File 89B400
C000

FINAL
ENVIRONMENTAL IMPACT STATEMENT

FOR A PROPOSED
COMBUSTION TURBINE GENERATOR FACILITY
NORTHERN STATES POWER COMPANY
PATHFINDER SITE
MINNEHAHA COUNTY, SOUTH DAKOTA

PREPARED FOR

SOUTH DAKOTA PUBLIC UTILITIES COMMISSION

JANUARY 14, 1993

TO THE READER

This Final Environmental Impact Statement has been prepared to fulfill the statutory requirements of the South Dakota Environmental Policy Act (SDCL 34A-9). Under SDCL 49-41B-12, the South Dakota Public Utilities Commission (Commission) may determine whether an environmental impact statement (EIS) should be prepared in accordance with SDCL 34A-9. On March 29, 1991, the Commission ordered an environmental impact statement to be prepared in this matter. This Final EIS has been prepared utilizing documents submitted to the Commission by Northern States Power Co. in support of its permit application to construct a combustion turbine generating facility and other publicly available information as needed to fulfill the statutory requirements. This document was jointly prepared by Vernon R. Schaefer, Delvin E. DeBoer, James N. Dornbush, David R. German, Gary E. Larson, L. Adrien Hannus, Timothy V. Gillen, and R. Peter Winham.

A Draft EIS was prepared to inform the public and other public agencies about proposed actions that may significantly affect the quality of the environment, and to solicit comments which will assist the Commission in determining the environmental consequences of the proposed action. A 30-day period to submit comments on the Draft EIS was provided. The comments and responses to the comments are included herein. The comments received can be considered by the Commission before making its regulatory decisions concerning this project. The Commission held a public hearing on Northern States Power Company's proposed Pathfinder Site combustion turbine project on December 2, 1992 at 7:00 PM at the Minnehaha County Commission Meeting Room, Minnehaha County Courthouse, Sioux Falls, South Dakota. The Draft Environmental Impact Statement was presented and an opportunity provided for questions. The Final Environmental Impact Statement will be entered as an exhibit for the Commission to consider in making its regulatory decisions on this project.

Any comments or questions on this document should be addressed to:

Mr. Marshall Damgaard, Executive Director
South Dakota Public Utilities Commission
State Capitol
500 East Capitol Avenue
Pierre, South Dakota 57501-5070

EXECUTIVE SUMMARY

Section 1. Description of the Project

Northern States Power Company (NSP) proposes to construct a combustion turbine generator (CTG) facility consisting of up to four 105-megawatt (MW) combustion turbines at the NSP Pathfinder Generating Plant located east of Sioux Falls, South Dakota. To supply natural gas for the CTG facilities, NSP also proposes to construct an approximately 13-mile-long natural gas pipeline south of the Pathfinder Site to connect to a Northern Natural Gas (NNG) pipeline near Harrisburg, South Dakota. The purpose of the facility is to generate electricity from gas-fired turbines to meet peak electrical demand. The estimated cost of four CTG units and the pipeline is about $150,000,000 in 1994 dollars.

The proposed CTG facility site is at the present Pathfinder site where a 60 MW gas-fired steam generated plant and associated facilities are located on land owned by NSP. The proposed pipeline will be located south of the site and would mainly follow along existing electric transmission line and road corridors.

CTG units are primarily used as peaking facilities. When electrical demand in an area is at its highest, such as during summer hot spells, peaking units are run to meet the increase in demand for electricity. Peaking units are also used when other utility owned power plants are unexpectedly out of service or are shut down for maintenance.

The proposed CTG facility presently is scheduled for a January 1, 1995 in–service date. Subject to receipt of all necessary permits, construction of the CTG facility is scheduled to begin during May of 1993. The CTG facility construction would begin in June 1993. At present NSP is planning to construct two CTG units at the site with an additional two units planned in the future. The pipeline construction is scheduled to begin in March 1994, with construction completed by July 1994.

The estimated capital cost of the CTG facility is dependent on the number of CTG units installed at the site. At present two units are planned for installation in 1994 with an estimated cost of $78 million in 1994 dollars. The two additional units will be installed as needed and have an estimated cost of $67 million in 1994 dollars for a total estimated cost for four CTG units $145 million in 1994 dollars. The estimated cost of the proposed pipeline is $4 million in 1994 dollars, excluding easement acquisition right–of–way costs.

Section 2. Description of the Environmental Setting

The site area lies at the extreme southern edge of the Coteau des Prairies (Prairie Hills) section of the Central Lowlands physiographic province. The Coteau des Prairies is a highland plateau occurring between the Minnesota River lowland to the east and the James River lowland to the west. The general topography of the Coteau is rolling and hummocky because of glacial moraines, stream valleys, and various other geomorphic features such as prairie moraines, disintegration ridges, kames, kame terraces, plateaus, and collapse features. The Coteau des Prairies is packed and covered with glacial drift. The area has a pattern of relief typical of a glaciated prairie region.

The climate of the study area is a continental type, characterized by large seasonal and daily variations in temperature with normally ample spring and summer rainfall and lighter winter precipitation. There are frequent and sudden changes in weather, often daily, as the area is dominated by cold air masses from the north in the winter and by warm air masses from the south in the summer. Air quality in the vicinity of the proposed site may be subjectively characterized as clean.

The proposed CTG facility and gas pipelines are located in a region originally covered by tallgrass prairie vegetation. A variety of broadleaved herbs and shrubs were also important components of the native prairie vegetation. Woodlands in the region were originally confined to stream bottoms and moist ravines. Wetlands are common in the Prairie Pothole Region of north central North America. This region is the single most important area for breeding waterfowl, especially dabbling ducks, in North America.

Glacial aquifers, in the form of outwash sand and gravel deposited by glaciers, underlie a significant part of the floodplain of the Big Sioux River and its tributaries. There are two major bedrock aquifers present in the study area, the Split Rock Creek aquifer and Sioux Quartzite aquifer. Groundwater quality is quite variable, depending on the geochemical constituents of the aquifer. The groundwater is relatively mineral–laden, with TDS concentrations typically 5 to 10 times that of surface water. Surface water quality is heavily influenced by runoff events from snow–melt and rainfall events. Wide ranges in turbidity result from changes in runoff quality and variation in sediment carrying capacity as streamflows vary.

Land use in the affected area is primarily agricultural, with some additional industrial and urban components.

Section 3. Environmental Impacts

The construction and operation of the proposed CTG units and construction of the pipeline will have some impact on the environment of the area, but the incorporation of pollution control devices and the implementation of plans to mitigate certain impacts will minimize unavoidable loss of environmental quality.

The primary impacts on air quality during construction of the CTG units and the pipeline will be an increase in construction related noise and an increase in fugitive dust due to wind erosion. The primary impacts on airshed quality during operation of the proposed CTGs will be an increase in noise levels near the site and emissions of pollutants to the atmosphere resulting from natural gas and/or distillate oil combustion.

One of the major impacts of the construction activities will be the destabilization of surface soils at the plant site and along the pipeline resulting from ground preparation, excavation, and increased susceptibility of the soil to wind and water erosion. Several of the soils along the pipeline route have the potential for sustaining high erosion or for being unstable in shallow excavations.

Direct wetland impacts by CTG facility and pipeline construction would be small. The pipeline corridor would disturb wetlands as they are being installed but wetlands should recover if construction methods are correctly implemented. The preferred route crosses two small intermittent streams and some lesser drainages, and it passes through or nearby several small wetlands.

No plants on the federal or state lists of threatened or endangered species were detected in the immediate project area, nor are there any habitats where the listed species would be expected to occur. Construction is not expected to adversely affect any threatened or endangered species.

Two isolated cultural resources finds do not meet the necessary criteria of significance for National Register eligibility. No further work is recommended at these locations. Additional cultural resources monitoring during construction is recommended.

Table of Contents

CHAPTER 1 – INTRODUCTION 1

CHAPTER 2 – A DESCRIPTION OF THE PROPOSED ACTION AND ITS ENVIRONMENTAL SETTING 4

2.1. Project Description 4
2.2. Proposed CTG Facility Description 5
2.2.1. Site Location and Characteristics 5
2.2.2. Combustion Turbine Generator Units 6
2.2.3. Operation 6
2.2.4. Pollution Controls 7
2.2.4.1. Air Emissions 7
2.2.4.2. Wastewater 8
2.2.4.3. Sound Control 8
2.2.5. Water Usage 8
2.2.6. Transmission Facilities 9
2.2.7. Fuels 9
2.2.7.1. Natural Gas 9
2.2.7.2. Distillate Fuel Oil 10
2.3. Description of Proposed Pipeline Alternatives 10
2.3.1. Location and Pipeline Characteristics 10
2.3.2. Pipeline Construction 12
2.3.2.1. Gas Transmission Line Standards of Construction 13
2.3.2.2. Construction Sequence 14
2.3.3. Operation and Maintenance 16
2.3.3.1. Patrolling and Leak Surveys. 16
2.3.3.2. Line Markers For Gas Transmission Lines 16
2.3.3.3. Monitoring 17
2.3.3.4. Emergency Plans 17
2.3.4. Odorization 17
2.3.5. Corrosion Protection 17
2.4. Description of the Environmental Setting – Physical Characteristics 17
2.4.1. Climate 17
2.4.2. Physiography and Topography 19
2.4.3. Geology 20
2.4.4. Soils 22
2.4.5. Mineral Resources 27
2.4.6. Seismic Activity 27
2.4.7. Vegetation 27
2.4.8. Animals 31
2.4.8.1. Mammals 31
2.4.8.2. Birds 32
2.4.8.3. Amphibians and Reptiles 33
2.4.8.4. Fisheries 33
2.4.8.5. Aquatic Invertebrates 34
2.4.9. Threatened and Endangered Species 35
2.4.10. Surface Water Resources 38
2.4.10.1. General Description 38
2.4.10.2. River Discharge 39
2.4.10.3. Floodplains 40
2.4.10.4. River Water Quality 40
2.4.10.5. Other Water Bodies 41
2.4.10.6. Wetlands 42

2.4.11. Ground Water Resources 44
2.4.11.1. Glacial Aquifers 44
2.4.11.2. Bedrock Aquifers 45
2.4.11.3. Hydrogeology of the Pathfinder Site 46
2.4.11.4. Water Quality 48
2.4.12. Airshed Conditions 49
2.4.12.1. Air Quality 49
2.4.12.2. Sound Levels 50
2.5. Description of Social and Economic Characteristics 51
2.5.1. Land Use 51
2.5.2. Zoning 53
2.5.3. Infrastructure 54
2.5.3.1. General 54
2.5.3.2. Electrical Utilities 54
2.5.3.3. Telephone Service 55
2.5.3.4. Water Supply Facilities 55
2.5.3.5. Sanitary Sewers 55
2.5.3.6. Stormwater Facilities 56
2.5.3.7. Natural Gas Distribution 56
2.5.3.8. Roadways 56
2.5.3.9. Rail Line 56
2.5.4. Cultural Resources 56
2.5.5. Demographics 58
2.5.6. Income Characterization 59
2.5.7. Economic Conditions 59
2.5.8. Aesthetics 60

CHAPTER 3 – THE ENVIRONMENTAL IMPACT OF THE PROPOSED ACTION INCLUDING SHORT-TERM AND LONG-TERM EFFECTS ... 61

3.1. Impact on the Natural Environment 61
3.1.1. Construction Impacts 61
3.1.1.1. Air Quality 61
3.1.1.2. Land and Water Characteristics 62
3.1.1.3. Impacts on Terrestrial and Aquatic Resources 65
3.1.2. Operational Impacts 66
3.1.2.1. Airshed Impacts 66
3.1.2.2. Ground Water Quality 73
3.1.2.3. Surface Water Quality 76
3.1.2.4. Impacts to Aquatic Resources 78
3.1.2.5. Impacts to Terrestrial Resources 83
3.1.2.6. Water Use Impacts 83
3.1.2.7. Transmission Line Electric and Magnetic Fields 84
3.2. Impact on the Socio–Economic Environment 84
3.2.1. Land Acquisition 84
3.2.2. Property Values 85
3.2.3. Tax Payments 85
3.2.4. Construction Workforce 85
3.2.5. Economic Impacts 86
3.2.6. Traffic 86
3.2.7. Health and Safety 87
3.2.8. Solid Waste 87
3.2.9. Farming Operations 87
3.2.10. Energy 87
3.2.11. Cultural Resources 88

3.2.12. Aesthetics 88

CHAPTER 4 – ANY ADVERSE ENVIRONMENTAL EFFECTS WHICH CANNOT BE AVOIDED SHOULD THE PROPOSED ACTION BE IMPLEMENTED 90

4.1. Impacts to Water Quality 90
4.2. Impacts to Vegetation and Terrestrial Habitat 91
4.3. Impacts to Impacts to Fish and Aquatic Organisms 91
4.4. Impacts to Mammals and Birds 92
4.5. Impacts to Wetlands 92
4.6. Impacts on Farming Operations 93
4.7. Impacts to Ground Water Supplies 93
4.8. Impacts to Air Quality 93
4.9. Impacts to Cultural Resources 94

CHAPTER 5 – ALTERNATIVES TO THE PROPOSED ACTION 90

5.1. NSP's Long–Term Resource Needs 95
5.2. Alternative Power Plant Sites 96
5.3. No Action Alternative 98
5.4. Purchase Power from Other Systems 99
5.5. Alternative Methods of Generation 100
5.6. Conservation and Load Management 101
5.7. Alternate Pipeline Routes 101

CHAPTER 6 – ANY IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES WHICH WOULD BE INVOLVED IN THE PROPOSED ACTION SHOULD IT BE IMPLEMENTED 103

CHAPTER 7 –MITIGATION MEASURES PROPOSED TO MINIMIZE THE ENVIRONMENTAL IMPACT 104

7.1. Mitigation of Construction Impacts 104
7.1.1. Soil Erosion 104
7.1.2. Soil Compaction 105
7.1.3. Fugitive Dust 105
7.1.4. Wetlands 106
7.1.5. Vegetation 106
7.1.6. Restoration of the Right–of–Way 106
7.1.7. Land Acquisition 107
7.1.8. Farming Operations 107
7.1.9. Cultural Resources 107
7.2. Mitigation of Operational Impacts 108
7.2.1. Air Quality 108
7.2.2. Water Quality 108

CHAPTER 8 – THE GROWTH-INDUCING ASPECTS OF THE PROPOSED ACTION 110

REFERENCES 111

APPENDIX A – List of NSP Documents Filed Related to Application

APPENDIX B – Table of Previously Recorded Cultural Sites and Surveys

APPENDIX C – Comments Received and Responses

LIST OF FIGURES

Figure	Title
1-1	Site Location Map
1-2	Anticipated sales and property tax payments
2-1	Preferred and Alternative Pipeline Route Map
2-2	Site Facility Layout
2-3	Combustion Turbine Generator Diagram
2-4	Transmission Line Arrangement
2-5	Transmission Line - Typical Cross-Section Right-of-Way
2-6	Highway - Typical Cross-Section Right-of-Way
2-7	Pipeline Construction Sequence
2-8	Generalized Geological Cross-Section
2-9	Geological Cross Section
2-10	Areal extent and thickness of Split Rock Creek Aquifer
2-11	Soils Associations Map
2-12	Original Native Vegetation of South Dakota
2-13	Land Use Map
2-14	Wetlands Map
2-15	Sampling Locations, Big Sioux River and Selected Tributaries
2-16	Flood Plain Map
2-17	Well & River Monitoring Location Map
2-18	Areal Extent and thickness of Glacial Aquifers in Eastern Minnehaha County
2-19	Geologic Cross-Section Location Map
2-20	Geologic Cross-Section Pathfinder Site
2-21	Water Table Contour Map Pathfinder Site
2-22	Isopach Map, Sand Aquifer Within the Split Rock Creek Formation
2-23	Total Dissolved Solids Concentration Maps
2-24	Pathfinder Site Sound Monitoring Stations
2-25	Zoning Map
2-26	Locations of previously recorded cultural sites
2-27	Locations of previously recorded cultural surveys
3-1	Soil Erosion Map
3-2	Drainage Pattern for Proposed CTG Facility
3-3	Wind Frequency Distribution
5-1	NSP Demand Forecast
5-2	NSP Obligations and Committed Resources

LIST OF TABLES

Table	Title
1-1	Anticipated permits and approvals from federal and state agencies
2-1	General Composition of Natural Gas
2-2	General Composition of No. 2 Distillate Fuel Oil
2-3	Normal monthly temperatures and precipitation at Sioux Falls
2-4	List of Prairie Herbs Around Sioux Falls
2-5	List of Emergent Vegetation Around Sioux Falls
2-6	List of Birds Observed on the Pathfinder Site
2-7	Mammals Observed on the Pathfinder Site
2-8	List of Birds Species Occurring in the Sioux Falls Area
2-9	List of Mammals Occurring in the Sioux Falls Area
2-10	List of Amphibians and Reptiles Occurring in the Sioux Falls Area
2-11	Common and Scientific Names of Fish Spicies Collected in the Sioux Falls Area
2-12	Relative Abundance of Fish Species Near Sioux Falls on the Big Sioux River
2-13	Fish Species Collected by Seining in the Big Sioux River
2-14	Fish Species Collected by Baited Hoopnet and Electrofishing in the Big Sioux River
2-15	Fish Species Collected in the Big Sioux River During 1980 and 1983 by SDDGFP
2-16	Comparison of Fish Species From 1965 & 1967
2-17	Benthos, Big Sioux River
2-18	South Dakota's Federally Listed Threatened and Endangered Species
2-19	South Dakota's State Listed Threatened and Endangered Species
2-20	Critical Species Observed within 15 Miles of the Proposed CTG Site
2-21	Monthly mean and range of flow in the Big Sioux River at Sioux Falls 1972-1990
2-22	Flow excedence values for the Big Sioux River at North Cliff Avenue, Sioux Falls
2-23	Water quality standards for the Big Sioux River near the proposed CTG facility
2-24	Big Sioux River water quality data values 1974 to 1990
2-25	Summary of Split Rock Creek Aquifer Tests
2-26	Summary of chemical analysis of water from the Big Sioux Aquifer
2-27	Summary of chemical analysis of water from the Split Rock Creek Aquifer
2-28	Summary of chemical analysis of water from the Brandon Aquifer
2-29	Ground water quality from monitoring wells near settling basins, Pathfinder site
2-30	Comparison of Sioux Falls ambient air quality data with National Ambient Air Quality Standards
2-31	Sound level monitoring stations- Pathfinder Site
2-32	Pathfinder ambient sound level monitoring data recorded July 18,1991
2-33	Calculated day-night sound levels based on background sound measurements
2-34	Land use/sound compatibility index
2-35	Population and population change for selected governmental units 1970-1990
2-36	Per capita personal incomes for selected governmental units, 1980 to 2010
2-37	Average unemployment for selected governmental units, 1984-1990
2-38	Average covered employment and earnings Minnehaha County and South Dakota
3-1	Typical Construction Equipment Noise Ranges
3-2	Adverse impacts of Air Pollutants
3-3	Estimated pollutant emission rates proposed CTG's
3-4	National Ambient Air Quality Standards
3-5	BACT control technologies for proposed CTG's

3-6 Comparison of maximum predicted pollutant concentrations with PSD increments
3-7 Comparison of maximum predicted pollutant concentrations with significant Impact Increments
3-8 Comparison of maximum predicted pollutant concentrations with NAAQS
3-9 Comparison between estimated concentrations of seepage to Big Sioux Aquifer and SDGWQS
3-10 Comparison of estimated discharge into Big Sioux River and SDSWQS.
3-11 Estimated TDS concentrations in Big Sioux River at various river stages after mixing.
3-12 Anticipated property and sales tax payments
5-1 Cost items investigated for each candidate site
5-2 NSP'S planned capacity purchases during summer months in MW

CHAPTER 1

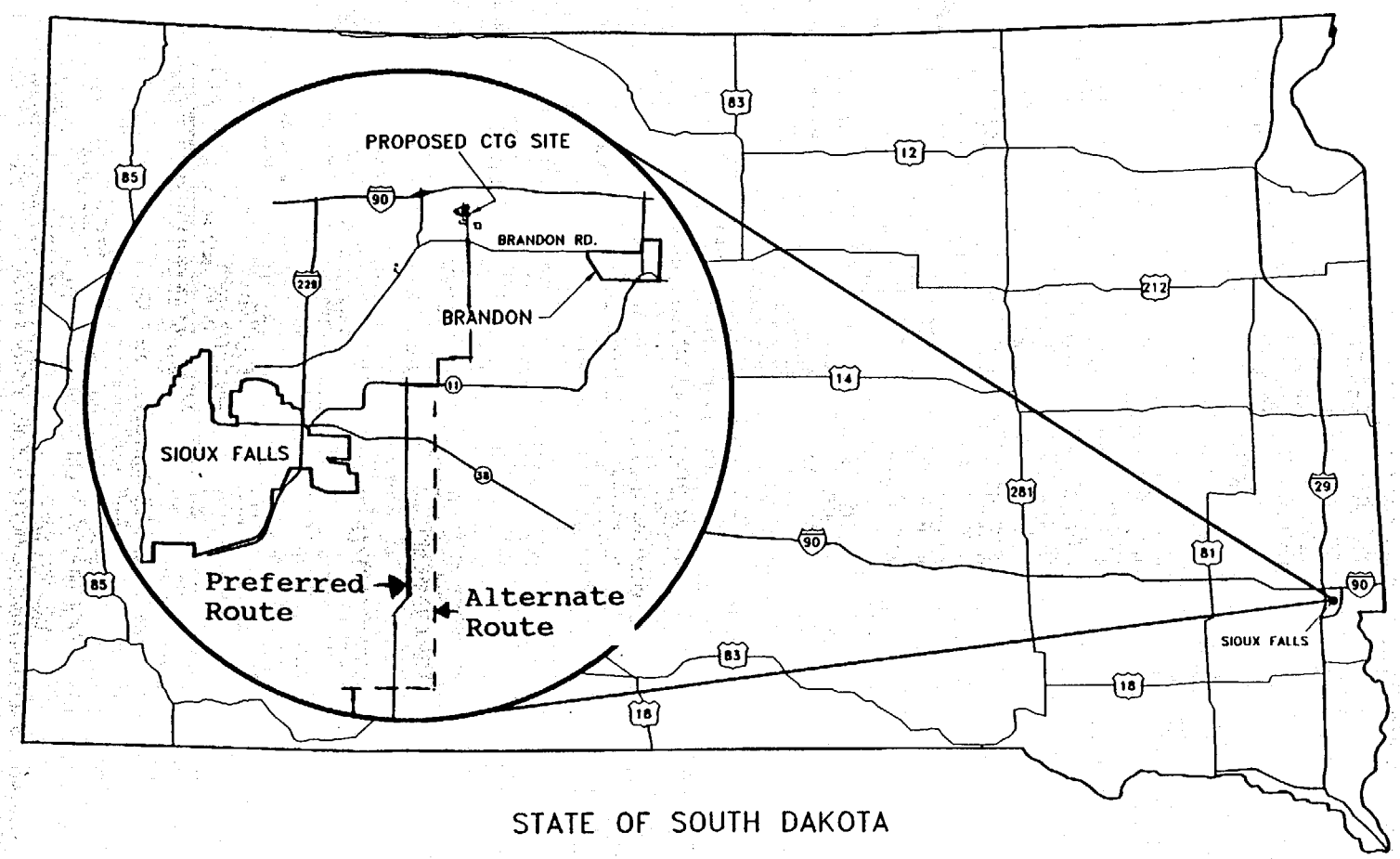
INTRODUCTION

Northern States Power Company (NSP) proposes to construct a combustion turbine generator (CTG) facility consisting of up to four 105-megawatt (MW) combustion turbines at the NSP Pathfinder Generating Plant located east of Sioux Falls, South Dakota. To supply natural gas for the CTG facilities, NSP also proposes to construct an approximately 13-mile long natural gas pipeline south of the Pathfinder Site to connect to a Northern Natural Gas (NNG) pipeline near Harrisburg, South Dakota. The general location of the project is shown on Figure 1–1. The purpose of the facility is to generate electricity from gas-fired turbines to meet peak electrical demand. The estimated cost of four CTG units and the pipeline is about $150,000,000 in 1994 dollars.

The proposed CTG facility site is at the present Pathfinder site where a 60 MW gas-fired steam generated plant and associated facilities are located on land owned by NSP. The proposed pipeline will be located south of the site and would mainly follow along existing electric transmission line and road corridors.

On January 9, 1991 the South Dakota Public Utilities Commission (Commission) received a Notice of Intent from NSP to apply for a permit for construction of this project. Under SDCL 49–41B–6, the Commission was required to designate the affected area relative to the filing and to designate a local review committee within thirty days after the filing of the Notice of Intent. SDCL 49–41B–2(8) defines the term "siting area" as "that area within ten miles of a proposed energy conversion facility or which is determined by the commission to be affected by a proposed energy conversion facility." In addition, ARSD 20:10:22:01(1), defines "affected area" as "that area which may be affected environmentally, socially, aesthetically, or economically by the location of a facility at a proposed site." Accordingly, on February 6, 1991, the Commission designated a local review committee and designated the affected area by this action as "a five-mile radius of the site of the proposed energy conversion facility, along with that area in Minnehaha and Lincoln Counties where the proposed pipeline will be routed."

Under SDCL 49–41B–12, the South Dakota Public Utilities Commission may determine whether an environmental impact statement (EIS) should be prepared in accordance with SDCL 34A–9. On March 29, 1991, the Commission ordered an environmental impact statement to be prepared in this matter. This Draft Environmental



NORTHERN STATES POWER COMPANY
MINNEHAHA COUNTY, SOUTH DAKOTA

FIGURE 1-1
SITE LOCATION MAP

DWG NO.: N05644052.F107 | DAMES & MOORE

Impact Statement has been prepared to fulfill the statutory requirements of the South Dakota Environmental Policy Act (SDCL 34A–9) and to inform the public and other public agencies about proposed actions that may significantly affect the quality of the environment and to solicit comments which will assist the Commission in determining the environmental consequences of the proposed action.

The Commission received NSP's Application for a Construction Permit for an Energy Conversion Facility on September 25, 1991. In its application NSP anticipated that the natural gas would be supplied from Minnegasco through a planned main extension to supply gas needs for Sioux Falls residents. On October 3, 1991 the Commission received a Petition for Declatory Ruling in which Minnegasco sought a determination from the Commission as to whether its proposed main extension would be subject to Commission siting jurisdiction. At its October 22, 1991, meeting, the Commission ruled that its jurisdiction was limited to that portion of the gas pipeline which would extend from the main line to the energy conversion facility and would exclusively serve the energy conversion facility. Accordingly, on October 25, 1991, the Commission ordered that the affected area be amended to "a five-mile radius of the site of the proposed energy conversion facility."

In January of 1992 NSP informed the Commission that negotiations between NSP and Minnegasco regarding gas supply had reached an impasse and that NSP would be amending its application to include a gas pipeline. The Commission received that addendum to the application on April 7, 1992, which amended and supplemented NSP's original application to include an associated natural gas pipeline to connect the proposed energy conversion facility at the Pathfinder site to a Northern Natural Gas pipeline near Harrisburg, South Dakota, approximately 13 miles south of the CTG facility. Accordingly, on May 5, 1992, the Commission issued an order revising the affected area "to include the area designated by NSP as the route for its proposed pipeline." The affected area for the purpose of this report is therefore:

> "the five-mile radius around the Pathfinder site and the corridor south of the site encompassing the preferred and alternative pipeline routes."

