shrubs, wetlands, and tallgrass prairie. Trees tend to be concentrated in irregularly narrow riparian areas along the North and South Forks and the main channel of the Whetstone River, and in linear wind breaks across fields and near farmsteads. The landscape character for portions of the expanded groundwater area within the North Fork and South Fork of the Whetstone River is generally described as a gently undulating plain with occasional ponds, wetlands, and native prairie amid the agricultural tracts. The human-made developments that intermingle with the area's natural amenities include several gravel pits associated with river deposits. Modified landscape character consists of farmsteads and scattered residences interspersed throughout the open agricultural landscape. A few transmission lines and distribution lines cross the expanded groundwater area.

3.8.3 Visual Resource Classes

As a result of the visual resource inventory, three visual resource classifications were assigned within the expanded groundwater area. Class II areas were designated along portions of U.S. Highway 12 and along the Whetstone River tributaries. Areas of interspersed farmsteads, tree groves, and croplands were designated as Class III areas, and areas of unvegetated residential, commercial and industrial development, open croplands, and background viewing situations were designated as Class IV.

3.9 Noise

There are no changes to the noise information in Section 3.10.2 of the Draft EIS with respect to the plant vicinity groundwater area. Background information on the meaning of decibel levels is included in Section 3.10.1 of the Draft EIS. The primary land use within the expanded groundwater area is rural agricultural land. Ambient noise in rural areas commonly consists of rustling vegetation, farm equipment, and infrequent vehicle pass-bys. During the growing season, an additional noise source is a grass airstrip for crop dusting within the far west portion of the expanded groundwater area. Other noise in these areas is associated with the existing Big Stone Power Plant and the Northern Lights Ethanol Plant, located between approximately two to six miles to the east and northeast of the expanded groundwater area.

There are approximately 30 sensitive receptors in the expanded groundwater area including residences and farmsteads where typical noise levels are 30 to 40 decibels on the A-weighted scale (dBA). Higher ambient noise levels, typically 50 to 60 dBA, could be expected near roadways and associated with occasional noise impacts from the existing Big Stone Power Plant and the Northern Lights Ethanol Plant. In rural areas, the expanded groundwater areas would be classified as Noise Area Classification (NAC)-3; they would be classified as NAC-1 in residential areas.

3.10 Social and Economic Values and Environmental Justice

3.10.1 Social and Economic Values

The description of census and income statistics in the Draft EIS applies to all groundwater areas. The nearest occupied residence to the plant vicinity groundwater area is approximately 0.5 mile from the proposed plant site. Several residences and farmsteads exist within the expanded groundwater area.

3.10.2 Environmental Justice

The environmental justice discussion in Section 3.11.2.2 of the Draft EIS applies to this Supplemental Draft EIS without additional discussion.

ENVIRONMENTAL CONSEQUENCES

CHAPTER 4

4.0 Environmental Consequences

Chapter 4 presents the analysis of impacts related to the changes to the proposed Big Stone II Project outlined in Chapter 2. As described in Chapter 2, the substantial changes to the proposed plant site include elimination of the 450-acre make-up water storage pond, elimination of the 25-acre cooling tower blowdown pond, elimination of the new brine concentrator, relocation of the cooling tower, construction of a new water pretreatment building, and the use of groundwater for back-up water for the proposed plant.

The analysis in this chapter includes the impacts of proposed groundwater activities and cooling system alternatives associated with the proposed Big Stone II Project for each resource area. There have been no substantial changes in the impacts from construction and operation of the proposed plant except those noted in the discussions for each of the resource areas. The introductory remarks to Chapter 4 found in the Draft EIS are applicable to this Supplemental Draft EIS. Table 2.2-1 of this Supplemental Draft EIS describes the standard mitigation measures (SMMs) referred to in this chapter.

4.1 Air Quality

4.1.1 Introduction

This section discusses impacts to air quality that would result from the air emissions associated with the Revised Proposed Action and Alternative 3, which includes well drilling and installation and pipeline construction activities. With the exception of the additions noted below, the identification of issues, impact assessment methods, and significance criteria are the same as presented in Section 4.1.1 of the Draft EIS.

Identification of Issues

The issues associated with constructing and operating the proposed Big Stone II plant are the same as presented in Section 4.1.1 of the Draft EIS. In addition, the analysis of air quality impacts resulting from the proposed well drilling and installation, pipeline construction activities, and cooling alternative selection must consider:

- Potential short-term fugitive dust emissions that would be a nuisance to property owners near construction activities for the proposed Project.
- The differences in long-term emissions associated with cooling system alternatives. Steam electric generation efficiency would be affected by the selection of the cooling alternative, which in turn affects air emissions.

- Heat rate, which is related to a power plant's air emissions. The cooling system selected for any power plant affects the net heat rate[1] of the steam turbine and thus impacts the net efficiency of the power plant. Efficiency impacts are primarily due to two factors: (1) steam generator and steam turbine design and (2) auxiliary electrical loads[2]. Efficiency is directly proportional to the amount of fuel consumed per kilowatt-hour of generation, which in turn may affect air emissions such as carbon dioxide (CO_2, a greenhouse gas) from the plant.

Impact Assessment Methods

The impact assessment included a review of the proposed methods and equipment required for construction of the groundwater wells and the interconnecting pipelines along with mitigation measures to control fugitive emissions. The analysis also compares the operation impacts of the steam electric generation unit efficiencies and associated air emissions for the two alternative cooling systems carried forward for analysis.

Significance Criteria

The criteria for significance for air quality are the same as presented in Section 4.1.1 of the Draft EIS.

4.1.2 Plant Emissions and Air Quality Impacts Assessments

4.1.2.1 Revised Proposed Action

The discussion of regulated pollutant emissions and greenhouse gas emissions from the proposed power plant in Section 4.1.2 of the Draft EIS is applicable to the Revised Proposed Action's wet cooling technology. The efficiency of the steam-generating unit (boiler) and steam turbine affect the emissions of pollutants. Table 2.3-1 compares the efficiencies of the alternatives and shows that using a wet cooling system would provide the most efficient process for generating electricity along with the least amount of air emissions. The Revised Proposed Action has 0.15 percent lower impacts to air quality than the original proposed alternative (i.e., Alternative 1 in Section 2.3.1) for sulfur dioxide, nitrogen oxides, carbon monoxide, particulate matter, mercury, and carbon dioxide. Although the air emissions would be less under the Revised Proposed Action, the Prevention of Significant Deterioration (PSD) Permit would still be applicable. With 0.15 percent lower air emissions for the Revised Proposed Action, there would be no substantial change to the results of air modeling noted in Table 4.1-4 of the Draft EIS.

4.1.2.2 Alternative 3

A description of Alternative 3 is in Section 2.5 of this document, and includes wet/dry cooling technology. The discussion of impacts from regulated pollutant emissions from the proposed power plant from Section 4.1.2 of the Draft EIS is applicable to Alternative 3. However, using a wet/dry cooling system would have a slightly higher heat rate (lower efficiency) because of auxiliary electrical loads and steam turbine generating unit design requirements associated with the dry cooling process. As shown in Table 2.3-1, Alternative 3 has the lowest efficiency of all the alternatives, and estimated

[1] Heat rate is a measurement to calculate how efficiently a generator produces electric energy and is expressed as the number of British thermal units (Btu's) required to produce a kilowatt-hour of electrical energy.

[2] Auxiliary electrical loads (power uses), such as those required for fans for dry cooling, water treatment systems, and water pumps, are drains on net power output, and therefore impact the amount of net power delivered to the electric grid.

CO_2 emissions would be approximately 8.7 tons per hour more than the Revised Proposed Action. On an annual basis, this would be about 76,000 more tons per year of CO_2 compared to the Revised Proposed Action. Emission of other pollutants would be proportionally higher on a pounds per kilowatt-hour produced. In comparison with the original proposed alternative, Alternative 3 has higher air quality impacts.

4.1.3 Construction Impacts

4.1.3.1 Revised Proposed Action

Plant and Ancillary Facility Construction

Air quality impacts for construction of the proposed plant and ancillary facilities and buildings (e.g., cooling tower, pretreatment facility, coal, and limestone handling equipment, and ash handling equipment) would be the same as described in the Draft EIS in Section 4.1.2.

Well Construction

Based on the results of the exploratory drilling described in Section 3.2, the Revised Proposed Action would require the construction of 7 to 14 permanent wells within the proposed groundwater areas. Local or regional drillers would drill the additional proposed groundwater production wells. Minor fugitive dust emissions could occur along dirt access roads from the positioning and removing of drilling equipment from drill sites and during drilling activities. These activities are short-term in nature and would only occur in the immediate area around these activities. Standard Mitigation Measure (SMM) Air-4 requires contractors to minimize dust nuisances during construction activities and would apply to well construction activities.

Drilling equipment would use gasoline or diesel engines to power the equipment needed to drill the wells, resulting in minor emissions from internal combustion engines. Well testing activities may also use gasoline or diesel engines to power pumping equipment during short-term pumping tests, typically lasting up to four days. Drilling and testing activities are short-term, lasting only a few days at each location. SMM Air-1 requires construction equipment to operate efficiently to not cause excessive emissions. Application of SMM Air-1 would apply to all construction equipment for the proposed Project.

Construction at the proposed well sites includes other permanent facilities including a pre-engineered building, fence, access road, and electrical service for the groundwater pumps. Construction of the small pre-engineered building (i.e., a pumphouse, approximately 10 feet by 15 feet) would be on a concrete slab surrounding the well, with a 50-foot by 50-foot fence surrounding the pumphouse. The pumphouse building would be weathertight and heated, and ventilated if appropriate. Each proposed well site would also have an access road constructed from the nearest County road and a distribution line constructed to supply power to the well pumps. The distribution lines would be either overhead poles or underground (or a combination of both), according to the preference of the service provider. Minor fugitive dust emissions could occur during the construction of these proposed facilities; however, these activities are short-term in nature. SMM Air-4 would apply to construction of permanent facilities at well locations. Once construction is completed and disturbed areas reseeded to blend with the surrounding vegetation in accordance with SMM Bio-5, the disturbed ground would no longer be susceptible to wind erosion, and fugitive dust emissions would cease.

Pipeline Construction

Proposed pipeline construction activities would include trenching that could result in minor fugitive dust emissions. Minor fugitive dust emissions could also occur when covering the piping placed in the trenches. Trenching equipment would use gasoline or diesel engines to power the equipment needed to perform the trenching and covering activities. These activities are short-term in nature. SMMs Air-2 and Air-4 would also apply to proposed pipeline construction activities.

Well and Pipeline Operations

During operations, infrequent maintenance activities would occur that might cause fugitive dust from vehicles using County roads and access roads to the well sites. These emissions would be consistent with general farming operations within the proposed groundwater areas and would not cause any measurable changes to regional air quality ratings.

4.1.3.2 Alternative 3

Construction impacts for Alternative 3 would be the same as for the Revised Proposed Action.

4.1.4 Summary of Impacts to Air Quality

The summary of impacts to air quality for the Revised Proposed Action or Alternative 3 is the same as in the summary of impacts described in Section 4.1.2 of the Draft EIS. Air emissions from either alternative would be subject to air permit conditions specified by the SDDENR, which would require the proposed plant emission to not exceed NAAQS or PSD regulatory limits, which SDDENR has determined as protective of human health and the environment. Air quality impacts for the Revised Proposed Action or Alternative 3 would not exceed significance criteria for air resources.

Construction and operation activities for the proposed wells, pipelines, and electrical distribution lines for the Revised Proposed Action or Alternative 3 would not exceed significance criteria for air resources. There would be no long-term impacts to air resources from these proposed activities. Short-term impacts from fugitive dust and vehicle emissions would not exceed any State, Federal, or local air quality regulations and would not interfere with any regional air quality plan. Therefore, impacts to air resources from these activities would not be significant.

4.2 Water Resources

4.2.1 Introduction

Section 4.2 of the Draft EIS discussed the impacts to groundwater, floodplains, and surface water that would result from constructing and operating the proposed Project. Many of the impacts related to floodplains and surface water discussed in the Draft EIS would not occur because the 450-acre make-up water storage pond would not be constructed under the Revised Proposed Action. The 450-acre make-up water storage pond described in the Draft EIS would have removed about 0.8 square mile of contributing watershed area from the Whetstone and Upper Minnesota River drainages, including 65 acres of wetlands. With elimination of the make-up water storage pond and relocation of the cooling tower, these impacts to wetlands and runoff within the watershed of the pond would not occur.

This section describes the impacts of proposed well drilling and installation, pipeline construction, and groundwater use associated with the changes to the proposed Big Stone II Project. With the exception

of the additions noted below, the identification of issues, impact assessment methods, and significance criteria are the same as presented in Section 4.2.1 of the Draft EIS.

Identification of Issues

In addition to the issues identified in Section 4.2.1 in the Draft EIS, impacts to water resources may occur from using groundwater as the source for back-up water supply for the proposed Big Stone plant.

Groundwater

- The proposed Project has the potential to contaminate groundwater by spills or leaks from equipment or materials storage, seepage from ponds, the disposal of coal combustion byproducts, or inadequate sanitation practices. This issue primarily relates to constructing and operating the proposed plant and ancillary facilities.
- The consumptive use of groundwater as a back-up water supply has the potential to affect the availability of groundwater supplies in the local area for other beneficial uses.

Surface Water

- Groundwater pumping could cause reductions in groundwater flow contributions to the total runoff of surface water resources. The reduced contributions of groundwater to stream runoff could cause an extension in the period of natural stream flow reductions due to seasonal variation.

Impact Assessment Methods

As described in Section 3.2, the Co-owners conducted hydrogeological investigation activities in the areas proposed for groundwater use that included the installation of 34 continuous-core borings using Rotosonic drilling methods. Two 2-inch diameter observation wells and two 12-inch diameter production wells were also installed. The Co-owners conducted aquifer tests (pumping tests) at two groundwater production wells to collect data on the aquifer's response to pumping. The core borings, well installations, and aquifer tests supported the development of a numerical groundwater flow model of the regional aquifer system, which was calibrated to observed groundwater level conditions and subsequently used to predict the effects of pumping of proposed plant water-supply wells.

The surface-water model developed was based on historical climatological data and proposed plant water demand for a 70-year period with climatic conditions similar to the period between 1930 to 2000 (Barr, 2006b). The historical 70-year period was the basis for predicting water levels in Big Stone Lake, with both the existing and proposed Big Stone plants operating at full output levels for a similar 70-year period. The climatological input parameters of the surface-water modeling resulted in predictions of the lake levels of Big Stone Lake on a weekly basis. Big Stone Lake was used as the source for plant water demands when Big Stone Lake water levels permitted withdrawals. During periods when lake levels did not permit surface-water withdrawal, a combination of water stored in ponds at the plant site and groundwater from the Veblen Aquifer was used to satisfy the water demands for the existing and proposed Big Stone plants. The surface-water model provided quantitative estimates of weekly groundwater demand for the 70-year period. These estimates of groundwater demand were used in the groundwater flow model.

The groundwater flow model of the Veblen Aquifer is a numerical simulation of groundwater flow conditions over approximately 1,000 square miles using the computer code MODFLOW. Well logs from SDDENR were used to determine variations in aquifer thickness over the modeled area, as well as the core borings conducted as part of the Co-owners' hydrogeologic investigation. Detailed surface-water features were included in the model, such as Big Stone Lake, the Minnesota River, and the Whetstone River. The model was calibrated to groundwater elevations (as measured in borings and wells installed during the Co-owners' investigation and water levels reported in regional well logs from the SDDENR), with greater emphasis placed on observations near the proposed Big Stone plant's well field. The groundwater flow model's ability to closely predict groundwater inflows into the Whetstone River was also verified.

The calibrated groundwater flow model was then used to predict the effects of pumping on groundwater levels, base flow contributions to the Whetstone River and groundwater inflows to Big Stone Lake for a 55-year period between 1945 and 2000. The pumping rates used in this predictive simulation were obtained from the surface-water model. The total groundwater pumping was distributed among 14 wells. The groundwater modeling results were used to estimate the regional effects of future pumping and the approximate yields from proposed wells. The groundwater modeling results also aided in identifying adverse effects, if any, from the pumping of wells as a back-up supply of water for the proposed Big Stone II plant (Barr, 2007a and 2007c).

Significance Criteria

The following significance criterion relative to groundwater pumping is added to the significance criteria in Section 4.2.1 of the Draft EIS for water resources.

Surface Water

A significant impact on surface water would result if the following were to occur from constructing or operating the proposed Project:

- Groundwater pumping that causes a significant extension in the period of naturally occurring seasonal reduction of flow in surface water that results in insufficient quantities of water for downstream users.

4.2.2 Groundwater

4.2.2.1 Introduction

Both the Revised Proposed Action and Alternative 3 propose to use groundwater as the supplemental source of water supply for the proposed Big Stone II plant and would require the systems outlined in this introduction. This introduction provides information applicable to the Revised Proposed Action and Alternative 3.

Proposed Water Uses

OTP, on behalf of the Co-owners, filed an application for a Water Appropriation Permit with SDDENR on March 27, 2007 (OTP, 2007c). Water Permit No. 6846-3 was approved by the South Dakota Water Management Board (SDWMB) on August 23, 2007 (SDWMB, 2007). The permit would allow the Co-owners to withdraw the groundwater needed for the proposed Big Stone II plant.

During typical operations, surface water from Big Stone Lake is proposed as the primary source of make-up water for both the existing Big Stone plant and proposed Big Stone II plant.

During periods when withdrawals from Big Stone Lake are restricted by permit (such as during a drought) or other operational constraints (such as maintenance at the lake intake structure), make-up water would be withdrawn from the existing cooling pond. When Big Stone Lake and the cooling pond supply sources could not meet the plant needs, the cooling pond would be "topped off" with groundwater using the proposed groundwater supply system (wells and pipeline).

Modeling results showed at least one period of extended drought occurred during the historical modeling period, which would have resulted in water from Big Stone Lake not being available for use. Under these circumstances, the groundwater appropriation would be used as the sole source of water supply for both the existing and proposed Big Stone II plants. With the working storage volume in the existing cooling pond of approximately 3,500 acre-feet (af) and a maximum annual groundwater appropriation of 10,000 af, both the existing and proposed Big Stone II plants could operate at full output for about one year without withdrawals from Big Stone Lake. Modeling showed that the groundwater appropriation alone would not be enough to operate the existing and proposed plants at full output levels after one year and power output would have to be curtailed, or the Co-owners could request a waiver of the appropriation limits from SDDENR, if an extended drought period were to occur.

The proposed Big Stone II plant would operate as a zero liquid discharge (ZLD) facility where no releases of industrial process wastewater would occur to surface water resources.

Stormwater runoff from the plant site and domestic water use would be consistent with that described in Section 4.2.2.3 of the Draft EIS.

Groundwater Treatment

Using groundwater to supply back-up water would create additional water treatment requirements due to chemical differences between surface water and groundwater. The changes are described in Section 2.2.4.

Groundwater Resource Evaluation and Testing Activities

A groundwater flow model of the Veblen Aquifer covering an approximately 1,000 square-mile area was prepared using the results of the hydrogeological investigation activities and pumping test (Barr, 2007a and 2007c). The borders of the model include Big Stone Lake and the Minnesota River to the east, the Prairie Coteau to the west, and 10 miles to the north and 20 miles to the south of the proposed Big Stone II plant. The groundwater model was used to estimate the regional effects of future pumping, to estimate the approximate yields from proposed wells, and to aid in identifying adverse effects, if any, from the pumping of wells as a back-up supply of water for the existing and proposed Big Stone II plants. The model incorporates the thickness and depth information of other known Veblen Aquifer data from existing wells within the modeled area.

The model also considered recharge to the Veblen Aquifer. Recharge from infiltrating rainfall and snowmelt are the primary mechanisms for adding water to the Veblen Aquifer. In Minnesota, recharge rates of four to eight inches per year for groundwater modeling are commonly used (Barr 2007a). Since there are no site-specific data available for recharge rates in the modeled area, the model used a conservative estimate of one inch per year (i.e., well below the likely average recharge rate). Using a

conservative recharge rate would generate a model with a larger predicted maximum drawdown area. The SDDENR prepared a report on the Co-owners' Water Appropriation Permit Application (SDDENR, 2007b). In their report, the SDDENR calculated the amount of recharge rate necessary to equal the average annual withdrawals of the appropriation applied for by the Co-owners (approximately 3,700 acre-feet per year (afy)) plus withdrawals by the existing Grant County users (approximately 1,000 afy). According to the report, an average annual recharge rate of 0.34 inches per year would balance withdrawals for the proposed plants, assuming average annual withdrawals of 4,700 afy (SDDENR, 2007b).

The groundwater model was able to show a sustained yield of 6,200 gallons per minute for a simulated period of one year from 7 to 14 proposed well locations that would be installed within the groundwater areas. The model demonstrates that the 10,000 afy groundwater appropriation for the existing and proposed plants could be met from these 7 to 14 proposed wells. The results of the groundwater modeling indicate that the Veblen Aquifer is a confined aquifer where a thick sequence of surficial clay overlies the aquifer. This occurs over large portions of the modeled area.

4.2.2.2 Revised Proposed Action

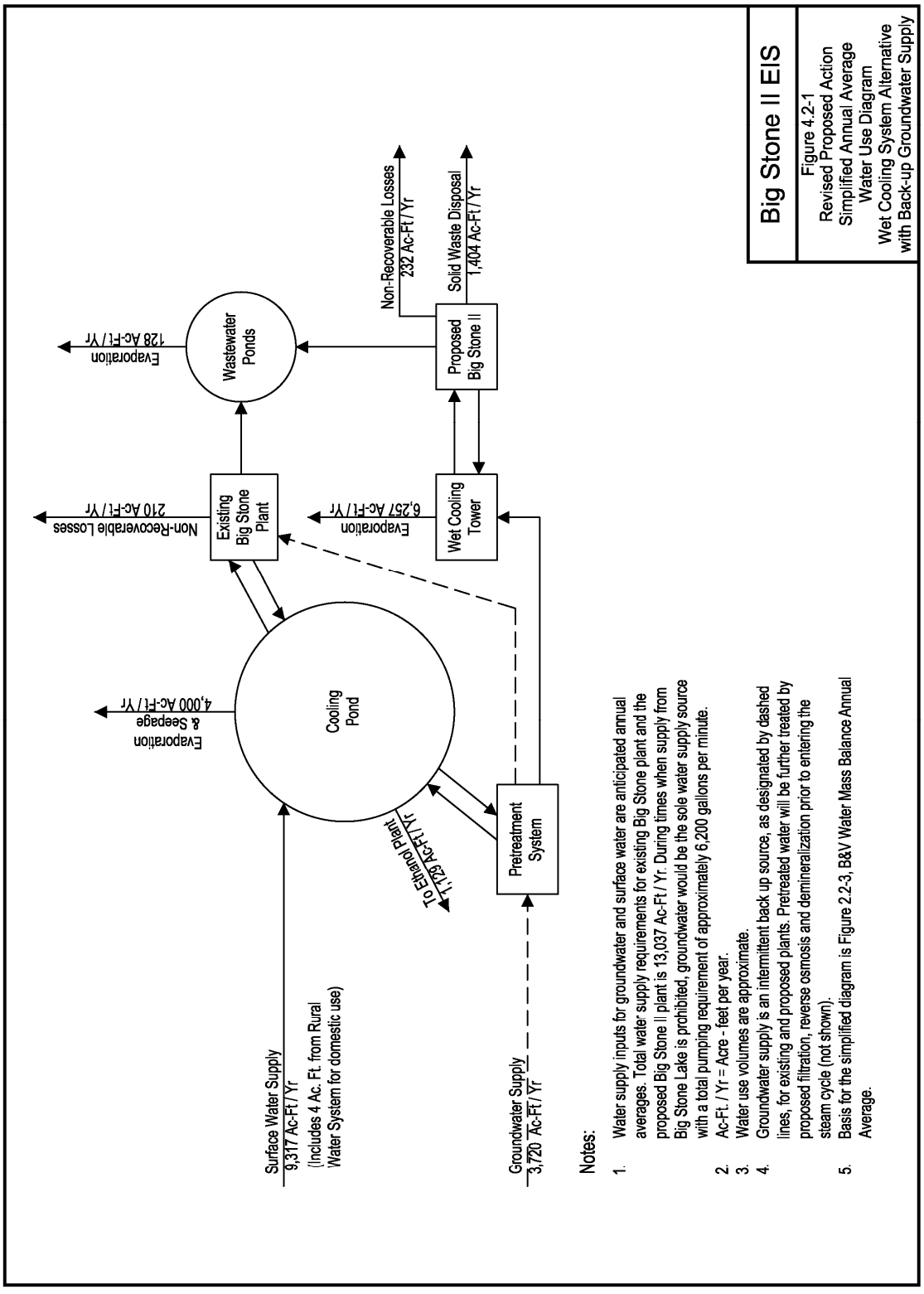
Groundwater Use

Detailed modeling of the annual water withdrawals from Big Stone Lake over a 70-year period was performed for the Revised Proposed Action, based on historical climatic conditions between the years 1930 and 2000 (Barr, 2006b). This modeling assumed the following input parameters:

- Existing plant and proposed Big Stone II plant combined annual consumptive water use of about 13,000 af, which includes an annual average groundwater appropriation of about 3,720 af.
- Available storage in the existing cooling pond of approximately 3,500 af.
- The order of appropriations from water supply sources would be (1) from Big Stone Lake, (2) from storage in the on-site ponds, and (3) from groundwater.
- Withdrawals to replenish the on-site ponds would first be from Big Stone Lake, followed by supply from groundwater.

The model predicts that the amount of groundwater required to annually operate the existing plant and the proposed Big Stone II plant ranged from zero af (4 out of 70 years) to 10,000 af (3 out of 70 years). The modeling indicates that groundwater would need to be withdrawn from the Veblen Aquifer in 66 of the 70 years. For some years, the total water requirements exceed 13,000 afy and accounts for refilling the depleted cooling pond after drought years. This may occur when either surface water or groundwater is available, and there is storage available in the cooling pond.

Figure 4.2-1 illustrates the annual average water use modeled for both the existing and the proposed plants under the Revised Proposed Action using a wet cooling system for the proposed Big Stone II plant. The total combined water consumption would be approximately 13,000 afy for both plants, an increase of approximately 1,300 afy from the 11,700 afy stated in the Draft EIS. This increase is the result of a more detailed design for the proposed Big Stone II plant and the revised water management and water treatment plans for the proposed Project.


Big Stone II EIS
Figure 4.2-1
Revised Proposed Action
Simplified Annual Average
Water Use Diagram
Wet Cooling System Alternative
with Back-up Groundwater Supply
Surface Water Supply
9,317 Ac-Ft / Yr
(Includes 4 Ac. Ft. from Rural
Water System for domestic use)
Groundwater Supply
3,720 Ac-Ft / Yr
Cooling
Pond
Evaporation
& Seepage
4,000 Ac-Ft / Yr
To Ethanol Plant
1,729 Ac-Ft / Yr
Pretreatment
System
Existing
Big Stone
Plant
Non-Recoverable Losses
210 Ac-Ft / Yr
Wet Cooling
Tower
Evaporation
6,257 Ac-Ft / Yr
Proposed
Big Stone II
Non-Recoverable Losses
232 Ac-Ft / Yr
Solid Waste Disposal
1,404 Ac-Ft / Yr
Wastewater
Ponds
Evaporation
128 Ac-Ft / Yr
Notes:
1. Water supply inputs for groundwater and surface water are anticipated annual averages. Total water supply requirements for existing Big Stone plant and the proposed Big Stone II plant is 13,037 Ac-Ft / Yr. During times when supply from Big Stone Lake is prohibited, groundwater would be the sole water supply source with a total pumping requirement of approximately 6,200 gallons per minute.
2. Ac-Ft. / Yr = Acre - feet per year.
3. Water use volumes are approximate.
4. Groundwater supply is an intermittent back up source, as designated by dashed lines, for existing and proposed plants. Pretreated water will be further treated by proposed filtration, reverse osmosis and demineralization prior to entering the steam cycle (not shown).
5. Basis for the simplified diagram is Figure 2.2-3, B&V Water Mass Balance Annual Average.

During proposed normal operations, the annual average surface water use from Big Stone Lake would be about 9,300 af and about 3,700 af from groundwater. During periods when water withdrawals are not permitted from Big Stone Lake, the proposed groundwater supply system would be required to provide the majority of the existing plant and proposed Big Stone II plant needs. This could involve up to 10,000 af of groundwater over a one year period, assuming use of the on-site cooling pond for the remaining 3,000 af. During extended drought periods, groundwater appropriation limits would limit the full output operation of the proposed plant.

Groundwater Pumping and Production Impacts

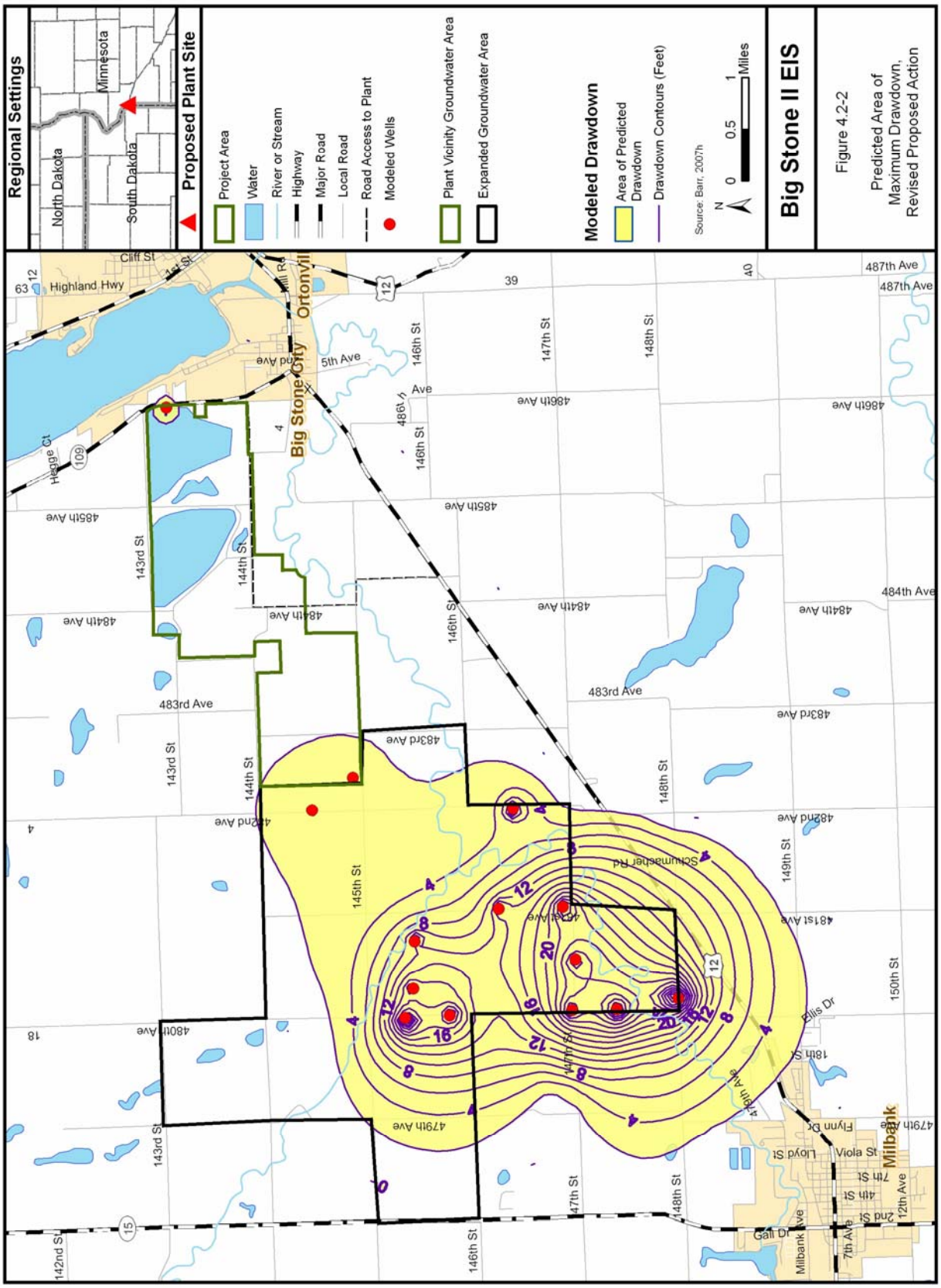
As discussed in Section 3.2, the Veblen Aquifer is confined in some areas and unconfined in other areas. Hydrogeological investigation activities showed that some areas of the expanded groundwater area encounter shallow water table conditions in the unconfined portions of the Veblen Aquifer. In these areas, drawdown from proposed groundwater pumping would form a cone of depression at the surface of the water table in the vicinity of the wells. The amount of drawdown at a well is related to an aquifer's saturated thickness and the aquifer's hydraulic conductivity (i.e., a measure of an aquifer's ability to transmit water). Wetlands or streams with little or no clay beneath them may be in greater hydraulic contact with the water table. However, the results of the 82-hour pump test conducted on Well PW1-2 did not show any evidence of leakage effects or hydraulic connection with surface water bodies near Well PW 1-2. The pumping test indicates that the Veblen Aquifer, overlain by 97 feet of clay at Well PW 1-2, is a confined aquifer in this area, and is not in good hydraulic connection with the nearby Whetstone River (Barr, 2007a).

Figure 4.2-2 shows the predicted area of maximum drawdown of the Veblen Aquifer due to groundwater pumping for the proposed Project for the entire period of model simulation (55 years). The figure shows the greatest drawdown on the south side of the expanded groundwater area, where predicted drawdown of the Veblen Aquifer is approximately 37 feet. Since relative distribution of pumping for all wells was held constant in the model, the predicted drawdown in the figure reflects anticipated aquifer characteristics of lower hydraulic conductivity and/or thinner aquifers within the areas of greatest drawdown. Groundwater modeling indicates that predicted drawdowns of the Veblen Aquifer would not cause reductions in yield for wells near Milbank and areas to the south.

The Water Appropriation Permit would allow the Co-owners to withdraw the groundwater needed for the existing and proposed Big Stone plants. The SDDENR independently evaluated the availability of groundwater from the Veblen Aquifer during their review of the Co-owners' Water Appropriation Permit Application. They prepared a report to the South Dakota Water Management Board recommending approval of the Co-owners' application (SDDENR, 2007b). In their report, the SDDENR concluded:

- The Veblen Aquifer in Grant County is a viable aquifer.
- There is a reasonable probability that unappropriated water is available from the Veblen Aquifer for this appropriation.
- The appropriation proposed by the Co-owners' application will not adversely impact existing rights.

The SDDENR calculated the amount of recharge rate necessary to equal the average annual withdrawals of the appropriation applied for by the Co-owners (approximately 3,700 afy) plus withdrawals by the existing Grant County users (approximately 1,000 afy). According to the report,


Regional Settings
North Dakota
Minnesota
South Dakota
Proposed Plant Site
Project Area
Water
River or Stream
Highway
Major Road
Local Road
Road Access to Plant
Modeled Wells
Plant Vicinity Groundwater Area
Expanded Groundwater Area
Modeled Drawdown
Area of Predicted Drawdown
Drawdown Contours (Feet)
Source: Barr, 2007h
N
0
0.5
1
Miles
Big Stone II EIS
Figure 4.2-2
Predicted Area of Maximum Drawdown, Revised Proposed Action
Big Stone City
Ortonville
Milbank
Highland Hwy
Cliff St
1st St
Mill Rd
5th Ave
Hegge Ct
Schlumasher Rd
Ellis Dr
Flynn Dr
Lloyd St
Viola St
Gall Dr
Milbank Ave
7th Ave
4th St
7th St
2nd St
12th Ave
142nd St
143rd St
144th St
145th St
146th St
147th St
148th St
149th St
150th St
483rd Ave
484th Ave
485th Ave
486th Ave
487th Ave
479th Ave
480th Ave
481st Ave
482nd Ave
4
8
12
16
20

assuming average annual withdrawals of 4,700 afy, an average annual recharge rate of 0.34 inches per year would balance withdrawals of 10,000 afy for the proposed plants.

Based on SDDENR's evaluation, pumping of the aquifer in accordance with the permit would have no significant impacts to other beneficial uses of the aquifer. Water Permit No. 6846-3 was approved by the SDWMB on August 23, 2007 (SDWMB, 2007).

Construction Impacts

Section 2.2.1 describes construction activities for the proposed well sites and pipelines used to convey groundwater to the proposed plant. Impacts to groundwater from proposed well and pipeline construction activities could occur from accidental discharges of chemicals. To avoid spills during well drilling and pipeline construction, additional mitigation measure W-2 would require the contractors to prepare plans to address the use of regulated substances, spill response, and compliance with State, Federal, and local regulations. Adverse impacts from spills would be minimized by the adoption of additional mitigation measure W-2.

- **W-2.** The construction contractor would prepare a Pipeline Construction Work Plan consistent with industry standards and State, Federal, and local regulations. The plan would include protocols to address spill prevention, response equipment, guidelines for handling spills, and spill cleanup. The work plan would also require the construction contractor to check for underground utilities prior to construction and to provide flagmen to control traffic flow along county roads when needed. The drilling contractor would prepare a Spill Prevention and Response Plan.

With implementation of additional measure W-2, adverse impacts to groundwater quality from proposed well and pipeline construction activities would not be significant.

4.2.2.3 Alternative 3

The wet/dry cooling system alternative would also use a combination of surface water supply and groundwater supply. Generally, although the location and the total number of wells required for a wet/dry cooling alternative and the wet cooling alternative would be the same, the duration of pumping and the average pumping rate is generally less for the wet/dry alternative.

Groundwater Impacts

The same modeling of the annual water withdrawals from Big Stone Lake was conducted for Alternative 3 as for the Revised Proposed Action (Barr, 2007f). This modeling assumed the following input parameters for Alternative 3:

- Existing plant and proposed Big Stone II plant combined annual consumptive water use of about 7,300 af, which includes an annual average groundwater appropriation of about 2,036 af.
- Available storage in the existing cooling pond of approximately 3,500 af.
- The order of appropriations from water supply sources would be (1) from Big Stone Lake, (2) from storage in the on-site ponds, and (3) from groundwater.
- Withdrawals to replenish the on-site ponds would be first from Big Stone Lake, followed by supply from groundwater.

The model predicts that the amount of groundwater required to operate the existing plant and the proposed Big Stone II plant using wet/dry cooling technology ranged from zero afy (6 out of 70 years) to approximately 6,984 afy maximum, which occurred in only one year out of 70. For some years, the total water requirements exceed 7,300 afy and account for refilling the depleted cooling pond after drought years. This may occur when either surface water or groundwater is available, and there is storage available in the cooling pond.

Figure 4.2-3 illustrates the annual average water use for both the existing and the proposed plants under Alternative 3 using a wet/dry cooling system for the proposed Big Stone II plant. The total combined water consumption would be approximately 7,300 afy for both plants, approximately 5,700 afy less than the Revised Proposed Action. The annual average surface water appropriation from Big Stone Lake would be approximately 5,236 af and groundwater appropriation would be about 2,036 af. During periods when water withdrawals are not permitted from Big Stone Lake, the groundwater supply system would be required to provide the majority of the existing plant and proposed Big Stone II plant needs, which could involve approximately 3,800 af of groundwater over a one year period, assuming use of the on-site cooling pond for the remaining 3,500 af.

The frequency of groundwater supply system use to support the total plant water supply during periods of curtailed withdrawals from Big Stone Lake is reduced because of the lower consumptive use. According to modeling performed by the Co-owners, if the proposed Project uses a wet/dry cooling tower system, the groundwater appropriation limits would not limit the full output operation of the proposed plant during extended drought periods and plant output would not need to be curtailed.

Groundwater Pumping and Production Impacts

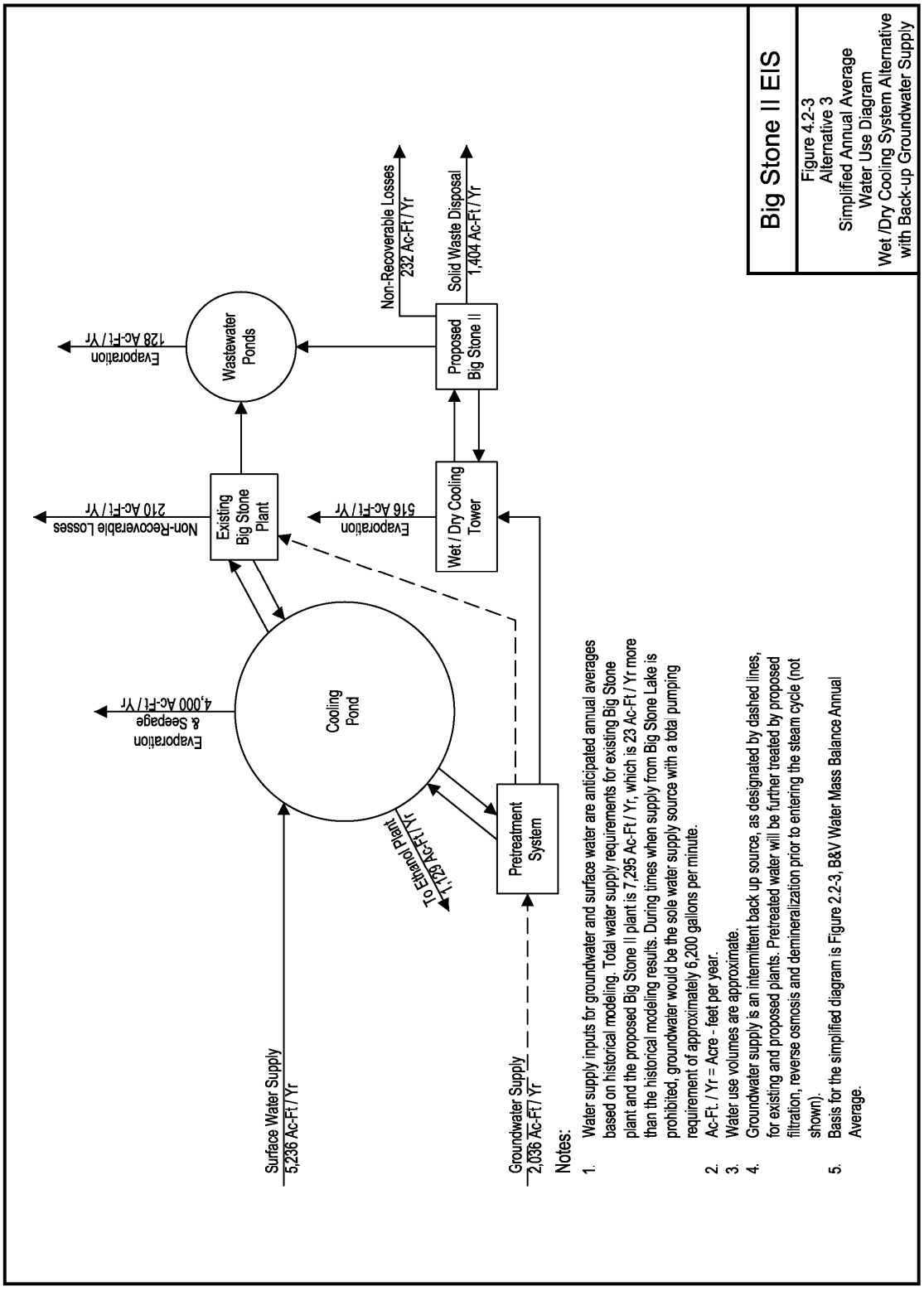
The discussion of groundwater pumping and production impacts in Section 4.2.2.2 is the same for Alternative 3, except modeling shows that the predicted maximum drawdown area for groundwater use by the wet/dry cooling alternative is about 55 percent of the area of maximum drawdown for the wet cooling alternative (Barr, 2007f). The predicted maximum drawdown of the Veblen Aquifer, also on the south side of the expanded groundwater area, would be approximately 24 feet.