These boundaries are shown in Figure 1–2.

There are a number of federal, state, and local statutes and regulations which are applicable to the construction and operation of the proposed plant. The primary permit

consists of an Application for Construction Permit for an Energy Conversion Facility which must be approved by the South Dakota Public Utilities Commission. Other federal, state, and local permits applicable to this project are summarized in Table 1–1.

In support of its application for a permit for constructing an energy conversion facility and for other permits needed for the project, NSP prepared and submitted a number of supplemental reports. These reports have been used extensively in the preparation of this report. A listing of the reports submitted by NSP is shown in Appendix A. These documents are available to the public at several locations in the Sioux Falls area. In addition, the report of the Local Review Committee was used to address the social and economic impacts of the proposed project.

The following chapters describe the proposed project, the environmental setting of the affected area, the potential impacts the project will have on the environment including short-term and long-term effects, adverse environmental effects which cannot be avoided if the proposed project is implemented, alternatives to the project, irreversible and irretrievable commitments of resources involved in the proposed action, mitigation measures to minimize the environmental impact, and the growth-inducing aspects of the project.

Table 1–1. Anticipated permits and approvals from federal and state agencies.

Agency	Activity	Type of Approval	Status
Federal Agencies			
U.S. Army Corps of Engineers	Discharge of dredged or fill materials to waters	Section 404 of Clean Water Act approval	Applied for, pending
U.S. Environmental Protection Agency	Air pollutant emissions	Permit to construct and operate air emission source	Approved Sept. 2, 1992
U.S. Environmental Protection Agency	Wastewater discharge to surface water	NPDES permit modification	Applied for, pending
U.S. Environmental Protection Agency (by U.S. Army COE)	Construction activity impacts on water quality	Section 401 Water Quality Certification	Applied for, pending
Federal Aviation Administration	Construction of stack	Stack permit	Not Required
U.S. Department of Energy	Fuel Use Exemption Act	Exemption to burn natural gas and No. 2 fuel oil	Not applicable
State Agencies			
South Dakota Public Utilities Commission	Construction and operation of energy conversion facility	Permit to construct Energy Conversion Facility	Applied for, pending
South Dakota Department of Environment and Natural Resources	Water supply	Water Appropriations Permit	Approved March 4, 1992
SDDENR	Ground water discharge	Ground Water Discharge Permit	Approved Oct. 1, 1992
SDDENR	Oil storage tanks	Certification of Compliance	Approved Nov. 20, 1992
State Historical Society of South Dakota	Site preparation and grading	Approval of archeological surveys	Pending

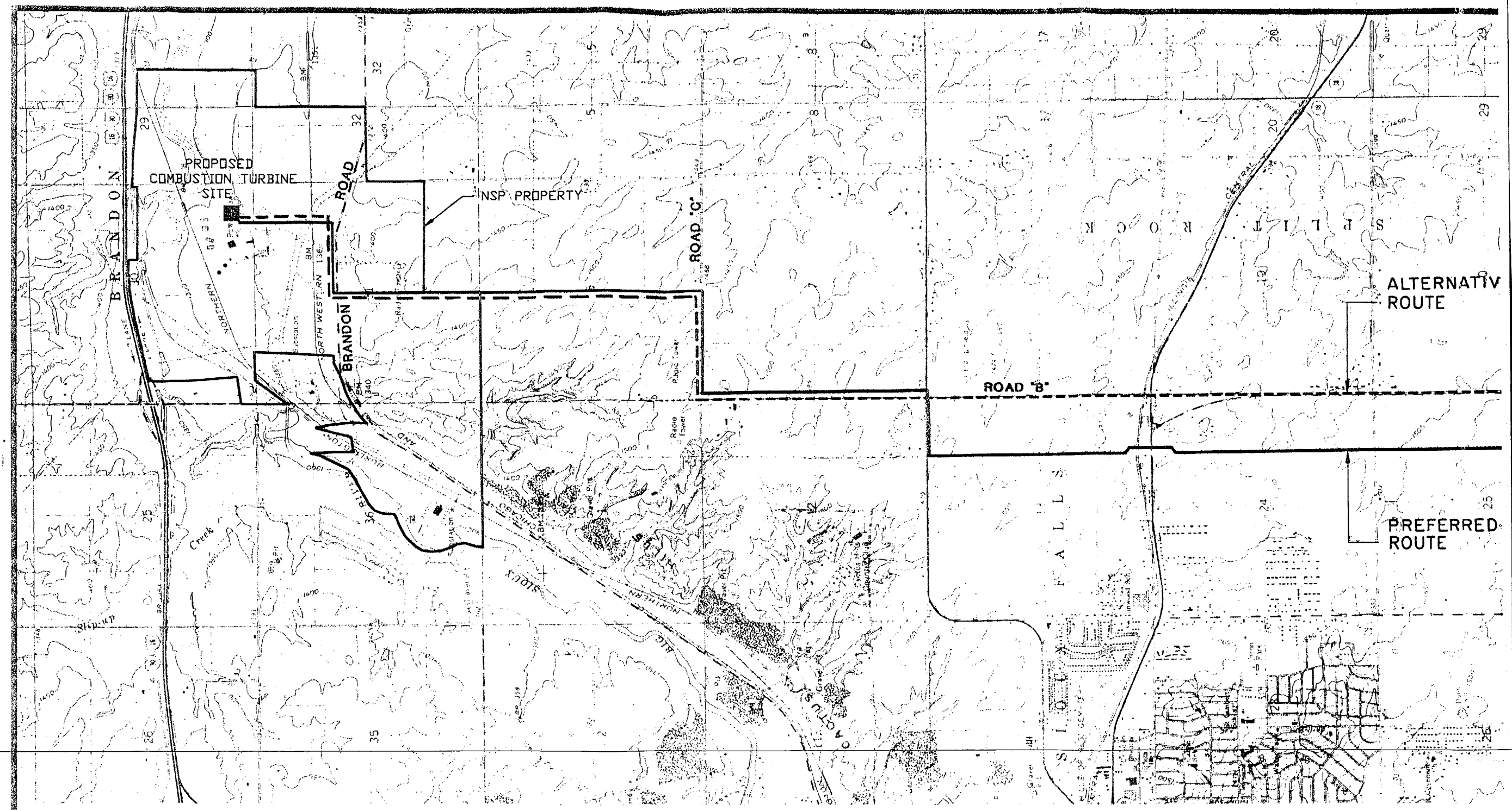
CHAPTER 2
A DESCRIPTION OF THE PROPOSED ACTION AND ITS ENVIRONMENTAL SETTING

2.1. Project Description

Northern States Power Company (NSP) proposes to construct a combustion turbine generator (CTG) facility consisting of up to four 105-megawatt (MW) combustion turbines at the NSP Pathfinder Generating Plant located east of Sioux Falls, South Dakota. To supply natural gas for the CTG facilities, NSP also proposes to construct an approximate 13-mile long natural gas pipeline south of the Pathfinder Site to connect to the Northern Natural Gas (NNG) pipeline near Harrisburg, South Dakota. The general site location is shown in Figure 1–1 with a more precise location of the proposed pipeline routes shown in Figure 2-1. CTG units are primarily used as peaking facilities. When electrical demand in an area is at its highest, such as during summer hot spells, peaking units are run to meet the increase in demand for electricity. Peaking units are also used when other utility–owned power plants are unexpectedly out of service or are shut down for maintenance.

The proposed CTG facility presently is scheduled for a January 1, 1995 in–service date. Subject to receipt of all necessary permits, construction of the CTG facility at the Pathfinder site is scheduled to begin during May of 1993. At present NSP is planning to construct two CTG units at the site with an additional two units planned in the future. The pipeline construction is scheduled to begin in March 1994 with construction completed by July 1994.

The estimated capital cost of the CTG facility is dependent on the number of CTG units installed at the site. At present two units are planned for installation in 1994 with an estimated cost of $78 million in 1994 dollars. The two additional units will be installed as needed and have an estimated cost of $67 million in 1994 dollars, for a total estimated cost for four CTG units $145 million in 1994 dollars. The estimated cost of the proposed pipeline is $4 million in 1994 dollars, excluding easement acquisition right–of–way costs.


PROPOSED
COMBUSTION TURBINE
SITE
NSP PROPERTY
ROAD "C"
ROAD "B"
BRANDON
ALTERNATIV
ROUTE
PREFERRED
ROUTE
0
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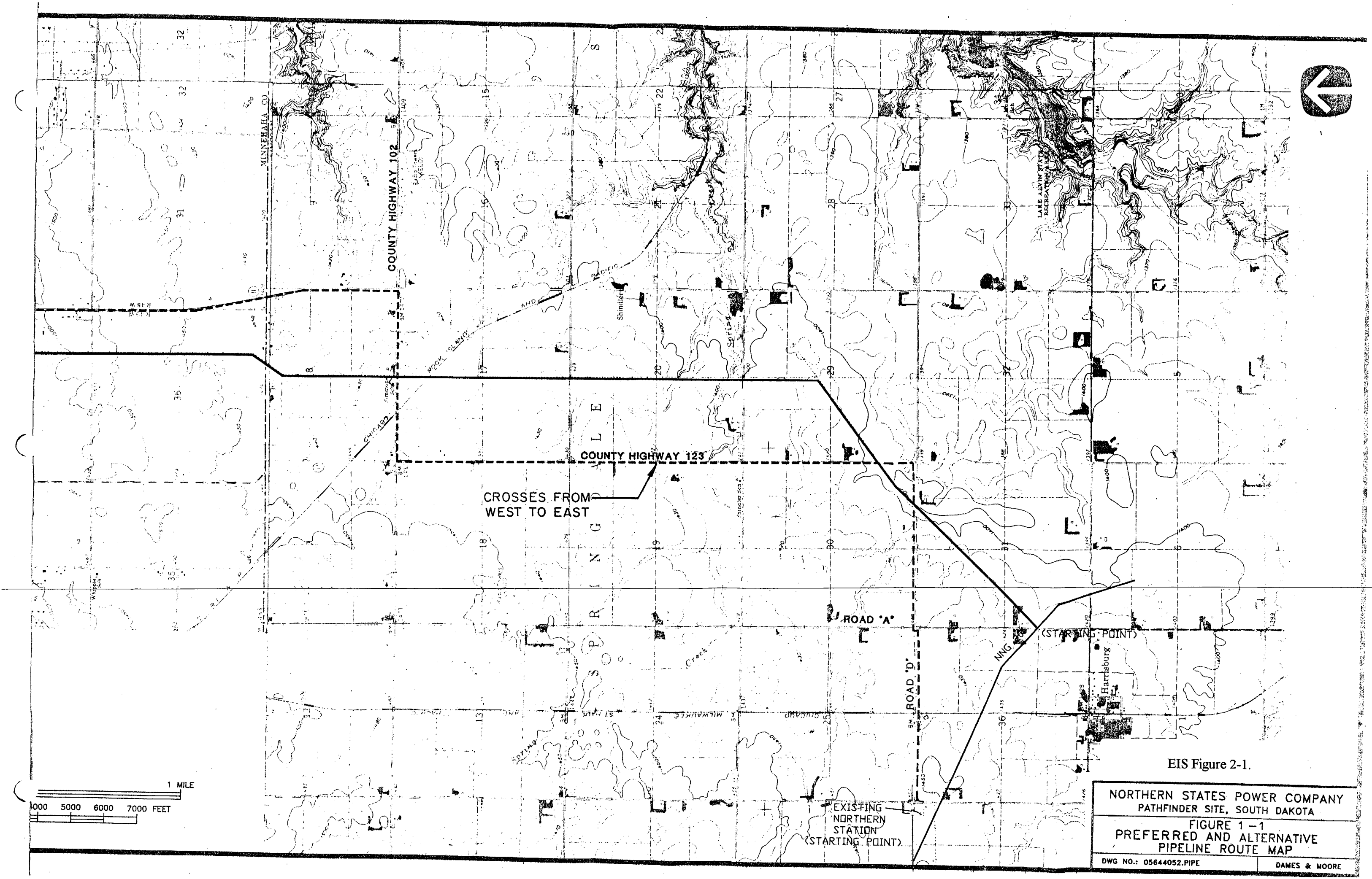


EIS Figure 2-1.

2.2. Proposed CTG Facility Description

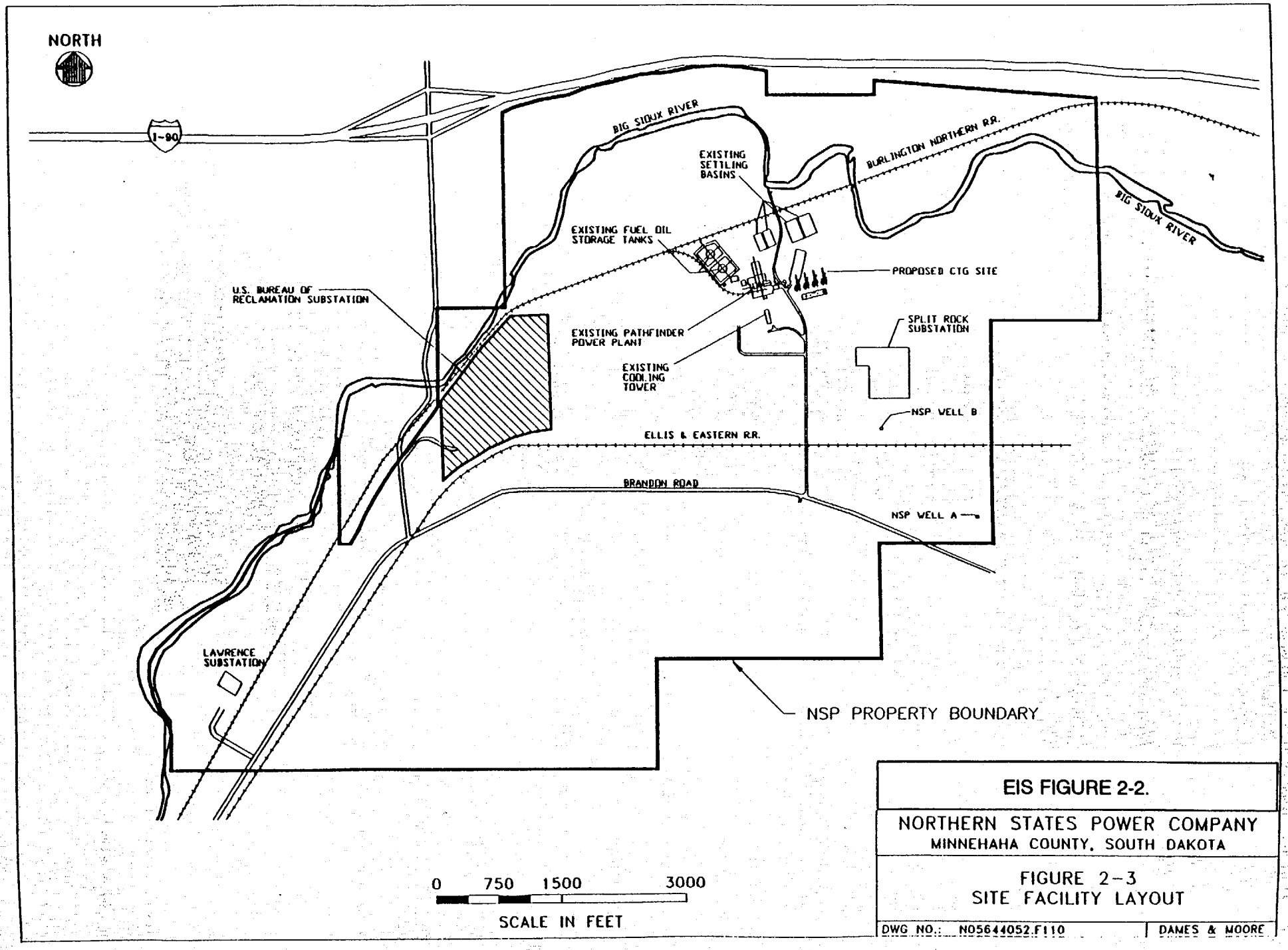
2.2.1. Site Location and Characteristics

The proposed Combustion Turbine Generator facility will be located at NSP's Pathfinder Power Plant site on property owned by NSP, in the southwest quarter of Section 30, Township 102 north, Range 48 west in Minnehaha County, South Dakota. The site is approximately 0.75 miles north northeast of the Sioux Falls city limits, 6.5 miles northeast of the Sioux Falls city center, and approximately 2.8 miles west of the city of Brandon. The Pathfinder site location is shown in Figure 2-2.

The plant site property is bordered by Interstate 90 to the north. The southern boundary is located approximately 3,400 feet south of the Brandon Road. The Big Sioux River flows west to east across the site, forming the western boundary at the southwestern corner of the property and running through the property in the northern portion of the site. The existing Pathfinder Power Plant is located south of the Big Sioux River. There are three substations in the vicinity of the proposed CTG site. NSP's Lawrence Substation is located in the southwestern property corner, NSP's Split Rock Substation is located southeast of the proposed plant site, and the U.S. Bureau of Reclamation's Substation is located southwest of the proposed CTG site. Two railroad lines are located within NSP's property boundary, one operated by Burlington Northern and the other operated by Ellis & Eastern. The relative location of the substations, railroads and the existing plant to NSP property boundaries is shown in Figure 2–2.

Existing facilities at the Pathfinder site include a 60 MW natural gas-fired steam generating plant, two 2–million gallon fuel oil storage tanks, a cooling tower, four settling basins, a river intake structure, two water supply wells, a substation and associated electric transmission facilities, and miscellaneous equipment required to support the operation of the steam plant. The location of these facilities is shown in Figure 2–2. The existing Pathfinder power plant will continue to operate in addition to the proposed CTG facility.

The Pathfinder site was the location of a 1962 vintage demonstration nuclear powerplant. The nuclear steam supply equipment was decommissioned. The reactor vessel and all nuclear equipment has been removed from the Pathfinder site.



EIS FIGURE 2-2.

NORTHERN STATES POWER COMPANY
MINNEHAHA COUNTY, SOUTH DAKOTA

FIGURE 2-3
SITE FACILITY LAYOUT

DWG NO.: N05644052.F110 | DAMES & MOORE

The proposed facility will consist of up to four Westinghouse 501D5 CTG units. The primary fuel supply for the proposed CTG facility will be natural gas, which will be supplied by a new pipeline as described below. The existing plant fuel oil tanks and equipment will be used to supply No. 2 distilled fuel oil, the back–up fuel supply. The existing settling basins will be used for the CTG facility's water treatment system waste water discharge. Existing wells at the Pathfinder Plant site will be used to supply water to the CTG facility and for domestic purposes.

2.2.2. Combustion Turbine Generator Units

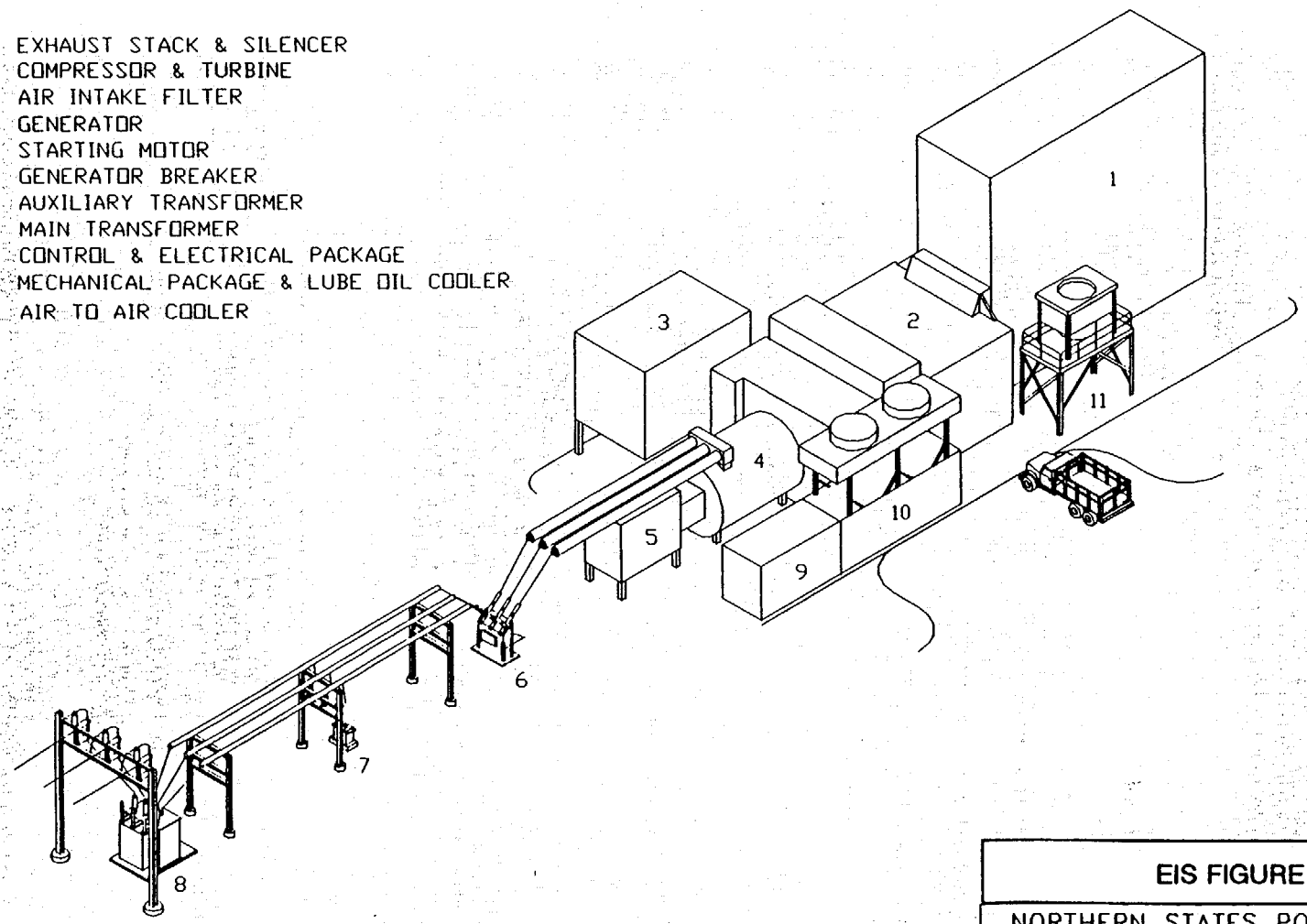
The 105 MW CTGs selected for the Pathfinder site will be manufactured by Westinghouse. CTGs are compact, modular power plants that can be installed quickly and at a lower capital cost than other types of generating facilities such as coal, nuclear, or hydroelectric generating plants. The major components of each CTG are combustors, air intake filter, compressor, turbine, generator, 50–foot emission stack, starting motor, generator breaker, auxiliary and main transformers, and related controls and support equipment. The major components of a typical CTG are shown in Figure 2–3. Each combustion turbine unit is approximately 150 feet by 70 feet in dimension. Four units situated side-by-side will require approximately two acres of land which does not include buffer zones around the unit.

High pressure air (typically 10 to 15 atmospheres) is generated by the compressor and supplied to the combustor, where it is mixed with fuel. The air-fuel mixture is burned in the combustor, and the resultant gases are directed to the turbine. The expanding hot gas spins the turbine, which, in turn, drives the compressor and a generator to produce electric power. The combustion gas is exhausted to the atmosphere through a 50-foot high stack. Silencers will be installed in both the air intake and exhaust plenums to minimize noise emissions. The turbines will be equipped with a water injection system to control nitrogen oxide (NO_X) emissions.

2.2.3. Operation

Under normal conditions, the proposed CTG facility at the Pathfinder site will be operated remotely from the NSP system operations center in Minneapolis, Minnesota. An operator and security personnel at the existing Pathfinder Plant will be responsible for the operation, maintenance, and site security coverage of the proposed CTG facility.

1. EXHAUST STACK & SILENCER
2. COMPRESSOR & TURBINE
3. AIR INTAKE FILTER
4. GENERATOR
5. STARTING MOTOR
6. GENERATOR BREAKER
7. AUXILIARY TRANSFORMER
8. MAIN TRANSFORMER
9. CONTROL & ELECTRICAL PACKAGE
10. MECHANICAL PACKAGE & LUBE OIL COOLER
11. AIR TO AIR COOLER



EIS FIGURE 2-3.

NORTHERN STATES POWER COMPANY
PATHFINDER SITE, SOUTH DAKOTA

FIGURE 2-4
COMBUSTION TURBINE GENERATOR DIAGRAM

DWG NO.: N05644052.F109 | DAMES & MOORE

Combustion turbine start-up is accomplished by spinning the turbine with a motor. Once the speed of the turbine is sufficient to establish a proper flow of air through the combustors, fuel can be injected and ignited. The power generated from the combustion process is then used to bring the turbine speed up to 3600 revolutions per minute. After the unit is synchronized to the NSP transmission system, the load is increased as required. The typical start-up time is 20 minutes from initial start to full load operation.

2.2.4. Pollution Controls

2.2.4.1. Air Emissions

The proposed CTG facility will emit nitrogen oxides (NO_X), sulfur dioxide (SO_2), carbon monoxide (CO), particulates, volatile organic compounds (VOCs), and unburned hydrocarbons when natural gas is burned. When fuel oil is burned, beryllium (Be) will be emitted as well.

Emissions control for the proposed CTG facility based on Best Available Control Technology (BACT) analyses are as follows:

- NO_X control will be by water injection when combusting either natural gas or No. 2 distillate fuel oil;
- CO emissions, which are a byproduct of the combustion process, are controlled by maintaining proper combustion techniques;
- SO_2 emissions will be minimized by using natural gas as the primary fuel. When the use of the back-up fuel is required, No. 2 distillate fuel oil, a low sulfur fuel oil (anticipated sulfur content of 0. 37 percent by weight) will be used to minimize SO_2 emissions;
- VOC emissions will be minimized by maintaining proper combustion techniques.
- TSP/PM_{10} emissions will be minimized by using natural gas as the primary fuel and by maintaining proper combustion techniques; and
- Emissions of Be will be minimized by using natural gas as the primary fuel.

To minimize adverse ground-level air quality impacts, 50–foot tall stacks will be constructed to exhaust spent gas from the proposed CTG units. NSP conducted air quality modeling to ensure that adverse air quality impacts will be minimized. A more detailed discussion of anticipated impacts to air quality from operation of the proposed CTG facility is contained in Section 3.1.2.1. NSP has applied for and received a permit from Region 8 EPA to construct and operate the proposed CTG facility. The Conditional Permit to

Commence Combustion and Operate was issued on September 7, 1992. The permit contains several conditions with respect to monitoring and operations to assure compliance with provisions of the Clean Air Act.

2.2.4.2. Wastewater

Wastewater from the proposed CTG facility and existing Pathfinder Power Plant will be discharged to four existing settling basins. It is anticipated that the capacity of the basins may be exceeded, resulting in a discharge to the Big Sioux River. This discharge is expected to meet all applicable water quality standards for the Big Sioux River with the exception of Total Dissolved Solids (TDS). However, TDS concentrations in the river are expected to meet the water quality standards once the discharge water and the river water are completely mixed. Anticipated impacts as a result of this discharge are discussed in Section 3.1.2.3.

NSP is working with the South Dakota Department of Environment and Natural Resources (SDDENR) to develop an acceptable permit for the discharge from the settling basins to the Big Sioux River, which is detailed in its NPDES Permit Application, part of NSP's Facility Permit Application.