Construction Impacts

The discussion of well and pipeline construction impacts discussed in Section 4.2.2.2 is the same for Alternative 3.

4.2.2.4 Summary of Impacts to Groundwater

Constructing and operating the proposed plant and groundwater well system would not degrade water quality within the affected area. The consumptive use of groundwater for proposed plant uses would not deplete groundwater supplies or interfere with groundwater recharge in the affected area in a way that would adversely affect existing, proposed, or future uses of groundwater resources. The SDDENR concluded that the appropriation proposed by the Co-owners' application would not adversely impact existing rights and has imposed conditions to the approved Water Appropriation Permit that avoid adverse impacts to future groundwater resources (SDDENR, 2007b). The Water Appropriation Permit was approved by the SDWMB on August 23, 2007 (SDWMB, 2007). Short- and long-term impacts to groundwater resources from constructing and operating the proposed plant would not cause significant impacts to groundwater resources. During extended drought periods, plant


Big Stone II EIS
Figure 4.2-3
Alternative 3
Simplified Annual Average
Water Use Diagram
Wet /Dry Cooling System Alternative
with Back-up Groundwater Supply
Surface Water Supply
5,236 Ac-Ft / Yr
Groundwater Supply
2,036 Ac-Ft / Yr
Cooling
Pond
Pretreatment
System
To Ethanol Plant
1,128 Ac-Ft / Yr
Evaporation
& Seepage
4,000 Ac-Ft / Yr
Existing
Big Stone
Plant
Non-Recoverable Losses
210 Ac-Ft / Yr
Wet / Dry Cooling
Tower
Evaporation
516 Ac-Ft / Yr
Wastewater
Ponds
Evaporation
128 Ac-Ft / Yr
Proposed
Big Stone II
Non-Recoverable Losses
232 Ac-Ft / Yr
Solid Waste Disposal
1,404 Ac-Ft / Yr
Notes:
1. Water supply inputs for groundwater and surface water are anticipated annual averages based on historical modeling. Total water supply requirements for existing Big Stone plant and the proposed Big Stone II plant is 7,295 Ac-Ft / Yr, which is 23 Ac-Ft / Yr more than the historical modeling results. During times when supply from Big Stone Lake is prohibited, groundwater would be the sole water supply source with a total pumping requirement of approximately 6,200 gallons per minute.
2. Ac-Ft. / Yr = Acre - feet per year.
3. Water use volumes are approximate.
4. Groundwater supply is an intermittent back up source, as designated by dashed lines, for existing and proposed plants. Pretreated water will be further treated by proposed filtration, reverse osmosis and demineralization prior to entering the steam cycle (not shown).
5. Basis for the simplified diagram is Figure 2.2-3, B&V Water Mass Balance Annual Average.

output may be limited by the groundwater appropriation limit for the Revised Proposed Action, while it would not limit plant output for Alternative 3.

4.2.3 Floodplains – All Alternatives

The description of issues, impact assessment methods, and significance criteria for floodplains are the same as those described in Section 4.2.1 of the Draft EIS. The impacts to floodplains within the proposed plant site area are the same as those described in Section 4.2.2.2 of the Draft EIS.

The proposed groundwater production wells would not be drilled or installed within any of the flood hazard zones mapped by the Federal Emergency Management Agency as outlined in Section 3.2.3. The proposed groundwater pipeline gathering system is still in design; therefore, the exact routes of pipelines connecting the proposed groundwater production wells to pipelines have not been determined. However, water pipeline corridors within the expanded groundwater area would cross flood hazard zones associated with the Whetstone River, but these would be short-term construction activities. The proposed pipeline construction activities would not modify the floodplains or adversely affect the capacity of the floodplains, constrict or modify flow conveyances, or measurably add to flood flows. Therefore, these activities would not cause a modification of a floodplain or adversely affect the capacity or flow of a floodplain in the groundwater areas and the proposed project would not cause significant impacts to floodplains.

4.2.4 Surface Water

The Revised Proposed Action and Alternative 3 do not include the 450-acre make-up water storage pond; therefore, the surface water impacts due to the pond, as described in Section 4.2.2.3 of the Draft EIS, would not occur. Impacts to surface water from constructing the proposed wells and pipelines would be the same as those described for groundwater (i.e., the potential for accidental spills of chemicals from construction equipment) in Section 4.2.2.2 of this Supplemental Draft EIS. The remaining discussion of surface water in Section 4.2.2.3 of the Draft EIS is applicable to this Supplemental Draft EIS, except as noted below.

4.2.4.1 Revised Proposed Action

Plant Water Usage

As described in Section 4.2.2, the total annual combined water requirements for the existing Big Stone and proposed Big Stone II plants is estimated at approximately 13,000 af, under the Revised Proposed Action. On average, this proposed water requirement would be composed of 9,317 afy from the Big Stone Lake surface water supply and about 3,720 afy from the groundwater supply. Based on detailed modeling, surface water alone would not meet proposed water supply requirements in 66 out of 70 years.

Effects on Big Stone Lake Levels and the Minnesota River Flows

With the average proposed surface water supply requirements of about 9,300 afy, the predicted impacts on Big Stone Lake, over a 70 year study period would be:

- On average, the Big Stone Lake elevation would decrease by 0.15 feet, (which is the same as described in Section 4.2.2.3 of the Draft EIS)

- The worst effect would be a lake elevation reduction of 0.83 feet in two non-consecutive weeks (as compared to a one-foot reduction in two non-consecutive weeks stated in Section 4.2.2.3 of the Draft EIS).

The key issue with respect to water withdrawals from Big Stone Lake is the impact on low flows (less than 80 cubic feet per second (cfs)) in the Minnesota River below Big Stone Lake. Section 4.2.2.3 of the Draft EIS discusses these impacts. The water supply plan described in the Draft EIS and the proposed water supply plan under the Revised Proposed Action are nearly identical, and the impacts on the Minnesota River low flows are limited to less than two percent of the low flow weeks modeled in the 70-year study period. This is because the surface water appropriations permit limits most lake appropriations to periods when the Minnesota River flows are relatively high (e.g., during spring runoff periods). The existing and proposed Big Stone II plants' combined surface water usage for the Revised Proposed Action would reduce flows out of Big Stone Lake into the Minnesota River, but these reductions would be less than significant.

Groundwater flow modeling predicts that pumping of proposed wells would not cause a reduction in groundwater flows to Big Stone Lake or the Minnesota River (Barr, 2007c). The maximum drawdown of the modeled pumping wells does not extend to Big Stone Lake or the Minnesota River. The model also indicates that groundwater inflows into Big Stone Lake were not reduced during the 55-year simulation period.

Effects on the Whetstone River

Rainfall runoff and snowmelt dominate the flows in the Whetstone River. Over the past 70 years, the months of April through July have typically had the highest flows in the Whetstone River, averaging 110 cfs. Only a very small portion of flow in the Whetstone River (about 1.8 percent of average flow) originates as groundwater inflows (i.e., approximately two cfs). The Veblen Aquifer is separated from most of the stream reaches of the Whetstone River either by low-permeability clay on top of the aquifer or an unsaturated zone where the elevation of the water table is below the Whetstone River. January and February are low-flow periods when surface-water runoff contributions are small and groundwater inflows dominate. During this period, the Whetstone River's flow is about two cfs, or less. Several times over the past 70 years, extended dry conditions with low precipitation caused the water table to drop below the elevation of the Whetstone River, and there was no flow in the river.

The groundwater model predicted changes in groundwater contribution to streamflow into areas of the Whetstone River within the groundwater areas (Barr, 2007c). The proposed groundwater pumping, over time, would reduce the average groundwater contribution to the Whetstone River by approximately 0.64 cfs (from approximately 2.0 cfs to 1.36 cfs), or approximately 32 percent of total groundwater contribution. The groundwater contribution is a small portion of total flow in the Whetstone River, and the predicted reduction in the average annual stream flows is approximately 1.3 percent and 0.5 percent during the months of April through July.

Historically, during dry periods or periods below-freezing when surface runoff from precipitation or snowmelt is absent, stream flows in the Whetstone River have fallen to very low levels (below 0.5 cfs). Over a 55-year period from 1932 through 1986, average monthly stream flows have fallen below 0.5 cfs 23 times (3.4 percent), typically occurring in the months of January, February, and September. Modeling indicates that decreases in the contribution of groundwater to base flow from pumping would cause the frequency of stream flows below 0.5 cfs to rise from 3.4 percent to 7.4 percent of the time, assuming that future climatic conditions are similar to past conditions.

Construction Impacts

The proposed groundwater activities (i.e., well drilling and installation, pipeline construction, and construction of electrical distribution lines) that involve equipment traffic or other disturbance within water bodies or on banks or shorelines, would create surface water impacts from erosion, turbidity and sedimentation. Spills, leaks or improper disposal of construction materials could degrade surface water quality. The potential for spills or leaks to contaminate surface water resources would be reduced by implementing SMM Water-6. If the 100-foot distance is not practical, then the greatest feasible distance from such features would be used. Additional BMPs (such as "good housekeeping," approved storage practices, runoff controls and sediment barriers) as identified in construction plans and any related issued permits would be employed to further protect surface water resources.

Short-term surface water impacts would be avoided or minimized by stormwater pollution prevention planning and the implementation of proposed Project measures to control runoff, erosion, and sedimentation during construction activities. With diligent planning and implementation of control practices, compliance with any permit stipulations, and application of the Co-owners' proposed mitigation measures SMM Water-2 through -11, short-term impacts to surface waters from groundwater construction activities would be minimized.

Damage to ditches, tile drains, terraces, roads and other features would be corrected as identified in proposed SMM Land-10, which stipulates that such features would be restored as nearly as practicable to their original condition.

Construction of the groundwater pipelines and electrical distribution lines would require stream and river crossings. The crossings could cause erosion to stream banks or contribute to stream turbidity. Depending upon the point of stream crossing, stream flow may be low enough to go through the stream with minimal impacts. Alternatively, using directional boring technology (i.e., under the stream) could also be considered when crossing a large stream. At those locations where it is necessary to cross wetlands, streams or tributaries, crossing would be in compliance with the applicable USACE and SDDENR permit and mitigation requirements following procedures typical of utility water line installation. Any disturbances would be temporary, and any area disturbed would be restored shortly after construction in accordance with permit requirements.

By the implementing SMMs, impacts to surface water would be less than significant.

4.2.4.2 Alternative 3

Plant Water Usage

If Alternative 3, the wet/dry cooling alternative, was implemented, the total annual water requirements for the existing Big Stone and proposed Big Stone II plants would be reduced to approximately 7,300 afy. Because surface water from Big Stone Lake would not always be available when needed, the proposed water requirement would be composed of about 5,236 afy from the Big Stone Lake surface water supply and about 2,036 afy from the groundwater supply.

Effects on Big Stone Lake Levels and the Minnesota River Flows

With the total proposed water requirements of approximately 7,300 afy under Alternative 3 and average proposed surface water supply requirements decreasing to about 5,236 afy, the predicted impacts on Big Stone Lake, over a 70 year study period, are summarized as follows:

- On average, the Big Stone Lake elevation would decrease by 0.14 feet, (which is less than predicted under the Revised Proposed Action)
- The worst effect would be a lake elevation reduction of 0.58 feet in two non-consecutive weeks.

Similar to the Revised Proposed Action, impacts on the Minnesota River low flows for Alternative 3 are limited to less than one percent of the low flow weeks modeled in the 70-year study period due to water permit limits during high flows.

These short-term impacts of infrequent reduction or cessation of lake overflows on downstream resources would be less than significant, consistent with the conclusions in the Draft EIS.

Effects on Whetstone River

If the wet/dry cooling alternative was implemented, the impacts discussed above in Section 4.2.4.1 would be reduced but at a higher cost (see Section 2.3.3). The discussion in Section 4.2.4.1 would be the same except for the following changes.

The groundwater model also predicted changes in base flows into areas of the Whetstone River within the groundwater areas for Alternative 3 (Barr, 2007f). Under Alternative 3, proposed groundwater pumping over time would reduce the average groundwater flow into the Whetstone River by approximately 0.30 cfs (from approximately 2.0 cfs to 1.70 cfs, or approximately 15 percent of total groundwater inflow. Predicted reduction in the Whetstone River flows is approximately 0.6 percent of average annual stream flows and 0.23 percent of average stream flow during the months of April through July for Alternative 3.

Modeling of Alternative 3 indicates that decreases in the contribution of groundwater to base flow in the Whetstone River from groundwater pumping would cause the frequency of stream flows that are below 0.5 cfs to rise from 3.4 percent to 5.3 percent of the time, assuming that future climatic conditions are similar to past conditions.

Construction Impacts

The construction impacts would be the same as the Revised Proposed Action.

4.2.4.3 Summary of Impacts to Surface Water

No impact on lake levels and outflows from Big Stone Lake are expected as a result of proposed groundwater pumping for the Revised Proposed Action or Alternative 3.

Minor episodic decreases in base flow to the Whetstone River would occur due to proposed groundwater pumping. However, the pumping would not cause a significant extension in the period of naturally occurring seasonal reduction of flow in surface water that results in insufficient quantities of water for downstream users. These impacts would be less than significant.

By the implementing SMMs, construction associated with groundwater activities would not result in a violation of Federal and/or state water quality standards, alter drainage patterns, or violate Section 404 of the CWA or other applicable surface water regulation due to erosion. Impacts to surface water during construction activities would be less than significant.

4.3 Geology and Minerals, Paleontological Resources, and Soils

4.3.1 Introduction

This portion of this Supplemental Draft EIS focuses on impacts to geologic resources, including mineral deposits and paleontological resources, and to soils within the groundwater areas for the two alternatives. There has been no change in the identified issues, impact assessment methods, or significance criteria presented in Section 4.3.1 of the Draft EIS. A review of state and local programs that promote soil conservation and erosion control in South Dakota is presented in Section 4.3.1 of the Draft EIS.

4.3.2 Geology, Minerals, and Paleontological Resources

There are no changes to the discussion of impacts to geology, minerals, and paleontological resources presented in Section 4.3.2 of the Draft EIS. There are no unique geologic features, State-designated outcrops, or paleontological in the region as presented in Section 3.3 of this Supplemental Draft EIS.

4.3.3 Soils

There are no changes to the impacts to soils at the proposed plant site, as presented in Section 4.3.2 of the Draft EIS. The discussion below is applicable to the expanded groundwater area.

4.3.3.1 Revised Proposed Action

Surficial soil disturbances that could result in the formation of rills or gullies, or that could results in sediment deposition in downgradient lands or water bodies would occur during construction of the proposed wells and electrical distribution lines. Trenching activities would also be required to install the pipelines to carry the groundwater from the proposed well sites to the proposed plant.

Well Drilling and Installation Construction

The total area of soils temporarily disturbed during proposed well drilling and installation activities would be about 0.25 acre per well site. Long-term impacts to proposed groundwater well site areas are based on a 10 feet by 15 feet structure to house the wellhead and equipment and a 50-foot by 50-foot fenced area around that structure, for a total of 2,500 square feet (approximately 0.06 acre). Each proposed well site would also have an access road approximately 50 feet long by 12 feet wide. Twelve of the fourteen proposed well sites would be near roads and would require only short access roads. Two of the proposed well sites are further out in agricultural fields, and would require access roads approximately 1,300 to 1,700 feet long.

Each proposed well site would incorporate stormwater runoff and erosion controls to prevent soil loss or accelerated erosion in accordance with SMM Water-2. SMM Water-3 and additional measure W-2 would require minimization of soil contamination by implementing spill prevention, reporting, and cleanup practices required under SDDENR regulations. Under SMM Bio-5, disturbed areas would be repaired and reseeded to prevent erosion and contamination after construction activities. SMM Land-11 requires that all well drilling and installation be completed in agricultural areas or uncultivated pastureland at the edge of farm fields, avoiding impacts to center-pivot irrigation structures, and preventing erosion during discharges of groundwater during pump tests. No additional mitigation measures are needed.

Pipeline Installation

To the extent possible, pipeline routing would occur along the rights-of-way (ROW) of county roads and roads along section lines, and along well access roads in accordance with SMM Land-12. In atypical cases, limited segments of proposed piping could be placed outside of these ROW areas or buried in agricultural fields. Negotiations with landowners for easements across their properties would be required. Approximately 36.7 acres of soils would be temporarily disturbed during trenching and pipeline installation activities assuming 80,000 linear feet of piping and a 20-foot wide construction zone. With the implementation of SMM Water-2, stormwater runoff, and erosion controls would be implemented as appropriate along the corridors to prevent soil loss or accelerated erosion. In accordance with SMM Water-3 and W-2, soil contamination would be minimized by implementing spill prevention, reporting, and cleanup practices required under SDDENR regulations. Soil disturbance impacts would be temporary, and disturbed areas would be repaired and reseeded in accordance with SMM Bio-5. No additional mitigation measures would be needed.

Electrical Distribution to Wells

The local distribution company would perform construction and maintenance of the electrical distribution to power the proposed well pumps in accordance with their standard operating procedures. Generally, distribution lines would be constructed along the ROWs of county roads and along section lines. Most of the proposed wells would be located near an existing three-phase electric distribution network. In some cases, longer extensions of the distribution network may be required and may be outside of existing electrical distribution ROW; landowner easements would be required. Approximately 29.8 acres of soils would be temporarily disturbed during the erection of utility poles and stringing of overhead distribution line, assuming approximately 43,300 linear feet of new distribution line and a 30-foot wide construction zone. Some segments of the proposed distribution lines could be buried. Similar to well installation, impacts to soil would be temporary and implementation of SMM Water-2 would prevent soil loss or accelerated erosion, SMM Water-3 and additional measure W-2 would minimize soil contamination, and disturbed areas would be repaired and reseeded in accordance with SMM Bio-5; no additional mitigation measures would be needed.

4.3.3.2 Alternative 3

The impacts and mitigation measures associated with soils for Alternative 3 would be the same as the Revised Proposed Action.

4.3.3.3 Summary of Impacts to Soils

Surficial soil disturbances would occur during proposed well drilling and installation activities, during trenching activities associated with construction of proposed pipelines that would carry the

groundwater from the well sites to the proposed plant and during pole erection and line stringing activities associated with the construction of proposed electricity distribution lines to power the well pumps. Implementation of SMM Water-3 and W-2 would minimize impacts to soils due to spills. With the implementation of SMM Water-2, SMM Bio-5, SMM Land-11, and SMM Land-12, the amount of soil loss or erosion that would result in the formation of rills or gullies, or that would result in sediment deposition in downgradient lands or water bodies would be reduced to less than significant.

4.4 Biological Resources

4.4.1 Introduction

This section addresses the impacts to biological resources from the proposed well drilling and installation, well testing activities, and pipeline construction and operation activities within the groundwater areas. Impacts associated with construction and operation of the proposed plant and ancillary facilities are addressed in Section 4.4.1 of the Draft EIS. The discussion of identified issues, impact assessment methods, and significance criteria presented in Section 4.4.1 of the Draft EIS are applicable to this analysis except that additional description is provided in this introduction regarding the impact assessment methods for wetlands. Figure 2.2-2 shows the groundwater areas studied for impacts to biological resources.

Wetlands in the vicinity of the proposed groundwater wells were identified and impacts were assessed using the following sources:

- USFWS National Wetland Inventory (NWI) mapping
- 2004 and 2005 Farm Service Agency (FSA) color aerial photography
- Field delineations of wetlands near the proposed plant
- FSA annual crop photos dating back to 1980
- Field surveys of area vegetation

The NWI mapping, color aerials, delineations, and field surveys were used to determine the number and locations of wetlands in the area. The FSA crop photos were used to assess the responses of area wetlands to drought and excessive wet periods over time. Riparian areas in the area were identified by using the color aerials and field surveys.

Wetland impacts resulting from proposed groundwater pumping were assessed using the groundwater modeling discussed in Section 4.2. Modeling results for the Revised Proposed Action and Alternative 3 were compared and correlated with the locations of wetlands using a modeling input of 1.6 feet or more of drawdown (1.6 feet is equivalent to 0.5 meters, as used by the groundwater model). In addition, the presence or absence of thick clay deposits (i.e., greater than 10 feet of clay) under each wetland within the drawdown boundary was determined. The thickness of the clay layer beneath a given wetland governs the influence of groundwater on the wetland's water regime, and wetlands with little or no clay beneath them are potentially in greater hydraulic contact with the water table. Changes in the water table level are more likely to manifest themselves in such wetlands. Based on this

information, the number of wetlands that would be affected by proposed groundwater pumping was determined.