2.2.4.3. Sound Control

Sound emitted from the proposed CTGs will be reduced by the use of a silencer in the air intake and the flue gas exhaust ducts. Sound will also be reduced by an insulated enclosure over the compressor, turbine and generator.

2.2.5. Water Usage

NSP proposes to supply the proposed CTG facility with water from two existing on-site wells screened in the Split Rock Creek Aquifer, which currently supply the Pathfinder Power Plant. The location of these wells is shown in Figure 2–2, where they are labeled as NSP Well A and NSP Well B. These wells may supply water at a combined rate of up to 650 gallons per minute (gpm). Well A, which has a maximum output of 500 gpm, serves the existing plant and will also serve the proposed CTG facility. Well B, which has a maximum output of 150 gpm, serves the domestic needs of the existing plant and will also serve the proposed CTG facility. Based on available information, it appears that the Split Rock Creek Aquifer will be capable of adequately supplying the water needs for operation of the proposed CTG facility and Pathfinder Plant. Additional information about the Split Rock Creek Aquifer is presented in Sections 2.4.11.2 and 3.1.2.2.

NSP submitted a Water Appropriations Permit Applications to the SDDENR for both wells. The Water Appropriations Permit Applications are included as an exhibit to the Facility Permit Application. These permits were approved on March 2, 1992.

2.2.6. Transmission Facilities

Approximately 2,500 feet of new 115 kV transmission line will be constructed to connect the proposed CTG facility with the existing Split Rock Substation located on the Pathfinder site. The new transmission facilities will be wholly contained on existing NSP property and will not require any clearing activities. The proposed transmission line route is shown on Figure 2–4. The exact details of the transmission facilities will not be known until detailed engineering has been conducted for the project, which will be performed after NSP receives a permit to construct the facility. The proposed transmission facilities are described below.

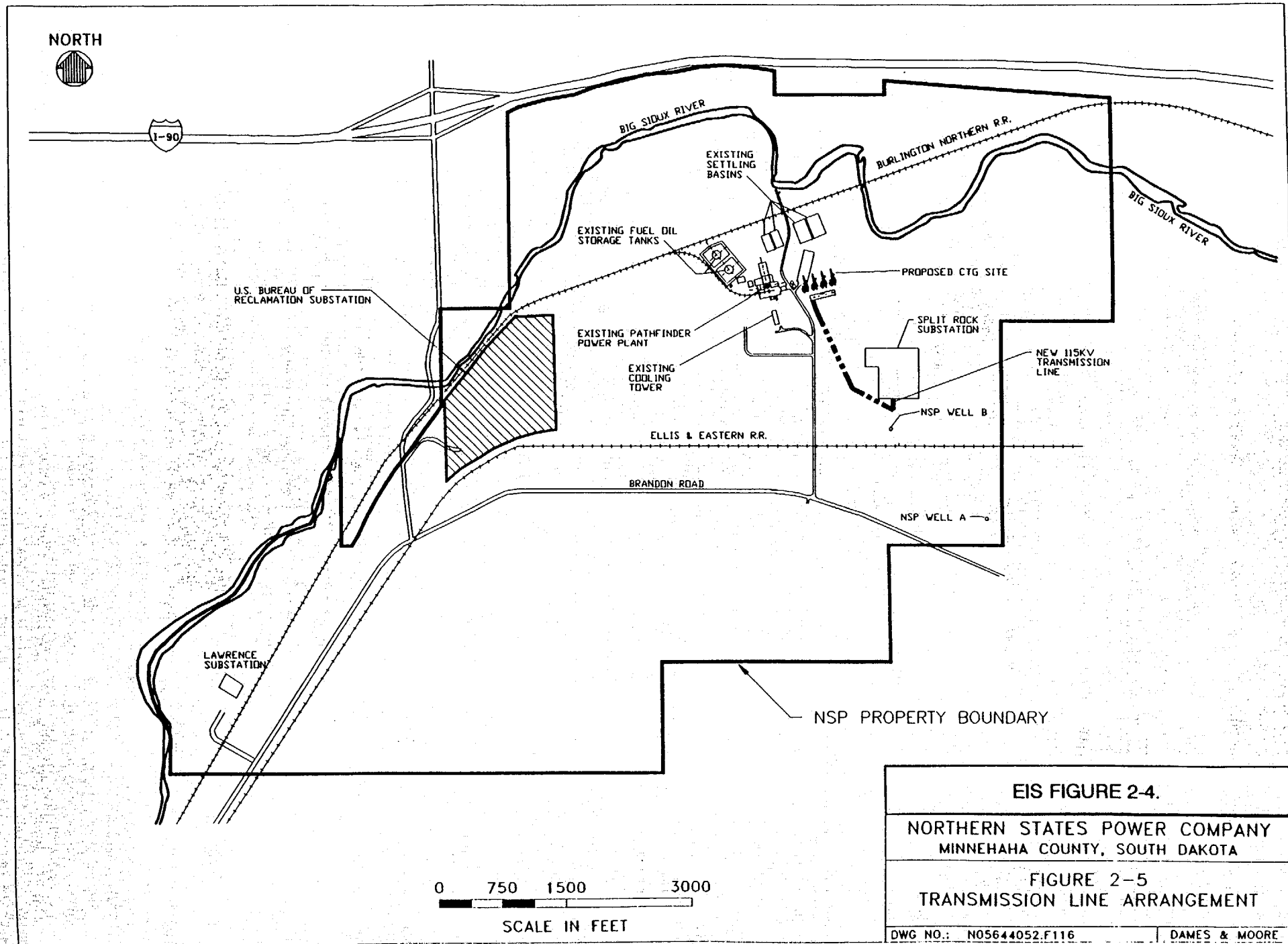
The new transmission facility is expected to be a single-pole, three-arm, three-conductor, single-circuit configuration with one shield wire on top. Alternately, the transmission facility could be a single-pole, six-arm, three conductor, double-circuit configuration with one shield wire on top. The poles for the transmission facility are expected to consist of eight single wooden structures with heights of 80, 85, 90, and 95 feet (two poles at each height). The poles are expected to be spaced at approximately 350 feet.

The exact transmission line layout, configuration, number of poles, heights, and spans will not be known until detailed engineering has been performed. The new transmission facility will be built to NSP standards and comply with all applicable Federal, State and local codes and regulations. The new transmission facility will be wholly contained on NSP property and therefore no right-of-way condemnation requirements will be required.

2.2.7. Fuels

2.2.7.1. Natural Gas

The primary fuel utilized by the proposed CTG facility will be natural gas of pipeline quality. Natural gas Btu content is approximately 1,000,000 Btu per 1000 cubic feet plus or minus 10 percent. The specific gravity of the natural gas will range from 0.58 to 0.62, and a maximum water content of 7 pounds per million cubic feet of gas can be expected. The anticipated approximate chemical analysis of the natural gas is shown in Table 2–1. The



EIS FIGURE 2-4.

NORTHERN STATES POWER COMPANY
MINNEHAHA COUNTY, SOUTH DAKOTA

FIGURE 2-5
TRANSMISSION LINE ARRANGEMENT

DWG NO.: N05644052.F116 | DAMES & MOORE

Table 2-1.

GENERAL COMPOSITION OF NATURAL GAS FUEL

Element	Pipeline Laboratory Standard (%)	Actual Recorded Composition[1](%)
N_2 - Nitrogen	4.0	1.07
CO_2 - Carbon Dioxide	1.0	0.42
C_1 - Methane	86.0	95.05
C_2 - Ethane	3.0	2.5
C_3 - Propane	0.5	0.09
IC_4 - Iso-Butane	0.5	0.0
NC_4 - Normal Butane	0.5	0.01
IC_5 - Iso-Pentane	0.5	0.0
NC_5 - Normal Pentane	0.5	0.0
C_6 - Hexanes	0.5	0.0
H_6 - Helium	1.0	0.03
H_2 - Hydrogen	2.0	0.03

Proximate Analysis % by volume.

[1] Taken from St. Paul area gas chromatograph

natural gas will be delivered to the proposed CTG facility by the proposed pipeline connecting the a Northern Natural Gas pipeline near Harrisburg.

2.2.7.2. Distillate Fuel Oil

Backup fuel for the proposed CTG facility will be No. 2 distillate fuel oil, which will be used during times when natural gas is unavailable. It is anticipated that a one week supply of fuel oil will be stored on-site in the two existing fuel oil storage tanks, based on the assumption that the proposed CTG facility would operate 50 hours per week at full capacity at winter design conditions. The Btu content of No. 2 distillate fuel oil is expected to be about 19,000 Btu per pound plus or minus 10 percent. The anticipated approximate chemical analysis of the No. 2 distillate fuel oil is shown in Table 2–2. The No. 2 distillate fuel oil will be delivered to the site by rail or truck depending on market conditions and transferred to storage in the existing fuel oil storage tanks.

2.3. Description of Proposed Pipeline Alternatives

2.3.1. Location and Pipeline Characteristics

Two potential pipeline routes (referred to as Preferred Route and Alternative Route in Figure 2–1) have been proposed by NSP to supply the proposed CTG facility with natural gas. Both routes would run in a general north-south direction (the preferred route is approximately 13 miles in length; the alternative route is approximately 14 miles in length) connecting the proposed CTG facility to a Northern Natural Gas (NNG) pipeline, southwest of the Pathfinder site near Harrisburg, South Dakota.

The preferred pipeline route would begin at the NNG 20-inch diameter pipeline just northeast of the town of Harrisburg, in Lincoln County, South Dakota, approximately 1/3 mile north of County Highway 110 and on either the west or east side of an unnamed, unnumbered Springdale Township road (referred to in Figure 2–1 as Road "A") where the NNG pipeline crosses Road "A". A Town Border Station, consisting of isolation valves, metering, and equipment to add odorant to the natural gas will be installed at the connection point over approximately one acre.

From that point, the pipeline would run approximately 1.2 miles northeast to the intersection with the Western Area Power Association (WAPA) electric transmission line corridor. The pipeline would then run northeast approximately 0.7 miles along the southeast side of the WAPA transmission line corridor. From that point, the pipeline would run north

Table 2-2.

GENERAL COMPOSITION OF NO. 2 DISTILLATE FUEL OIL

COMPOUND	WEIGHT PERCENT
Aliphatic Hydrocarbons	64%
Aromatic Hydrocarbons	35%
Xylene	1%
Olefinic Hydrocarbons	1-2%
Naphthalene	1%
Sulfur	0 - 0.57 ppm
Arsenic	0.012 - 0.13 ppm
Cadmium	0.089 - 0.89 ppm
Chromium	0.055 - 2.8 ppm
Iron	3.8 - 71.0 ppm
Lead	<0.49 - 2.0 ppm
Manganese	0.29 - 6.2 ppm
Molybdenum	0.018 - 0.27 ppm
Nickel	<6.1 - 23.0 ppm
Vanadium	<0.06 - 0.16 ppm
Zinc	1.3 - 4.8 ppm

Sources: The Installation Restoration Program Toxicology Guide, Volume 4, Oak Ridge National Laboratory, 1989; MSDS for No.2 Distillate Fuel Oil

approximately 7.0 miles along the west side of the WAPA transmission line into Minnehaha County; however, just south of Highway 38, the pipeline would cross at an angle to the east side of the transmission line and then cross back to the west side just north of Highway 38. At South Dakota Route 11, the pipeline would run east 0.25 miles along the south side of South Dakota Route 11 to the east side of an unnamed, unnumbered Split Rock Township road (referred to as "Road B" in Figure 2–1). There the pipeline would run along the east side of Road "B" for 1.0 mile to the north side of an unnamed, unnumbered Brandon Township road (referred to as Road " C" in Figure 2–1). The pipeline then would run east along the north side of Road "C" for 0.5 miles to a point near the section line where it would run north following the west side of a property line following the west side of the section line for approximately 1.5 miles to the north side of Brandon Road. At that point the pipeline would run east along the north side of Brandon Road for approximately 0.25 miles to the east side of the existing entrance road to the Pathfinder Power Plant site. The pipeline would then turn north running approximately 0.5 miles along the east side of the entrance road to the proposed CTG facility site.

The alternative pipeline route would begin at the NNG station located approximately 1.1 miles northwest of the town of Harrisburg and run east approximately 1.0 mile along the south side of an unnamed, unnumbered Springdale Township Road (referred to as "Road D" in Figure 2–1). At that point, the pipeline would cross at an angle to the north side of Road "D". The pipeline would then run approximately 1.0 mile east along the north side of the unnamed, unnumbered Springdale Township Road to County Highway 123. The pipeline would then run north approximately 2.0 miles along the west side of County Highway 123. At that point, the pipeline would cross at an angle to the east side of County Highway 123 and run approximately 1.5 miles north along the east side of County Highway 123 to County Highway 102. The route would then run approximately 1.0 mile east along the south side of County Highway 102 to the intersection with South Dakota Route 11. It would then run north along South Dakota Route 11 approximately 5.75 miles into Minnehaha County to the intersection of Road "C". The pipeline would likely cross back and forth across South Dakota Route 11 several times to avoid residential and farm units. The pipeline then would run east along the north side of Road "C" for 0.5 miles to a point near the section line where it would run north following the west side of a property line following the west side of the section line for approximately 1.5 miles to the north side of Brandon Road. At that point the pipeline would run east along the north side of Brandon Road for approximately 0.25 miles to the east side of the existing entrance road to the Pathfinder Power Plant site. The pipeline

would then turn north running approximately 0.5 miles along the east side of the entrance road to the proposed CTG facility site.

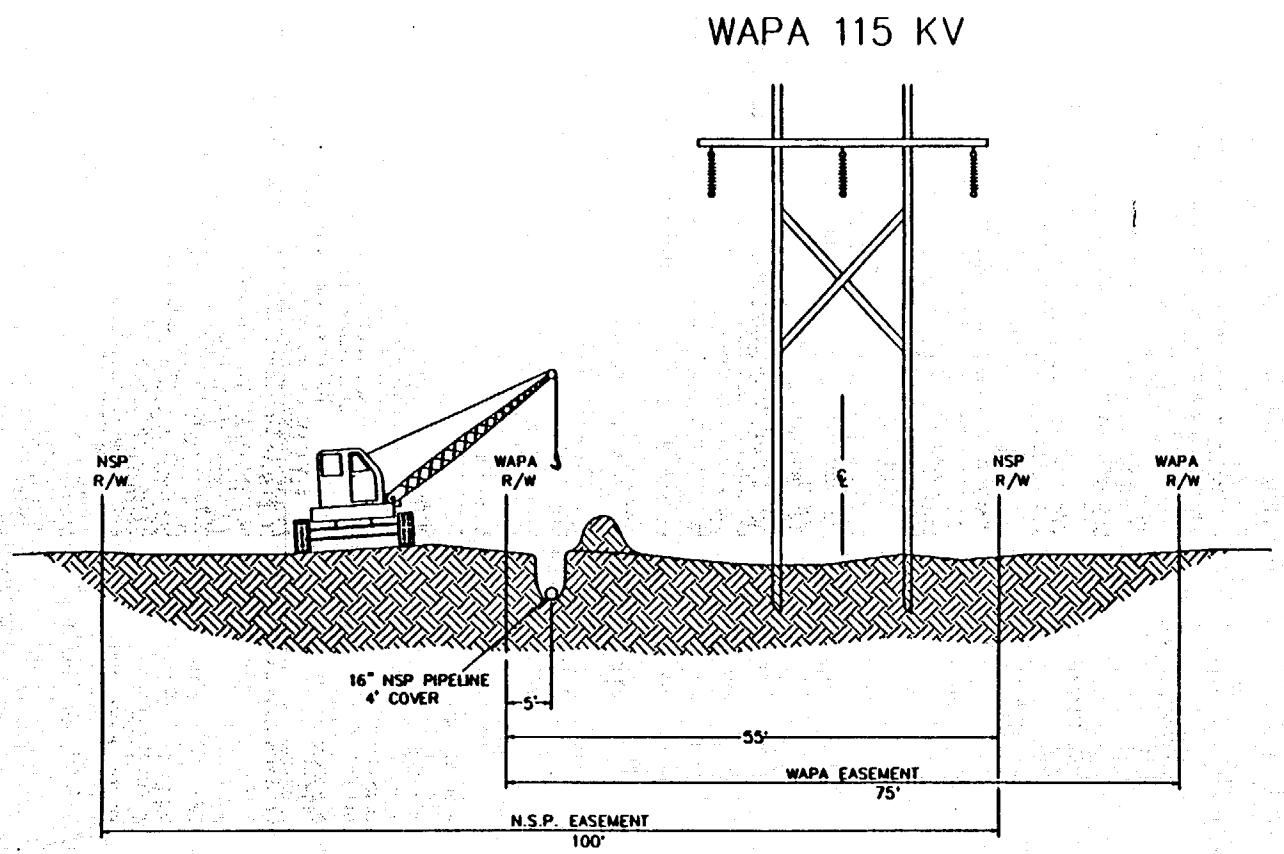
For those locations where the pipeline will run along the WAPA transmission line NSP is proposing to obtain a 100-foot easement overlapping with the WAPA easement. The pipeline is proposed to be placed five feet inside of the WAPA easement with the NSP 100 foot easement centered on the pipeline as shown in Figure 2–5, which depicts a typical right-of-way cross-section along the WAPA transmission line right-of way. For those locations where the pipeline will run along roadways NSP is proposing to obtain a 50-foot easement next to the roadway right-of-way. The pipeline would be placed five feet inside of the NSP easement, as shown in Figure 2–6, which depicts a typical right-of-way cross-section along a highway or township road. The majority of the preferred pipeline route will be located within a 100-foot easement, 55 feet of which will be an existing WAPA electric transmission line easement. Thus, 45 feet of the 100-foot easement will be a new easement which NSP intends to obtain from the various landowners along the pipeline route. The majority of the alternative route is along public roadway and would require purchase of a 50–foot easement along the public road right–of–way. Portions of the pipeline which are not along the WAPA transmission line corridor, not along a public roadway, and are not within NSP's property will require the purchase of a 100-foot easement.

NSP anticipates that the actual pipeline location within the right-of-way may vary up to about 10 feet, to accommodate specific site conditions. Similarly, adjustments to the specific point where direction changes occur are expected to be less than 100 feet, to accommodate specific site conditions and final arrangements with landowners. NSP anticipates providing a final pipeline route drawing after construction of the pipeline is complete.

The expected maximum flow rate of natural gas through the pipeline will be 5.0 million cubic feet per hour or 120 million cubic feet per day. The design pressure of the natural gas pipeline will be 900 pounds per square inch (psi).

2.3.2. Pipeline Construction

The following sections describes the construction standards and techniques that NSP has proposed to use during the construction of the pipeline and during the subsequent operation of the pipeline.



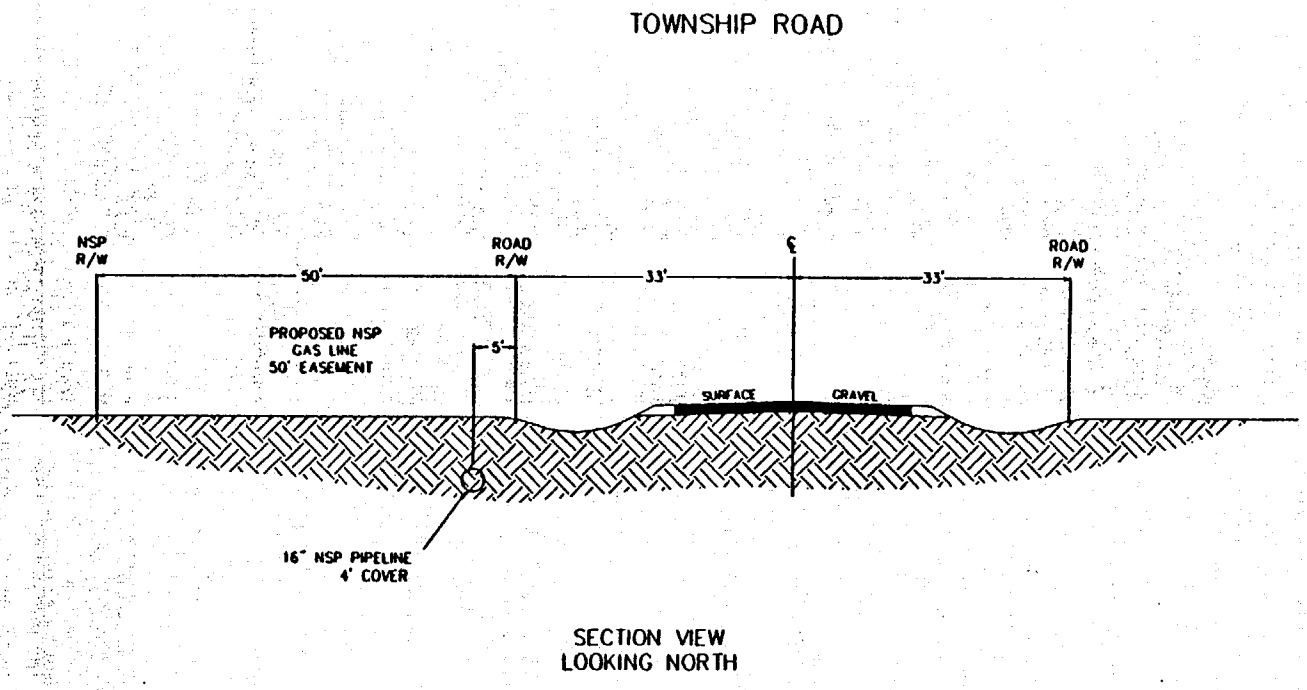
SECTION VIEW
LOOKING NORTH

EIS FIGURE 2-5.

NORTHERN STATES POWER COMPANY
MINNEHAHA COUNTY, SOUTH DAKOTA

FIGURE 2-1
TRANSMISSION LINE –
TYPICAL CROSS-SECTION RIGHT-OF-WAY

DWG NO.: 05644052 | DAMES & MOORE



EIS FIGURE 2-6.

NORTHERN STATES POWER COMPANY
MINNEHAHA COUNTY, SOUTH DAKOTA

FIGURE 2-2
HIGHWAY –
TYPICAL CROSS-SECTION RIGHT-OF-WAY

DWG NO.: D5644052 | DAMES & MOORE

2.3.2.1. Gas Transmission Line Standards of Construction

NSP has proposed that the northernmost approximately 6.0 miles of the pipeline consist of a 12-inch diameter steel pipe while the remaining approximate 7 miles consist of a 16-inch diameter steel pipe. The 12-inch diameter natural gas pipe will have a wall thickness of 0.312 inches and will be American Petroleum Institute (API) 5L Grade X-42 seamless or electric resistance welded. The composition of the pipe will conform to the chemical requirements specified in the API-5L Standard.

The 16-inch diameter natural gas pipe will have a wall thickness of 0.281 inches (except at uncased road crossings in which case the wall thickness will be 0.375 inches) and will be American Petroleum Institute (API) 5L Grade X-52 and seamless or electric resistance welded. The composition of the pipe will conform to the chemical requirements specified in the API-5L Standard.

The entire length of the pipeline will be designed for a Class 3 location with a design factor of 0.50 in accordance with the United States Department of Transportation (US DOT) Safety Regulations, Title 49, Code of Federal Regulations (CFR), Part 192, which prescribe federal safety standards for transportation of natural gas by pipelines. A Class 3 location is defined as an area that has 46 or more buildings intended for human occupancy; or an area where the pipeline runs within 100 yards of either a building or a small, well-defined outside area that is occupied by twenty or more persons at least five days a week for ten weeks in any one-year period.

Block valves will be located along the pipeline in accordance with the Federal Safety Standards for Gas Lines as established in 49 CFR 192.179 Transmission Line Valves. NSP will locate block valves in accordance with Class 3 location requirements. Block valves will be full opening, through conduit, weld-ended or flanged meeting requirements of API 60. Maximum allowable operating pressure for the valves is 1,440 pounds per square inch (psi) for the 12-inch diameter section of pipeline and 1,440 psi for the 16-inch diameter section of the pipeline. The ANSI rating on the valves is Class 600.

The design, construction, testing and marking of the valves will comply with the requirements of US DOT, 49 CFR 192.145 Valves and 192.147 Flanges.

2.3.2.2. Construction Sequence

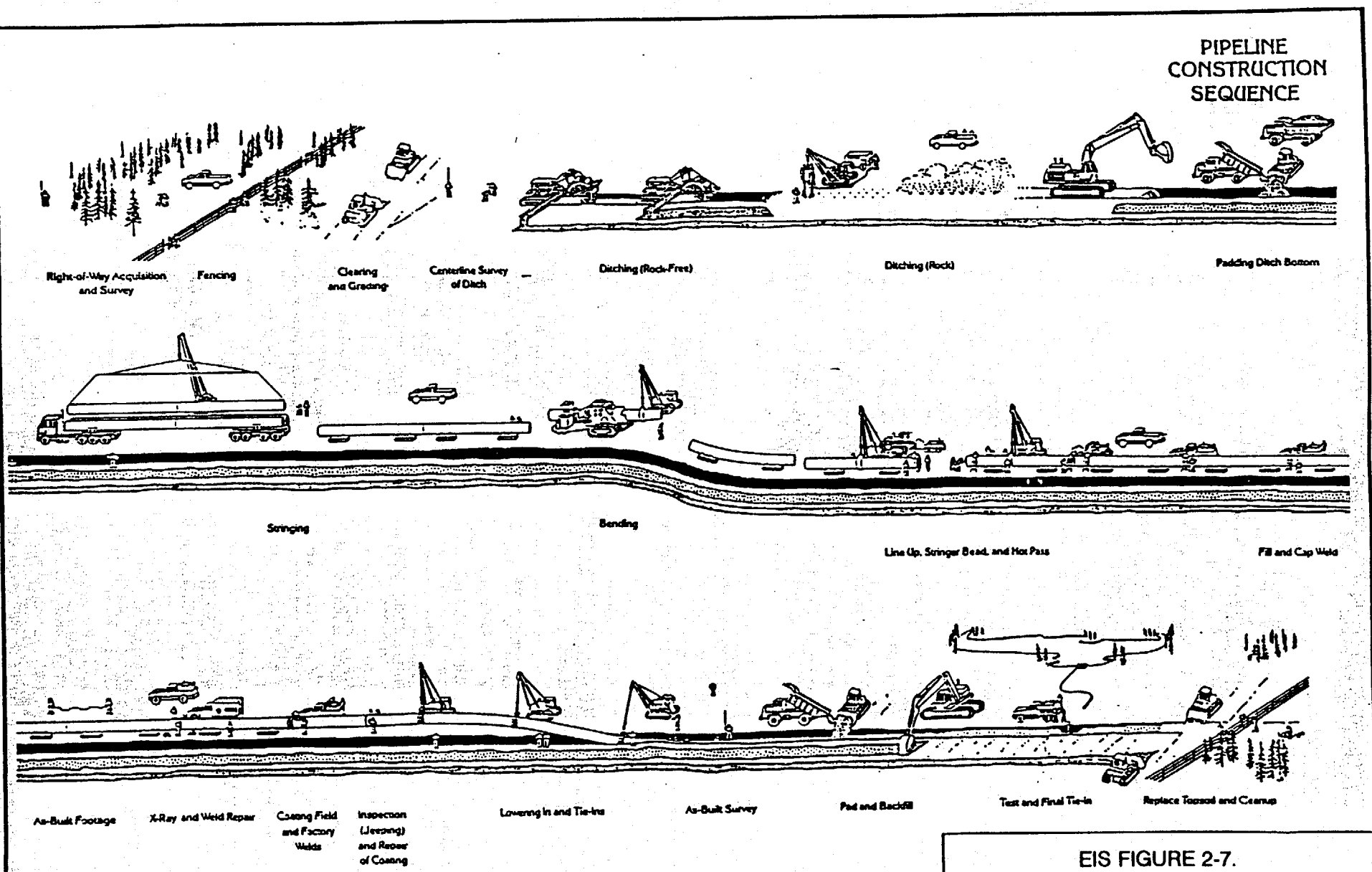
The proposed construction sequence of the pipeline is depicted in Figure 2-7. The initial step will be to prepare a right-of-way, approximately 100 feet wide, which is cleared and contoured following an on-ground engineering-staked survey line. Above-ground vegetation and obstacles will be cleared to allow safe and efficient use of construction equipment. A storage area will be set up for equipment, piping, and other material.

When encountered along a right-of-way, fences will be adequately braced before any opening to the fence is made. Locking gates or appropriate fencing will be installed when construction in the area has been completed. Damage to fences, gates, and cattle guards will be restored to the original condition or replaced. Access and livestock control will be employed during construction to limit land use impact.

Clearing of the right-of-way will follow accepted industry practices and sound construction guidelines. Debris created from preparation of the right-of-way will be disposed using approved methods during restoration. Contouring or blading of a right-of–way will be done only to ensure the safe movement of machinery and ditching equipment along the installation route of the pipeline. Where necessary, road materials will be obtained from appropriate sources. Grading and cut-and-fill excavation will be performed to minimize effects on natural drainage and slope stability. On steep terrain or where diversion dams must be built to facilitate construction, the areas will be restored upon completion of construction to resemble original conditions.

Typically, trench depths will range from 60 to 70 inches and vary in width from 24 to 52 inches depending on soil type and the minimum cover requirements of the pipe. Minimum cover will be 42 inches and typically will be 48 inches in depth. When rock or rocky formations are encountered, tractor-mounted mechanical rippers may not be practical. In this situation, blasting or draglines may be employed. It is not expected that blasting will be required for the pipeline.

In areas where there is a need to separate top and subsoils, a two-pass trenching process will be used. The first pass will remove topsoil and the second pass will remove subsoil with soils from each of the excavations being placed in separate banks. This allows for proper restoration of the soil during the backfilling process. Soil banks will contain gaps to prevent storm runoff water from backing up or flooding.



EIS FIGURE 2-7.

NORTHERN STATES POWER COMPANY
MINNEHAHA COUNTY, SOUTH DAKOTA

FIGURE 2-3
PIPELINE CONSTRUCTION SEQUENCE

DWG NO.: 05644052 | DAMES & MOORE

Pipe will be transported to the right-of-way via truck, and unloaded by tractors fitted with side booms. The pipe will then be strung either prior to or after ditching. The stringing operation involves the placement of coated pipes, valves, and fittings along the right-of-way.

After the pipe is strung along the trench and before the sections of pipe are joined together, individual sections of the pipe are bent to allow for uniform fit of the pipeline with the varying contours of the bottom of the trench. A track-mounted, hydraulic pipe bending machine tailors the shape of the pipe to conform to the contours of the terrain. The actual bend is made by a set of clamps, or shoes, that grip the outside surface of the pipe at the point where the bend is to be made. If multiple or complex bends are required in a section of pipe, that section of the pipeline is fabricated in the factory.

Installation of the pipe, following the bending, commences with swabbing the pipe, lining it up for welding, holding it in position until it is securely joined by welding, completing the welds, and lowering it onto skids or blocks.

Welding is the mechanical fusing of the individual sections of pipe to form the pipeline. Each weld must exhibit the same structural integrity as the pipe with respect to strength and ductility. Each weld is inspected by radiographic examination to determine the quality of the weld. Radiographic examination is a nondestructive method of inspecting the inner structure of welds to determine the presence of defects. Defects would be repaired or removed as outlined in API 1104. Radiographic inspections will be performed as outlined in 49 CFR 192, Transportation of Natural and Other Gas by Pipeline.

Each girth weld is protected from corrosion by field coating or wrapping the weld. Once completed, the pipeline is lowered into the trench using special side boom tractors which lift the line, move it over the open trench, and then lower the string of pipe into the trench.

After the pipe has been lowered into the trench , the trench is backfilled. Backfill will be placed by appropriate techniques to avoid potential settlement that would leave a surface depression.

After burial, the pipeline is pressure tested to ensure that the system is capable of withstanding the operating pressure for which it was designed.

The final phase of pipeline construction involves clean-up and restoration of the right-of-way. Construction debris and surplus materials will be removed and disposed in accordance with applicable federal, state, and local standards. The right-of-way surface will be restored and smoothed with disc harrows or other equipment, and stabilized where necessary using earth-filled sacks, rock, riprap or other materials. Finally, the right-of-way will be revegetated to approximately its original condition.

2.3.3. Operation and Maintenance

The proposed pipeline system will be operated and maintained in accordance with the United States Department of Transportation Federal Safety Standards for Gas Lines, 49 CFR 192, Subpart L–Operations and Subpart M–Maintenance. These regulations include requirements pertaining to patrolling and leak surveys, the placement of line markers for gas transmission lines, monitoring, and the preparation of emergency plans.

2.3.3.1. Patrolling and Leak Surveys.

In accordance with 49 CFR 192, the transmission line facility will be monitored periodically to determine, and take appropriate action concerning, changes in class locations, gas leakage, erosion, cathodic protection requirements and other conditions affecting safe transmission line operation. Specifically, the transmission line will be patrolled at intervals not exceeding fifteen months, but at least once each calendar year. Highway and railroad crossings will be patrolled at intervals not exceeding seven and one-half months, but at least twice each calendar year, preferably spring and fall.

The patrol will consist of a Flame Ionization or Combustion Gas Indicator (CGI) survey during which the operator will check surface conditions on and adjacent to the transmission line right-of-way for indications of leaks, construction activities, and other factors affecting safety and operation. Additional required surveys may be performed by visual inspection of the right-of-way and testing all involved vents with a CGI.

2.3.3.2. Line Markers For Gas Transmission Lines

In accordance with 49 CFR 192, an approved gas line marker will be placed and maintained as close as practical over the buried transmission line at each crossing of a public road, railroad, navigable waterway and wherever else necessary to identify the location of the facility to reduce the possibility of damage or interference.

2.3.3.3. Monitoring

The pipeline cathodic protection system will be inspected and monitored in accordance with DOT 192.

2.3.3.4. Emergency Plans

Emergency plans will be developed in conjunction with local officials and will include notification of local officials in the event that an NSP-related accident occurs.

2.3.4. Odorization

The natural odor intensity of natural gas is low. Therefore, NSP will install an automatic odorization system which will control odorant flow based upon the gas flow rate input signal. The odorizing system will include a day storage tank of approximately 150 gallons and a make-up tank of approximately 1,000 gallons.

2.3.5. Corrosion Protection

All the pipes will be externally coated and cathodically protected by a groundbed/rectifier system to prevent corrosion as required by 49 CFR 192 Subpart I - Requirements for Corrosion Control (192.451 through 192.491). In addition, all above–ground piping that is exposed to the atmosphere will be examined for coating damages, and will be evaluated to determine areas of atmospheric corrosion at intervals not to exceed three years. Remedial action will be taken when necessary.

2.4. Description of the Environmental Setting – Physical Characteristics

2.4.1. Climate

The climate of the study area is a continental type, characterized by large seasonal and daily variations in temperature with normally ample spring and summer rainfall and lighter winter precipitation. There are frequent and sudden changes in weather, often daily, as the area is dominated by cold air masses from the north in the winter and by warm air masses from the south in the summer. Storm systems associated with these weather fronts can cause thunderstorms in the late spring and summer, and blizzard conditions during the months of January, February and March. No large bodies of water are nearby to affect the climate of the study area.

The temperature can fluctuate frequently in the study area. The seasonal range in temperature is large, and occasionally there is a large change in temperature from one day to

the next. Masses of cold air often move in rapidly, causing strong gusty winds for several hours, and a rapid drop in temperature. Monthly normal temperature values are shown in Table 2-3. The average daily temperature reaches its minimum of about 15 °F during January and its maximum of about 75 °F during July. During the late fall and winter, cold fronts sometimes bring temperature drops of as much as 40 °F in a 24-hour period. There are usually a few occasions each year when the temperature lowers to 20 °F or 25 °F below zero. Temperatures above 100 °F are quite rare. There are normally only two or three such occurrences each year and these are most likely to occur in between July 1st and August 15th. In the study area, the average date of the last frost (32 °F and below) in the spring is May 5. The average date of the first frost in the fall is October 3.

The average annual precipitation at Sioux Falls, the closest monitoring station to the study area, is about 25 inches per year, but the annual precipitation varies widely form the average. Approximately 65 percent of the normal yearly precipitation falls during the April to August growing season. Monthly normal precipitation values are shown in Table 2-3. Spring and summer precipitation usually comes in showers and thundershowers of short duration which vary widely in intensity and in amount of precipitation. Hail occasionally accompanies the thundershowers and may be expected on an average of about two to three times per year.

The average snowfall in the Sioux Falls area is about 41 inches per year. One or two very heavy snows usually occur during each winter season. Eight to 12 inches of snow may fall in 24 hours and there have been a few instances of falls in excess of 15 inches. On February 17-18, 1962, the Sioux Falls area received 26.0 inches of snow in a 24-hour period. Strong winds often accompany the snowfall, causing large drifts in and near sheltered areas, while open fields remain nearly bare. During such storms, highways are usually blocked for a day or so, and county roads may be blocked much longer. As the ground is generally frozen during the time the snow melts little of the runoff infiltrates into the ground (Driessen 1976).

The average annual National Weather Service Class A pan evaporation in the area is about 50 inches, of which about 39 inches, or 77 percent of the annual amount, occurs from May to October. The pan evaporation represents a maximum, or potential evaporation. The average annual evaporation from small lakes is about 36 inches. The actual loss from soil is usually less, depending upon available soil moisture (Driessen 1976).

Table 2–3. Normal monthly temperatures and precipitation at Sioux Falls.

Month	Normal Temperature °F	Normal Precipitation inches
January	14.9	0.61
February	20.4	0.76
March	32.2	1.44
April	47.2	2.50
May	59.0	3.46
June	68.5	4.09
July	74.4	2.95
August	71.8	3.09
September	61.7	2.76
October	49.9	1.57
November	33.3	1.06
December	20.2	0.72

Mean Annual Temperature (°F)	46.2
Mean Annual precipitation (inches)	25.02
Length of record (years)	76
Maximum Temperature (July 1936) (°F)	110
Minimum Temperature (February 1899) (°F)	– 42
Maximum Monthly precipitation (May 1898) (inches)	9.42
Minimum monthly precipitation (October 1952) (inches)	0.00
Average Frost-free period	April 19 to October 23

The normals are based on the climatological normals for the period 1960-89.

Southerly winds prevail at Sioux Falls in the summer and early fall, but during the late fall and winter northwesterly winds often prevail. The average wind speed in the area is approximately 11.1 miles per hour. Strong wind of 50 miles per hour or more can occur any month of the year but is most likely during thunderstorms in summer. Other times of the year strong wind may be associated with the passage of a strong cold front or a deep low-pressure area. Incomplete records of wind velocity show the strongest winds as 70 mph, with gusts to as much as 90 mph. Strong winds and blowing snow normally bring blizzard conditions a few times each year. It is possible from a tornado to touch down in the area, but such occurrences have been extremely rare.

The study area experiences a considerable amount of sunshine and clean air. The area receives about 65% of the total possible sunshine, with the percentage of sunshine reaching 75% in July and August. Usually the air is clear with excellent visibility due to considerable air movement from areas not densely populated and not highly industrialized.

2.4.2. Physiography and Topography

The study area lies at the extreme southern edge of the Coteau des Prairies (Prairie Hills) section of the Central Lowlands physiographic province. The Coteau des Prairies is a highland plateau occurring between the Minnesota River lowland to the east and the James River lowland to the west. The Coteau is a 200-mile-long, flatiron-shaped constructional remnant from glacial ice sheets that moved south along the eastern edge of South Dakota (Flint 1971). The general topography of the Coteau is rolling and hummocky because of glacial moraines, stream valleys, and various other geomorphic features such as prairie moraines, disintegration ridges, kames, kame terraces, plateaus, and collapse features . The Coteau des Prairies is packed and covered with glacial drift. The area has a pattern of relief typical of a glaciated prairie region. The major physiographic subregions are: broad, level alluvial valleys which are flanked by escarpments and relict Pleistocene terraces; steeply sloping valleys with headwater streams; and relatively level upland plains. The distribution of steep slopes (over 15%) is closely associated with the highly dissected stream valleys. Elevations within the Coteau area range from more than 2000 feet above sea level at its northeastern margin to 1090 feet above sea level at the southern margin where the Big Sioux River empties into the Missouri River.

The Big Sioux River is the only large stream that drains the Coteau. The river's course, which approximates the central axis of the Coteau, seems to have been developed during one of the glacial ages when glacial meltwater flowed southward, confined between two glacial lobes

that flanked the Coteau. Most of the tributaries to the Big Sioux River flow from the east. Lakes ponds, and marshes are more abundant west of the Big Sioux River than east of it.

The drainage in the entire study area flows directly to the Big Sioux River. Its tributaries dominate the drainage in the area producing a dendritic drainage system. The stream dissection of the area is generally well developed.

In the study area the elevation is approximately 1300 feet above sea level near the proposed CTG facility and ranges to about 1500 feet in the uplands just south of the Pathfinder site to about 1380 feet at the south end of the pipeline routes. The Big Sioux River cuts a channel across the study area which produces much of the relief. The pipeline runs along an area of ground and end moraines (see Geology) and as a result has a hilly topography. Loess has capped the ground moraine in and around the area of the pipeline routes in Minnehaha County.

The topography in the pipeline route area is quite rough with hills rising from thirty to forty feet above their neighboring valleys. The topography is entirely stream-made, with short valleys fingering into one another to make a dendritic net, which completely drains the area to the Big Sioux River. No swamps or lakes occur in these hill areas, although wetland areas are prominent in undrained glacial depressions.

2.4.3. Geology

The Coteau des Prairies is composed of bedrock formations and a mantle of unconsolidated glacial drift of variable thickness. Four major glacial stages invaded the Coteau: the Nebraskan, the Kansan, the Illinoian, and the Wisconsin glaciers. The Wisconsin age glaciers generally are further subdivided into the Iowan, Tazewell, Cary, and Mankato substages, from the oldest to the youngest. The glacial action eroded, or ground up, the local bedrock and mixed it with material that was carried down from the north. When the glaciers melted, silt, clay, sand, and gravel were left as unconsolidated deposits.

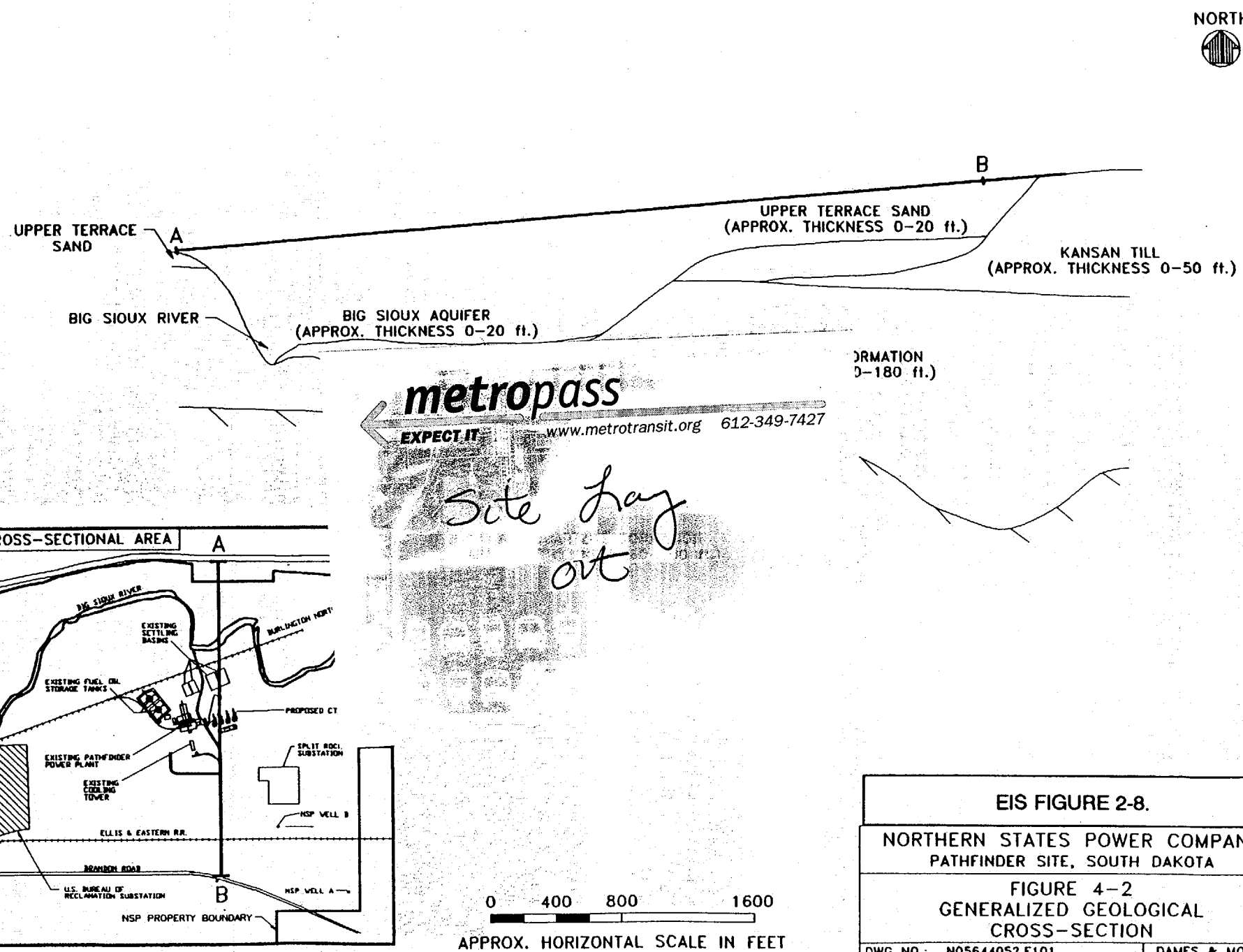
The glacial deposits in the Coteau are underlain by a number of bedrock units which are either Precambrian or Cretaceous in age. The Precambrian units consist of the Sioux Quartzite and the Corson Diabase, from oldest to youngest. Cretaceous units underlying the glacial materials, from oldest to youngest, are the Dakota Formation, Graneros Shale, Greenhorn Limestone, Carlisle Shale, Niobrara Formation, Split Rock Creek Formation, and

the Pierre Shale. The Cretaceous units underlie the glacial deposits and overlie the Precambrian unit(s). In many places these units have been eroded away (Iles 1988).

Within the immediate area of the Pathfinder site and the pipeline routes the surface is covered by glacial deposits up to 200 feet in thickness, although Sioux Quartzite crops out in many locations along the Big Sioux River, the most notable of which is the outcrop at Falls Park in Sioux Falls. As shown in Figure 2–8, the glacial deposits near the Pathfinder site are from zero to 50 feet thick. In addition, at the site upper terrace sands and sands and gravels along the Big Sioux River are exposed. Along the pipeline routes the thickness of the till increases to as much as 200 feet. These glacial deposits are mantled with a loess cap from a few feet thick to as much as 10 feet thick. The loess thins out with distance south of the Pathfinder site and the Big Sioux River and generally is absent south of the Minnehaha County line. Underlying the till deposits is the Split Rock Creek Formation, varying in thickness from a few tens of feet to several hundred feet. The variability in the Split Rock Creek Formation surface and its thickness is shown in Figure 2–9, a geologic section across the south part of Minnehaha County, approximately six miles north of the county line.

The Big Sioux aquifer lies under the flood plain of the Big Sioux River. The aquifer is continuous under the floodplain except for the area where the Sioux Quartzite crops out at the surface at the falls in Sioux Falls. This effectively separates the Big Sioux aquifer into northern and southern parts in this area. The Pathfinder site is located along the southern part of the Big Sioux aquifer, where the sands and gravels are from a few feet to about 30 feet thick. The aquifer consists of a fine to coarse, poorly sorted sand and fine to coarse pebble gravel with thin (three– to five–feet thick) interbedded clay and till layers in some area. The aquifer is underlain by till, siltstones and shales of the Split Rock Creek Formation and Sioux Quartzite. Properly constructed wells in the Big Sioux aquifer may yield as much as 1,000 gal/min where the thickness exceeds 25 ft. (Lindgren and Niehus 1992).

The till along the pipeline routes generally is considered a Kansan-age till and consists of a mixture of clay, slit, sand, and gravel deposited as the glaciers receded. The till is relatively low in permeability due to its clay content and is characterized by pothole depressional features and a well-developed network of intermittent stream channels. During inter-glacial periods, wind erosion removed and redeposited silt-size particles on top of the till uplands. These loess deposits range in thickness from a few feet to 10 feet or more. Water erosion provided deposits of outwash sands and gravels in which the fines were removed. The outwash deposited primarily occur along the Big Sioux River, although



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Site Lay out

EIS FIGURE 2-8.

NORTHERN STATES POWER COMPANY
PATHFINDER SITE, SOUTH DAKOTA

FIGURE 4–2
GENERALIZED GEOLOGICAL CROSS–SECTION

DWG NO.: N05644052.F101 | DAMES & MOORE

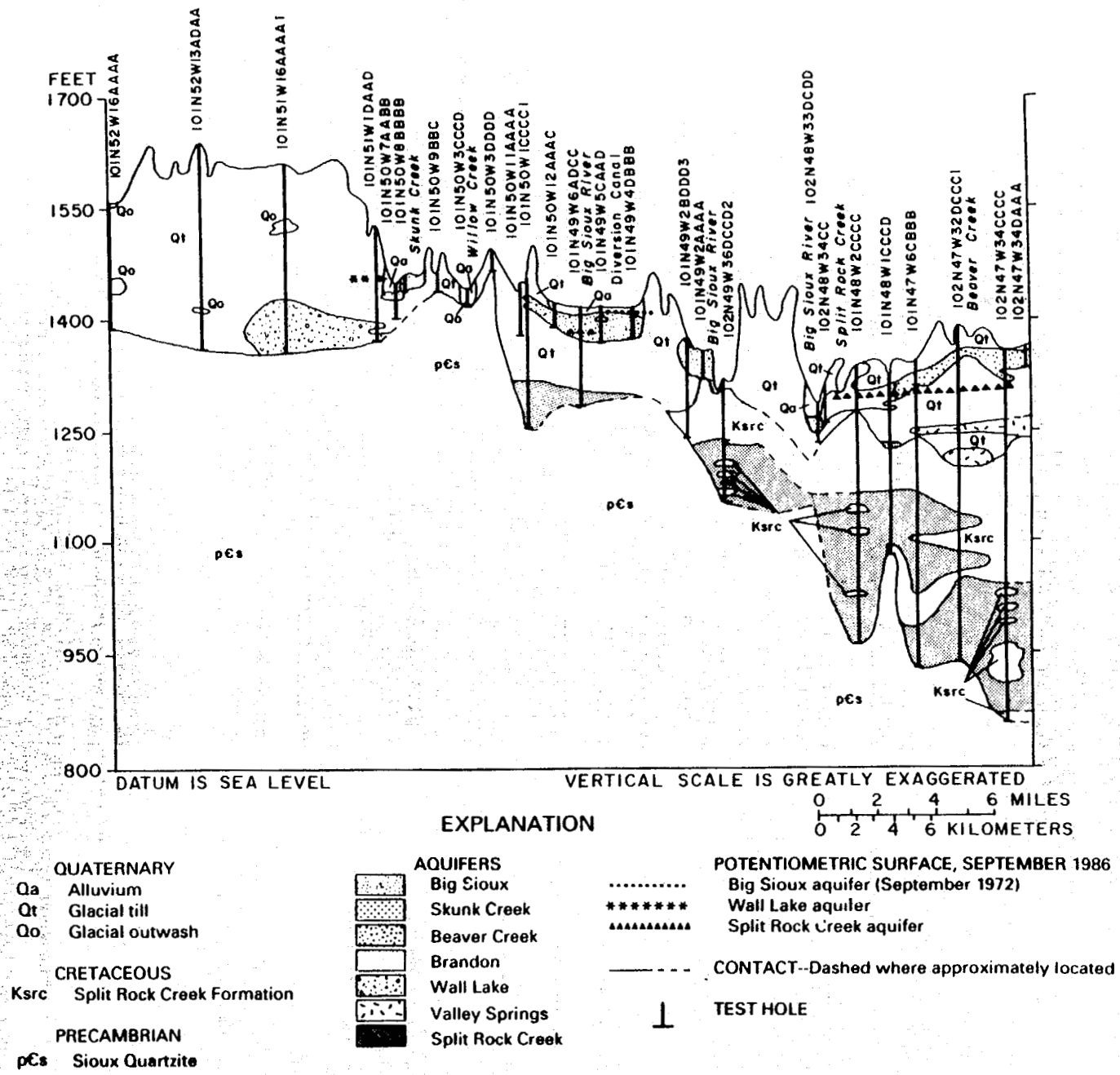


Figure 2–9. Geologic section across southern Minnehaha County (from Lindgren and Niehus 1992).

localized pockets of sands and gravels can be present in the uplands. Local alluvium also exists in the uplands, a result of water-deposited material along upland channels.

The Split Rock Creek Formation underlies the till over a large part of the study area. The Split Rock Creek Formation is composed of 1 to 5 layers of fine to coarse well-sorted quartzose sand interbedded with 4- to 45-feet-thick layers of siltstone, shale, and claystone. The total thickness of the formation can be several hundred feet, with the sands having a maximum cumulative thickness of 220 feet and an average cumulative thickness of about 50 feet (Lindgren and Niehus 1992). Near the Pathfinder site the thickness of the sand aquifer materials is about 60 feet. The areal extent and thickness of the Split Rock Creek aquifer is shown in Figure 2-10. The potentiometric surface of the Split Rock Creek aquifer generally is about 1300 feet near the Pathfinder site, considerably above the top of the aquifer surface.