4.4.2 Vegetation

The elimination of the make-up water storage pond from consideration for the proposed Project would result in a reduction in impacts to vegetation types at the proposed plant site. The make-up water storage pond would have removed about 476.1 acres of vegetation within the proposed Project area. With the exception of the acreage differences, the impacts to vegetation discussed in Section 4.4.2.1 of the Draft EIS are the same for this Supplemental Draft EIS.

4.4.2.1 Revised Proposed Action

Table 4.4-1 shows the short- and long-term disturbance to vegetation types within the proposed groundwater areas. Elimination of the make-up pond and cooling tower blowdown pond and the relocation of the cooling tower would result in a reduction of the total long-term vegetation impacts (removal) at the proposed plant site affected from 532.2 acres noted in Table 4.4-1 in the Draft EIS to 27.5 acres. Installation of the proposed groundwater production wells, access roads, pipelines, and electrical distribution lines would affect an additional 11.8 acres of vegetation and developed areas. Short-term impacts would increase from 80.1 acres in the Draft EIS to 150.1 acres from these proposed construction activities. This is due to the short-term effects from herbaceous trampling and partial removal of aboveground plant cover associated with installation of proposed groundwater production wells, and associated proposed pipeline and electrical distribution lines.

To minimize disturbances to vegetation, proposed pipelines and electrical distribution lines would be constructed to the extent possible along the ROW of county roads and roads along section lines in accordance with SMM Land-12. Disturbed vegetation would return to pre-disturbance conditions following successful reclamation within two years depending on the sensitivity of the plant communities, the timing and extent of the disturbance, and the topographic setting following SMM Bio-5.

The discussion of effects of air emissions on plant communities from the proposed Big Stone II plant and the discussion of noxious weeds in Section 4.4.2.1 of the Draft EIS would be applicable to the Revised Proposed Action. Introduction of noxious weeds could occur during construction activities for the proposed groundwater wells, pipelines, and electrical distribution. Implementation of additional measure V-1 would prevent, control, and manage noxious weeds by requiring the Co-owners to prepare an Integrated Weed Management Plan.

4.4.2.2 Alternative 3

The impacts and mitigation measures associated with vegetation for Alternative 3 would be the same as the Revised Proposed Action because the same groundwater wells, pipelines, and electrical distribution would be required for the Revised Proposed Action and Alternative 3.

Table 4.4-1. Summary of Acreages of Affected Vegetation Types. Groundwater Areas

Facilities[a]	Agriculture		Wetland/ Riparian[b]		Forest[b]		Prairie		Subtotal of Vegetation Affected		Developed		Total Affected Land Area	
	Short-term	Long-term	Short-term	Long-term	Short-term	Long-term	Short-term	Long-term	Short-term	Long-term	Short-term	Long-term	Short-term	Long-term
Proposed Power Plant	0	0	--[d]	0	0	0	0	0	0	0	0	20.8[c]	**0**	**20.8**
Cooling Tower	0	0	--[d]	0	0	0	0	0	0	0	0	2.0[c]	**0**	**2.0**
Construction Laydown	49.6	0	--[d]	0	0	0.4	18.3	0	67.9	0.4	0	0[c]	**67.9**	**0.4**
Construction Parking	12.2	0	--[d]	0	0	0	0	2.6	12.2	2.6	0	1.7[c]	**12.2**	**4.3**
Groundwater Well Sites	3.5	1.6[e]	--[d]	0	0	0	0	0.2[e]	3.5	1.8[e]	0	0.1	**3.5**	**1.9**
Groundwater Pipelines[f]	3.8	0	--[d]	0	0	0	0.9	0	4.7	0	32.0	0	**36.7**	**0.0**
Electrical Distribution Lines to Wells[g]	2.4	0.8	--[d]	0	0	0	3.7	1.2	6.1	2.0	23.7	7.9	**29.8**	**9.9**
Total	71.5	2.4	--[d]	0	0	0.4	22.9	4.0	94.4	6.8	55.7	32.5	**150.1**	**39.3**

[a]Proposed plant facilities do not impact open water or shrubland.
[b]Any impact to forest and wetland vegetation cover types is considered a long-term impact based on length of recovery time after construction and reclamation.
[c]Located on areas disturbed for construction of the existing Big Stone plant.
[d]The area of short-term impacts to wetlands cannot be estimated at this time. This is because routes for proposed electric distribution lines and water pipelines have not been finalized. Routes for proposed electric distribution lines would be designed to span wetlands, thus eliminating long-term wetland impacts. Groundwater pipeline routes will also be selected to avoid or minimize wetland impacts. Short-term impacts could still occur from trenching for pipelines during the winter, driving across dry or frozen wetlands, mowing wetlands, soil sampling as part of a wetland determination and removal of poles from existing wetlands. Short-term impact to wetlands would not extend more than two reproductive cycles after construction.
[e]Long-term agricultural impacts from assumed groundwater well sites are based on an assumed 10-foot by 15-foot structure to house the wellhead and equipment and a 50-foot by 50-foot fenced area around that structure. Total long-term impact per well site is 2,500 square feet (about 0.06 acre). Also included at each well site is an access road approximately 50 feet long by 12 feet wide. There are ten proposed well sites located in agricultural land, three in grassy areas, and one in a developed area on the east portion of the existing plant water storage pond. Twelve of the fourteen proposed well sites are located near existing roads and would require short access roads. Two of the proposed well sites are further out in agricultural fields and would require access roads from 1300 feet to 1700 feet long. The 0.2-acre area under the prairie designation is actually grassy (uncultivated pastureland) areas adjacent to farm fields, rather than native prairie.
[f]The final groundwater pipeline alignments have not yet been determined. Impacts from proposed groundwater pipeline construction are based on the most direct route from the wells to the plant site, forming a network that primarily parallels existing roads. The proposed groundwater pipeline would be installed adjacent to a range of vegetative cover types. However, the proposed pipeline itself would be constructed immediately adjacent to the existing roadside drainage ditches. These are considered developed cover types. There is one segment of the proposed groundwater pipeline network that crosses open land.
[g]Vegetation impacts related to the addition of electric distribution lines to power proposed wells are based on a conceptual network of lines connected to the existing three-phase electric distribution lines in the area. Additional lines parallel roads to the extent practicable. Acreages shown are based on a 30-foot construction corridor (short-term impact) and a 10-foot permanent easement in which the proposed distribution lines would be located (long-term impact).
Source: Barr, 2007d

4.4.2.3 Summary of Impacts to Vegetation

Implementation of either the Revised Proposed Action or Alternative 3 would significantly reduce the amount of vegetation impacted for the proposed Project — from 612.3 acres presented in the Draft EIS to 189.4 acres, a 69 percent reduction. Impacts to vegetation would occur due to long- or short-term removal of vegetation or from the introduction of noxious weeds. Following the implementation of the standard and additional mitigation measures, no significant impacts to rare plants, native plant communities or other sensitive features identified by a State or Federal resource agency, or spread of noxious weeds would occur from construction and operation activities discussed in this Supplemental Draft EIS.

4.4.3 Wildlife

With the exception of the discussion of impacts due to proposed groundwater pumping, the impacts to wildlife discussed in Section 4.4.2.2 of the Draft EIS are the same for this Supplemental Draft EIS. Additional activities impacting wildlife within the groundwater areas are discussed below. Differences in acres of habitat impacts are due to the elimination of the make-up water storage pond and the cooling tower blowdown pond from the Proposed Action presented in Table 4.4-1 in the Draft EIS and addition of the proposed groundwater wells, pipelines and electrical distribution lines presented in Table 4.4-1 in this Supplemental Draft EIS.

4.4.3.1 Revised Proposed Action

Impacts to wildlife species would include the long-term loss of approximately 6.8 acres of vegetation (decreased from 510.7 acres in the Draft EIS) and the short-term loss of 94.4 acres (increased from 80.1 acres in the Draft EIS) of habitat to industrial use from constructing the proposed Big Stone II plant and the facilities associated with groundwater use. Construction of the proposed plant and groundwater facilities would result in the long-term removal of approximately 2.4 acres (decreased from 414.3 acres in the Draft EIS) of agricultural land used for row crops that would be of moderate use as wildlife habitat. Short-term disturbance would result in the loss or alteration of an additional 94.4 acres (increased from 80.1 acres in the Draft EIS) of agricultural and prairie vegetation for temporary construction uses and facilities associated with proposed groundwater use.

In addition to the loss of habitat area, wildlife impacts also include reduced use of habitats at or near the proposed groundwater well sites, pipeline routes, and the electric distribution lines during construction activities. Wildlife would likely avoid these areas during construction, but would be able to use similar habitats at distances that vary with a given species' tolerance of human activity. However, these impacts would be short-term; wildlife would return to the area once construction activities cease.

Due to the effects of groundwater pumping (noted in Section 4.2.2), a reduction in the flow of water within the Whetstone River could effect minor changes in the ways that wildlife use the river. These changes may include shifts in forage, cover, and reproductive behaviors to adjacent stream reaches with flow more suitable to a given wildlife behavior. The reduction in stream flow from proposed groundwater pumping is not anticipated to induce long-distance migration of wildlife species to other rivers or streams associated with the Whetstone River. Changes in wildlife use of the Whetstone River caused by reductions in flow would not cause a significant loss of wildlife population or violate any statutes or regulations pertaining to wildlife. Therefore, this impact would be less than significant.

Other impacts to wildlife from constructing and operating the proposed plant are the same as those discussed in Section 4.4.2.2 of the Draft EIS, except for the changes discussed below.

Game Species

Direct impacts to big game species (e.g., white-tailed deer) would include the long-term disturbance of approximately 39.3 acres and short-term disturbance of 150.1 acres of forage and cover and increase habitat fragmentation. Of these 189.4 acres (decreased from 612.3 acres in the Draft EIS), approximately 73.9 are agricultural land.

Nongame Species

Direct impacts to nongame species (e.g., small mammals, passerines, raptors, amphibians, and reptiles) from constructing the proposed plant would result in the long-term disturbance of approximately 39.3 acres of habitat, a decrease from the 532.2 acres noted in Table 4.4-1 of the Draft EIS. The majority of this area, 22.8 acres, is located on land previously impacted by construction of the existing Big Stone plant and does not provide ideal habitat to nongame species due to its proximity to human activity.

Impacts to nongame species would also occur from the loss of 150.1 acres of forage and cover during construction of the proposed plant, groundwater well sites, pipeline routes, and the electric distribution lines. Wildlife would likely avoid these areas during construction, but would be able to use similar habitats at distances that vary with a given species' tolerance of human activity. These impacts would be short-term; wildlife would return to the area once construction activities cease. Significant impacts to nongame species are not expected to occur during construction of the proposed groundwater wells, pipelines, or electrical distribution lines.

4.4.3.2 Alternative 3

The impacts and mitigation measures associated with wildlife for Alternative 3 would be the same as the Revised Proposed Action because the same number of groundwater wells, pipelines, and distribution lines are proposed.

4.4.3.3 Summary of Impacts to Wildlife

Disturbances to wildlife within the groundwater areas from construction or operation of the proposed wells, pipelines, or electrical distribution lines would not be sufficient to cause a species to become listed or proposed for listing as threatened or endangered. Since species compatible with the existing use would likely be compatible with the proposed use, there would not be a significant long-term impact to wildlife due to habitat alteration.

4.4.4 Fisheries

With the exception of the discussion of impacts due to proposed groundwater pumping, the impacts to fisheries discussed in Section 4.4.2.3 of the Draft EIS are the same for this Supplemental Draft EIS. Fisheries in the groundwater areas are currently dominated by species in the Whetstone River considered rough fish (buffalo, suckers, redhorse, and carp). Additional activities impacting fisheries within the groundwater areas are discussed below.

4.4.4.1 Revised Proposed Action

Construction Impacts

The Whetstone River flows through the expanded groundwater area and is located adjacent to and south of the proposed plant site. The proposed construction activities would use petroleum fuels, oil, or other regulated substances for drilling, completion, and testing equipment. Impacts to fisheries could occur if spills of these substances would reach surface water or groundwater resources. Effects of a spill would depend upon the quantity entering the water body, weather conditions, and characteristics of the receiving water (i.e., volume, flow, depth, etc.). To avoid spills during proposed well construction, the well drilling contractor would prepare a Spill Prevention and Response Plan and the pipeline construction contractor would prepare a Pipeline Construction Work Plan to address use of

regulated substances in accordance with additional measure W-2. The electricity distribution line provider would use standard operating procedures to control spills.

None of the proposed construction activities would result in an unpermitted violation of statutes or regulations that involve protection of fish habitat, including spawning areas. There would not be a loss of a population of aquatic species that would result in the species being listed or proposed for listing as threatened or endangered.

Construction activities would disturb soils in the drainage area of the Whetstone River that could result in sedimentation from erosion if not properly controlled. Implementation of SMMs Bio-5, Water-2, and Water-5 would prevent erosion from occurring during construction of these facilities. Implementation of W-2 and SMMs for spill prevention and erosion control would minimize the potential for adverse impacts to fisheries. Significant impacts to fisheries are not expected to occur during the proposed well drilling and installation activities.

Well Operations

With respect to operations of the proposed plant, there are no changes to the discussion of impacts to fisheries presented in Section 4.4.2.3 of the Draft EIS, except for the impacts of long-term pumping of the Veblen Aquifer upon the Whetstone River, discussed in Section 4.2.4.1 of this Supplemental Draft EIS. Fish populations in the Whetstone River exist within an annual cycle of winter low flow and spring-summer high flow. Surface water runoff from precipitation and early spring snowmelt sustain high flow periods in the Whetstone River, generally from April through July. Groundwater flows contribute a greater portion of the river's flow only during January and February; however, flow during this period is less than two cfs. As a result, the annual variation in flow of the Whetstone River would not be significantly different from the flow regime that currently supports Whetstone River fish populations.

Any changes in flow resulting from reduction in groundwater input would be minor. These changes could include shifts in the ways in which fish use the various components of the stream environment. These components include areas of higher and lower current that in turn influence fish spawning habitat, cover for young fish and forage for all age classes of fish. The reductions in flow are not sufficient to notably alter fish behaviors. However, any changes caused by reductions in flow would be reflected in minor shifts in fish use of the river. These shifts, if they were to occur, would be local. Reductions in stream flow due to proposed groundwater pumping would not induce long-distance migration of fish species from the Whetstone River. Changes in fish use of the Whetstone River caused by reductions in flow would not cause a loss of fish populations or violate any statutes or regulations pertaining to fisheries. Therefore, this impact would be less than significant.

Based on the groundwater modeling performed by the Co-owners, there is no evidence that proposed long-term pumping of the Veblen Aquifer would have any significant impact on the Big Stone Lake or the Minnesota River. Section 4.2.4.1 discusses the effects of the proposed groundwater pumping on the Whetstone River.

4.4.4.2 Alternative 3

The impacts to fisheries and mitigation measures associated with construction would be the same as the Revised Proposed Action because the same number of proposed groundwater wells, pipelines, and distribution lines would be required.

The groundwater modeling described in Section 4.2.4.2 for Alternative 3 indicated fewer impacts to Big Stone Lake, the Minnesota River, and the Whetstone River when compared to the Revised Proposed Action. Therefore, impacts associated with well operations under Alternative 3 would be slightly less than those described in Section 4.4.4.1 for the Revised Proposed Action. Based on the groundwater modeling performed by the Co-owners, there is no evidence that proposed long-term pumping of the Veblen Aquifer would have any significant impact on the Big Stone Lake or the Minnesota River. Section 4.2.4.2 discusses the effects of the proposed groundwater pumping on the Whetstone River.

4.4.4.3 Summary of Impacts to Fisheries

None of the proposed well drilling and installation or pipeline construction activities would result in an unpermitted violation of statutes or regulations that involve protection of fish habitat, including spawning areas. There would not be a loss of a population of aquatic species that would result in the species being listed or proposed for listing as threatened or endangered. Impacts to fisheries from spills and erosion would be minimized by requiring a Spill Prevention and Response Plan for drilling activities and a Pipeline Construction Work Plan for proposed pipeline construction activities, implementing SMMs, and operating under required permits.

4.4.5 Special Status Species

With the exception of minor and episodic reductions in the flow of the Whetstone River due to proposed groundwater pumping, the impacts to special status species as discussed in Section 4.4.2.4 of the Draft EIS are the same for this Supplemental Draft EIS.

4.4.5.1 Revised Proposed Action

Upland special status species are not dependent on groundwater and changes in groundwater levels would not affect these species. Groundwater contribution to the Whetstone River (as discussed in Section 4.2.4.1) and to local wetlands (as discussed in Section 4.4.6) is minor during most of the year, especially during periods of peak activity for special status species. Reductions in groundwater flows contributing to aquatic habitats would have a negligible impact on the quality and availability of those habitats. Therefore, impacts to special status species that use the Whetstone River or wetlands in the groundwater areas would be less than significant. Additional activities impacting special status species within the groundwater areas are discussed below.

Construction Impacts

No significant impacts to special status species would be expected to occur during proposed well drilling and installation activities conducted within the expanded groundwater area. The impacts to special status species within wetlands is discussed in Section 4.4.6 below. The proposed groundwater pipeline system is still being designed. Therefore, the exact routes of pipelines connecting the proposed groundwater production wells to the proposed plant are not currently known. To minimize disturbances to special status species, proposed pipelines, and electrical distribution lines would be constructed, to the extent possible, along the ROW of county roads and roads along section lines, to avoid wetlands, streams, and tributaries in accordance with SMM Land-12.

Operations Impacts

With respect to operations of the proposed plant, there are no changes to the discussion of impacts to special status species presented in Section 4.4.2.4 of the Draft EIS, except for the impacts of long-term pumping of the Veblen Aquifer upon the Whetstone River, discussed in Section 4.2.4.1. The contribution of groundwater to the flow of the Whetstone River is approximately 1 percent of the river's 110 cfs flow during the April-July period when most special status species are in active reproductive and/or growth stages of their annual life cycles. Therefore, reduction of the groundwater contribution to the Whetstone River would not result in a significant reduction in the river's flow, and impact on special status species using the Whetstone River and/or local wetlands would be less than significant.

Sensitive species that use wetlands in the expanded groundwater area have adapted their life cycles to the water regime and annual variations in water level of the wetlands. Of the 133 wetlands in the groundwater area, 109 are above thick clay layers and are unlikely to be affected by proposed groundwater pumping. In these wetlands, there would be no shift in water regime anticipated, hence no effect on listed species. In the 24 remaining wetlands that have hydraulic contact with the water table, proposed groundwater pumping could shift the water regime to one with a shorter period of surface water and more accelerated dry down later in the growing season. However, these basins would not be permanently lost. Since early growing season hydrology in these wetlands comes primarily from surface runoff, water levels in these wetlands should continue to be sufficient to support listed species in the early growing season.

The only federally-listed special status species that uses depressional wetlands in Grant County is the western prairie fringed-orchid. Field surveys of the Big Stone II site conducted in July 2005 for this species and potential habitat found no individuals or populations, and potential habitat was largely absent and marginal at best. Land use within the expanded groundwater area is primarily cultivated and/or grazed. In addition, the majority of wetlands in the area are either dominated by dense cattail and reed canary grass, or are farmed. Neither of these conditions promotes use by the western prairie fringed-orchid. Therefore, it is unlikely that western prairie fringed-orchid is present.

The only state-listed special status species known in the expanded groundwater area is the northern river otter. This species was observed in the Whetstone River during field surveys in July 2006, approximately 0.8 miles southeast of the existing Big Stone plant entrance. Critical stages in the life cycle of this species, including location of a mate, reproduction, rearing of young, and foraging, all occur during high-flow periods, when surface runoff primarily feeds the Whetstone River flow. During this time, the contribution of groundwater to the river's flow is approximately one percent of the total flow. Reductions in groundwater would therefore have a negligible impact on the Whetstone River flow and on the northern river otter's use of the river.

To ensure no sensitive species are present, biological surveys of the areas proposed for the well sites, pipelines, and electrical distribution lines would occur prior to construction in accordance with SMM Bio-1.

4.4.5.2 Alternative 3

The construction and operation impacts to special status species associated with Alternative 3 would be the same as the Revised Proposed Action, with the exception that fewer wetlands would be affected by proposed groundwater pumping due to less drawdown (as discussed in Section 4.2.2.3). The 1.6-foot minimum drawdown area is smaller in Alternative 3 than in the Revised Proposed Action and has only 38 wetlands. Of these, 22 wetlands are above areas of thin clay, and have hydraulic contact with groundwater, which would have the same effects from proposed groundwater pumping described above. However, the number of wetlands most likely to experience a shift in water regime is approximately the same for both Alternative 3 and the Revised Proposed Action. For Alternative 3, 58 percent of wetlands in the minimum drawdown area are in hydraulic contact with groundwater, whereas only 18 percent are for the Revised Proposed Action. As a result, the number of wetlands that could experience a shift in water regime is approximately the same under both Alternative 3 and the Revised Proposed Action.

4.4.5.3 Summary of Impacts to Special Status Species

Special status species that use the Whetstone River would not be adversely affected by minor periodic flow reductions caused by the proposed groundwater pumping. The overwhelming majority of the flow in the Whetstone River comes from precipitation and snowmelt, neither of which is affected by groundwater pumping. During the April-July period of peak biological activity for most special status species, the effect of groundwater pumping to the Whetstone River flow would be negligible. As a result, the proposed activities would not impede biological processes critical to the survival of special status species.