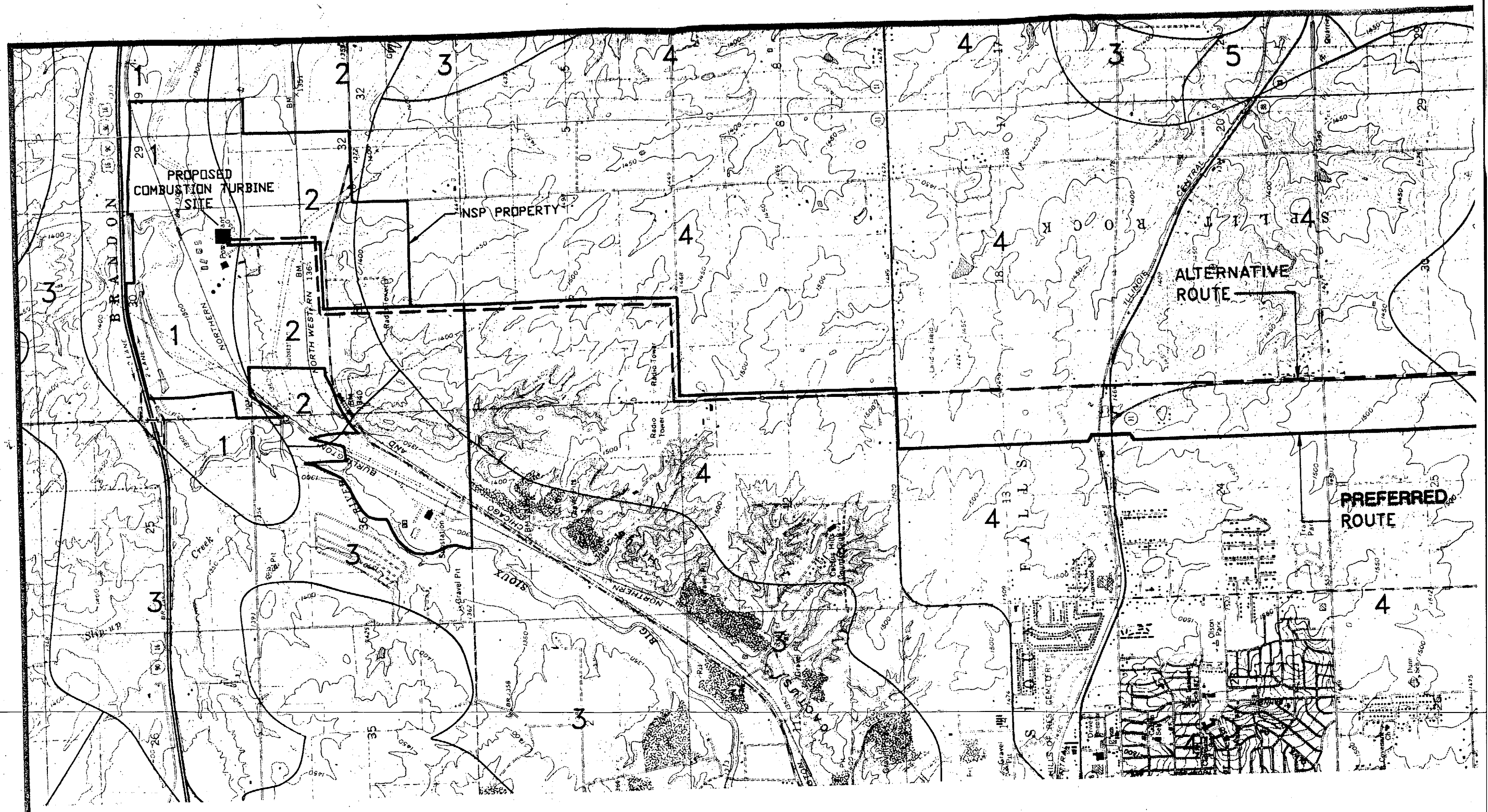
The Sioux Quartzite underlies the Split Rock Creek Formation and the glacial materials and is the basement formation in this area. The Sioux Quartzite is a metamorphosed sedimentary snadstone that consists predominately of pink-coated, fine grains of quartz sand cemented by silica. Locally, the Sioux Quartzite is well-fracture and jointed and can produce water in small quantities.

Additional information about the ground water potential of these geologic units is contained in Section 2.4.11.

2.4.4. Soils

Soil data for the affected area are available from the published soil surveys for Minnehaha County (Nestrud *et al.* 1964) and Lincoln County (Driessen 1976). The soil associations mapped within the affected area are shown in Figure 2-11. The soil descriptions between the two counties are named somewhat differently due to the different times when the soil surveys were conducted. The soil association names have been kept consistent within each county. A soil association is a group of soils geographically associated in a characteristic repeating pattern. From the north to south along the pipeline routes the soil associations range from alluvial derived materials to soils derived on upland loess and glacial till materials with intermittent alluvial soils along stream beds.

Ten soil associations are present at the plant site and along the pipeline routes. These are shown in Figure 2–11 with the numbers below corresponding to the numbers shown in Figure 2–11.

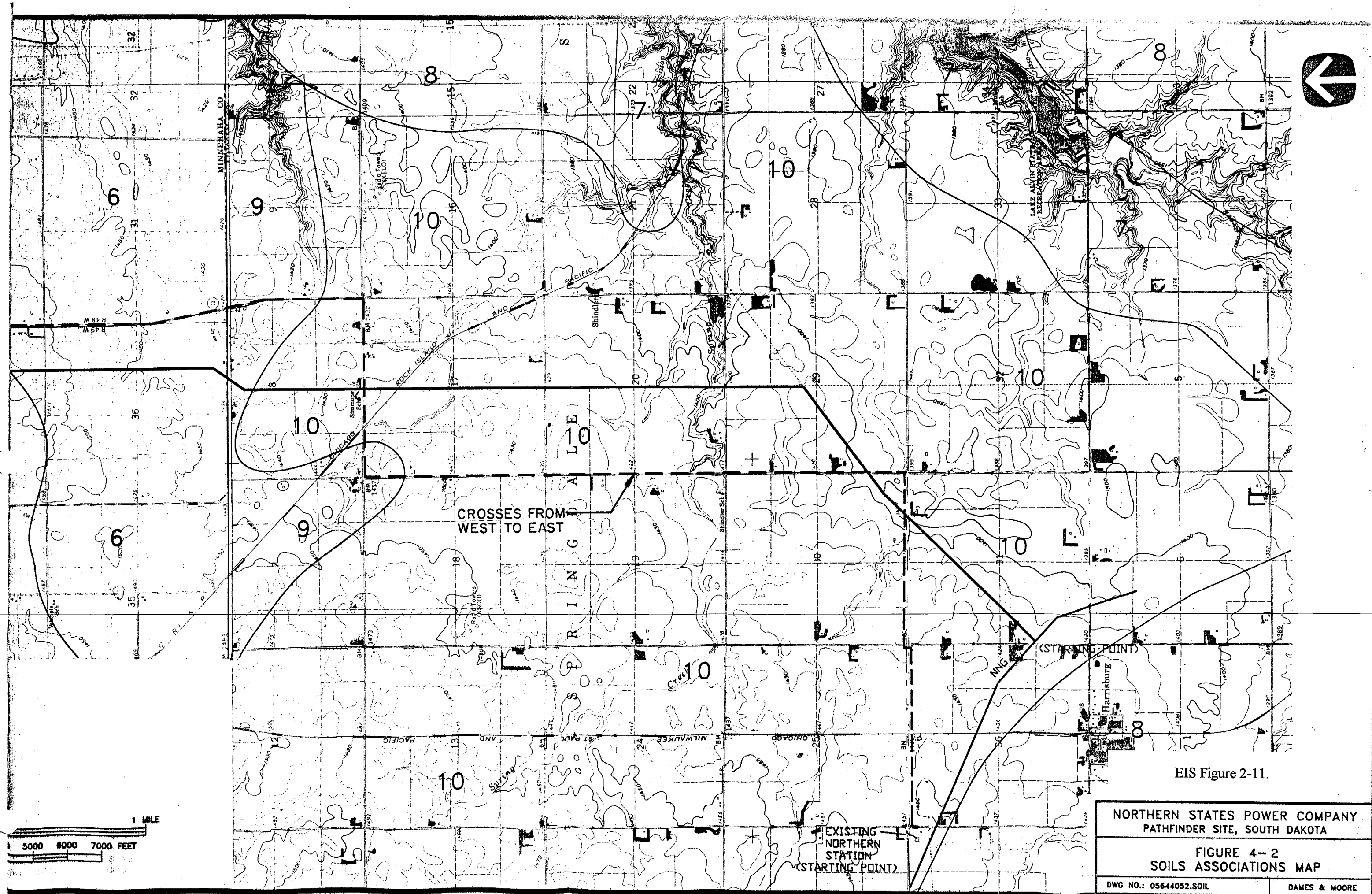


LEGEND:

1. Luton–Dimmick: Fine–textured to moderately fine–textured soils on flood plains
2. Fordville–Estelline: Medium–textured soils over sand and gravel on stream terraces
3. Buse–Sioux: Coarse–textured and medium–textured soils in glacial drift
4. Nora–Moody: Medium–textured and moderately fine–textured soils in loess on uplands
5. Rockland: Rock outcrops and shallow soils
6. Kranzburg–Parnell: Moderately fine–textured and fine–textured soils in loess and till
7. Shindler–Steinauer–Renner: Deep, well–drained, hilly to steep, loamy soils formed in glacial drift and till on uplands
8. Wentworth–Chancellor: Deep, well drained, and somewhat poorly drained, nearly level, silty soils formed in glacial drift and till on uplands
9. Egan–Shindler–Worthing: Deep, well–drained, gently sloping to rolling, silty and loamy soils; and poorly drained, level, clayey soils formed in glacial drift and till on uplands and in depressions
10. Egan–Chancellor: Deep, well–drained and somewhat poorly drained, mainly gently or gently sloping, silty soils formed in glacial drift and till on uplands

0 1/2 0

1000 0 1000 2000 3000



EIS Figure 2-11.

NORTHERN STATES POWER COMPANY
PATHFINDER SITE, SOUTH DAKOTA

FIGURE 4-2
SOILS ASSOCIATIONS MAP

DWG NO.: 05644052.SOIL | DAMES & MOORE

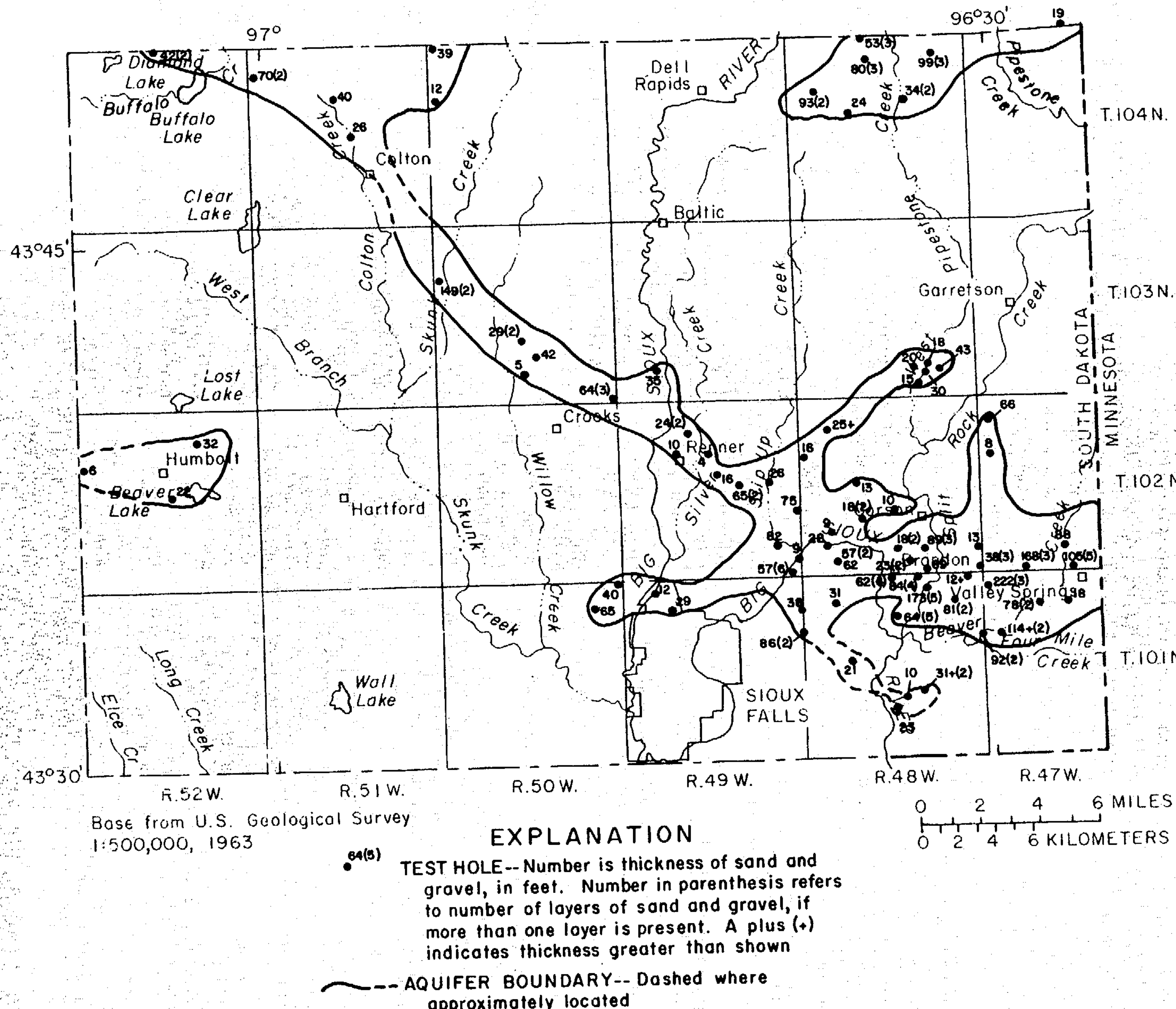


Figure 2–10. Areal extent and thickness of the Split Rock Creek aquifer in Minnehaha County (from Lindgren and Niehus 1992).

Minnehaha County

1. Luton-Dimmick
2. Fordville-Estelline
3. Buse-Sioux
4. Nora-Moody
5. Rockland
6. Kranzburg-Parnell

Lincoln County

7. Shindler–Steinauer–Renner
8. Wentworth–Chancellor
9. Egan–Shindler–Worthing
10. Egan–Chancellor.

A description of each of these soil associations, excerpted from the Soil Surveys, is presented below.

Luton-Dimmick Association: This association occurs on level or nearly level bottoms along the Big Sioux River and its tributaries. It contains fine–textured to moderately fine–textured soils on flood plains that are moderately well–drained to very poorly–drained. The soils in this association that can be cultivated are fertile, but difficult to till. They dry out slowly in the spring, and planting is usually delayed. Flooding is also a problem, especially during the spring thaws and after heavy rains. Corn, soybeans small grains, and alfalfa are grown and produce good to high yields if precipitation is normal or less than normal. Some of the wetter areas can be used for hay or pasture.

Fordville–Estelline Association: This association consists of nearly level to gently-sloping on stream terraces along the Big Sioux River. It contains medium–textured moderately well–drained to well–drained soils over sand and gravel. The soils in this association are generally cultivated and produce fair to good yields. Corn, small grains, and alfalfa are grown. The water–holding capacity is fair. Because of underlying sand and gravel, these soils are somewhat droughty. Wind erosion is a problem in areas where the surface is not protected. Sheet erosion is likely where runoff is uncontrolled.

Buse–Sioux Association: This association consists of thin, excessively drained coarse–textured and medium–textured soils that formed in glacial drift on hilly uplands, gravely knobs and ridges, and stream terraces. This soil association is mostly associated with pasture

land. The soils are droughty, and runoff is excessive. Some areas are too steep for safe operation of farm machinery. Commercial gravel is obtained from this association in the Catus Hills area between the Pathfinder Plant site and the City of Sioux Falls.

Nora–Moody Association: This association consists of medium–textured and moderately fine–textured, well–drained soils formed in loess on uplands. These soils are deep (10 to 30 inches or more) and exist on slopes ranging from 3 to 9 percent. The majority of this association is cultivated. Corn, small grains, soybeans, and alfalfa are grown and generally produce fair to good results. Because these soils are silty and have rapid runoff, they erode easily, resulting in the deposit of substantial amounts of sediment.

Rockland Association: This association consists of shallow soils and quartzite outcrops that occur on uplands and on bottoms. The soils on uplands occur in cracks or as a thin mantle over rock. The soils on bottoms are in sediments that have been deposited in a thin layer over rock. Boulders, stones, and gravel are scattered over this association, and many cliffs have formed. Some parts of this association are in pasture, but most areas are too rocky or too steep for agricultural use.

Kranzburg–Parnell Association: This association consists of moderately fine–textured (till) and fine–textured (loess) soils occurring in nearby level to rolling soils on uplands and in depressions. The majority of this association is cultivated. Corn, small grains, soybeans, and alfalfa produce good to high yields. Wet or steep areas are generally used for hay or pasture, but some areas are drained and cultivated. If excessive runoff is not controlled, soils on slopes will erode.

Shindler–Steinauer–Renner Association: This soil association consists of deep, well-drained soils formed in glacial drifts and tills on uplands. It consists of breaks and sides of valleys of the Big Sioux River and some of its tributaries. Slopes are mostly hilly to steep and commonly are dissected by short drainage ways or draws. Fertility ranges from low to high. Runoff is rapid on much of this association, and the hazard of erosion is very severe. Control of water erosion is the main concern of management. Nearly all of this association is native grass or trees and is used for pasture, woodland, wildlife habitat and recreation, Farmsteads are mostly in adjacent soil associations.

Wentwork–Chancellor Association: This association consists of deep, well-drained, and somewhat poorly drained, nearly level, silty soils formed in glacial drift and glacial till

on smooth-appearing uplands which contain very slight rises interspersed with many shallow swales and closed depressions. Fertility and organic-matter-content are high in the major soils of this association. Available water capacity is high. Runoff is slow and collects in swales and depressions. The hazards of water erosion and soil blowing are slight. This association has a high potential for cultivated crops and for pasture and hay. Almost all of it is cultivated. Corn, oats, soybeans, and alfalfa are the main crops. Pastures are small and are commonly found near farmsteads.

Egan–Shindler–Worthing Association: This soil association consists mainly of deep, well-drained, silty and loamy soils formed in glacial drift on gently undulating to rolling uplands, and to a lesser extent of poorly-drained, level, clayey soils in potholes or closed depressions. Local relief ranges from 10 to 30 feet. Slopes are commonly short in the higher parts of the landscape and on the sides of drainage ways. Fertility and organic-matter content range from low to high. Runoff is medium and ponds in areas. Water erosion control and improvement of drainage and tilth are the main concerns of management. Most of this association is cultivated. Corn, soybeans, oats, and alfalfa are the main crops. Some of the steeper areas and the undrained depressions are used for pasture and wildlife habitat. The main enterprises are cash crops, beef cattle, and hogs.

Egan–Chancellor Association: This association contains deep, well-drained, and somewhat poorly drained soil on mainly gently sloping, silty slopes formed in glacial drift and till on uplands. The uplands consist of rises or swells interspersed with many swales and small depressions. Local relief ranges from four to twenty feet. Fertility and organic-matter content are high in the major soils of this association. Available water capacity is high. Runoff is medium and collects in the swales and depressions. Main concerns of management include control of water erosion, improvements of drainage, and maintenance of tilth. This association has a high potential for crops and for pasture and hay. Most of it is cultivated. Corn, soybeans, oats, and alfalfa are the main crops. Some of the undrained wet areas are used for pasture.

The soils at the Pathfinder site generally developed on alluvial materials and consist of Alcester Silt Loam, Estelline Silt Loam and Fordville Loam. These soils are fine-grained and generally silty and occur on slopes of 0 to 5 percent. The Pathfinder site also has terrace escarpment soils which have developed on 7 to 20 percent slopes. These soils are more coarse-grained and sandy.

The pipeline routes are initially in the same alluvial soils described above. Upon crossing the Brandon Road south of the plant, the pipeline crosses a short section of Estelline Silt Loam and then begins a rise out of the valley to the uplands. Along the rise are Buse Loam soils developed in glacial till. Once on the upland areas the soils consist of Moody Silt Loams, Moody–Nora Silty Clay Loams, and Nora–Crofton Silt Loams for approximately six miles along the pipeline routes. The soils alternate between these complexes as the topography undulates up and down the dissected terrain. The Nora–Crofton soils occur on the sloped areas with the Moody soils on the relatively flat upland areas. Both soils have developed in calcareous loess parent materials. Loess is a aeolian or wind-deposited material, consisting of predominately silt-sized particles. The distinguishing feature of the two soils is the thickness of the A and B horizons, with the Nora–Crofton soils having a thinner A and B horizon as a result of more erosion action on slopes. These loessial soils are highly erosive as evidenced by the large amount of contour farming taking place in the area.

The loess material begins to thin out about a mile south of Highway 38, in Section 25, T 101 N., R 49 W. The upland areas along the pipeline routes here consist of Moody soils on flat areas and Trent Silty Clay Loam and Flandreau Loam on the sloped areas. The Trent and Flandreau soils develop on loess materials underlain by silty clay and sand, respectively. In Section 36, T 101 N., R 49 W, the last section before the routes enter Lincoln County, the soils consist of Kranzburg Silty Clay Loam developed on loess–like materials underlain by glacial till. The glacial till is relatively close to the surface in this area.

As the pipeline routes cross into Lincoln County the soils encountered are named the Chancellor–Tetonka Silty Clay Loams, the Egan–Shindler soil complex, and the Worthing Silty Clay. The topography is relatively flat with several depressional areas and only the stream bed of Spring Creek causing much change in elevation over a short distance. The Chancellor–Tetonka and Worthing soils formed in upland depressions consisting of silty materials derived from local alluvium washed into the depressions. The Egan–Shindler soils formed in silty clay derived from glacial till on gently undulating to steeply sloping upland areas. About two miles into Lincoln County the Wentworth–Chancellor Silty Clay Loams are encountered. These soils occur on nearly level areas and form in silty glacial till. The Wentworth–Chancellor soils are intermixed with the Chancellor–Tetonka and the Egan–Shindler soils along the final four miles of the pipeline routes.

2.4.5. Mineral Resources

Many sand and gravel pits are present within the affected area, primarily along the Big Sioux River to the west of the Pathfinder site. The only other potential source of significant mineral resources is the Sioux Quartzite formation. The Precambrian Sioux Quartzite is a metamorphosed pink sandstone underlying most of Minnehaha County, with outcrops in stream valleys and areas where glacial drift has been eroded. Major present–day uses for the stone include concrete aggregate, railroad ballast, road construction, rip–rap for dams and riverbank stabilization, and production of ferro–silica for the steel industry (Jarrett 1990). Similar deposits to the Sioux Quartzite resting on and derived from complex terrains of older metamorphic and igneous rock have been found to contain very significant deposits of gold and uranium (Southwick *et al.* 1986). To date, however, there have been no documented occurrences of economic or subeconomic mineralization in conjunction with the Sioux Quartzite (Jarrett 1990).

2.4.6. Seismic Activity

Major faulting has been recognized and studied in the Black Hills area of western South Dakota. Although minor synclines, anticlines, and faults are expected to be scattered elsewhere in the state, their presence is masked by glacial sediments.

The Pathfinder site is located in an area that is relatively free of damaging seismic activity associated with faults. Only two earthquakes have been recorded in the Sioux Falls area since 1872. The first was recorded in 1921 with a measured intensity of 3 on the Modified Mercalli Scale, which would indicate an earthquake which is noticeable indoors and on upper floors of buildings but is not generally recognized by most people as an earthquake. The second earthquake was recorded in 1938 with a measured intensity of 5 on the Modified Mercalli Scale. An earthquake of this intensity is typically noticed by everyone in the vicinity and usually results in minor damage such as broken dishes, windows, and cracked plaster (Burchett 1979).

2.4.7. Vegetation

The proposed CTG facility and gas pipelines are located in a region originally covered by tallgrass prairie vegetation. As shown in Figure 2–12 the tallgrass prairie covered roughly the eastern one-fifth of South Dakota. Dominant grasses were big bluestem (Andropogon gerardii), switchgrass (Panicum virgatum), Indiangrass (Sorghastrum nutans) and little bluestem (Schizachyrium scoparium). Grasses of shorter stature, such as blue grama

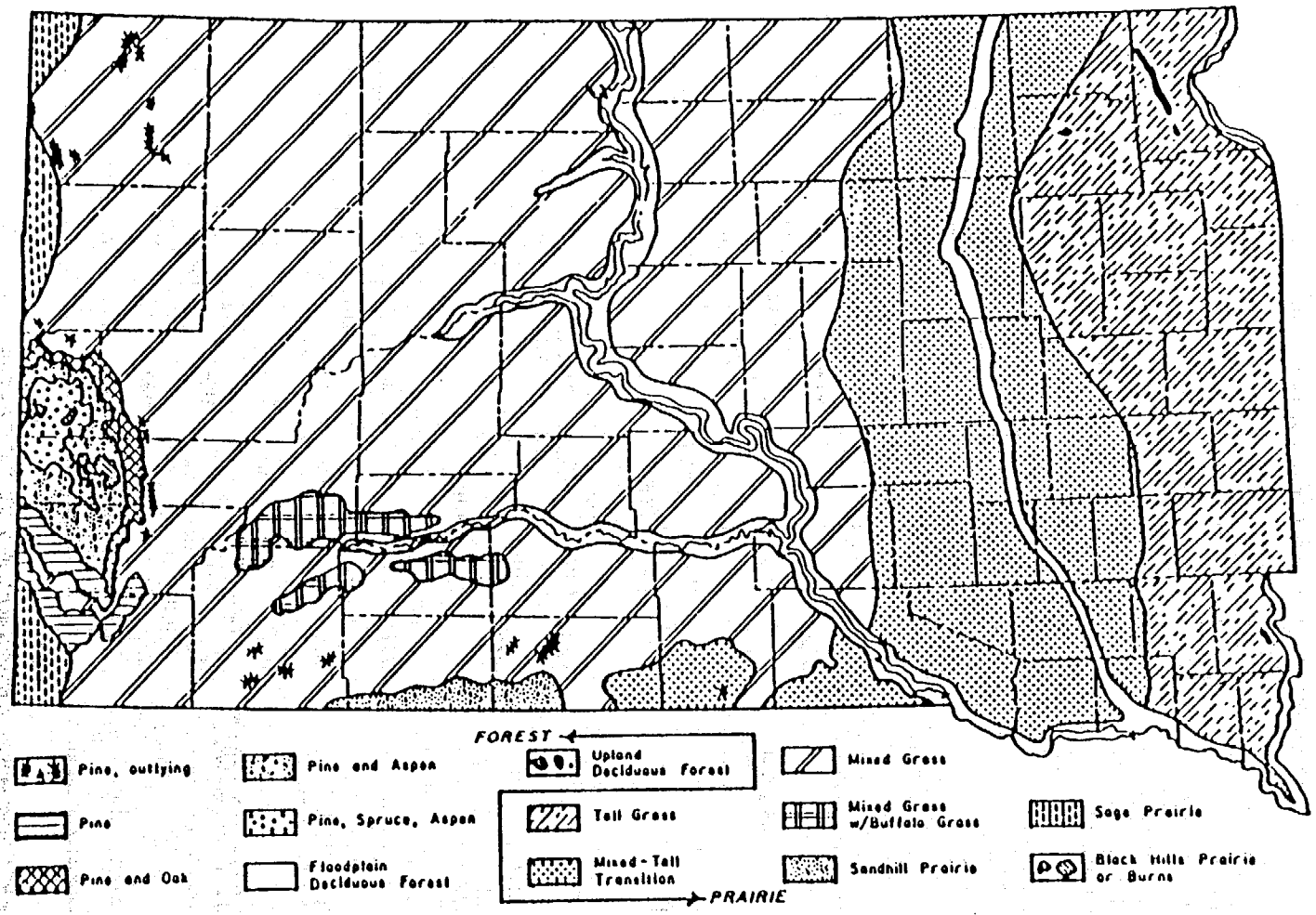


Figure 2. Natural Vegetation of South Dakota (prepared by Byron E. Harrell, based on: Küchler 1964; J.R. Johnson and Nichols 1970; USDA Soil Conservation Service Map 5,P-35,738, 1970; Svotos 1976; USDA aerial photographs).

(from Whitney, et. al., 1978)

EIS FIGURE 2-12.

NORTHERN STATES POWER COMPANY
PATHFINDER SITE, SOUTH DAKOTA

FIGURE 4-11
ORIGINAL NATIVE VEGETATION OF SOUTH DAKOTA

Dames & Moore

(Bouteloua gracilis), sideoats grama (B. curtipendula) and needleandthread (Stipa comata), were abundant on drier hilltops and slopes. A variety of broadleaved herbs and shrubs were also important components of the native prairie vegetation. Table 2–4 gives a listing of common herbaceous tallgrass prairie species found in the Sioux Falls vicinity.

Woodlands in the region were originally confined to stream bottoms and moist ravines, appearing as western extensions of the Eastern Deciduous Forest into the Tallgrass Prairie region (Malin 1953). Major trees of floodplain woodlands in the Sioux Falls area included cottonwood (Populus deltoides), silver maple (Acer saccharinum), boxelder (A. negundo) and peachleaf willow (Salix amygdaloides). Trees more characteristic of the moist ravines and terrace slopes above the river channels included bur oak (Quercus macrocarpa), American elm (Ulmus americana), slippery elm (Ulmus rubra), green ash (Fraxinus pennsylvanica), and hackberry (Celtis occidentalis).

Hydrophytic vegetation, such as cattails (Typha spp.), bulrushes (Scirpus spp.) and wetland grasses and sedges, were associated with the scattered depressions and streams on the prairie. Table 2-5 gives a listing of common hydrophytes encountered in wetland habitats of the Sioux Falls area.

The original vegetation of eastern South Dakota has been largely eliminated or dramatically modified since settlement of the region in the mid 1800's. With the vast majority of land now under cultivation only small isolated remnants of the original prairie still exist. Even these remnants have changed drastically due to livestock grazing, fire suppression and invasion by exotic plant species, especially smooth brome (Bromus inermis) and Kentucky bluegrass (Poa pratensis). The majority of wetlands have likewise been eliminated or otherwise altered by ditching and drainage for agriculture. Consequently, little remains in the project area of what could be considered natural vegetation, even though most native plant species are still found within the region.

Of the native vegetation types, natural woodlands are the most unchanged since settlement owing to their occurrence in flood prone areas and on steep terrain poorly suited for agriculture. Fairly large tracts remain of riparian woodland on the Big Sioux River floodplain and of hardwood communities in the ravines and on the steep hillsides bordering the Big Sioux River Valley. Some compositional change in these woodlands has resulted from the escape of introduced trees (e.g., Siberian elm, Ulmus pumila) and shrubs (e.g., Tatarian honeysuckle, Lonicera tatarica), and the large scale loss of American elm to Dutch

Table 2-4.

LIST OF PRAIRIE HERBS AROUND SIOUX FALLS

Scientific Name	Common Name
Allium canadense	Wild onion
Andropogon gerardi	Big bluestem
A. scoparius	Little bluestem
Bouteloua curtipendula	Side-oats grama
B. gracilis	Blue grama
B. hirsuta	Hairy grama
Buchloe dactiloides	Buffalo grass
Calamagrostis canadensis	Blue joint
Koeleria cristata	June grass
Lilium philadelphicum	Wood-lily
Muhlenbergia cuspidata	Muhly
Panicum virgatum	Switch grass
Sisyrinchium campestre	White-eyed grass
Sorgastrum nutans	Indian grass
Sporobolus cryptandrus	Sand dropseed
Stipa spp.	Porcupine grass
Trasdescantia bracteata	Spiderwort
Zygadenus elegans	Death camas
Anemone canadensis	Canada anemone
A. cylindrica	Thimble weed
A. patens	Pasque-flower
Antennaria neglecta	Pussy toes
Artemisia spp.	Wormwood
Asclepias verticillata	Whorled milkweed
Aster spp.	Aster
Astragalus spp.	Milk-vetch
Cassia fasciculata	Partridge-pea
Comandra pallida	Bastard toad-flax
Delphinium verescens	Larkspur
Desmodium canadense	Tickclover
Echinacea pallida	Purple coneflower
Erigeron strigosis	Daisy fleabane
Euphorbia heterophylla	Fire-on-the-mountain
E. marginata	Snow-on-the-mountain
Gentiana puberula	Downy gentian
Geum triflorum	Purple avens, Prairie smoke
Glycyrrhiza lepidota	Licorice
Grindelia squarrosa	Gum plant, Rosin-weed
Helianthus spp.	Sunflower
Heliopsis helianthoides	Ox-eye
Kuhnia eupatorioides	False boneset
Lactuca pulchella	Blue lettuce
Liatris aspera	Rough blazing-star
L. punctata	Dotted blazing-star
Linum sulcatum	Flax
Lithospermum spp.	Puccoon
Lobelia spicata	Pale-spike lobelia
Lygodesmia juncea	Rush-pink

REFERENCE' Rogers, 1974

Table 2-4.

PRAIRIE HERBS - (Continued)

Scientific Name	Common Name
Monarda fistulosa	Wild bergamot
Oenothera serrulata	Evening primrose
Onosmodium occidentalis	False gromwell
Oxytropis lambertii	Loco-weed
Pedicularis canadensis	Wood-betony, Lousewort
Petalostemum candidum	White prairie clover
P. purpureum	Purple prairie clover
Penstemon gracilis	Small beard-tongue
Penstemon grandiflorus	Large-flowered beard-tongue
Phlox pilosa	Downy phlox
Physalis heterophylla	Clammy ground-cherry
P. lanceolata	Ground-cherry
P. virginiana	Virginia ground-cherry
Plantago purshii	Wooly plantain
Psoralea agorophylla	Silverleaf scurf-pea
P. esculenta	Prairie-turnip
Ratibida columnifera	Coneflower
R. pinnata	Gray-headed coneflower
Rudbeckia hirta	Black-eyed Susan
Senecio plattensis	Prairie ragwort
Silphium laciniatum	Compass-plant
Solidago canadensis	Canada goldenrod
S. missouriensis	Missouri goldenrod
S. nemoralis	Gray goldenrod
S. rigida	Hard-leaved goldenrod
Tragopogon dubius	Goat's beard
Veronicastrum virginicum	Culver's root
Viola nuttallii	Prairie yellow violet
V. pedatifida	Prairie violet

Table 2-5.

LIST OF EMERGENT VEGETATION AROUND SIOUX FALLS

Scientific Name	Common Name
Anacharis canadensis	Water-weed
Carex spp.	Sedge
Cyperus spp.	Chufa nut grass
Eleocharis spp.	Rush
Equisetum spp.	Horsetail, Scouring rush
Hypoxis hirsuta	Star-grass
Juncus spp.	Spike rush
Lemna minor	Lesser duckweed
Phragmites communis	Cane
Potamogeton spp.	Pondweed
Sagittaria latifolia	Arrowhead
Scirpus spp.	Bulrush
Sparganium eurycarpum	Giant burreed
Spartina pertinata	Cord grass
Typha latifolia	Common cattail
Apocynum sibiricum	Indian hemp
Asclepias incarnata	Swamp-milkweed
Bidens vulgata	Beggar-ticks
Cicuta maculata	Water-hemlock
Gentiana andrewsii	Closed gentian
Heracleum lanatum	Cow-parsnip
Impatiens pallida	Touch-me-not, Jewel-weed
Lobelia siphilitica	Lobelia
Lactuca biennis	Lettuce
Lathyrus palustris	Vetchling, Wild pea
Liatris pycnostachya	Blazing star
Lycopus americanus	Bugle-weed, Water-horehound
Mentha arvensis	Mint
Nasturtium officinale	Water-cress
Polygonum spp.	Smartweed
Potentilla anserina	Silver-weed
P. rivalis	Cinquefoil
Rorippa islandica	Marsh-cress, yellow cress
Rudbeckia laciniata	Goldenglow
Scutellaria lateriflora	Skullcap
Silphium perfoliatum	Compass-plant
Sium suave	Water-parsnip
Solidago ginatea	Goldenrod
Stachys palustris	Hedge nettle
Vernonia fasciculata	Ironweed

REFERENCE: Rogers, 1974

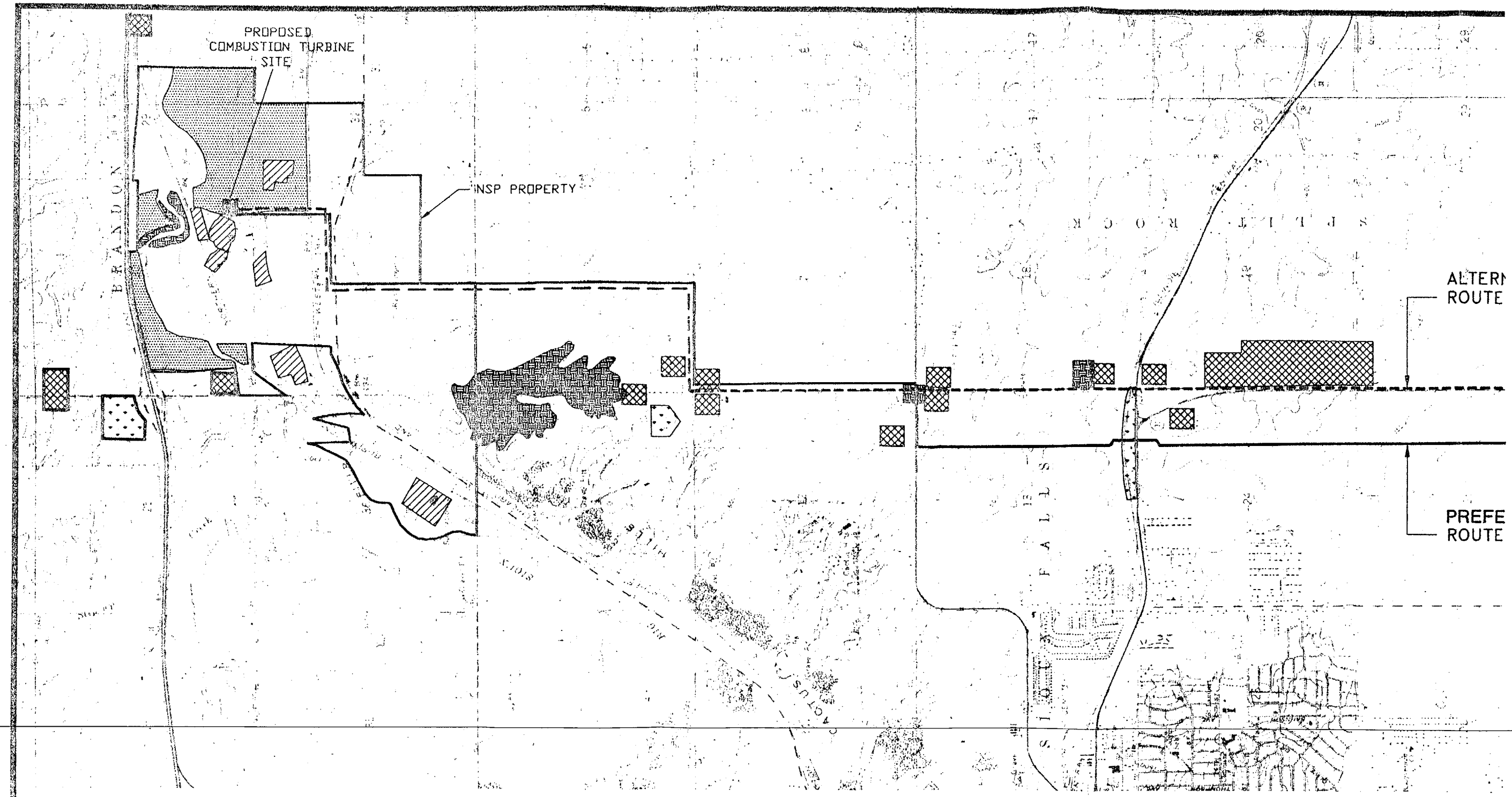
elm disease, but the basic nature of these woodlands is relatively unchanged. The gradual spread of trees from woodlands onto adjacent idled land within the region indicates the past importance of prairie wildfires in keeping trees confined to moist areas. The fact that trees can successfully occupy sites originally covered by prairie is substantiated by the success of shelterbelt plantings in this agricultural region.

The land on the Pathfinder Site for the proposed CTG facility lies on a natural terrace above the Big Sioux River floodplain. Smooth brome, an aggressive introduced grass that largely excludes other species, comprises most of the vegetative cover on the construction site. However, a walking tour of the site in May 1992 also revealed one unmapped seepage discharge wetland on the gradual north-facing slope on the construction site. The wetland area supports some young cottonwoods, willows (Salix spp.), and an abundance of scouring rush, Equisetum hyemale. A drainage ditch running along the base of the slope carries seepage from the wetland to the river below. In the classification of Cowardin *et al.* (1979), this wetland area would fit the PEMB category (Palustrine system, emergent vegetative cover, saturated substrate).

Downslope from the CTG site along the Big Sioux River is a narrow zone of riparian woodland. Also, one small area of native prairie occurs nearby along the east boundary of the Big Sioux River floodplain on the Pathfinder Site. These areas of natural vegetation should lie outside the area directly impacted by the CTG and pipeline construction.

A pedestrian survey of the preferred gas pipeline route on May 8 and 9, 1992, revealed that the 13 mile route passes almost entirely through farmed land (See Figure 2-13). Most fields had residues of corn and soybeans. Small grains and alfalfa were noted on smaller acreages, and only a few small tracts were pasture.

The preferred route crosses two small intermittent streams and some lesser drainages, and it passes through or nearby several small wetlands (see Figure 2-14). Using the wetland classification system of Cowardin *et al.* (1979), the wetlands are described as palustrine systems with (potentially) an emergent vegetative cover (PEM). The water permanence regime for most of these wetlands is temporary (PEMA), meaning that surface water is present for usually only 1-3 weeks early in the growing season. Because saturated soil conditions are of short duration, temporary wetlands are normally farmed along with the adjacent uplands. Hence, vegetation typical of temporary wetlands was absent from wetlands with a PEMA label because they were under cultivation.

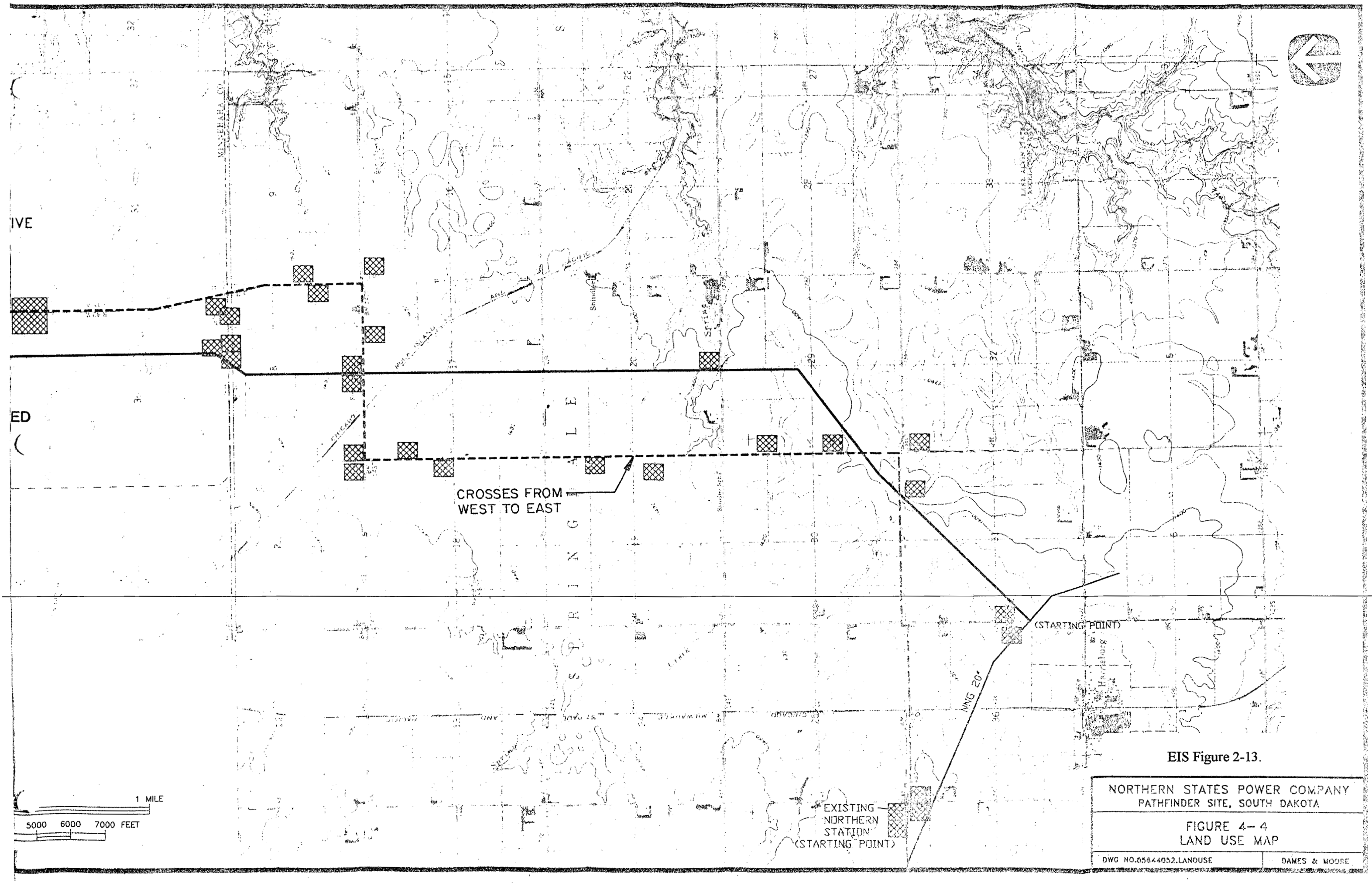


LEGEND

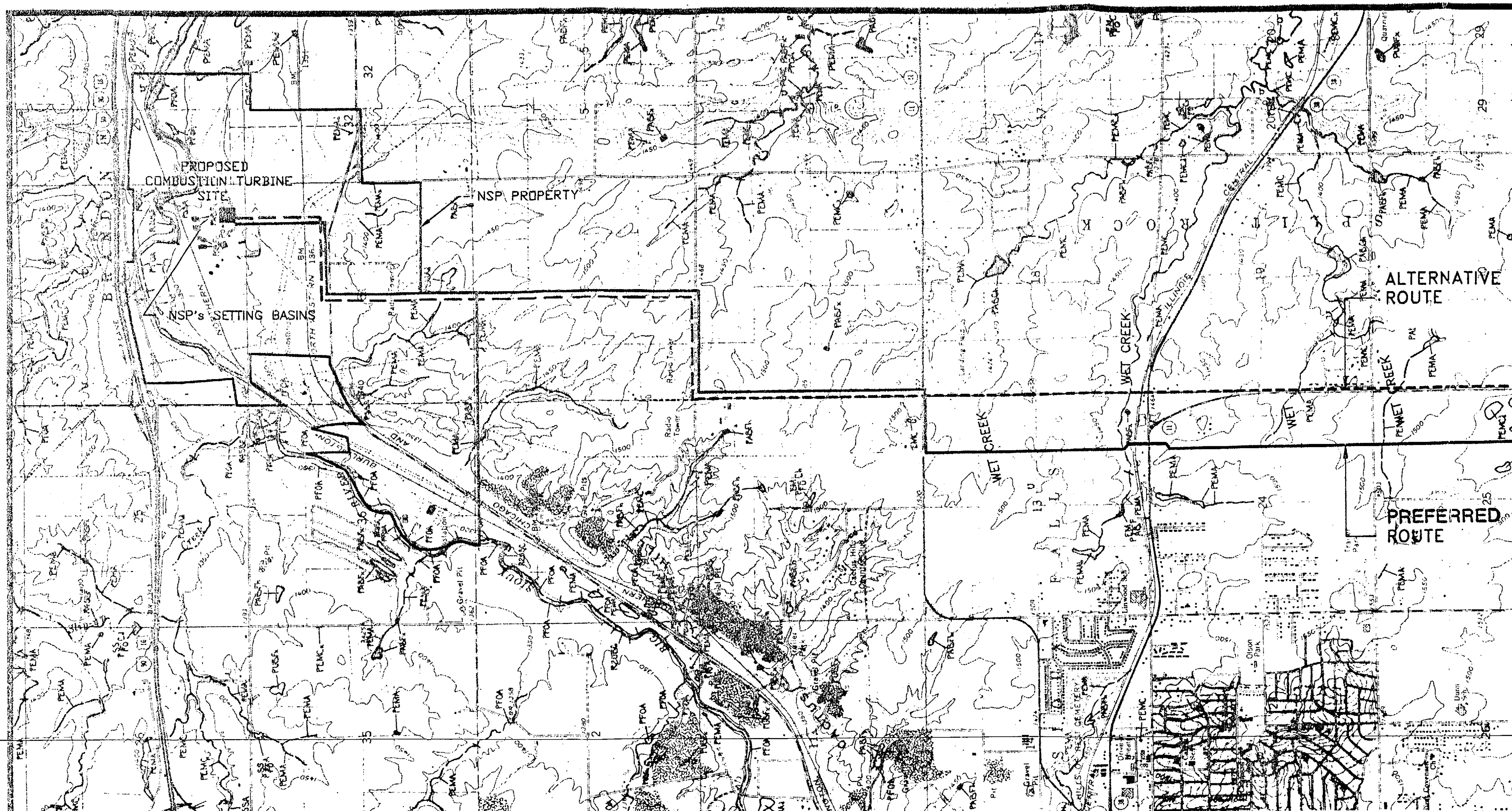
- AGRICULTURAL LAND
- RURAL RESIDENCES AND FARMSTEADS, FAMILY FARMS AND RANCHES
- INDUSTRIAL
- PUBLIC, COMMERCIAL, AND INSTITUTIONAL USE
- FORESTED LAND
- NOISE SENSITIVE LAND USE (OVERLAY)
- GRASS LAND

0 1/2 0

1000 0 1000 2000 3000



EIS Figure 2-13.



LEGEND:

(oval symbol) = WETLAND AREAS

SYSTEM — PABGh — WATER REGIME
CLASS — SPECIAL MODIFIER

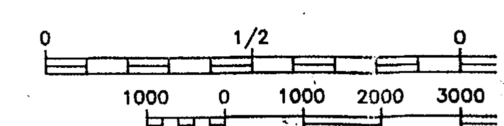
SYSTEMS AND SUBSYSTEMS
- E = ESTUARINE
- P = PALUSTRINE
- R = RIVERINE

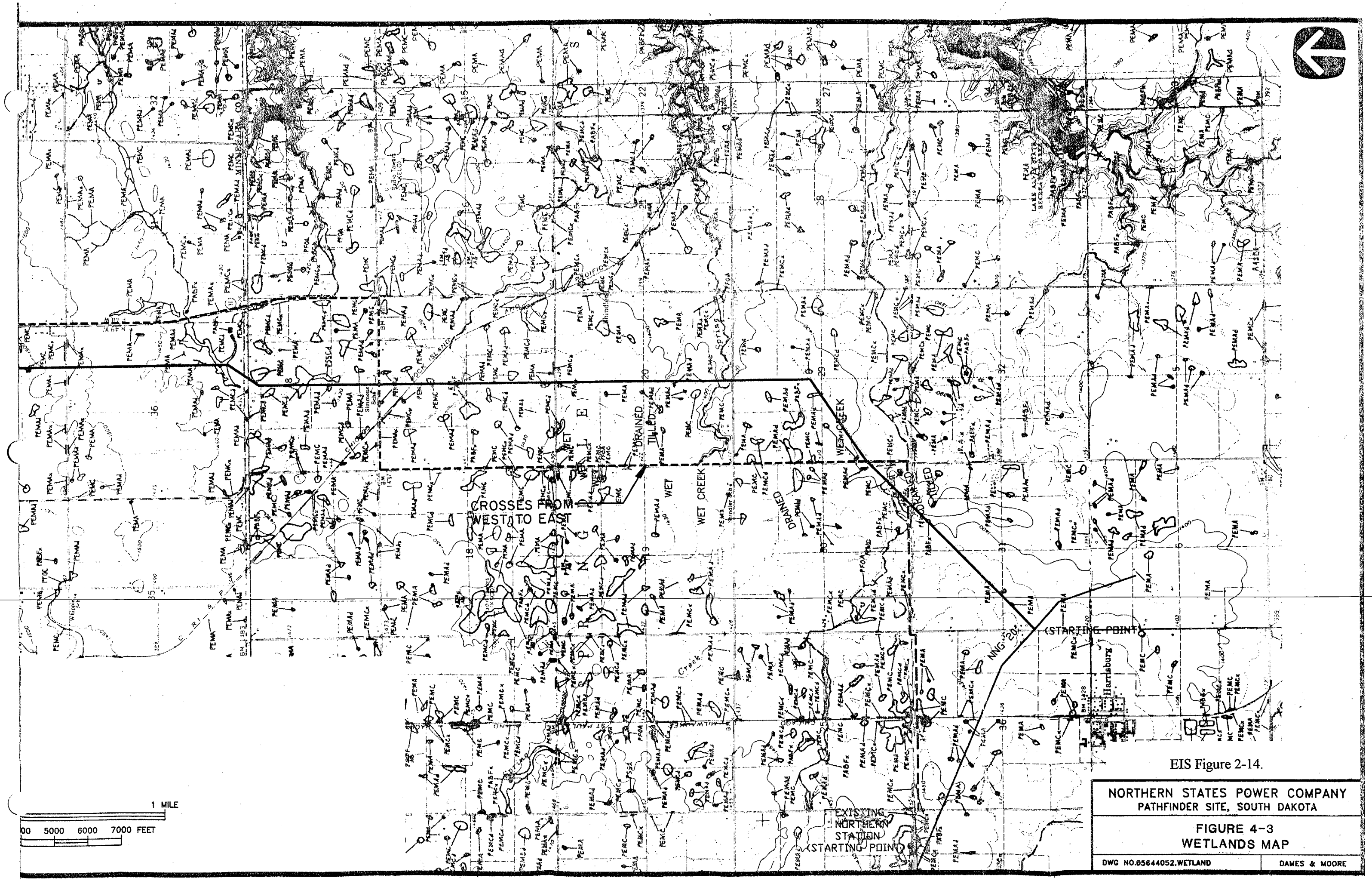
CLASSES
- AB = AQUATIC BED
- SB = STREAMBED
- US = UNCONSOLIDATED SHORE
- EM = EMERGENT
- SS = SCRUB-SHRUB
- FO = FORESTED

WATER REGIME MODIFIERS
- A = TEMPORARY
- C = SEASONAL
- F = SEMIPERMANENT
- G = INTERMITTENTLY EXPOSED

SPECIAL MODIFIERS
- d = PARTLY DRAINED/ DITCHED
- f = FARMED
- h = DIKED/IMPOUNDED
- x = EXCAVATED

(symbol) = UPLAND (NON-WETLAND)





EIS Figure 2-14.