None of the anticipated impacts on special status species would result in an unpermitted violation of statutes or regulations pertaining to special status fish or mussel species. No impacts to special status fish and mussel species would occur. Residual impacts to special status fish and mussel species would not be significant by implementing standard mitigation measures. There would be no significant impacts to special status species associated with the proposed well drilling and installation or pipeline construction activities.

4.4.6 Wetland/Riparian Areas

Wetlands in the area of the groundwater modeling study are typically small (less than one acre) isolated depressions in the flat to gently rolling landscape. The landscape southwest of the existing Big Stone plant and northeast of Milbank has relatively few wetlands, especially compared to the area north of the existing Big Stone plant, which is dotted with numerous small wetlands (Barr, 2007c).

Most of the wetlands in the groundwater areas collect precipitation and local surface runoff. Precipitation is the main source of water in these wetlands, and runoff from snowmelt is the next most important source. It is possible that some of the wetlands also have shallow groundwater contributing to their hydrology. However, regardless of the degree to which a wetland is hydraulically connected to the groundwater, the principal source of water for the wetlands in the groundwater areas is surface runoff, especially early season snowmelt and spring precipitation.

An important factor in considering the hydrology of wetlands in the groundwater modeling study area is the thickness of clay layers beneath the surface soils. Soil boring data available from SDDENR and collected from OTP's hydrogeological investigations were used to identify areas where the thickness

of the clay layer is less than 10 feet. Wetlands could be in hydraulic contact with groundwater and more strongly influenced by variability in the water table in such areas. Conversely, the water table has little if any influence on wetlands sitting above thicker clay deposits. These wetlands are likely perched above the water table surface and would not be affected by changes in groundwater levels.

Riparian areas within the groundwater areas are restricted to a few reaches of the Whetstone River main branch and its north and south forks. Along much of the Whetstone and its forks, adjacent vegetation immediately abuts the stream, with no riparian area. Other stretches of the Whetstone River have steep banks that drop nearly vertically to the streambed, leaving an abrupt change from upland vegetation to the stream itself, with no riparian transition.

4.4.6.1 Revised Proposed Action

Well Drilling and Installation Construction

In accordance with additional mitigation measure W-3, well drilling, and well installation activities within the groundwater areas would not occur within wetland/riparian areas.

- **W-3.** The drilling and installation of wells would avoid wetland/riparian areas.

With implementation of additional measure W-3, no impacts to wetland/riparian areas are expected to occur during the additional proposed well drilling and installation activities conducted within the expanded groundwater area.

Pipeline Construction

Impacts to wetlands from pipeline construction include the loss or reduction of jurisdictional and isolated wetland or riparian areas or a decline in wetland or riparian community functionality. The National Wetland Inventory (NWI) provides information on the types and size of wetlands in the groundwater areas. Based on this information, the proposed pipelines can be routed to avoid most wetlands. Therefore, disturbance to wetland/riparian areas during proposed pipeline construction is likely to be small. Any wetland crossed by the proposed pipeline corridors would be delineated to determine the amount of wetlands impacted. The USACE reviews each crossing to determine the appropriate wetland approval. Because of the small amount of wetlands or riparian areas impacted by pipeline construction activities, USACE Nationwide Permits would most likely apply to crossing locations. These impacts would also be temporary, since the original ground contour would be restored after the installation of the pipeline. Mitigation for jurisdictional wetlands would be required as part of the Clean Water Act (CWA) Section 404 permit issued by the USACE or under a nationwide permit administered by USACE.

The Co-owners would maintain sound water and soil conservation practices during proposed pipeline construction activities to protect topsoil and adjacent water resources and minimize soil erosion in accordance with SMMs Land-9, Bio-3, and Water-2 thru Water-10. By avoiding sensitive wetland and riparian communities and implementing mitigation in accordance with USACE requirements, construction and operation impacts associated with the proposed pipeline would be minimized. Following the implementation of the SMMs, no significant impacts are expected as a result of construction and operation of the proposed pipelines.

Indirect loss of wetlands and riparian areas include the alteration of local drainage patterns, degradation of water quality, erosion and sedimentation, and the introduction of invasive plant species

or creation of conditions that favor these species. There would be no alteration of local drainage patterns, because pre-construction ground contours would be restored, in accordance with SMM Geo-5. Water quality and erosion and sedimentation impacts can be eliminated through the implementation of SMM Water-2 during construction to control the amount and quality of runoff. However, introduction of invasive plant species is possible because of the disturbance of the ground and the prevalence of invasive species along the proposed pipeline route. Invasive species would be minimized in accordance with SMM Bio-5 and additional mitigation measure V-1 (described in Section 4.4.2.1 of the Draft EIS). With implementation of the SMMs noted above, indirect loss of wetland/riparian areas from proposed construction and operation would not be significant.

Electricity Distribution to Wells

Construction activities associated with the erection of proposed utility poles and stringing of line for electricity distribution to wells would avoid direct impacts to wetland/riparian areas. In accordance with SMM Bio-3, wetland/riparian areas in the path of the proposed distribution lines would be spanned, to the extent possible. Therefore, no impacts to wetland/riparian areas would occur due to construction of the proposed electricity distribution network.

Well Operations

The impacts to wetlands by proposed groundwater pumping were evaluated during groundwater modeling. The impact evaluation (see Section 4.4.1) identified wetlands within an area in which the modeling indicates a minimum water table drawdown of 1.6 feet. These wetlands were further studied for their contact with groundwater. The evaluation identified 133 wetlands totaling 218.6 acres in the ground water modeling area. Historical FSA aerial photographs of the wetlands in the area show the variability in area and estimated hydrology of wetlands during wet and dry years. The FSA aerial photos suggest that many of the wetlands in the area dry down during periods of drought, to the point where they are farmed for a period of years until drought conditions ease.

Based on the results of the proposed well drilling activities (discussed in Section 3.2), it is known that some areas where proposed groundwater production wells could be placed would encounter shallow water table conditions in the unconfined Veblen Aquifer. Groundwater pumping would form a cone of depression at the surface of the water table of unconfined portions of the Veblen Aquifer in the vicinity of the proposed pumping wells. Wetlands with little or no clay beneath them may be in greater hydraulic contact with the water table. Changes in the water table level are more likely to manifest themselves in these wetlands.

The 133 wetlands were evaluated for their water regimes (i.e., a qualitative measure of their tendency to be flooded), the thickness of clay layers beneath the basins and USACE jurisdiction. Of the 133 wetlands, there are 24 wetlands (comprising 77.4 acres) underlain by little or no clay which could be influenced by changes in the water table level. For these 24 wetlands, proposed groundwater pumping could shift the water regime to one with a shorter period of surface water (e.g., seasonally flooded wetlands may potentially become temporarily flooded wetlands) and more accelerated dry down could occur later in the growing season. Of the 22 wetlands that may be under USACE jurisdiction, 15 are above thick clay layers and are therefore not likely to be affected by groundwater pumping. Seven other wetlands that may be under USACE jurisdiction, totaling 26.1 acres, are above thin clay layers and may have their annual variations in water level altered by groundwater pumping.

The effects to wetlands from proposed pumping of groundwater could be minimized by periodic storms and/or seasonal wet cycles. Conversely, periods of drought would increase the effect of

proposed groundwater pumping on wetlands with a hydraulic connection to the water table. Groundwater pumping would not cause these wetlands to be lost or permanently de-watered.

4.4.6.2 Alternative 3

The construction impacts and mitigation measures associated with wetland/riparian areas for Alternative 3 would be the same as the Revised Proposed Action. The impacts to wetlands by proposed groundwater pumping under Alternative 3 were evaluated in a similar manner as discussed for the Revised Proposed Action.

There are 38 wetlands totaling 101.3 acres in the 1.6-foot minimum drawdown area modeled under Alternative 3. Twenty-two of the 38 wetlands totaling 76 acres (58 percent of the total) are over areas of thin clays and are therefore in hydraulic contact with groundwater. Under the Revised Proposed Action, only 24 of 133 wetlands (18 percent) in the minimum drawdown area are in hydraulic contact with groundwater.

Seven of the 38 wetlands evaluated under Alternative 3 may be under the jurisdiction of the USACE. One wetland is perched above thick clay layers and is therefore not likely to be affected by proposed groundwater pumping. Six wetlands, totaling 23.6 acres, are above thin clay layers and proposed groundwater pumping may affect their annual variations in water level altered.

4.4.6.3 Summary of Impacts to Wetland/Riparian Areas

Under both the Proposed Action and Alternative 3 there are wetlands that may have hydraulic contact with groundwater (i.e., not perched over clay). In these wetlands, proposed groundwater pumping could shift the water regime to shorter periods of shallow surface water (e.g., seasonally flooded wetlands may become temporarily flooded wetlands) and more accelerated dry down could occur later in the growing season. The number and area of wetlands that could experience a shift in the frequency and degree of wetness is approximately equal for both the Proposed Action and Alternative 3. However, in Alternative 3, the proportion of wetlands in which the frequency and degree of wetness may change is higher. Table 4.4-2 summarizes wetland impacts for the alternatives.

Table 4.4-2. Comparison of Wetlands in Contact with Groundwater

Alternative	No. of Wetlands[a]	Total Area (acres)	No. of Wetlands in Contact with Groundwater[b]	Area (acres)
Revised Proposed Action	133	218.6	24	77.4
Alternative 3	38	101.3	22	72.6

[a]The number of wetlands in the 1.6-foot minimum drawdown area modeled for the Alternative.
[b]As determined by the depth of clay layers beneath the wetlands. Wetlands above thin clay are in potential contact with groundwater; wetlands above thicker clays are not.
Source: Barr, 2007k

Wetlands where the water regimes may be shifted by proposed groundwater pumping would not be lost or permanently de-watered by groundwater pumping. There would be no loss of wetland or riparian areas and no degradation or loss of any Federal- or State-protected wetlands as defined by Section 404 of the CWA or other applicable regulations. There would be no indirect loss of wetland or

riparian areas caused by degradation of water quality, diversion of water sources or erosion and sedimentation resulting from altered drainage patterns.

Under both the Revised Proposed Action and Alternative 3, reductions in the flow of the Whetstone River from proposed groundwater pumping (see Section 4.2.4.1) would be less than significant and would represent only a small fraction of the river's flow. This would result in no reduction of or adverse impact to riparian areas.

Following the implementation of the SMMs and permitting procedures of the USACE, no significant impacts to wetland/riparian areas would occur from the proposed well installation, pipeline construction, and electrical distribution line construction activities.

4.5 Cultural Resources

4.5.1 Introduction

This section presents potential impacts of the alternatives to archaeological and historical resources. There has been no change in the identified issues, impact assessment methods or significance criteria presented in Section 4.5.1 of the Draft EIS. The cultural resources discussion for the Revised Proposed Action and Alternative 3 are the same.

A Programmatic Agreement (PA) has been developed for the proposed Project in accordance with the stipulations of Section 106 of the National Historic Preservation Act (NHPA). The PA (Western, 2006c) was developed by Western and was completed after consultation with the Minnesota and South Dakota State Historic Preservation Officers (SHPO), the Co-owners, interested tribes, cooperating agencies, and other interested parties. Western, the South Dakota and Minnesota SHPOs, and other interested parties have signed the PA; it went into effect on January 9, 2007. Western is currently working with Tribal Historic Preservation Officers to include tribal values in the PA through ongoing consultation meetings. The PA would apply to either alternative.

The PA outlines the steps to be taken to identify cultural resources and to: evaluate them to determine eligibility for listing on the National Register of Historic Places (NRHP); identify potential adverse effects; to develop measures to avoid, reduce or mitigate adverse effects; and address inadvertent discoveries of cultural and paleontological resources. It also assigns roles and responsibilities for implementation of the PA, which ensures that all interested parties are involved in decisions regarding the treatment of historic and traditional cultural properties (TCPs) that may be affected by the proposed Project.

4.5.2 Historical and Archaeological Resources Impacts

The proposed Project would be completed in accordance with the PA. By following the procedures outlined in Section 106 of the NHPA and the PA, adverse impacts, e.g., damage to, or loss of, archaeological and historic resources eligible for inclusion in the NRHP, would be avoided or mitigated. Unavoidable impacts to NRHP-eligible sites would be mitigated through implementation of a treatment plan in accordance with the PA. The proposed Project is not located on any Native American lands. An ethnographic study is being performed by tribal members to identify TCPs within the area of the proposed Project.

In those instances where site avoidance is the agreed mitigation, activities within the expanded groundwater area and the proposed plant site would be monitored or sites flagged to prevent inadvertent destruction of cultural resources. Additionally, well drilling and construction crews would be monitored to the extent possible to prevent vandalism or unauthorized removal or disturbance of cultural artifacts or materials in accordance with SMM Cult-2.

Appropriate mitigation measures for protection of cultural and historical resources are included in the PA. Impacts to NRHP-eligible sites would not be significant with implementation of the PA and SMMs.

4.6 Land Use

4.6.1 Introduction

This section discusses the impacts of activities within the groundwater areas related to land use. There has been no change in the introductory remarks, identified issues, impact assessment methods or significance criteria presented in Section 4.7.1 of the Draft EIS. The discussion of land use is the same for the Revised Proposed Action and Alternative 3, since the same number of wells would be required. Acreages of land use impacts are the same as acreages of affected vegetation found on Table 4.4-1.

The proposed well drilling and installation activities, pipeline and electrical distribution line construction, and groundwater production activities would require land use-related action, and approvals or permits for construction and operation, including a Water Appropriation Permit issued by the SDDENR.

The assumptions for acreage calculation for land use impacts associated with the transmission lines are listed below:

Short-term disturbances:

- A 20-foot wide construction zone would be required for proposed pipeline construction, with an estimated requirement of 80,000 linear feet.
- A 30-foot wide construction zone would be required for construction of proposed electricity distribution lines, with an estimated requirement of 43,300 linear feet.

Long-term disturbances:

- Each proposed well site would have a pre-engineered 10-foot by 15-foot pumphouse building surrounded by a 50-foot by 50-foot fence.
- All proposed access roads from the county roads to the proposed well sites would be 50 feet long and 12 feet wide, except two, which would be about 1,300 to 1,700 feet long.

Additional assumptions are listed below:

- All proposed wells would be drilled up to 300 feet deep in agricultural areas or uncultivated pastureland at the edge of farm fields. Drilling and installation of proposed wells would avoid wetland/riparian areas.

- To the extent possible, construction of the proposed pipelines and electrical distribution lines would occur within road ROWs.

4.6.2 Land Use Planning

For the Revised Proposed Action, a total of 24.5 acres at the proposed plant site would have long-term land use impacts for construction of the proposed plant. This would be on land zoned industrial that has already been disturbed by construction of the existing Big Stone plant. The construction laydown and parking areas would require 80.1 acres of short-term impacts and 3.0 acres of permanent land use, since the loss of forest and prairie land uses types would be long-term. Land use impacts at the proposed plant site for Alternative 3 would be approximately the same as the Revised Proposed Action because the construction laydown and parking areas would not change, and the construction of the cooling tower and dry towers would be also be in areas previously disturbed by the existing Big Stone plant.

The construction of the proposed groundwater wells, pipelines, and electrical distribution lines would occur in the plant site and expanded groundwater areas. SMM Land-11 requires that all proposed well drilling and installation be completed in agricultural areas or uncultivated pastureland at the edge of farm fields. This would minimize impacts to forest land, prairie, shrublands, open water, or wetland/riparian areas. For the Revised Proposed Action, a total of 1.8 acres of long-term land use impacts to agricultural land and uncultivated pastureland at the edge of farm fields would occur for the construction and operation of the proposed well sites and access roads to the well sites. Proposed groundwater pipeline installation would result in short-term impacts to 3.8 acres of agricultural, 0.9 acres of uncultivated pastureland and 32.0 acres of previously disturbed land within road ROW. Construction of proposed electricity distribution lines to supply electrical power to the well pumps would result in short-term impacts to 2.4 acres of agricultural lands, 3.7 acres of uncultivated pastureland and 23.7 acres of previously disturbed land within road ROW.

Land use impacts for proposed well and pipeline installation for Alternative 3 would be the same as the Revised Proposed Action since the same number and locations of proposed wells would be used for both alternatives.

No zoning changes would be required for the proposed well, pipeline installation, or electricity distribution lines under either alternative.

4.6.3 Public Facilities

No public facilities, such as day care centers, hospitals, or airports, are located within the expanded groundwater area. Section 4.7.2.2 of the Draft EIS describes the public facilities for the proposed plant site.

4.6.4 Recreation

Recreational impacts are the same for the Revised Proposed Action and Alternative 3. Walk-in recreation areas are private lands where hunters can walk in and hunt for game during the appropriate seasons. Because the proposed plant site would be permanently fenced, approximately 80 acres of walk-in recreation land would be unavailable, while 109 acres would be temporarily disturbed during proposed construction. Increases to the work force during proposed well drilling and installation and

pipeline construction would not add a large number of recreational users to the area. Electrical workers installing the proposed electrical distribution line for the well pumping would be local and supplied by the local electrical utility installing the lines. Section 4.7.2.3 in the Draft EIS describes the impacts that could occur from increases in the construction work force of the proposed plant.

The Whetstone River receives recreational use for canoeing and wildlife watching. The currently observed flows over the course of the recreation season (late spring-early fall) would not be noticeably altered by the proposed groundwater pumping. Any reductions in flow and depth resulting from proposed groundwater pumping would be temporary and localized. Groundwater pumping would not affect most of the length of the Whetstone River, so impacts to recreational resources would not be significant. No additional mitigation measures are required.

4.6.5 Agricultural Practices and Prime and Unique Farmland

Agricultural impacts are the same for the Revised Proposed Action and Alternative 3. Construction of the Revised Proposed Action would temporarily disturb 71.5 acres of agricultural land. Construction of the laydown and parking areas comprise 61.8 acres and the remaining 9.7 acres from construction of the proposed groundwater well sites, pipelines, and electrical distribution lines.

Well drilling and installation activities would occur only on agricultural lands and on uncultivated pastureland at the edge of farm fields in accordance with SMM Land-11. Twelve of the proposed 14 well sites lie in soil units designated as prime farmland, or that would be prime farmland if soils were irrigated or drained. Two proposed well sites are in soils with no prime farmland designation. The proposed well sites, access roads, and electrical distribution lines would remove 2.1 acres of prime farmland from production. This loss would be a long-term impact. However, removal of 2.1 acres of prime farmland from the available 5,000 acres in the expanded groundwater area would not be a substantial loss in the region. After the life of the proposed Project, these areas could be reclaimed for agricultural use. In accordance with SMM Land-11, center-pivot irrigation operations would not be impacted by the construction or operation of the proposed well sites, pipelines, or electrical distribution lines.

4.6.6 Summary of Impacts to Land Use

The land use impacts for the Revised Proposed Action and Alternative 3 would not be significant since they do not conflict with local land use policies, goals, regulations, or any designated or planned special use areas. Construction and operation of the proposed groundwater wells and pipelines would not cause an increased demand for recreation activities in the area, result in a substantial loss of prime or unique farmland in the region, or interfere with long-term agricultural productivity. Therefore, there would be no significant land use impacts from construction and operation of the proposed groundwater wells and pipelines.

4.7 Infrastructure, Public Health and Safety, and Waste Management

4.7.1 Introduction

This section presents a discussion of impacts to infrastructure, public health and safety. It also discusses waste management issues associated with development of a new proposed groundwater supply system for the proposed Project. There has been no change in the identified issues, impact assessment methods or significance criteria presented in Section 4.8.1 of the Draft EIS. The discussion for infrastructure, public health and safety, and waste management is the same for the Revised Proposed Action and Alternative 3.

4.7.2 Infrastructure

Impacts to infrastructure for construction and operation of the proposed plant facilities for the Revised Proposed Action or Alternative 3 would be the same as discussed in Section 4.8.2.1 of the Draft EIS. Additional information regarding impacts from construction and operation of the proposed groundwater wells, pipelines, and electric distribution lines are outlined below.

Construction and Operation Impacts

Impact to existing infrastructure may occur associated with construction of the proposed well sites, pipelines, and electrical distribution lines. Impacts to road traffic would occur from movement of vehicles and equipment along county roads. To the extent possible, construction of the proposed pipelines and electrical distribution lines would occur within ROWs. Limited segments of pipeline could be placed outside of these ROW areas or buried in agricultural fields. Some segments of the proposed electrical distribution lines could be buried.

Twelve of the 14 proposed well sites are located close to roads on agricultural land. However, two of these well sites are located further out in agricultural fields, approximately 1,300 feet to 1,700 feet from the county roads. Therefore, in some cases, extensions of the proposed pipelines and electrical distribution network (outside of the road ROWs) would be required to cross agricultural land to power these two well sites. Negotiations with landowners for easements across private properties would be required. Road traffic impacts could occur during a one- to two-month construction period along the road ROWs. These impacts would be short-term, and the increases in traffic would not exceed a level of service established by the local or state transportation management agency.

Underground utilities may exist in road ROWs where construction of proposed pipelines and electrical distribution lines would occur. In accordance with additional mitigation measure W-2, prior to construction of proposed pipeline and electrical distribution lines, appropriate underground utility locating procedures would be implemented to avoid damage to those utilities in accordance with South Dakota requirements. The potential for adverse impacts to existing underground utilities would be minimized through implementation of mitigation measure W-2.

Proposed operations associated with the groundwater areas are anticipated to include occasional visits to well locations, periodic collection of aquifer data from the monitoring wells and nominal maintenance activities. These activities would be infrequent and consistent with activities in the area and would not interfere with any local traffic patterns. Therefore, there would be no significant impacts to infrastructure from operation of the proposed groundwater supply system.