NORTHERN STATES POWER COMPANY
PATHFINDER SITE, SOUTH DAKOTA

FIGURE 4-3
WETLANDS MAP

DWG NO.05644052.WETLAND | DAMES & MOORE

Some wetlands along the preferred route have been ditched and drained (PEMAd), and at two locations along the route dugouts have been excavated next to natural wetlands areas (PEMCx). One particularly large wetland is crossed by the route one half mile south of the Minnehaha County line. This wetland has been partially drained (PEMCd) but still retains water for much of the growing season and thus supports vegetation indicative of a seasonal flooding regime. Reed canarygrass (Phalaris arundinacea) is especially abundant. Hydrophytic vegetation is also characteristic of the southernmost floodplain crossed by the preferred route. The wet meadow vegetation on this floodplain is dominated by prairie cordgrass (Spartina pectinata), reed canarygrass, and sedges (Carex spp.). The meadow is apparently mowed or grazed annually. Other wetlands with hydrophytic vegetation along the preferred route appear to be outside the pipeline construction corridor.

No natural woodlands are intersected by the preferred route. Near the north end of the route, the pipeline would pass within 1000 feet of oak woodland owned by the Izaak Walton League (Figure 2-13). Otherwise, the only wooded habitat encountered on the preferred route is a planted shelter belt near the Simmons School, one mile south of the Minnehaha County line.

One small remnant of prairie vegetation is found near the north end of the pipeline route where the preferred and alternate routes overlap. The remnant occurs on NSP property near the summit of the north-facing slope south of the Brandon Road in an area that is otherwise covered with smooth brome. The abundance of Kentucky bluegrass within the prairie relict and the sparseness of native grasses suggests that this tract was formerly grazed by livestock. Among the native prairie species noted on the site are big bluestem, little bluestem, switchgrass, leadplant (Amorpha canescens), goldenrod (Solidago spp.) and aster (Aster spp.).

The alternate pipeline route was also surveyed. The route was driven instead of walked because it is entirely along roadway except for the north portion where it overlaps the preferred route. For the remainder of its length, where this route is separate from the preferred one, it cuts mainly through cropland, tree plantings and tame grasses (smooth brome and Kentucky bluegrass) in the road right-of-way. Natural vegetation on this route is restricted to hydrophytes in wetland basins and along drainage courses. Wetlands pose a bigger obstacle along this route than the preferred one because there is more semipermanent wetland habitat potentially in the pipeline corridor, e.g., one mile south of the Minnehaha

County line along Highway 11. The wetlands (not to mention the human dwellings) along this route make the preferred route the more favorable. On the basis of vegetation resources alone, however, neither route should be rejected.

2.4.8. Animals

The terrestrial and amphibic fauna of the Sioux Falls area is quite diverse, as would be expected in an area of transition between biomes. At one time the prairie was dominated by large herbivores such as bison, pronghorn antelope, elk and deer. These grazing animals were preyed upon by wolf, coyote, cougar, bear, and Plains Indians. Bison herds have been replaced largely by cattle and other domesticated animals. Many small herbivores were also present in the grasslands including prairie dog, ground squirrel, pocket gopher and jackrabbit. With the exception of prairie dogs, most are still present today.

A survey of animals at the Pathfinder Site was conducted by NSP on May 20, 1991. The survey focused on bird, mammal, reptilian and amphibian species observed. Tables 2–6 and 2–7 list the bird and mammal species observed during the site visit. Other species of birds, mammals and amphibians and reptiles known to occur in the Sioux Falls area are listed in Tables 2–8, 2–9 and 2–10 (Rogers 1974).

2.4.8.1. Mammals

Fifty-nine species of mammals are documented for the project area although nine no longer occur in the wild state (Rogers 1974). A list of mammals occurring in the Sioux Falls area is presented in Table 2-9.

White-tailed Deer: White–tailed deer were limited to the timbered bottom lands during the period when the prairie was dominated by bison. They were nearly exterminated by settlers in the late 1800's and have been re-established in large numbers through management by the S.D. Department of Game, Fish, and Parks. No regular hunting season was possible in Minnehaha County until 1960 when a harvest of 100 bucks was allowed. The 1992 season will allow a harvest of 700 deer.

The Pathfinder Site provides good quality habitat for deer because of the wooded areas along the Big Sioux River and in the draws that extend into adjacent prairie cropland. Deer were observed on the site during the NSP survey in May of 1991, as well as during the pedestrian survey conducted on May 8 and 9, 1992.

Table 2-6

LIST OF BIRDS OBSERVED ON THE PATHFINDER PLANT SITE

Common Name	Scientific Name
Gray partridge	Perdix perdix
Western meadowlark	Sturnella neglecta
Common grackle	Quiscalus quiscula
House sparrow	Passer domesticus
Ring-necked pheasant	Phasianus colchicus
Black-capped chickadee	Parus atricapillus
Yellow warbler	Dendroica petechia
Common yellowthroat	Geothlypis trichas
Northern oriole	Icterus galbula
Orchard oriole	Icterus spurius
House wren	Troglodytes aedon
Field sparrow	Spizella pusilla
Brown-headed cowbird	Molothrus ater
Red-winged blackbird	Agelaius phoeniceus
Bobolink	Dolichonyx oryzivorus
Spotted sandpiper	Actitis macularia
Canada goose	Branta canadensis
Blue jay	Cyanocitta stelleri
Robin	Turdus migratorius
Hairy woodpecker	Dendrocopos villosus
Mourning dove	Zenaida macroura
Red-eyed vireo	Vireo olivaceus
American redstart	Setophaga ruticilla
Eastern kingbird	Tyrannus tyrannus
Killdeer	Charadrius vociferus
Catbird	Dumetella carolinensis
Eastern phoebe	Sayornis phoebe
Rose-breasted grosbeak	Pheucticus ludovicianus
Eastern wood pewee	Contopus virens
American goldfinch	Spinus tristis
White-breasted nuthatch	Sitta carolinensis
Clay-colored sparrow	Spizella pallida
Song sparrow	Melospiza melodia
Swainsons thrush	Catharus ustulata
Brown thrasher	Toxostoma rufum
Least flycatcher	Empodonax minimus
Flycatcher sp.	Empidonax sp.
Tennessee warbler	Vermivora pergrina
Red-tailed hawk	Buteo jamaicensis
Bank swallow	Riparia riparia
N Rough-winged swallow	Stelgidopteryx ruficollis
Cliff swallow	Petrochelidon pyrrhonota
Black-billed cuckoo	Coccyzus erythropthalmus
American crow	Corvus brachyrhynchos

NOTE: Field study conducted on May 20, 1991

Table 2-7.

MAMMALS OBSERVED ON THE PATHFINDER SITE

Common Name	Scientific Name
White-tailed deer	Odocoileus virginianus
Eastern cottontail	Sylvilagus floridanus
Fox squirrel	Sciurus niger
Gray squirrel	S. carolinensis
Weasel	Mustela sp.
Beaver	Castor canadensis
Raccoon	Procyon lotor

NOTE: Field study conducted on May 20, 1991

Table 2-8.

LIST OF BIRDS SPIECIES OCCURRING IN THE SIOUX FALLS AREA

KEY:
Check list of birds of the Sioux Falls area
A - Abundant; C - Common; U - Uncommon; R - Rare
P - Permanent resident (nesting); S - Summer resident (nesting);
M - Migrant; W - Winter resident

Order	
Gaviiformes	
Common loon	UM
Podicipediformes	
Red-necked grebe	RM
Horned grebe	UM
Eared grebe	UM
Western grebe	US
Pied-billed grebe	CS
Pelecaniformes	
White pelican	UM
Double-crested cormorant	UM
Ciconiiformes	
Great blue heron	CM
Green heron	CS
Great egret	UM
Snowy egret	RM
Black-crowned night heron	US, CM
Yellow-crowned night heron	RM
American bittern	CS
Least bittern	US
White-faced ibis	RM
Anseriformes	
Whistling swan	RM
Canada goose	CM
White-fronted goose	UM
Snow (and blue) goose	AM
Mallard	AM
Black duck	RM
Gadwall	CM, US
Pintail	AM, US
Green-winged teal	CM, RS
Blue-winged teal	AS
American wigeon	CM
Northern shoveler	AM
Wood duck	CS
Redhead	CM, US
Ring-necked duck	CM
Canvasback	CM, US
Lesser scaup	AM
American goldeneye	UM
Bufflehead	UM
Ruddy duck	CM, US
Hooded merganser	RM
Common merganser	CM
Red-breasted merganser	CM
Falconiformes	
Turkey vulture	RS
Sharp-shinned hawk	CM
Cooper's hawk	UM
Red-tailed hawk	CS, UW
Red-shouldered hawk	RS
Broad-winged hawk	UM
Swainson's hawk	US
Rough-legged hawk	UW
Golden eagle	RM
Bald eagle	UW
Marsh hawk	US
Osprey	RM
Prairie falcon	RM
Peregrine falcon	RM
Merlin	RM
American kestrel	CM, US
Galliformes	
Bob-white	UP
Ring-necked pheasant	CP
Gray partridge	CP
Turkey	RP
Gruiformes	
Sandhill crane	RM
King rail	RS
Virginia rail	CS
Sora	CS
American coot	AS
Common gallinule	RM
Charadriiformes	
Piping plover	RS
Semi-palmated plover	UM
Killdeer	AM, CS
American golden plover	UM
Black-bellied plover	UM
American woodcock	RS
Common snipe	CM
Ruddy turnstone	RM
Upland sandpiper	CS
Spotted sandpiper	US
Solitary sandpiper	CM
Willet	UM

REFERENCE: Rogers, 1974

Table 2-8. (Continued)
LIST OF BIRD SPECIES

Greater yellowlegs	UM
Lesser yellowlegs	CM
Pectoral sandpiper	CM
White-rumped sandpiper	CM
Baird's sandpiper	CM
Least sandpiper	CM
Dunlin	UM
Long-billed dowitcher	UM
Short-billed dowitcher	RM
Stilt sandpiper	UM
Semi-palmated sandpiper	CM
Western sandpiper	UM
Buff-breasted sandpiper	UM
Marbled godwit	RM
Hudsonian godwit	UM
Sanderling	UM
American avocet	RM
Wilson's phalarope	CM
Northern phalarope	UM
Herring gull	UM
Ring-billed gull	CM
Franklin's gull	AM
Forster's tern	UM
Common tern	UM
Caspian tern	RM
Black tern	CS
Columbiformes	
Rock dove (pigeon)	AP
Mourning dove	AS, RW
Cuculiformes	
Yellow-billed cuckoo	CS
Black-billed cuckoo	CS
Strigiformes	
Barn owl	RP
Screech owl	CP
Great-horned owl	CP
Snowy owl	RW
Barred owl	UP
Long-eared owl	UW
Short-eared owl	RS, UW
Burrowing owl	RM, RS
Caprimulgiformes	
Whippoorwill	RS
Common nighthawk	CS
Apodiformes	
Chimney swift	AS
Ruby-throated hummingbird	US
Coraciiformes	
Belted kingfisher	CS
Piciformes	
Common flicker	AS, UW
Red-bellied woodpecker	UP
Red-headed woodpecker	CS
Yellow-bellied sapsucker	CM
Hairy woodpecker	CP
Downy woodpecker	AP
Passeriformes	
Eastern kingbird	AS
Western kingbird	CS
Great crested flycatcher	CS
Eastern phoebe	CS
Say's phoebe	RS
Yellow-bellied flycatcher	UM
Willow flycatcher	CS
Least flycatcher	CS
Alder flycatcher	RS
Eastern wood pewee	CS
Olive-sided flycatcher	UM
Horned lark	CS, CW
Tree swallow	CM, CS
Bank swallow	CS
Rough-winged swallow	CS
Barn swallow	AS
Cliff swallow	CS
Purple martin	CS
Blue jay	AS, CW
Black-billed magpie	RW
Common crow	CP
Black-capped chickadee	AP
White-breasted nuthatch	CP
Red-breasted nuthatch	UW
Brown creeper	CM, UW
House wren	AS
Winter wren	RW
Long-billed marsh wren	CS
Short-billed marsh wren	CS
Mockingbird	RS
Gray catbird	CS
Brown thrasher	AS
American robin	AS, RW
Wood thrush	US
Hermit thrush	UM
Swainson's thrush	CM
Gray-cheeked thrush	CM
Veery	UM, RS
Eastern bluebird	US, RW
Mountain bluebird	RS
Golden-crowned kinglet	CM, UW
Ruby-crowned kinglet	AM, RW
Water pipit	UM
Bohemian waxwing	RW
Cedar waxwing	UW
Loggerhead shrike	RW

Table 2-8. (Continued)
LIST OF BIRD SPECIES

Northern shrike	US
Starling	AP
Bell's vireo	US
Yellow-throated vireo	UM
Solitary vireo	CM
Red-eyed vireo	CS
Philadelphia vireo	RM
Warbling vireo	AS
Black-and-white warbler	CM
Prothonotary warbler	RS
Tennessee warbler	AM
Orange-crowned warbler	CM
Nashville warbler	CM
Parula warbler	RM
Yellow warbler	CS
Magnolia warbler	UM
Cape May warbler	RM
Yellow-rumped warbler	AM
Black-throated blue warbler	RM
Black-throated green warbler	RM
Cerulean warbler	RS
Blackburnian warbler	UM
Yellow-throated warbler	RS
Chestnut-sided warbler	UM
Bay-breasted warbler	RM
Blackpoll warbler	CM
Pine warbler	RM
Palm warbler	RM
Ovenbird	RS
Northern waterthrush	CM
Mourning warbler	UM
Yellowthroat	AS
Yellow-breasted chat	US
Hooded warbler	RM
Wilson's warbler	UM
Canada warbler	UM
American redstart	CM, CS
House sparrow	AP
Bobolink	CS
Eastern meadowlark	RS
Western meadowlark	AS
Yellow-headed blackbird	AS
Red-winged blackbird	AS, UW
Orchard oriole	CS
Northern oriole	CS
Rusty blackbird	CM, RW
Brewer's blackbird	UM
Common grackle	AS, RW
Brown-headed cowbird	CS
Scarlet tanager	US
Cardinal	CP
Rose-breasted grosbeak	CS
Blue grosbeak	US
Indigo bunting	CS
Dickcissel	AS
Evening grosbeak	UW
Purple finch	CM, UW
Pine grosbeak	RW
Common redpoll	UW
Hoary redpoll	RW
American goldfinch	CS, UW
Pine siskin	CM, US
Red crossbill	UW
White-winged crossbill	RW
Rufous-sided towhee	CS, RW
Lark bunting	RS
Savannah sparrow	US
Grasshopper sparrow	AS
LeConte's sparrow	UM
Henslow's sparrow	RM
Vesper sparrow	AS
Lark sparrow	US
Gray junco	CM, UW
Tree sparrow	AW
Chipping sparrow	AS
Clay-colored sparrow	CM, US
Field sparrow	US
Harris' sparrow	CM, RW
White-crowned sparrow	CM
White-throated sparrow	CM
Fox sparrow	UM
Lincoln's sparrow	CM
Swamp sparrow	CS
Song sparrow	AS, UW
Lapland longspur	UW
Smith's longspur	RM
Chestnut-collared longspur	RM
Snow bunting	UW

Table 2-9.

LIST OF MAMMALS OCCURRING IN THE SIOUX FALLS AREA

Check list of mammals of possible occurrence in the Sioux Falls area

KEY: (*no longer present in the wild state)

Order Marsupialia
- Family Didelphidae
  - Didelphis marsupialis-Opossum

Order Insectivora
- Family Talpidae
  - Scalopus aquaticus-Eastern mole
- Family Soricidae
  - Blarina brevicauda-Short-tailed shrew
  - Microsorex hoyi-Pygmy shrew
  - Sorex cinereus-Masked shrew

Order Chiroptera
- Family Vespertilionidae
  - Lasionycteris noctivagans-Silver-haired bat
  - Lasiurus borealis-Red bat
  - L. cinereus-Hoary bat
  - Pipistrellus subflavus-Eastern pipistrel
  - Eptesicus fuscus-Big brown bat
  - Myotis keenii-Keen's myotis
  - M. lucifugus-Little brown myotis

Order Lagomorpha
- Family Leporidae
  - Lepus townsendii-White-tailed jackrabbit
  - Sylvilagus floridanus-Eastern cottontail

Order Rodentia
- Family Sciuridae
  - Sciurus carolinensis-E. gray squirrel
  - S. niger-Fox squirrel
  - *Tamiasciurus hudsonicus-Red squirrel
  - Spermophilus franklinii-Franklin's ground squirrel
  - S. richardsonii-Richardson's ground squirrel
  - S. tridecemlineatus-Thirteen-lined ground squirrel
- Family Geomyidae
  - Geomys bursarius-Plains pocket gopher
- Family Heteromyidae
  - Perognathus flavescens-Onychomys leucogaster-Northern grasshopper mouse
  - Clethrionomys gapperi-Red-backed vole
  - Microtus ochrogaster-Prairie vole
  - M. pennsylvanicus-Meadow vole
  - Ondatra zibethicus-Muskrat
- Family Muridae
  - Mus musculus-European or house mouse
  - Rattus norvegicus-Norway rat
- Family Zapodidae
  - Zapus hudsonius-Jumping mouse
- Family Erethizontidae
  - Erethizon dorsatum-Porcupine

Order Carnivora
- Family Canidae
  - Canis latrans-Coyote
  - *C. lupus-Gray wolf
  - Urocyon cinereoargenteus-Gray fox
  - Vulpes fulva-Red fox
  - V. velox-Swift fox
- Family Felidae
  - *Felis concolor-Mountain lion
  - *Lynx canadensis-Lynx
  - L. rufus-Bobcat
- Family Procyonidae
  - Procyon lotor-Raccoon
- Family Mustelidae
  - *Lutra canadensis-River otter
  - Taxidea taxus-Badger
  - Mephitis mephitis-Striped skunk
  - Spilogale putorius-Spotted skunk
  - Mustela frenata-Long-tailed weasel
  - M. rixosa-Least weasel
  - M. vison-Mink
- Family Ursidae
  - *Ursus americanus-Black bear

Table 2-10.

LIST OF AMPHIBIANS AND REPTILES OCCURRING IN THE SIOUX FALLS AREA

Check list of amphibians and reptiles of possible occurrence in the Sioux Falls area

CLASS AMPHIBIA
- Order Urodela - Salamanders
  - Family Ambystomidae
    - Ambystoma tigrinum - Tiger salamander
- Order Anura - Toads and Frogs
  - Family Pelobatidae
    - Scaphiopus bombifrons - Plains spadefoot toad
  - Family Bufonidae
    - Bufo americanus - American toad
    - B. cognatus - Great Plains toad
    - B. woodhousei - Rocky Mountain toad
  - Family Hylidae
    - Acris crepitans - Cricket frog
    - Pseudacris triseriata - Chorus frog
  - Family Ranidae
    - Rana pipiens - Leopard frog

CLASS REPTILIA
- Order Chelonia - Turtles
  - Family Chelydridae
    - Chelydra serpentina - Snapping turtle
  - Family Testudinae
    - Chrysemys picta - Painted turtle
    - Terrapene ornata - Ornate box turtle
  - Family Trionychidae
    - Trionyx muticus - Smooth softshell
    - T. spinifer - Spiny softshell
- Order Squamata - Lizards and Snakes
  - Family Scincidae
    - Eumeces septentrionalis - Northern prairie skink
  - Family Colubridae
    - Storeria occipitomaculata - Red-bellied snake
    - Thamnophis radix - Plains garter snake
    - T. sirtalis - Red-sided garter snake
    - Tropidoclonion lineatum - Northern lined snake
    - Heterodon nasicus - Western hognose snake
    - Diadophis punctatus - Prairie ringneck
    - Coluber constrictor - Yellow-bellied racer
    - Opheodrys vernalis - Smooth green snake
    - Elaphe vulpina - Fox snake
    - Pituophis melanoleucus - Bullsnake
    - Lampropeltis doliata - Red milk snake
  - Family Viperidae
    - Crotalus viridis - Prairie rattlesnake

REFERENCE: Rogers, 1974

Small Game: White-tailed jackrabbit, eastern cottontail and fox squirrels reside in the project area. The jackrabbit populations are cyclical with wide variations in population density. Cottontail and fox squirrel populations are more stable and are hunted in the winter season. The wooded bottomland along the Big Sioux River provides high quality habitat for both species.

Furbearers: Important furbearers in the project area are beaver, muskrat, coyote, fox, raccoon, skunk, weasel and mink. Weasel, beaver, and raccoon were observed during the NSP survey in 1991.

Nongame Mammals: Numerous species of nongame mammals live in the Sioux Falls area (Rogers 1974). Their numbers vary from rare to abundant and depend on the availability of preferred habitat and their overall geographical range. Abundant species include thirteen-lined ground squirrels, pocket gopher, and several species of mice and voles. In the study area the Pathfinder Site would be expected to have a higher small mammal density and diversity than the pipeline route since the former is primarily undisturbed land while the latter is largely under agricultural use.

2.4.8.2. Birds

Two hundred sixty-one bird species have been documented in the Sioux Falls area, most of which could be expected to occur at the Pathfinder Site or along the pipeline route, (Table 2-8) (Rogers 1974). Forty-four of these species were observed during the NSP survey in 1991 (Table 2-6). About 94 percent of the bird species documented in the area seasonally migrate either to nesting areas or to wintering areas.

Abundant or common permanent residents include ring-necked pheasant, gray partridge, pigeon, screech owl, great horned owl, common crow, white breasted nuthatch, starling, house sparrow, and cardinal. Ring-necked pheasant and gray partridge are two introduced species which are important game birds.

Up to 106 species of summer resident birds (nesting) could potentially occur in the project area. Several species of ducks and geese that are summer residents or migrants are commonly hunted in the Sioux Falls area. Small wetlands located along the pipeline route and the Big Sioux River at the Pathfinder Site provide important habitat for waterfowl and

shorebirds primarily during the spring migration. Wooded areas along the river provide nesting habitat for wood ducks and several dabbling ducks.

2.4.8.3. Amphibians and Reptiles

Twenty-seven species of amphibians and reptiles could potentially occur in the Sioux Falls area, including one salamander, four toads, three frogs, six turtles, one lizard and 12 snakes (Rogers 1974). Ephemeral ponds, other wetlands, and the Big Sioux River provide habitat for amphibians during the breeding and larval portions of their life cycles. Several species migrate to upland areas during the summer.

The Big Sioux River provides excellent habitat for snapping turtles and painted turtles, which are abundant in the area. Garter snakes are common along the river and adjacent prairie areas. Other reptiles listed in Table 2–10 are uncommon.

2.4.8.4. Fisheries

The fishery of the Big Sioux River is typical of warm water rivers in this region. A thesis written by Sinning (1968) and unpublished data collected by the S. D. Department of Game, Fish, and Parks provide the best data on fish populations in the Big Sioux River near the proposed CTG facility.

In 1967 and 1968, Sinning conducted sampling at 14 stations over the length of the Big Sioux River by a number of methods including trap, hoop, gill nets, seines, electrofishing, explosives, and poisoning. Sampling stations numbered 6 through 10 were in the vicinity of Sioux Falls. Common and scientific names of all fish collected in the river are listed on Table 2–11. Relative abundances of the fishes in the reaches near Sioux Falls are shown on Table 2–12.

The results of Sinning's survey indicate that there are some differences in the fish populations above and below Sioux Falls. He attributed this finding to differences in habitat availability, water quality, and the falls being a barrier to fish passage. Species common above Sioux Falls but absent below included yellow perch, common shiners, and trout perch. Quillback, freshwater drum, white bass, gizzard shad, and goldeye were relatively common below Sioux Falls but absent upstream. Six species were collected at all five sites near Sioux Falls including black bullhead, carp, sucker, red shiner, sand shiner, and fathead minnow.

Table 2-11.

COMMON AND SCIENTIFIC NAMES OF FISH SPECIES COLLECTED IN THE BIG SIOUX RIVER

Common Name	Scientific Name
Shortnose gar	Lepisosteus platostomus
Gizzard shad	Dorosoma cepedianum
Goldeye	Hiodon alosoides
Central mudminnow	Umbra limi
Northern pike	Esox lucius
Stoneroller	Campostoma anomalum
Creek chub	Semotilus atromaculatus
Bluntnose minnow	Pimephales notatus
Fathead minnow	Pimephales promelas
Western silvery minnow	Hybognathus argyritis
Brassy minnow	Hybognathus hankinsoni
Sand shiner	Notropis stramineus
Bigmouth shiner	Notropis dorsalis
Red shiner	Notropis lutrensis
Rosyface shiner	Notropis rubellus
Topeka shiner	Notropis tristis
Common shiner	Notropis cornutus
Emerald shiner	Notropis atherinoides
Carp	Cyprinus carpio
Dace spp.	Rhinichthys spp.
Blacknose dace	Rhinichthys atratulus
Northern redbelly dace	Phoxinus eos
River carpsucker	Carpoides carpio
Quillback	Carpoides cyprinus

Table 2-11. (continued)

Common Name	Scientific Name
White sucker	Catostomus commersoni
Shorthead redhorse	Moxostoma macrolepidotum
Redhorse spp.	Moxostoma spp.
Bigmouth buffalo	Ictiobus cyprinellus
Smallmouth buffalo	Ictiobus bubalus
Black buffalo	Ictiobus niger
Channel catfish	Ictalurus punctatus
Flathead catfish	Pylodictus olivaris
Black bullhead	Ictalurus melas
Stonecat	Noturus flavus
Trout-perch	Percopsis omiscomayous
White bass	Morone chrysops
White crappie	Pomoxis annularis
Black crappie	Pomoxis nigromaculatus
Green sunfish	Lepomis cyanellus
Orangespotted sunfish	Lepomis humilus
Yellow perch	Perca flavescens
Walleye	Stizostedion vitreum
Sauger	Stizostedion canadense
Johnny darter	Etheostoma nigrum
Iowa darter	Etheostoma exile
Freshwater drum	Aplodinotus grunniens

Table 2-12.

RELATIVE ABUNDANCE OF FISH SPECIES NEAR SIOUX FALLS ON THE BIG SIOUX RIVER

Species	Station[1]				
	6	7	8	9	10
Bigmouth buffalo[2]	A+	S			
Black bullhead	A+	S	A	C	S
Black bullhead (YY)[3]	S	S	C		
Carp	A	A	A+	A	C
Carp (YY)	C		A	C	C
Quillback				C	S
Quillback (YY)				S	A
Channel catfish					S
Channel catfish (YY)	A			C	A
Black crappie	C		C		
White crappie	S			S	
Northern pike	S				
Northern redhorse	A			C	A
White sucker	S		S	A	A
White sucker (YY)	A	C	A	C	C
Green sunfish	C	S	A	C	
Orangespotted sunfish		S	S		S
Pumpkinseed			S		
Walleye (YY)		S		S	
Silvery minnow		S			
Emerald shiner	S	S			A
Red shiner	A+	A	A	C	A+
Sand shiner	A+	A	A	C	A+

Table 2-12. (continued)

Species	Station[1]				
	6	7	8	9	10
Bluntnose minnow	S	S			
Fathead minnow	A	C	A+	A+	A+
Creek chub	S			C	A
Trout-perch	A	C			
Johnny darter		C		C	C
Stonecat	C		S		

[1]#6 and #7 are above Sioux Falls, #8, #9, and #10 are downstream
[2]A+ = very abundant, A= abundant, C= common, S= scarce
[3]YY = young-of-the-year

Source: Sinning, J.A. 1968, Fishes of the Big Sioux River. M.S. Thesis, South Dakota State University, Brookings, South Dakota, 72 pp.