4.7.3 Public Health and Safety

Impacts to public health and safety for construction and operation of the proposed plant facilities for the Revised Proposed Action or Alternative 3 would be the same as discussed in Section 4.8.2.2 of the Draft EIS. Additional information regarding impacts from construction and operation of the proposed groundwater wells, pipelines, and electric distribution lines are outlined below.

Construction and Operation Impacts

Many of the risks and potential exposures to workers discussed in Section 4.8.2.2 of the Draft EIS also apply to proposed well drilling and installation and pipeline and electrical distribution construction activities such as exposures to fugitive dust and noise, welding, and painting activities. Implementation of additional mitigation measure PH-1 would require incorporation of Occupational Safety and Health Administration (OSHA) standards and would reduce the risk of the proposed construction and operations activities.

Construction activities for the proposed pipelines and electrical distribution lines within road ROWs would expose workers to risks associated with local traffic along the county roads. Adverse impacts from accidents and traffic risks to workers would be minimized if additional mitigation measure W-2 were adopted.

4.7.4 Hazardous Materials and Waste Management

Construction and operation of the Revised Proposed Action or Alternative 3 would have the same impacts and mitigation as described in Section 4.8.2.3 of the Draft EIS. Construction of the proposed well sites, pipelines, and electrical distribution line could result in accidental spills of oils, chemicals, and other fluids that may impact soils and water resources. Adherence to applicable regulations and best management practices would reduce the likelihood of a significant spill or release. To avoid potential spills during pipeline construction, additional mitigation measure W-2 would require the drilling contractor to prepare a Spill Prevention and Response Plan and the pipeline construction contractor to prepare a Pipeline Construction Work Plan to address the use of regulated substances and spill response. The potential for adverse impacts from spills would be minimized if additional mitigation measure W-2 were adopted.

Solid wastes (including hazardous wastes) generated during construction and operation activities would be managed and disposed of according to applicable regulations (SMM Gen-1), which would reduce the likelihood for adverse impacts to human health and the environment.

4.7.5 Summary of Impacts to Infrastructure, Public Health and Safety, and Waste Management

Less than significant impacts to traffic conditions could occur during movement of drilling equipment and other construction materials to the proposed well sites and during proposed pipeline construction

activities along the ROWs close to roads. However, none of these activities would cause increases in traffic that exceed the level of service established by the local or state transportation management agency. None of the proposed activities within the groundwater areas would create road dust or severe road damage at levels to create hazardous situations for motorists and pedestrians. Potential impacts to existing underground utilities in road ROWs where proposed pipelines and electric distribution would be installed would be avoided by implementing mitigation measure W-2.

The risks for exposures of workers during construction of proposed wells, pipelines, and electrical distribution lines would not be significant with implementation of additional mitigation measures PH-1 and W-2, which would require contractors to take appropriate actions to prevent risks to workers. Impacts to public health and safety associated with constructing and operating the Revised Proposed Action or Alternative 3 would be less than significant.

With implementation of standard mitigation measures and additional mitigation measure W-2, proposed construction activities would not result in improper disposal of solid or sanitary wastes or spills, and impacts from releases of hazardous materials, regulated substances or oil would be minimized. These activities would not cause a significant impact due to hazardous material and waste management practices.

4.8 Visual Resources

The visual resource impact assessment for activities associated with construction of the proposed plant and ancillary facilities presented in the Revised Proposed Action or Alternative 3 would be the same as presented in Section 4.9.2 of the Draft EIS. This is because, although certain facilities have shifted, the overall profile of the proposed plant is not substantially different than that proposed in the Draft EIS. There have been no changes in the impact assessment methods or significance criteria presented in Section 4.9.1 of the Draft EIS. This section discusses the visual impacts associated with proposed groundwater production well installations and the electrical distribution lines within the groundwater areas of the proposed Project. Installation of the proposed pipelines would not be a long-term impact to visual resources. The discussion of impacts to visual resources is the same for the Revised Proposed Action and Alternative 3.

Visual impact considerations discussed in this Supplemental Draft EIS include proposed installation of the 7 to 14 groundwater production wells and associated buildings, fences, pipelines, and electrical distribution lines proposed under the Revised Proposed Action or Alternative 3.

The Visual Resource Management (VRM) classes within the groundwater areas at the plant site are the same as those described in Section 4.9.2 of the Draft EIS. VRM Class II areas are along portions of U.S. Highway 12 and along the Whetstone River valley tributaries. Areas of interspersed farmsteads, tree groves, and croplands were designated as Class III areas. Areas of unvegetated residential, commercial, and industrial development, open croplands, and background viewing situations were designated as Class IV. Any proposed wells, pipelines, electrical distribution lines, and buildings installed in the expanded groundwater area would be located on either VRM Class III lands at the edge of agricultural fields or within Class IV lands.

Installation of the proposed groundwater wells in the rural area would involve temporary drilling equipment for a few days. The proposed pipeline installation would also involve heavy equipment for installation, but this would also be temporary. Permanent facilities at the proposed wells sites would be limited to a small pumphouse building and fencing. The proposed electric distribution lines

required for the electric interconnection of the well sites would be of similar design and height as the existing distribution lines that serve rural farm houses in the area.

No significant long-term additive impacts would result from the proposed well installations, pipelines, buildings, fences, and distribution lines; and no substantial degradation to scenery resources of the Class II, III, or IV landscapes would occur. No substantial degradation of the foreground character or scenic quality of a visually important landscape would occur. No substantial dominant visual changes would occur due to construction of the well-associated facilities. Visual impacts associated with proposed well and building installations within the groundwater areas would be less than significant. No additional mitigation measures are required to lessen impacts from the wells, buildings, fences, or distribution lines.

4.9 Noise

This section discusses noise impacts that would result from proposed well drilling and installation, pipeline construction, construction of electrical distribution lines and groundwater production activities associated with the proposed Big Stone II Project. The discussion of identified issues, impact assessment methods and significance criteria presented in Section 4.10.1 of the Draft EIS are applicable to this Supplemental Draft EIS. With the exception of the additions below, the noise impacts originating from construction and operation of the proposed plant and related activities are the same as those described in Section 4.10 of the Draft EIS. The discussion of noise impacts is the same for the Revised Proposed Action and Alternative 3.

Well Drilling and Installation Impacts

Noise impacts associated with well drilling would largely be associated with the drilling rigs and pumping equipment. Gasoline or diesel engines would be used to power the equipment needed to drill the proposed wells and perform pump testing, resulting in minor noise from internal combustion engines. These activities are short-term in nature and would not exceed any noise regulations.

Pipeline Construction

Noise impacts associated with proposed pipelines would largely be limited to construction activities. Proposed construction activities would include trenching and covering the piping after its placement in the trench. Gasoline or diesel engines would be used to power the trenching equipment, resulting in minor noise from internal combustion engines. These activities are short-term in nature and would not exceed any noise regulations.

Groundwater Production Impacts

Noise from the operation of the proposed wells would be limited to the pump motor, which would be inside a small building surrounding the well. With the pump noise attenuated by the buildings, there would be no substantial increase in the ambient noise levels in the groundwater areas.

Adverse impacts from noise would be minimized by the adoption of additional mitigation measure N-2.

- **N-2.** If noise complaints are received from local area residents during construction or operation of the groundwater activities, the Co-owners would work with the local resident(s) to mitigate their complaints.

Summary of Impacts

The proposed well drilling and installation, pipeline and electrical distribution line construction, and groundwater production activities are not expected to exceed any local, State, or Federal noise regulations or guidelines at sensitive receptors. However, in order to assure that noise impacts are less than significant, if adopted, additional mitigation measure N-2 would be implemented.

4.10 Social and Economic Values and Environmental Justice

4.10.1 Introduction

This section discusses the impacts to social and economic values and to environmental justice populations associated with the activities for the Revised Proposed Action and Alternative 3. Impacts to social and economic values and environmental justice for the construction and operation of the changes in the Revised Proposed Action or Alternative 3 are the same as for the plant site in Section 4.11 of the Draft EIS. The discussion of social and economic values and environmental justice is the same for the Revised Proposed Action and Alternative 3. Additional information is provided for the expanded groundwater area.

4.10.2 Social and Economic Values

The proposed groundwater activities (i.e., well drilling and installation, pipeline construction, and construction of electrical distribution lines) within the groundwater areas would require specialty contractors for construction activities. This work would be short-term (about one to two months in duration) and would require local accommodations and food services. However, there would be no excessive burdens placed on local services, since the activities would be short-term. Since the proposed construction activities would take place in rural areas, there would be no dislocation of any businesses or residences. Land owners would be compensated for any loss of land that would occur due to proposed construction and operation of the groundwater activities. Therefore, no significant impacts to social and economic values in the region are anticipated due to these activities.

Summary of Impacts

The proposed groundwater activities would not:

- Cause excessive burdens on local services.
- Permanently displace or cause long-term economic losses to existing residences or businesses.
- Cause permanent loss of work for any sector of the community, or divide any established communities.

Minor economic benefits to the community may occur due to contractors using local services for one to two months, but the effects would not be substantial.

4.10.3 Environmental Justice

The discussion in Section 4.11.2.2 of the Draft EIS regarding environmental justice is also applicable to the revisions presented in this Supplemental Draft EIS. There would be no differences between the Revised Proposed Action and Alternative 3.

4.11 Cumulative Impacts

The discussion of cumulative impacts found in Section 4.12 of the Draft EIS is still applicable to this Supplemental Draft EIS, with the addition of following discussion of cumulative impacts from the use of groundwater and construction of the groundwater wells, pipelines, and electrical distribution lines for the proposed Project.

Groundwater

This section discusses the impacts to the groundwater resources from past, present, and reasonably foreseeable future uses of the Veblen Aquifer. As described in Section 3.2.2, there are several permitted users of the Veblen Aquifer in Grant County, including commercial and industrial users, municipalities, and irrigation permits holders. While farmers are allowed to draw two afy, records indicate that the actual water used is only two to 20 percent of this, depending on yearly precipitation. Most of the surrounding domestic area uses municipal or rural water distribution systems.

Actual water level information available for Veblen Aquifer wells was used to calibrate the groundwater modeling for the proposed Project; and therefore reflects the past and present effects of groundwater pumping from the Veblen Aquifer. The proposed Project's pumping would only affect a small portion of the Veblen Aquifer — an area about six miles in diameter within the expanded groundwater area (see Figure 4.2-2). Under the Revised Proposed Action, maximum drawdown caused by the proposed Project's pumping is estimated to be approximately 37 feet for that area.

Records of actual water usage for the municipal, industrial, and commercial users are not available. However, yearly irrigation records are collected by the SDDENR. The SDDENR independently reviewed the Co-owner's groundwater application and issued a report with the following findings (SDDENR, 2007b).

- The average annual pumpage reported from the Veblen Aquifer for irrigation was 819.3 afy between 1979 to 2005.
- Total average withdrawal from all uses of the Veblen Aquifer in Grant County is presently expected to be less than 1,000 af annually.
- With the addition of the proposed plant's anticipated groundwater use of approximately 3,700 afy, the cumulative impact of withdrawals would be 4,700 afy.
- An average annual recharge rate of 0.34 inches per year would be adequate to balance withdrawals of 4,700 afy. This recharge rate is likely far less than the average annual recharge to the aquifer.
- The additional appropriation proposed by the Co-owners' application would not adversely impact existing water rights.

SDDENR maintains a website for the Water Rights Program that provides information on pending applications to appropriate water. According to the SDDENR website (SDDENR, 2007a), there are no other future groundwater appropriation projects pending within or near the groundwater areas. The list of past, present, and future projects presented in the Draft EIS that would use groundwater are not located in the groundwater areas. Therefore, the reasonably foreseeable cumulative impacts associated with the use of groundwater would be the proposed Project and the current water users. By implementing standard and additional mitigation measures and permit requirements, the proposed Big Stone II Project, when added to past, present, and reasonably foreseeable future actions, is not expected to result in significant cumulative impacts to groundwater resources.

Biological Resources

The discussion of cumulative impacts for biological resources found in Section 4.12 of the Draft EIS is still applicable to this Supplemental Draft EIS for the Revised Proposed Action or Alternative 3. This section provides additional discussion of the effects of reductions in groundwater levels from past, present, and reasonably foreseeable future uses on biological resources in the expanded groundwater area. It also discusses the cumulative impacts to biological resources from construction and operation of the groundwater well sites, pipelines, and electrical distribution lines. The biological resources considered are vegetation, wildlife and fisheries, special status species, and wetlands and riparian areas.

Vegetation

Over the past century, artificially maintained vegetation communities, specifically row-crop agriculture and non-native dominated pasturelands, have increasingly dominated vegetation in the expanded groundwater area. These vegetation types currently account for over half of the area. The majority of this vegetation cover receives water from precipitation and early spring snowmelt. A minor portion of the agricultural land has center-pivot irrigation drawing on local wells. Wooded areas and native prairies are primarily dependent on precipitation and spring snowmelt.

The impact of lower groundwater levels within the expanded groundwater area would have a negligible effect for the reasonably foreseeable future on vegetation in the area. The localized and episodic occurrence of groundwater reduction, coupled with the minimal dependence of local vegetation on groundwater, would not result in significant changes to the composition or quality of existing vegetation communities.

Construction and operation of the proposed Big Stone II plant would result in the removal of approximately 6.8 acres of vegetation within the plant vicinity and expanded groundwater areas. Approximately 2.4 acres would be in agricultural areas. Because the make-up water storage pond would not be constructed under the Revised Proposed Action or Alternative 3, cumulative vegetation loss would be 15.3 acres. This is a decrease of 503.7 acres from the cumulative vegetation loss for the Proposed Action presented in the Draft EIS. Because the proposed Project is located in a rural area and the losses are less than one acre per proposed well site, the proposed Project, when added to past, present and reasonably foreseeable future actions, is not expected to result in significant cumulative impacts to vegetation resources.

Wildlife and Fisheries

Small and large game animals and fur-bearing mammals dominate the past wildlife in the proposed Project area. Nearby larger lakes have been and continue to be important stopover areas for migratory

waterfowl. For upland wildlife, no significant cumulative impacts are expected from the proposed Big Stone II Project, when added to past, present, and reasonably foreseeable future actions.

Fisheries in the groundwater areas are currently dominated by species in the Whetstone River considered rough fish (buffalo, suckers, redhorse, and carp). It is likely that the composition of fish populations in the river included more sport fish in the past, including northern pike, smallmouth bass, and walleye. These species have declined with increased agricultural use and grazing, and the consequent reduction in water quality and shading of the river.

The Whetstone River is dominated by runoff of rainfall and snowmelt. Highest flows average 110 cfs and have occurred over the past 70 years between the months of April and July. Groundwater inflows during the peak flow periods have typically averaged less than 2 percent of the Whetstone River flow. Groundwater flows contribute a greater portion of the river's flow only during January and February, which currently and historically have been low-flow periods (less than two cfs). Fish populations in the Whetstone River currently and historically exist within this annual cycle of winter low flow and spring-summer high flow. Aquatic and semi-aquatic wildlife that use the Whetstone also currently and historically exist within this annual cycle.

The potential reduction of groundwater input to the flow of the Whetstone River, both from the proposed Project and continued existing uses of groundwater, would have a negligible effect for the reasonably foreseeable future on fisheries and aquatic wildlife in the area. This is because the contribution of groundwater to the Whetstone River flow is minor during periods of high flows. Moreover, flows in the reasonably foreseeable future would not be significantly lower than the current low flows observed during the winter.

Special Status Species

There are relatively few records of special status species in the groundwater areas due to the historical trend in the area of converting prairie and wooded areas to agricultural and pasture use, which has resulted in limited habitat for special status species. The only Federally listed species that could occur in the area that would use wetlands is the western prairie fringed-orchid. The only state-listed species known in the area that uses the Whetstone River is the northern river otter.

If other special status species are present but undocumented, the impact of the proposed Project would depend on the specific habitat required by a given species. Upland special status species in the groundwater areas currently and historically have had no dependence on groundwater. Those special status species which use the Whetstone River or wetlands within the groundwater areas have only a minimal dependence on groundwater inputs to those habitats, because both the Whetstone River and local wetlands receive water primarily from surface runoff in the form of precipitation and spring snowmelt. Those species which use the Whetstone River have life cycles adapted to the current and historical annual variation in the river's flow. Similarly, special status species that use local wetlands are adapted to the current and historical seasonal variation in the hydrological regime of the wetlands.

The potential reduction of groundwater input to the flow of the Whetstone River and local wetlands, both from the proposed Project and continued existing uses of groundwater, would have a negligible effect for the reasonably foreseeable future on special status species in the area. This is because groundwater contribution to the Whetstone River during the peak flow period is minor, and reductions would not significantly reduce flows. In addition, most wetlands within the groundwater areas are isolated from groundwater by thick clay deposits. In wetlands over thinner clay deposits, groundwater

reduction may reduce the wetlands' periods of saturation or inundation, but would not result in the loss of wetlands. Moreover, the general annual pattern of early season wetness and later summer drying would continue.

By implementing standard and additional mitigation measures and Section 7 consultation requirements, the proposed Big Stone II Project, when added to past, present and reasonably foreseeable future actions, is not expected to result in significant cumulative impacts to special status species.

Wetlands/Riparian Areas

Wetlands in the groundwater areas currently and historically have received water primarily from surface water runoff of precipitation and snowmelt. Wetlands in the area have also gone through longer-term cycles of prolonged dryness during drought periods and excessive wetness during years of above-average precipitation. Groundwater may contribute to some of the wetlands in the area, but the contribution is small relative to the surface water input. In addition, many of the wetlands in the area are isolated from contact with groundwater by thick clay deposits.

The potential reduction of groundwater input to local wetlands, both from the Revised Proposed Action and continued existing uses of groundwater, would have a negligible effect for the reasonably foreseeable future on wetlands in the groundwater areas. As noted above, most wetlands within the groundwater areas are isolated from groundwater. Wetlands in better contact with groundwater may be inundated or saturated for a shorter period near the end of the growing season, but would nevertheless remain and function as wetlands.

By implementing standard and additional mitigation measures, permits, and Section 7 consultation requirements, the proposed Big Stone II Project, when added to past, present and reasonably foreseeable future actions, is not expected to result in significant cumulative impacts to wetland or riparian resources.

Summary of Cumulative Impacts to Biological Resources

By implementing standard and additional mitigation measures and permit requirements, the proposed Big Stone II Project, when added to past, present, and reasonably foreseeable future actions, would not be expected t o result in significant cumulative impacts to biological resources.

OTHER REQUIRED CONSIDERATIONS

CHAPTER 5

5.0 Other Required Considerations

5.1 Unavoidable Adverse Environmental Impacts

Unavoidable adverse environmental impacts are those that would occur from constructing and operating the proposed Project after implementing standard and additional mitigation measures. Using groundwater as the back-up water supply for the proposed Project would not require construction of additional on-site storage, and impacts associated with the 450-acre make-up water storage pond would be eliminated. Additionally, the 25-acre cooling tower blowdown pond has been eliminated. Except for those impacts associated with the make-up water storage pond and the cooling tower blowdown pond, the unavoidable adverse environmental impacts of the proposed Project are the same as those described in Section 5.1 of the Draft EIS with the exceptions and additions described below.

Water Resources

The 450-acre make-up water storage pond described in the Draft EIS would have removed about 0.8 square mile of contributing watershed area from the Whetstone and upper Minnesota River drainages, including 65 acres of wetlands. With elimination of the make-up water storage pond, elimination of the cooling tower blowdown pond and relocation of the cooling tower, these impacts to wetlands and runoff within the watershed of the pond would not occur. The Revised Proposed Action or Alternative 3 would not result in any unavoidable adverse environmental impacts to watersheds or wetlands.

Based on the proposed water requirements of the Revised Proposed Action, operation of the proposed Big Stone II plant would require an additional 8,800 acre-feet per year (afy) of fresh water from Big Stone Lake. Water use modeling estimates that surface water appropriations from Big Stone Lake would require supplementation of approximately 3,720 afy of groundwater to meet combined plant needs under average annual conditions. If restrictions of withdrawal of surface water from Big Stone Lake occurs for a one-year period, groundwater consumptive use could rise to about 10,000 acre-feet using wet cooling under the Revised Proposed Action and about 7,300 acre-feet using wet/dry cooling under Alternative 3.

Soils

Changes from the Proposed Action described in the Draft EIS would reduce permanent soil removal for construction of the proposed plant from 532 acres to 27.5 acres. Under either the Revised Proposed Action or Alternative 3, an additional 12 acres of long-term impacts to soils would occur that are associated with construction and installation of groundwater production wells, ancillary facilities, electrical distribution line, and the pipeline to carry the groundwater from the wells to the plant. The 12 acres impacted would occur primarily in previously developed areas.

Biological Resources

Since the make-up water storage pond and the cooling tower blowdown pond would not be constructed, vegetation losses for construction of the proposed plant would be reduced to three acres.

About 12 acres of vegetation and soils would be disturbed during well and pipeline installation associated with groundwater activities, almost all of these areas would be re-seeded and restored.

Land Use

Conversion of 414 acres of land from agricultural use to commercial use in the Draft EIS would not occur due to elimination of construction of the make-up water storage pond and the cooling tower blowdown pond at the proposed plant site. Without construction of the make-up water storage pond and the cooling tower blowdown pond, unavoidable loss of prime and unique farmland would be reduced from 328 acres to 62 acres at the proposed plant site. Under either the Revised Proposed Action or Alternative 3, construction activities associated with the groundwater wells would affect 2.1 acres of prime farmland.

5.2 Short-term Uses of the Environment and Long-term Productivity

The Council on Environmental Quality regulations stipulate that the EIS include a description of "…the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity…" Construction and operation of the proposed Project would have an impact on the environment until the proposed Project components are retired and the land is reclaimed. Construction and operation of the proposed Project are considered short-term uses of the environment for this discussion. Long-term productivity refers to the sustainability of the affected resources. With the exceptions noted below, there are no changes to the relationships described in Section 5.2 of the Draft EIS.

- Since construction and operation of the make-up water storage pond and the cooling tower blowdown pond would not occur, there would be no long-term loss of productivity of wetlands in these areas. Additionally, long-term loss of wetlands would also be avoided associated with the cooling tower being moved to a new location.
- Construction of the proposed Project would permanently alter the long-term productivity of impacted prime and unique farmlands at the proposed plant site, as described in the Draft EIS. Impacts to prime and unique farmlands at the well sites would be short-term uses, as these sites could be reclaimed.

5.3 Irreversible/Irretrievable Commitment of Resources

With one addition, the irreversible or irretrievable commitment of resources is the same as those described for the Proposed Action within Section 5.3 of the Draft EIS.

Installation of the groundwater production field is a commitment to use these groundwater resources as a back-up to the surface water supply for the Revised Proposed Action. The consumptive use of groundwater is a loss of an irretrievable resource.

CONSULTATION AND COORDINATION

CHAPTER 6

CHAPTER 6
CONSULTATION AND COORDINATION

6.0 Consultation and Coordination

This chapter summarizes the consultation and agency coordination efforts undertaken in association with this Supplemental Draft EIS.

6.1 Consultation

Consultation and coordination with the U.S. Fish and Wildlife Service (USFWS), South Dakota and Minnesota State Historic Preservation Offices, and U.S. Army Corps of Engineers (USACE) continued throughout development of the Supplemental Draft EIS. Western submitted a draft of the Biological Assessment to USFWS for the proposed power plant in September 2007. The Biological Assessment for the transmission portion of the proposed Project is on hold pending outcome of the Minnesota Public Utility Commissions' decision concerning the High Voltage Transmission Line Route Permit.

Western participated in an informational meeting with several tribes on March 9, 2007, in Hankinson, North Dakota, to discuss the proposed Project and inform tribal members of groundwater exploration activities. Western held a government-to-government consultation meeting with the Sisseton-Wahpeton Tribal Council on June 20, 2007, and with the Upper Sioux Tribal Council on August 8, 2007. Information from these meetings will be incorporated into the Final EIS.

Western also completed consultation with the South Dakota and Minnesota State Historic Preservation Offices (SHPOs) concerning the Programmatic Agreement (PA) for compliance with Section 106 of the National Historic Preservation Act. Western and the SHPOs signed the PA between November 2006 and January 2007, validating the PA. Other interested parties including Otter Tail Power, USACE-Omaha District, and the South Dakota Public Utilities Commission, have also signed the PA. Three meetings were held between Western and Tribal Historic Preservation Officers and tribal members in April, May, and June 2007 concerning consultation for National Historic Preservation Act compliance. Information from these meetings will be incorporated into the PA for the proposed Project and the Final EIS.

6.2 Agency Coordination

The proposed development of the Big Stone II Project requires multiple state and Federal permits and approvals. This section provides additional information concerning groundwater permitting requirements for the proposed Project.

Groundwater resources in the state of South Dakota are owned by the people of the state, and as such, are subject to regulation regarding protection from pollution sources and allocation of groundwater for public and private use. The Ground Water Quality Program of the South Dakota Department of Environment and Natural Resources (SDDENR) is responsible for managing South Dakota's groundwater resources. A water appropriation permit, issued by the SDDENR, would be required prior to using any groundwater for the proposed Project. Once a water appropriation is obtained, it

remains effective indefinitely, provided water use is within permit parameters and not forfeited due to nonuse or abandonment.

Otter Tail Power Company, on behalf of the Co-owners, filed an Application For Permit To Appropriate Water within the State of South Dakota on March 28, 2007, for the groundwater resources needed for the proposed Project. A public hearing concerning the permit application was held before the South Dakota Water Management Board on July 11, 2007. The board approved the permit, subject to the conditions proposed in the Chief Engineer's report (SDDENR, 2007b). Conditions of the permit include:

- Protection of domestic water supplies and users having prior water rights.
- Requirements for well construction by licensed well drillers and compliance with other state rules.
- Authorization for a maximum annual withdrawal of 10,000 acre-feet per year (afy) and a total volume beneficial use not to exceed 4,700 afy averaged on a rolling 20-year period (which is also subject to reconsideration by the state regulating agency)
- Certain reporting requirements regarding annual withdrawals.

6.3 List of Government Agencies, Organizations, and Individuals to Receive the Supplemental Draft EIS

The government agencies, organizations, and individuals to receive the Supplemental Draft EIS are provided in Appendix B**.**

6.4 Future Public and Agency Involvement

The public and Federal, state, tribal, and local agencies will be provided the opportunity to comment on the adequacy of the Supplemental Draft EIS during a 45-day public comment review period, which is scheduled for fall 2007. Western will receive written comments by facsimile, e-mail, or postal service mail. A formal public hearing to receive public comment is scheduled at the date and location on the cover sheet for this document; verbal comments will be recorded and transcribed by a court reporter. Responses to the comments received during the public comment period will be included in the Final EIS.

The Supplemental Draft EIS will be available at the following local libraries and DOE Reading Rooms:

Appleton City Library, Appleton, Minnesota
Benson Public Library, Benson, Minnesota
Canby Public Library, Canby, Minnesota
Granite Falls Public Library, Granite Falls, Minnesota
Grant County Public Library, Milbank, South Dakota
Kerkhoven Public Library, Kerkhoven, Minnesota
Morris City Library, Morris, Minnesota
Ortonville Public Library, Ortonville, Minnesota

Watertown Regional Library, Watertown, South Dakota
Willmar Public Library, Willmar, Minnesota
Western Area Power Administration
Upper Great Plains Customer Service Region
South Dakota Maintenance Office
200 4th Street SW
Huron, SD 57350

Western Area Power Administration
Corporate Services Office
12155 West Alameda Parkway
Lakewood, CO 80228

U.S. Department of Energy
Forrestal Building, Reading Room 1E-190
1000 Independence Avenue SW
Washington DC 20585

LIST OF PREPARERS

CHAPTER 7

7.0 List of Preparers

The National Environmental Policy Act (NEPA) requires the Environmental Impact Statement (EIS) be prepared using an interdisciplinary approach. The NEPA evaluation integrates all aspects of the environment, including the natural sciences, social sciences, and environmental design arts. Table 7.1-1 lists the preparers and reviewers who participated in preparing this Big Stone II Power Plant and Transmission Project Supplemental Draft EIS. This Supplemental Draft EIS was prepared under the supervision of Western.

Table 7.1-1. List of Preparers and Reviewers for the Supplemental Draft EIS

Name	Education/Experience	Project Role
Western Area Power Administration – Lead Agency		
Lynn Almer	B.S. Chemistry, Earth Science Master of Natural Sciences 26 years experience	Technical review, water resources, overall review, and coordination
Mary Barger	B.A. Anthropology 27 years experience	Technical review, cultural resources
John M. Bridges	B.S. Zoology M.S. Zoology 32 years experience	Technical review, biological resources, ESA Section 7 consultation
Gary Burton	B.S. Fish Disease Technology 31 years experience	Technical review, fisheries
Joe Giliberti	B.S. Anthropology – emphasis on Archaeology M.A. Anthropology/Archaeology 19 years experience	Technical review, cultural resources
Ken Mathias	B.S. Mechanical Engineering M.S. Geophysics 30 years experience	Technical review, air quality, noise, health and safety, waste management
Erika Medina	B.S., Biochemistry and Biology 2 years experience	Technical review, air quality
Misti Kae Schriner	B.S. Biology 6 years experience	Technical review, biological resources, ESA Section 7 consultation
Robert Scott	MLA, Landscape Architecture & Environmental Planning 33 years experience	Technical review, visual resources
Dirk Shulund	B.S. Environmental Studies MBA Studies 6 years experience	Project Manager
Dave Swanson	B.A. Biological Sciences 30 years experience	Technical and NEPA compliance review
Stephen Tromly	B.S. Resource Conservation M.A. Anthropology with emphasis in Physical Archaeology 17 years experience	Technical review, Native American Concerns

Nancy Werdel	B.S. Mechanical Engineer Master of Urban and Regional Planning 18 years experience	NEPA Document Manager
Rural Utilities Services – Cooperating Agency		
Ayesh M. Abu-Eid, P.E.	Registered P.E. MA, NY, Washington DC M.SC.E.E.-Boston 37 years experience	Technical review
Nurul Islam	Ph. D. Agriculture Project Manager in federal and state governments 35 years experience	Overall review
Dennis Rankin	M.A. Biology 30 years experience	Overall review
U.S. Army Corps of Engineers – Cooperating Agency		
Cheryl Goldsberry	31 years experience	Project Manager, Regulatory Branch, Omaha District
John "Andy" Mitzel	B.S. Abused Land Rehabilitation 6 years experience	Project Manager, South Dakota Regulatory Office
Todd Vesperman	B.S. Natural Resources 9 years experience	Project Manager, Regulatory Branch, St. Paul District
R. W. Beck – Preparers		
Donna Brannan	Technical Editing Certificate Regis University, 2004	Editor
Ivan Clark	B.S. Electrical Engineering 36 years experience	Project Manager, proposed action, description of alternatives, water, noise
Evis Couppis	B.S. Chemical Engineering M.S. Chemical Engineering Ph.D. Chemical Engineering 32 years experience	Air quality
Dale Langan	Project design, AutoCad, and ArcGIS 33 years experience	Geographical Information Systems
Julie Lee	B.S. Civil Engineering 12 years experience	Description of alternatives, accident analysis, water
John McNurney	B.S. General Biology M.S. Environmental Engineering 36 years experience	Biological resources, visual
William Mundt	B.S. Geology 36 years experience	Assistant Project Manager, geology, cultural, land use, infrastructure, waste management, socioeconomics
Rebecca Shiflea	MBA Marketing 17 years experience	Document review, public involvement

Disclosure Statement

Attachment:

National Environmental Policy Act Disclosure Statement for the Environmental Impact Statement for the Big Stone II Power Plant and Transmission Project

The Council on Environmental Quality (CEQ) regulations at 40 CFR 1506.5 (c), which have been adopted by the Department of Energy (10 CFR 1021), require contractors who will prepare an Environmental Impact Statement (EIS) to execute a disclosure specifying that they have no financial or other interest in the outcome of the project. The term "financial or other interest in the outcome of the project" is defined for the purposes of this disclosure in Question 17 of the CEQ guidance "Forty Most Asked Questions Concerning CEQ's National Environmental Policy Act Regulations," (46 FR 18026 – 18038).

> "Financial or other interest in the outcome of the project' includes "Any financial benefit such as promise of future construction or design work in the project, as well as indirect benefits the contractor is aware of (e.g., if the project would aid proposals sponsored by the firm's other clients)."

In accordance with these requirements, R. W. Beck, Inc. (R. W. Beck) hereby certifies that it has no financial or other interest in the outcome of the Environmental Impact Statement for the Big Stone II Power Plant and Transmission Project ("Project"). R. W. Beck provides consulting engineering services on an on-going basis to some of the Project participants and such services do not involve any financial or other interest in the outcome of the Environmental Impact Statement for the Project.

Certified by:

Signature

Ivan L. Clark

Name

Project Manager

Title

October 16, 2007

Date

REFERENCES

CHAPTER 8

8.0 References

In addition to many of the references noted in Chapter 8 of the Draft EIS, the following additional references were used to prepare this Supplemental Draft EIS.

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APPENDIX A
Alternative Screening Process and Results

Alternatives Screening

In evaluating alternatives to support the supply of backup water to the Big Stone II Project, four alternatives were considered:

Alternative 1 – Wet Cooling with Surface Water Back-up

Alternative 2 – Wet Cooling with Groundwater Back-up

Alternative 3 – Wet/Dry Cooling with Groundwater Back-up

Alternative 4 – Dry Cooling with Groundwater Back-up

The Co-owners compared the four alternatives using operating, economic, and environmental screening criteria. Comparisons of operating criteria included net power output, heat rate improvements, and auxiliary power uses. Economic criteria included capital costs differences, chemical cost differences, and net present worth. Environmental criteria included comparisons of water consumption, air emissions, acres of land required, and impact to wetlands.

Operational Criteria

Net power output provides a comparison of the maximum net power that could be produced (in megawatts) by the plant under each alternative as the plant is subjected to average operating climatic conditions. Differences arise due to design requirements, design steam cycle efficiency, and auxiliary power requirements. A higher net power output provides the benefit of more power delivery to the electrical grid under conditions when ambient temperatures are near the annual average.

Heat rate measures how efficiently a generator produces electric energy. It is expressed as the number of British thermal units (Btu's) required to produce a kilowatt-hour of electrical energy. A lower heat rate indicates a more efficient generator. Generators that are more efficient cost less to operate and generate less pollution.

Auxiliary power uses, such as those required for fans for dry cooling, water treatment systems, and water pumps, are drains on net power output. Therefore, more auxiliary power reduces the amount of net power delivered to the electric grid.

Economic Criteria

The Co-owners compared differences in capital costs and operations costs required by each of the alternatives. Operational and capital costs are passed on to consumers through higher rates, and higher electricity rates would not be favorable to the consumer. Analysis of the net present worth (reported in 2007 dollars) allowed the Co-owners to compare the alternatives by projecting costs (capital, operating, and fuel costs) over a defined service life for each alternative. In this case, the lowest net present worth would be the most favored alternative.

Environmental Criteria

The following environmental criteria were evaluated for each alternative:

Consumptive water requirements

Air emissions

Acres of land required

Impacts to wetlands

Often times, there is a direct relationship between operational and environmental criteria; for example, where generator efficiency suffers due to higher heat rate, air emissions would increase as well. The type of cooling selected (e.g. wet vs. dry) is the primary factor determining the amount of water consumption and losses due to evaporation. Land use impact and wetlands impacts are also sensitive to the selection of the source for back-up water (i.e., surface water or groundwater).

Screening Results

Screening was completed based on the comparison of the four alternatives for various operational, cost, and environmental impacts outlined in the screening criteria. Table 1 provides the results of the screening analysis.

Operational Comparison

There is a differential of nine MW of net output among the four alternatives. With respect to heat rate, the higher heat rates (55 Btus to 147 Btus) are unfavorable when compared to the lowest heat rate for Alternative 2 (wet cooling with groundwater back-up). Auxiliary power is least for the base case and Alternative 1. The dry cooling technology in Alternatives 3 and 4 increases auxiliary power requirements compared to the base case. Alternative 1 requires significantly higher auxiliary power to support the water treatment systems (i.e. brine concentrator).

Economic Comparison

The alternative with the lowest capital cost is Alternative 2. Capital costs are approximately $53 million to $84 million higher for the other three alternatives. Differences in chemical costs are the lowest for the dry cooling alternative, since no annual expenses are required for water treatment for cooling purposes. However, when capital costs and annual chemical costs are factored into the net present worth analysis, Alternative 2 is significantly lower compared to the other three alternatives, by approximately $50 million to $82 million.

Table 1 Comparison of Cooling Alternatives and Water Supply Sources

Screening Criteria	Units[a]	Alternative 1 Wet Cooling with Surface Water Back-up	Alternative 2 Wet Cooling with Groundwater Back-up	Alternative 3 Wet/Dry Cooling with Groundwater Back-up	Alternative 4 Dry Cooling with Groundwater Back-up
Performance					
Net Output @ Average Annual Ambient Condition	MW	651	654	658	660
Differential Heat Rate[b]	Btu/kWh	+ 55	Base[l]	+ 147	+ 111
Differential Capital Cost[c]	$	$84,190,000	Base[l]	$53,520,000	$71,770,000
Differential Chemical Costs	$/yr	$1,131,500	$1,934,500	$82,344	Base
Differential Net Present Worth	$	$82,100,000	Base	$50,400,000	$65,000,000
Annual Average Water Consumption					
Losses due to Evaporation:					
Tower	gpm	3,878	3,878	320	0
Make-up Pond	gpm	500	0	0	0
Make-up Water (Surface and Groundwater)	afy	13,817	13,033	7,291	7,065
Auxiliary Power					
Water Treatment Systems Auxiliary Power[d]	kW	6,300	120	90	70
Heat Rejection Auxiliary Power[e]	kW	7,550	7,550	7,955	10,255
Total BSP II Auxiliary Power [f, g]	kW	54,250	50,270	50,515	53,105
Environmental Impacts					
New Land Use Impact[h]	Acres	532	39	39	39
Wetland Impacts[i]	Acres	65	0	0	0
Air Impacts: Air Emission (SO_2, NO_X, CO, PM, Hg & CO_2)[j, k]	%	0.15%	Base[l]	2.28%	2.18%

[a] Megawatts (MW) equal to 1,000 Kilowatts (kW), kilowatt-hour (kWh), British thermal units/ kilowatt hour (Btu/kWh); acre-feet per year (afy); kilowatt (kW); gallons per minute (gpm); sulfur dioxide (SO_2); nitrogen oxides (NO_X); carbon monoxide (CO); particulate matter (PM); mercury (Hg); carbon dioxide (CO_2).

[b] Net Plant Heat Rate at Boiler maximum continuous rating (MCR) and Average Ambient Conditions, shown as a differential from the "base" case. Alternative 2 is the base case for heat rate. Alternatives 1, 3, and 4 heat rates would be slightly higher, as shown.

[c] The capital costs provided by the assessment do not include installation costs of groundwater wells, costs for construction of the pipeline corridors, and did not include auxiliary power requirements for groundwater pumping systems. These costs were assumed to be relatively similar for Alternatives 2, 3, and 4.

[d] Accounts for both existing plant and proposed Big Stone II auxiliary power consumption.

[e] Proposed Big Stone II auxiliary power only.

[f] Existing Big Stone Plant auxiliary power savings are not factored into proposed Big Stone II heat rate values.

[g] Auxiliary Power at boiler MCR and Average Ambient Conditions.

[h] Alternative 1 includes all long-term acreage impacts due to construction of the proposed power plant and associated facilities, such as the make-up water storage pond and the cooling tower blowdown pond, which are eliminated in Alternatives 2, 3, and 4. Acreage impacts for Alternatives 2, 3, and 4 are all long-term acreage impacts due to installation of the proposed power plant, including new impacts due to groundwater production wells and ancillary facilities (i.e., well pumphouses, and access roads), but do not include temporary impacts due to pipeline construction (about 36.7 acres).

[i] For Alternative 1, impact to wetland/riparian areas due to construction of the new 450-acre make-up water storage pond and the cooling tower would be 65 acres. No wetlands would be impacted due to installation of groundwater wells.

[j] Air emissions, as percent over "base," assume emission control efficiencies remain constant and emission increase is dependant on the heat rate (Btu/kWh).

[k] Increased emission of six pollutants of concern (SO_2, NO_X, CO, PM, Hg & CO_2) are calculated as the ratio of the proposed Big Stone II heat rate, for any alternative, to the lowest heat rate, noted within as the "base" emission rate. The lowest heat rate is achieved in Alternative 2, where wet cooling is used with groundwater as the back-up water supply. Therefore, all increased air emissions are percentages above this "base."

[l] Base is the lowest cost alternative, lowest impact value, or lowest heat rate for the four alternatives. Using the Base Value, the other alternatives are then compared to the Base Value in terms of increased cost, increased impacts, or increased heat rate.

Source: Black & Veatch, 2007

Environmental Comparison

Air emission impacts were highest for Alternative 3 and 4 due to the higher heat rates associated with these alternatives. Alternative 2 showed the lowest air emissions impacts. Water consumption was the highest for the two wet cooling alternatives (Alternatives 1 and 2) and lowest where the dry cooling alternatives were utilized (Alternatives 3 and 4). Land use impacts were significantly higher for Alternative 1 due to the construction of the 450-acre make-up water storage pond and the 25-acre cooling tower blowdown pond. Land use impacts of these ponds would not occur for Alternatives 2, 3, and 4. No wetlands would be impacted from construction of the groundwater production wells (Alternatives 2, 3, and 4), assuming placement of wells in agricultural areas. Under Alternative 1, 65 acres of wetlands would be impacted from construction of the 450-acre make-up water storage pond and the former cooling tower location.

Summary

Based on the comparative review of the four alternatives, Alternative 2 offers the least economic costs and the least environmental impacts. Alternatives 3 and 4 require the least water consumption. However, the costs for the cooling technologies for Alternatives 3 and 4 are significantly higher. Based on the review, Alternatives 1 and 4 were eliminated due to their higher costs and environmental impacts and Alternatives 2 and 3 are carried forward for analysis in the Supplemental Draft EIS.

APPENDIX B
Government Agencies, Organizations and Individuals to Receive the Supplemental Draft EIS

Federal Agencies

U.S. Fish and Wildlife Service
- Bloomington, Minnesota
- South Dakota Field Office
- Big Stone National Wildlife Refuge
- Litchfield Wildlife Management District
- Morris Wildlife Management District
- Madison Wildlife Management District

U.S. Army Corps of Engineers
- Omaha District
- St. Paul District
- Pierre Office

U.S. Department of Agriculture
- Rural Utilities Service
- Natural Resources Conservation Service
- Farm Service Agency

U.S. Environmental Protection Agency
- Office of Federal Activities
- NEPA Program
- Environmental Planning & Evaluation
- Region 8

U.S. Department of Health and Human Services
- Centers for Disease Control

U.S. Department of the Interior
- Office of Environmental Policy & Compliance

Federal Aviation Administration

Federal Highway Administration
- Office of NEPA Facilitation

Federal Energy Regulatory Commission

Federal Emergency Management Agency
- Regional Environmental Officer

Tribal Governments

Upper Sioux Indian Community
Prairie Island Indian Community
Lower Sioux Indian Community
Spirit Lake Tribe
Sisseton-Wahpeton Oyate of the Lake Traverse Reservation
Flandreau Santee Sioux Tribe
Yankton Sioux Tribe
Santee Sioux Nation
Rosebud Sioux Tribe
Crow Creek Sioux Tribe
Cheyenne River Sioux Tribe
Lower Brule Sioux Tribe
Standing Rock Sioux Tribe
Shakopee Mdewakanton Sioux Community
Leech Lake Tribe of Ojibwe
Mille Lacs Band of Ojibwe
Northern Cheyenne Tribe
Fond Du Lac Band of Chippewa
Grand Portage Band of Chippewa Indians
Fort Peck Assiniboine and Sioux Tribes
White Earth Band of Ojibwe
Red Lake Band of Chippewa Indians
Bois Forte Band of Chippewa Indians

Minnesota State Government

Minnesota Department of Agriculture
Minnesota Department of Commerce
Minnesota Department of Natural Resources
Minnesota Department of Transportation
Minnesota Environmental Quality Board
Minnesota Pollution Control Agency
Minnesota Public Utilities Commission
Minnesota State Historic Preservation Office

Minnesota Local Government

Big Stone County, Minnesota
City of Ortonville
City of Clinton
City of Correll
City of Graceville
City of Johnson
City of Odessa
Akron Township
Big Stone Township
Malta Township
Moonshine Township
Odessa Township
Ortonville Township
Otrey Township

Chippewa County, Minnesota
City of Granite Falls
Granite Falls Township

Kandiyohi County, Minnesota
City of Kandiyohi
City of New London
City of Pennock
City of Spicer
City of Willmar
Dovre Township
Mamre Township
Green Lake Township
Harrison Township

Stevens County, Minnesota
City of Alberta
City of Chokio
City of Morris
Baker Township
Darnen Township
Oshkosh Township
Scott Township

Swift County, Minnesota
City of Appleton
City of Clontarf
City of Danvers
City of DeGraff
City of Holloway
City of Kerkhoven
City of Murdock
Benson Township
Dublin Township
Hayes Township
Kildare Township
Marysland Township
Moyer Township
Pillsbury Township
Shible Township
Six Mile Grove Township
Torning Township

Yellow Medicine County, Minnesota
City of Canby
City of Clarkfield
City of Hazel Run
Florida Township
Friendship Township
Hammer Township
Minnesota Falls Township
Omro Township
Stony Run Township
Tyro Township

South Dakota State Government

South Dakota Department of Environment and Natural Resources
South Dakota Department of Game, Fish and Parks
Environmental Review and Management
Natural Heritage Program
South Dakota Department of Transportation
South Dakota Public Utilities Commission

South Dakota Local Government

Deuel County, South Dakota
City of Gary
Antelope Valley Township
Glenwood Township
Herrick Township

Grant County, South Dakota
Grant County Highway Department
Adams Township
Alban Township
Big Stone Township
Vernon Township

Nongovernmental Organizations

Advisory Council on Historic Preservation
American Petroleum Institute
American Public Power Association
Clean Up the River Environment
Clean Water Action Alliance
Minnesota
South Dakota
Coal Exporters Association
Dakota Resource Council
Energy Communities Alliance
Environmental Defense
Friends of the Earth
Hawk Creek Watershed Project
Lignite Energy Council
Midwest Clean Energy Campaign
Minnesota Center for Environmental Advocacy
Minnesota Renewable Energy Society
Minnesota College Energy Coalition
National Center for Environmental Health
National Coal Council
National Rural Electric Cooperative Association
National Resources Defense Council
Rose Creek Anglers
Sierra Club
Midwest Office
North Star Chapter
Northern Plains
Stewards of the Land
The Minnesota Project
U.S. Energy Association
Western Clean Energy Campaign

Individuals

Eberto Amador
Sarah B. Archbold
Mike Asmus
Wade Athey
Scott Bauer
Ronald Bergman
Lisa Berkner
W. N. Bernard
Martin Bettman
Norman Beyer
Allan Boersma
F. Karen Bonawitz
Dean Borgeson
Brad Braaten
Delbert Brede
Jeff Burgess
Harvey Burmeister
Darryl Bursack
Alan Carlson
Leon Carlson
Dennis Carlson
Carole Carlson
Jonathan D. Carlson
Tom Cherveny
Knute Christensen
Leslie J. Cin
Ronald Citrowske
Vern Clarkson
Greg Cloos
Tom Connolly
Kenneth Dahlberg
Nick Dahy
Larry R. Dale
Bruce DeBlieck
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Dianne Desrosiers
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Steve Dois
Barbara A. Dolan
Mary Eberley
Brad Ellingboe
Douglas Erickson
Jon Erickson
Edwin Fairchild
Paul Fokken
Mark Frank
Avis Freitag
Dennis Garoutte
Jerry Gesch
Ray Geyer
Beverly Jane Gillespie
Monica Gross
Loran Haas
Roger Hacker
Raymond Haley
Dan Hamsel
Don Hansen
Doris Hanson
Clyde Hanson
Rich Hargis
Randy Hasnseh
Gayle Hawkinson-Pagel
Robert W. Hill
Nancy Hillenen
Harold Hipple
Joseph Hocum
Albert Hoffman
Roger Hoffman
Ann Holme
Warren Holzheimer
Chai Insook
David Jacobson
Joel James
Howard Janssen
Robert Jelen
Jay Juergens
Pete Kennedy
Dwayne Knutsen
James Koster
Jeanne Koster
Roger Kotschegarow
Randy Kouri
Daniel Krause
Gilbert Lanners
Darrel Larson
Richard Lindstrom
David Little
Larry Lohn
Dian Lopez
Joe Makepeace
Ronald Manthey
Duane Markes
Dorothy Mathison
Susan Mattson
Richard Maursetter
Gary Meister
Curt Melby
Paul Mikkelson
Mary Mitchell
David Moody
Gloria Muehlbauer Nelson
Walter R. Nelson
Herbert Nelson
Bruce Nilles
Duane Ninneman
Gerald Olson
Jeanne Pansch
Charnel Petersen
Robert A. Petersen
Harold Petersen
Steven M. Pirner
Joseph W. Pothen
Joe Quigley
Ian Radtke
Richard Raths
Larry Rebman
H. F. Rettmer
Dallas Ross
Robert Rust Schellberg
Darrell Schindler
John Schladweiler
William Schlogel
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GLOSSARY

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Acre-foot	The volume of water that would be contained within a surface area of one-acre and one-foot deep.
Aquifer	A body of rock or unconsolidated geologic materials that are sufficiently permeable to conduct groundwater and to yield economically significant quantities of water to wells and springs.
Archaeological site	A geographic locale that contains the material remains of prehistoric and/or historic human activity.
Archaeology	The reconstruction of past cultures through their material remains and the study of how cultures change over time.
Association, Soil	A group of soils geographically associated in a characteristic repeating pattern and defined and delineated as a single soil map unit.
Auxiliary electrical load	Power uses at a power plant, such as those required for fans for dry cooling, water treatment systems, and water pumps, which are drains on net power output, and therefore impact the amount of net power delivered to the electric grid.
Beneficial use	Any of various designated uses of water in an area. Water may be for agricultural, domestic or industrial use, fish spawning, recreation, wildlife habitat, or other uses.
Blowdown	A continuous or periodic discharge of cooling water or water from the steam boiler that is released to control solids or other dissolved constituents in the respective system.
Calcareous (soil)	A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.
Clay	As a soil separate, the mineral soil particles less than 0.002 millimeters in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand and less than 40 percent silt.
Clayey soil	Silty clay, sandy clay, or clay.
Community	A group of potentially interacting species living in close proximity and commonly recurring under similar conditions of soil, moisture, and topography at other locations within a landscape.

Confined aquifer	An aquifer that is overlain by a confining bed (i.e., a stratigraphic layer, such as a clay or a shale), which has a significantly lower permeability than the underlying aquifer zone. A confining layer significantly decreases the hydraulic connection between the confined aquifer and layers above the confining layer, including surface water features.
Cone of depression	In a confined aquifer, a depression in the potentiometric surface of a body of groundwater that has the shape of an inverted cone. In an unconfined aquifer, the surface of the cone is the level of saturation of the aquifer. The cone develops around a well from which water is being withdrawn and defines the area of influence of a well.
Control	Control means, as appropriate, eradicating, suppressing, reducing, or managing invasive species populations, preventing spread of invasive species from areas where they are present and taking steps such as restoration of native species and habitats to reduce the effects of invasive species and to prevent further invasions.
Co-owners	Otter Tail Power Company, Central Minnesota Municipal Power Agency, Great River Energy, Heartland Consumers Power District, Montana-Dakota Utilities Co., Southern Minnesota Municipal Power Agency, and Western Minnesota Municipal Power Agency (dba Missouri River Energy Services) – the seven electrical utilities that would be constructing and operating the proposed Project.
Cooling system	Technology used to condense and cool exhaust steam from the steam turbine using circulating water as a working fluid.
Cultural resources	A broad, general term meaning any cultural property and any traditional lifeway value (BLM Manual 8100).
Cumulative effect	The impact that results from identified actions when they are added to other past, present, and reasonably foreseeable future actions regardless of who undertakes such other actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time.
Deciduous	Plants and trees that shed leaves seasonally, and are leafless for part of the year.

Deep (soil)	A soil that is greater than 40 inches deep to bedrock or other significant geologic contact. Also, a depth of 40 inches or more to a characteristic of interest within a soil profile.
Disturbance	Human activities or natural events that affect components or processes in an ecological system, usually in an abrupt manner, resulting in observable changes in the ecological system.
Drawdown	The lowering of the water level in a well as a result of groundwater withdrawal.
Dry cooling	A type of cooling system using large fans and air to pass over a heat exchanger to condense and cool exhaust steam from a steam turbine.
Endangered species	Any species defined through the Endangered Species Act as being in danger of extinction throughout all or a significant portion of its range and published in the Federal Register.
Environmental Impact Statement (EIS)	A formal document to be filed with the Environmental Protection Agency and that considers significant environmental impacts expected from implementing a major federal action, as required under NEPA.
Erosion	Detachment and movement of soil or rock fragments by water, wind, ice, or gravity.
Erosion (Accelerated)	Erosion much more rapid than background geologic erosion rates, occurring mainly as a result of human or animal activities or a natural catastrophe such as fire.
Existing plant	The existing Big Stone unit I plant.
Existing plant site	The area associated with the operation of the existing Big Stone unit I plant.
Floodplain	A nearly level alluvial plain that borders a stream and is subject to inundation under flood-stage conditions unless protected artificially. It is usually a landform built of sediment deposited during overflow and shifting of the stream.
Furbearer	An animal bearing fur of commercial value.

Fugitive dust	Small airborne particles (such as dust) that originate from sources such as unpaved roads, construction activities on exposed soil areas, and agricultural activities.
Gravel	Rock fragments greater than 2 millimeters in diameter. Sizes range from pebbles (0.008 to 2.5 inches) to cobbles (2.5 to 10 inches) to boulders (greater than 10 inches).
Groundwater	Subsurface water that is stored in the zone of saturation. When at atmospheric pressure, the uppermost surface of groundwater is the "water table." A source of water for wells, seepage, and springs.
Groundwater inflow	The rate of water flux (in units of volume over time) from an aquifer system into a portion of a surface water body.
Habitat	The natural abode of a plant or animal, including all biotic, climatic, and edaphic factors affecting life.
Heat Rate	A measurement to calculate how efficiently a generator produces electric energy, and is expressed as the number of British thermal units (Btu's) required to produce a kilowatt-hour of electrical energy.
Historic	Period wherein nonnative cultural activities took place, based primarily upon European roots, having no origin in the traditional Native American culture(s).
Historic property	"any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places. The term includes, artifacts, records, and remains that are related to and located within such properties. The term 'eligible for inclusion in the National Register' includes both properties formally determined as such by the Secretary of the Interior and all other properties that meet National Register listing criteria" {quoted from 36 CFR 900.2(e)}.
Hummocky	Topographic expressions of uneven landforms, such as knolls, mounds, or other small elevation rises.
Incremental	The process of increasing or decreasing in number, size, quantity, or extent of habitat.
Intermittent stream	A stream that flows for prolonged portions of a year when it receives seasonal contributions from groundwater discharge, melting snow, or other surface and shallow subsurface sources.

Introduction	Intentional or unintentional escape, release, dissemination, or placement of a species into an ecosystem as a result of human activity.
Invasive	Any plant species which has been introduced by human action to a location, area or region where it did not previously occur naturally (i.e., is not native), becomes capable of establishing a breeding population in the new location without further intervention by humans and becomes a pest in the new location, threatening the local biodiversity.
Invasive species	An alien species whose introduction does or is likely to cause economic or environmental harm or harm to human health.
Invertebrate	An animal, such as an insect or mollusk, which lacks a backbone or spinal column.
Kilovolt	A unit of electrical potential equal to a thousand volts.
Loam	Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles and less than 52 percent sand particles.
Make-up water	Water which is supplied to cooling tower or steam boiler to compensate for losses from evaporation and releases necessary to control water quality.
Megawatt	A unit for measuring power that is equal to one million (10^6) watts.
Mesic	Refers to sites or habitats characterized by intermediate moisture conditions, (i.e., neither decidedly wet [hydric] nor decidedly dry [xeric]).
National Environmental Policy Act of 1969 (NEPA)	NEPA is the basic national charter for protecting the environment. It establishes policy, sets goals, and provides means for carrying out the policy.
National Register of Historic Places	A register of districts, sites, buildings, structures, and objects, significant in American history, architecture, archaeology, and culture, established by the "Historic Preservation Act" of 1966 and maintained by the Secretary of the Interior.

Natural resources	These include topography (consider slope and drainage patterns), soil, water courses and/or water bodies, geological formations, vegetation (consider rare, threatened or endangered species), and fish and wildlife.
Navigable waters of the U.S.	Navigable waters of the United States, as described in 33 CFR Part 329, are those waters that are subject to the ebb and flow of the tide and/or are presently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce. A determination of navigability, once made, applies laterally over the entire surface of the waterbody, and is not extinguished by later actions or events which impede or destroy navigable capacity. Navigable water of the United States fall under the jurisdiction of the U.S. Army Corps of Engineers.
Noxious weed	Any plant designated by a federal, state, or county government as injurious to public health, agriculture, recreation, wildlife, or property.
Paleontology	The study of fossils; what fossils tell us about the ecologies of the past, about evolution, and about place, as humans, in the world. Informs us about interrelationship between the biological and geological components of ecosystems over time.
Palustrine	All non-tidal wetlands that are substantially covered with emergent vegetation—trees, shrubs, moss, etc. Most bogs, swamps, floodplains, and marshes fall in this system, which also includes small bodies of open water (< 20 acres), as well as playas, mudflats, and salt pans that may be devoid of vegetation much of the time. Water chemistry is normally fresh but may range to brackish and saline in semiarid and arid climates.
Perennial	Present during all seasons of the year.
Poorly drained	A natural drainage class wherein water is removed so slowly that the soil is wet at shallow depths periodically during the growing season or remains wet for long periods. The occurrence of internal free water is shallow or very shallow and common or persistent. Free water is commonly at or near the surface long enough during the growing season so that many common agricultural crops cannot be grown unless the soil is artificially drained.
Potentiometric water level	The level to which water will rise in a tightly cased (sealed) well, typically from a confined aquifer.

Prairie Coteau	A geomorphic province located in eastern South Dakota that is approximately defined by a rolling plain of glacial origin.
Project area	The cumulative area within the proposed plant site and transmission line corridors, including substation modification locations.
Project vicinity	The cumulative area within the proposed plant site, proposed transmission line corridors and variations, substation modification locations and adjacent areas.
Proposed plant	The proposed Big Stone II plant.
Proposed plant site	The area associated with the construction and operation of the proposed Big Stone II plant.
Proposed project	The proposed plant site, transmission line corridors, variations (inclusive of these components) and substation modifications.
Riparian	Referring to or relating to areas adjacent to water or influenced by free water associated with streams or rivers on geologic surfaces occupying the lowest position of a watershed. Pertaining to, living or situated on, the banks of rivers and streams. 'Xeroriparian' refers to being situated on dry washes (ephemeral streams).
Riverine	Freshwater, perennial streams comprised of the deepwater habitat contained within a channel. This restrictive system excludes floodplains adjacent to the channel as well as habitats with more than 0.5 percent salinity.
Runoff	Excess water discharged into stream channels from rainfall or snowmelt on a land area. The water that flows off the surface of the land without sinking into the soil may be called surface runoff.
Sand	Individual mineral particles ranging in diameter from the upper limit of silt (0.05 millimeter) to the lower limit of fine gravel (2.0 millimeter).
Scrub	Refers to a stand of vegetation characterized by thick growth of dwarf or stunted trees and shrubs and a poor soil.
Sediment	Soil, rock particles, and organic or other debris carried from one place to another by wind, water, or gravity.

Sensitive species	All species that are under status review, have small or declining populations, live in unique habitats, or need special management. Sensitive species include threatened, endangered, and proposed species as classified by the Fish and Wildlife Service and National Marine Fisheries Service.
Shallow (soil)	A soil having a depth of 20 inches or less to bedrock or other significant geologic contact. Also, a depth of 20 inches or less to a characteristic of interest within a soil profile.
Shrub	A low woody plant.
Silt	Individual mineral particles ranging in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class: Soil that is 80 percent or more silt and less than 12 percent clay.
Special status species	Plant or animal species known or suspected to be limited in distribution, rare or uncommon within a specific area, and/or vulnerable to activities that may affect their survival.
Species	A taxon of the rank species; which is the basic unit and lowest principal category, of biological classification; in the hierarchy of biological classification, the category below genus; a group of organisms formally recognized as distinct from other groups.
Spring	Flowing water originating from an underground source.
Standard mitigation measures	Mitigation measures that are part of the proposed Project, which would be completed by the Co-owners to avoid or minimize impacts to various resources.
State Wildlife Management Area (SWMA)	State-managed wildlife production areas which support a variety of game species including waterfowl, pheasant, and white-tailed deer.
Substations	An assemblage of electrical equipment, such as transformers, circuit breakers, relays, etc., used to switch, control or regulate electrical voltage.
Surface water	Water that occurs at the surface of the earth in the form of rivers and streams, ponds, or lakes.

Terrestrial	Living or growing on land; not aquatic (e.g., a terrestrial plant or animal).
Threatened species	Any plant or animal species defined under the Endangered Species Act as likely to become endangered within the foreseeable future throughout all or a significant portion of its range; listings are published in the Federal Register.
Total dissolved solids	Total amount of dissolved material, organic or inorganic, contained in a sample of water.
Traditional cultural property	A cultural property that derives significance from traditional lifeway values associated with it. A traditional cultural property may qualify for the National Register if it meets the criteria and criteria exceptions at 36 Code of Federal Regulations 60.4 (BLM Manual 8100 – The Foundations for Managing Cultural Resources, page 34).
Unconfined aquifer	An aquifer whose water surface is exposed to atmospheric pressure via the pore space of overlying sediments. Also known as a water table aquifer.
Upland	Terrestrial ecosystems located away from riparian zones, wetlands, springs, seeps and dry washes; ecosystems made up of vegetation not in contact with groundwater or other permanent water sources.
Waterfowl Production Area (WPA)	Public lands, managed by the U.S. Fish and Wildlife Service, included in the National Wildlife Refuge System in 1966 through the National Wildlife Refuge Administration Act. The objective is to preserve wetlands and grasslands critical to waterfowl and other wildlife.
Water regime	A characterization of the frequency and degree of flooding and/or saturation in a wetland. Water regime is a function of the wetland's water budget (inflow and outflow water balance) and storage capacity, which is affected by the surface contours of the landscape and subsurface soil, geology and groundwater conditions.
Weed	A plant considered undesirable, unattractive or troublesome, usually introduced and growing without intentional cultivation.
Weighted Average of Sound Level (L) for Day (d) and Night (n)(L_{dn})	The day-night average sound level that is equal to the 24-hour A-weighted equivalent sound level with a ten-decibel penalty applied to nighttime levels.

Well drained	A natural drainage class wherein water is removed from the soil readily but not rapidly. The occurrence of internal free water commonly is deep or very deep; annual duration is not specified. Water is available to plants throughout most of the growing season in humid regions. Wetness does not inhibit the growth of roots for significant periods during most growing seasons.
Wet cooling	A type of cooling system using a recirculating water system and an evaporative cooling tower to condense and cool exhaust steam from a steam turbine.
Wetland	(1) Lands where saturation with water is the dominant factor determining the nature of soil development and the types of plant and animal communities living in the soil and on its surface. (2) A general term for sites which are permanently, seasonally, rarely, or never flooded, but which support plants characteristic of saturated soils. Dominant plants, or at least one co-dominant plant, are terrestrial or emergent, with subaerial stems and leaves.
Windshield survey	Observations made from automobile, while driving.
Zero liquid discharge facility	A facility whose wastewaters are contained within the property, and are not discharged to waters of the United States.

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