The SDDGFP conducted fish population sampling on the Big Sioux River in 1980 and 1983. In 1980 seining was the only method used. However, in 1983, seining, baited hoop nets, and electrofishing were all employed. Tables 2-13 and 2-14 list species collected at the stations closest upstream and downstream of the proposed CTG site using various trapping methods. Seining data revealed similar densities of fish at both locations. However, species diversity was slightly higher at the downstream site. Sampling with hoop nets and electrofishing showed similar species diversity at the two locations but greater density at the upstream station. Site specific habitat differences likely contributed to the difference in effectiveness of the various sampling methods. Table 2-15 compares species diversity over a longer reach of the river and shows the lowest diversity at the two sites near Sioux Falls, T101 and T102.

Comparing the results of the Sinning and SDDGFP studies in the vicinity of Sioux Falls reveals minor differences. Of the species collected by SDDGFP, five species were not observed by Sinning. Sinning, however, observed eleven additional species that were not found in the SDDGFP survey. The difference may be due to the variety of sampling methods Sinning used. Table 2-16 compares the species observed by the two studies over the length of the river.

2.4.8.5. Aquatic Invertebrates

Benthos (benthic macroinvertebrates)are free living aquatic animals without backbones, such as insects, clams, and snails, that inhabit the bottom of lakes, ponds and streams.

Aquatic insects and other invertebrate species are an important but little studied resource of the Big Sioux River. Aquatic invertebrates are important in the diets of both fish (Bailey and Harrison 1948, Hoops 1960) and waterfowl (Schroeder 1973). They can also be used as reliable indicators of water quality (Butcher 1946, Cook 1976, Gaufin and Tarzwell 1952, and Godfrey 1978). Aquatic insect data were collected in the Big Sioux River from its confluence with the Missouri River to Estelline, South Dakota in October 1972 by the Environmental Protection Agency (EPA 1973). Locations of sampling sites below Sioux Falls are shown in Figure 2–15. Benthos samples were collected with a Peterson grab at four sites per station and manually collected from rocky substrate. Results of the EPA survey for sites below Sioux Falls are shown in Table 2–17. Stations downstream from the Sioux Falls WATREC discharge indicated moderate to severe pollution damage to the Big Sioux River biota. Major upgrades to sewage treatment have occurred since the EPA study and it is likely that current invertebrate populations are more diverse than indicated by the 1972 data.

Table 2-13.

FISH SPECIES COLLECTED BY SEINING IN THE BIG SIOUX RIVER

	T101 R48 Downstream CTG Site			T102 R49 Upstream CTG Site		
	8/80	7/83	8/83	8/80	7/83	8/83
Northern pike		5	4			
Creek chub	10	2	2			
Bluntnose minnow		1	1			3
Fathead minnow		27	12		35	32
Minnow	29					
Sand shiner		14	3		29	2
Red shiner	4	21	68		3	27
Common shiner	99					
Dace spp.	7					
White sucker	21		1	13	23	6
Redhorse spp.	1			1		
River carpsucker	5	2	1		1	
Carp		1		1	1	1
Channel catfish	4	1	3	5	1	3
Black bullhead		3	4	22	1	10
Green sunfish		3	2	1		
Orangespotted sunfish		19	3			
White crappie		1		4		
Johnny darter		1	4		6	12
Total individuals	180	101	108	47	100	96
# species	9	14	13	7	9	9

Source: South Dakota Department of Game, Fish and Parks. Unpublished fishery data from the Sioux Falls Area Fishery Manager, Sioux Falls, South Dakota.

Table 2-14.

FISH SPECIES COLLECTED BY BAITED HOOP NET AND ELECTROFISHING IN THE BIG SIOUX RIVER (1983)

	T101 R48 DOWNSTREAM CTG SITE		T102 R49 UPSTREAM CTG SITE	
	Baited Hoop Net	Electrofishing	Baited Hoop Net	Electrofishing Net
Northern pike	-	3	-	-
White sucker	3	3	2	1
River carpsucker	-	-	-	1
Redhorse spp.	-	-	4	1
Carp	1	1	3	10
Channel catfish	6	5	1	-
Black bullhead	4	7	58	16
Green sunfish	-	5	-	-
White crappie	-	-	-	2
Total Individuals	14	24	68	31
# species	4	6	5	6

Source: South Dakota Department of Game, Fish and Parks.
Unpublished Fishery data from the Sioux Falls area Fishery Manager, Sioux Falls, South Dakota.

Table 2-15.

FISH SPECIES COLLECTED IN THE BIG SIOUX RIVER DURING 1980 AND 1983 BY SDDGFP

Species	Upstream of T102	T102	T101	T95	T93
Shortnose gar				x	x
Gizzard shad				x	x
Goldeye				x	x
Northern pike	x		x		
Stoneroller	x				
Creek chub	x		x		
Bluntnose minnow		x	x		
Fathead minnow		x	x	x	x
Western silvery minnow				x	x
Sand shiner		x	x	x	x
Bigmouth shiner				x	x
Red shiner	x	x	x	x	x
Rosyface shiner				x	x
Common shiner			x	x	x
Emerald shiner				x	x
Flathead catfish				x	x
Carp	x	x	x	x	x
Dace spp.	x	x			
River carpsucker		x	x		x
Quillback				x	x
White sucker	x	x	x		
Shorthead redhorse		x		x	x
Redhorse spp.	x	x		x	x

Table 2-15. (continued)

Species	Upstream of T102	T102	T101	T95	T93
Bigmouth buffalo	x	x			x
Channel catfish	x	x	x	x	x
Black bullhead	x	x	x	x	
Stonecat	x	x			
Trout-perch	x			x	
White crappie	x	x	x		
Green sunfish	x		x		
Orangespotted sunfish	x		x		
Yellow perch	x				
Walleye	x				x
Sauger				x	x
Johnny darter	x	x	x	x	x
Freshwater drum					x
Total Species	19	16	16	21	23

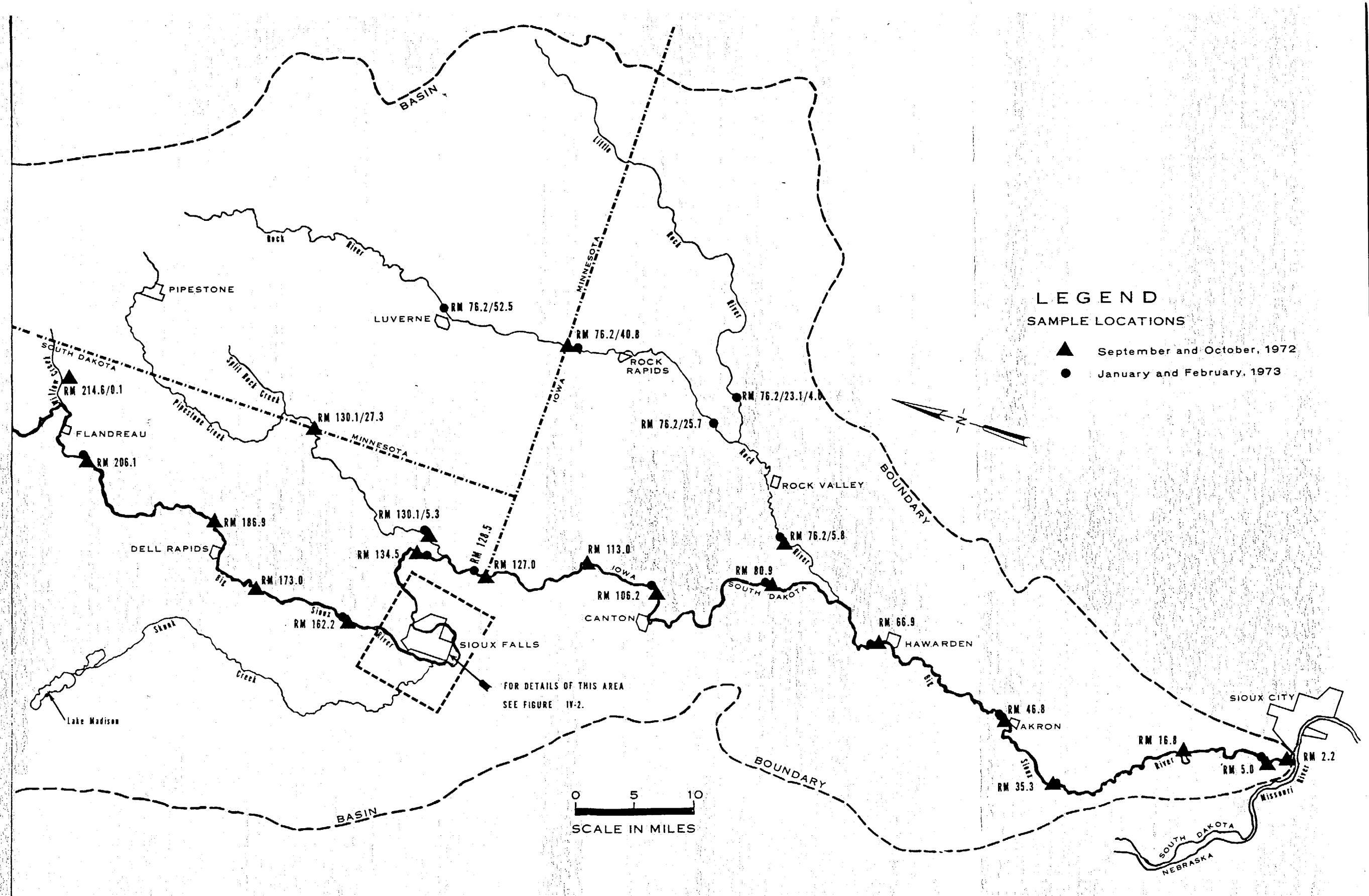
Table 2-16.

COMPARISON OF FISH SPECIES FROM 1965 & 1967 (SINNING, 1968) AND 1980 & 1983 (SDDGFP, unpub.)

	Sinning	SDDGFP
Shortnose gar		
Gizzard shad	x	x
Goldeye	x	x
Northern pike	x	x
Stoneroller	x	x
Creek chub	x	x
Bluntnose minnow	x	x
Fathead minnow	x	x
Western slivery minnow	x	x
Brassy minnow	x	
Sand shiner	x	x
Bigmouth shiner		x
Red shiner	x	x
Rosyface shiner		x
Common shiner	x	x
Emerald shiner	x	x
Dace spp.		x
Blacknose dace	x	
Carp	x	x
River carpsucker		x
Quillback	x	x
White sucker	x	x
Shorthead redhorse	x	x
Redhorse spp.		x

Table 2-16. (continued)

	Sinning	SDDGFP
Bigmouth buffalo	x	x
Smallmouth buffalo	x	
Channel catfish	x	x
Flathead catfish		x
Black bullhead	x	x
Stonecat	x	x
Trout-perch	x	x
White bass	x	x
White crappie	x	x
Black crappie	x	
Green sunfish	x	x
Orangespotted sunfish	x	x
Yellow perch	x	x
Walleye	x	x
Sauger		x
Johnny darter	x	x
Iowa darter	x	
Freshwater drum	x	x
Total species	34	36



EIS FIGURE 2-15.

Sampling Locations, Big Sioux River and Selected Tributaries, Estelline, South Dakota to Sioux City, Iowa.

From EPA 1972.

Table 2-17. Benthos, Big Sioux River (numbers per square foot). From EPA 1972.

Organism			River Mile								
			2.2	16.8	35.3	46.8	66.9	80.9	106.2	127	134.5
Annelida	Oligochaeta	Tubificidae	42			2					Q
		Hirudinea *Dina parva*									Q
Crustacea	Amphipoda	Talitridae *Hyalella azteca*								Q	Q
Insecta	Ephemeroptera	Leptophlebiidae *Paraleptophlebia sp.*		Q			Q	Q	Q	Q	Q
		Pothamanthidae *Potamanthus sp.*								Q	
		Siphlonuridae *Isonychia sp.*					Q	1	Q		Q
		Tricorythidae *Tricorythodes sp.*			Q				2		
		Caenidae *Caenis sp.*		Q				Q	Q		
		Leptophlebiidae *Leptophlebia sp.*					Q		Q		
		Ephemeridae *Hexagenia sp.*	2								
		Heptageniidae *Cinygmula sp.* *Stenonema sp.* *Heptagenia sp.*	 Q	 Q Q	 Q Q	 Q Q 1	 Q Q	 Q Q 9	 Q Q Q	 Q Q	 Q Q
		Baetidae *Baetis sp.* *Centroptilum sp.* *Pseudocloeon sp.*		Q	Q	Q	Q	3	4 4	Q	Q
	Odonata	Coenagriidae *Enallgma sp.* *Argia sp.*	 Q	Q	 Q			Q Q			
		Gomphidae *Gomphus sp.*	2	1				1			Q
	Coleoptera	Dytiscidae			Q						
		Elmidae *Stenelmis sp.*					Q		Q		
	Tricoptera	Hydropsychidae *Hydropsyche sp.* *Cheumatopsyche sp.*		 Q Q	 2 17	 5	 Q Q	 287	 310 51		 Q Q

Table 2-17. continued

		Polycentropidae									
		Polycentropus sp.		Q							
	Diptera	Simuliidae									
		Simuliium sp.		Q	Q		Q		19	Q	Q
		Ceratopogonidae									
		Chironomini	Q								
		Chironomus	3					3		Q	Q
		Cryptochironomus	3		2						
		Dicrotendipes	Q								
		Glyptotendipes	Q	Q					Q		
		Microtendipes				1					
		Paratendipes			2						
		Polypedilum		Q	Q		Q		9	Q	Q
		Xenochironomus				13		3			
		Orthocladiinae									
		Coryneura									
		Cricotopus									
		Orthocladius			Q		Q		Q		
		Psectrocladius		Q					Q		Q
		Thienemanniella				Q					Q
		Tanypodinae									
		Coeltanypus					Q	Q	3	Q	
		Podonominae							Q		
		Tanytarsini		Q							
Pelecypoda	Spaeriidae	Sphaerium	1	2					1		
Gastropoda	Pulmonata	Physidae							1		

Q - The Capital letter Q equals organisms collected qualitatively.

The lower Big Sioux River is a mud and sand dominated system with few riffle areas. Snags are common along the shoreline providing food shelter and attachment substrate for numerous species. Sampling results from the EPA study indicated the presence of the following invertebrates; Oligochaeta, Hirudinea, Crustacea, Insecta, Pelecypoda and Gastropoda. Insects accounted for most of the benthic diversity (Table 2-17). Fifteen species of mayflies (Ephemeroptera), three dragonflies (Odonata), three caddisflies (Tricoptera) and thirty true flies (Diptera) were reported.

The sampling station at river mile 134.5 was located nearest to and downstream from the proposed CTG site. It is just above the confluence with Split Rock Creek. Benthic fauna collected at this site included tubifix worms, a leech (Dina parva), fourteen species of aquatic insects and scuds. No quantitative data on population density were presented for this station (EPA 1973).

2.4.8.6. Plankton and Periphyton

Plankton and periphyton play a major role in the food web of aquatic communities. The term plankton covers both phytoplankton which are free-floating microscopic plants (algae) and zooplankton which are small aquatic animals that feed on phytoplankton. Periphyton refers to attached algae growing on rocks, vegetation, and other surfaces in streams, lakes and ponds. Periphyton are an important food source for microscopic animals and benthic organisms.

The major phytoplankton classes found in the environmental study area include golden-brown algae, green algae, blue-green algae (cyanobacteria), diatoms, and cryptomonads. Attached filamentous green algae and diatoms are the predominant groups in the periphyton of the Big Sioux River.

2.4.9. Threatened and Endangered Species

Table 2-18 depicts the federally-listed endangered and threatened species for South Dakota (USFWS 1989). Table 2-19 presents the state-listed endangered and threatened species which are not on the federal list (SDCL 1989). Most species on the state list are taxa that reach the periphery of their natural ranges in South Dakota, and they are not necessarily rare on a nationwide basis.

Table 2-19. (continued)

Finscale Dace, (Phoxinus neogaeus)	T	Found in cool spring waters. Has been historically found in a few lakes and streams near Spearfish. May be present in the Sand Hills area of South Dakota.
Longnose Sucker, (Catostomus catostomus)	T	Found in cool, spring-fed creeks in the Belle Fourche River drainage north of the Black Hills.
Trout-Perch, (Percopsis omiscomaycus)	T	Occurs over clean sand or gravel bottoms in both lakes and streams. Has been reported only from the Big Sioux and Minnesota River drainages in South Dakota.
Plains Topminnow, (Fundulus sciadicus)	T	Found in clear streams which have aquatic vegetation. Has been collected from isolated areas in Vermillion, James, Cheyenne, and Missouri drainages.
Blandings Turtle, (Emydoidea blandingii)	T	
False Map Turtle, (Graptemys pseudogeographica)	T	
Spiny Softshell Turtle, (Trionyx spiniferus)	T	
Eastern Hognose Snake, (Heterodon platyrhinos)	T	
The Lined Snake, (Tropidoclonion lineatum)	T	
Northern Red-Bellied Snake, (Storeria occipitomaculata)	T	

Status Code:
(E) - Endangered species
(T) - Threatened species

From the federal list, the bald eagle (Haliaeetus leucocephalus), piping plover (Charadrius melodus), and Peregrine falcon (Falco peregrinus anatum) are known to occur within the Sioux Falls area. The bald eagle and the Peregrine falcon are listed as being endangered and the piping plover is listed as threatened species. Bald eagles migrate through and winter in South Dakota with sightings reported for every county in the state. Eagles use mature riparian timber areas near the rivers, streams, and lakes.

Eagles are usually found in South Dakota from October through April, but juveniles have been sighted in the state during the summer months. Piping plovers are late spring and summer residents that nest on sparsely vegetated islands, sandbars, and shoreline of the Missouri River and in alkali wetlands. Their breeding season is from late April to August. Peregrine falcons migrate through South Dakota and are generally associated with wetlands and open areas, such as cropland and grassland. It is possible to sight them any month of the year in South Dakota.

The western prairie fringed orchid (Platanthera praeclara) is the only vascular plant on the federal endangered species list known to have occurred in South Dakota. Historically, the plant has been found in wet meadows of the Big Sioux River Valley, although no specimens have been seen in recent times. One collection from early in this century was taken near Brandon, South Dakota, approximately 2.8 miles east of the proposed CTG site. Another specimen was collected in 1898 near Brookings, over 50 miles north of the project site. Apparently the plant was rare in the region even at the time of settlement. Habitats known to support this orchid include tallgrass calcareous, silt loam prairie and subirrigated sand prairies. The prospects for western prairie fringed orchid still surviving in South Dakota are not good. Habitats required by the plant are those most likely to have been converted to farming.

No other plant or animal species occurring in Sioux Falls area is on the Federal endangered or threatened species list.

From the state list, the following species are known to occur in the Sioux Falls area: the osprey (Pandion haliaetus), buff-breasted sandpiper (Tryngites subruficollis), northern swift fox (Vulpes velox hebes), spiny softshell turtle (Trionyx spiniferus), the lined snake (Tropidoclonion lineatum), northern red-bellied snake (Storeria occipitomaculata), northern redbelly dace (Phoxinus eos), and the trout-perch (Percopsis omiscomaycus). All of these

species are listed as threatened. Historically, one endangered species, the central mudminnow (Umbra limi) was observed about 50 miles north of the proposed CTG site.

The two species of fish listed as threatened are the northern redbelly dace and the trout-perch. Northern redbelly dace were last observed in 1952 at two sites near Brookings about 50 miles north of Sioux Falls. Neither Sinning nor the SDDGFP recorded this species during their studies of the Big Sioux River. Phillips *et al.* (1982) list the preferred habitat of this species as boggy lakes, ponds and creeks, generally in quiet water. It is unlikely that the Big Sioux River would provide much suitable habitat for the northern redbelly dace. The other listed species, the trout-perch, is a fish of larger rivers and clear lakes. Trout-perch prefer deeper water with sandy to gravely bottoms and have been found to be sensitive to elevated water temperatures (Phillips *et al.* 1982). No trout-perch were collected at the stations near Sioux Falls during the SDDGFP sampling effort. Sinning (1968), however, found them to be abundant to common at the two sites upstream of the city, but absent at the sites closest to the proposed CTG facility (Table 2-12).

One endangered species, the central mudminnow, was last observed in 1956 about 50 miles north of the proposed CTG site. However, neither the Sinning nor the SDDGFP studies found this species during their fairly intensive sampling of the Big Sioux River. The preferred habitat of this species includes ponds, pools and ditches with mucky bottoms and choked with vegetation. The central mudminnow is quite tolerant of low dissolved oxygen levels and warm water temperatures but will not tolerate sedimentation (Phillips *et al.* 1982).

A database search was conducted for the area within 15 miles of the Pathfinder Site by the Department of Game, Fish and Parks Natural Heritage Survey to locate observed occurrences of endangered and threatened species, as well as species not officially listed as threatened or endangered, but of special concern due to population levels or threat of habitat loss. Table 2-20 lists the results of the database search including the species observed, Heritage Status, date last observed, and legal location of the observation. The only additional endangered or threatened species that was found to occur in the area was the Blanding's turtle (Emydoidea blandingii), which is on the state's threatened list.

Blanding's turtle was last observed in 1963 about four miles south of the Pathfinder Site. This turtle prefers calm shallow water with rich aquatic vegetation surrounded by sandy uplands, typical river backwaters, and prairie marshes (Coffin and Pfannmueller 1988). Blanding's turtle is threatened over most of its range. The presence of Blanding's turtle in

Table 2-20.

CRITICAL SPECIES OBSERVED WITHIN 15 MILES OF THE PROPOSED CTG SITE

COMMON NAME	SCIENTIFIC NAME	STATUS	LAST OBSERVED	TOWNSHIP-RAN & SECTION
Smooth Softshell	Apalone mutica	C	1983-Summer	102N048W03
Ringneck Snake	Diadophis punctatus	C(p)	1964-04-25	102N048W23
American Spikenard	Aralia racemosa	B(p)	1959-07-13	103N047W30
Finger Coreopsis	Coreopsis palmata	B(p)	1959-07-12	103N047W30
Meadowsweet	Spiraea alba	B(p)	1959-07-13	103N047W17
Meadowsweet	Spiraea alba	B(p)	1952-07-04	103N047W30
Culver's Root	Veronicastrum virginicum	B(p)	1959-07-13	103N047W17
Culver's Root	Veronicastrum virginicum	B(p)	1923-07-07	
Small White Lady's-Slipper 3C	Cypripedium candidum	A(p)	1920-05-29	
Rock Polypody	Polypodium virginianum	B(p)	1970-05-25	103N047W31
Topeka Shiner	Notropis tristis	A(e)	1939-09-19	101N050W10
Blanding's Turtle	Emydoidea blandingii	ST,U	1963-Fall	101N04918
Compass Plant	Silphium laciniatum	B	1988-07-01	101N049W18

STATUS CODES

FE	FEDERAL ENDANGERED	A	CRITICALLY RARE
FT	FEDERAL THREATENED	B	RARE
PE	PROPOSED FEDERAL ENDANGERED	C	UNCOMMON
FT	PROPOSED FEDERAL THREATENED	U	STATUS UNDETERMINED
CL	CANDIDATE FOR FEDERAL LISTING	H	HISTORICAL RECORD ONLY
SE	STATE ENDANGERED	X	PRESUMED EXTERPATED
ST	STATE THREATENED		

(p) PERIPHERAL (d) DISJUNCT (e) ENDEMIC

Table 2-20. (continued)

COMMON NAME	SCIENTIFIC NAME	STATUS	LAST OBSERVED	TOWNSHIP-RAN & SECTION
Champion Boxelder Tree	Acer negundo	-	1982-05-07	101N049W01
Finger Coreopsis	Coreopsis palmata	B(p)	1950-07-30	
Finger Coreopsis	Coreopsis palmata	B(p)	1983-09-22	102N049W36
Finger Coreopsis	Coreopsis palmata	B(p)	1985-01-05	101N049W01
Compass Plant	Silphium laciniatum	B	1966-10-10	101N049W01
Compass Plant	Silphium laciniatum	B	1892-08-24	101N050W
Compass Plant	Silphium laciniatum	B	1988-07-01	101N049W01
Compass Plant	Silphium laciniatum	B	1988-07-01	101N049W10
Bush Clover	Lespedeza capitata	B(p)	1962-08	
Bush Clover	Lespedeza capitata	B(p)	1985-01-05	101N049W01
Downy Gentian	Gentiana puberulenta	C	1985-01-05	101N049W01
Downy Gentian	Gentiana puberulenta	C	1966-10-18	101N050W34
Downy Gentian	Gentiana puberulenta	C	1983-09-22	101N049W36
Meadowsweet	Spiraea alba	B(p)	1892-08	101N050W

STATUS CODES

FE	FEDERAL ENDANGERED	A	CRITICALLY RARE
FT	FEDERAL THREATENED	B	RARE
PE	PROPOSED FEDERAL ENDANGERED	C	UNCOMMON
FT	PROPOSED FEDERAL THREATENED	U	STATUS UNDETERMINED
CL	CANDIDATE FOR FEDERAL LISTING	H	HISTORICAL RECORD ONLY
SE	STATE ENDANGERED	X	PRESUMED EXTERPATED
ST	STATE THREATENED		

(p) PERIPHERAL (d) DISJUNCT (e) ENDEMIC

Table 2-20. (continued)

COMMON NAME	SCIENTIFIC NAME	STATUS	LAST OBSERVED	TOWNSHIP-RAN & SECTION
Prairie Willow	Salix humilis	H	1923-09-07	101N049W
Wild Rice	Zizania aquatica	C(p)	1919-08-23	101N050W17
Ringneck Snake	Diadophis punctatus	C(p)	1963-09	101N049W
Tallgrass Prairie, Glacia		A	-	101N048W13
Champion Hackberry Tree	Celtis occidentalis	-	1982-06-21	101N048W10
Champion Green Ash Tree	Fraxinus pennsylvanica	-	1981-06-03	101N048W09
Champion Eastern Cottonwood Tree	Populus deltoides	-	1981-06-03	101N048W09
Champion Eastern Cottonwood Tree	Populus deltoides	-	1981-06-17	101N049W04
Champion Bur Oak Tree	Quercus macrocarpa	-	1981-06-17	101N048W04
Finger Coreopsis	Coreopsis palmata	B(p)	1951-08-04	
Finger Coreopsis	Coreopsis palmata	B(p)	1984-07-06	102N048W34
Finger Coreopsis	Coreopsis palmata	B(p)	1988-07-01	101N047W05
Compass Plant	Silphium laciniatum	B	1951-09-02	101N049W
Compass Plant	Silphium laciniatum	B	1971-07-15	101N048W13

STATUS CODES

FE	FEDERAL ENDANGERED	A	CRITICALLY RARE
FT	FEDERAL THREATENED	B	RARE
PE	PROPOSED FEDERAL ENDANGERED	C	UNCOMMON
FT	PROPOSED FEDERAL THREATENED	U	STATUS UNDETERMINED
CL	CANDIDATE FOR FEDERAL LISTING	H	HISTORICAL RECORD ONLY
SE	STATE ENDANGERED	X	PRESUMED EXTERPATED
ST	STATE THREATENED		

(p) PERIPHERAL (d) DISJUNCT (e) ENDEMIC

Table 2-20. (continued)

COMMON NAME	SCIENTIFIC NAME	STATUS	LAST OBSERVED	TOWNSHIP-RAN & SECTION
Compass Plant	Silphium laciniatum	B	1988-07-01	101N047W05
Black Walnut	Juglans nigra	C(p)	1977	101N048W13
White Water-Lily	Nymphaea odorata	H	-	101N049W28
Western Prairie Fringed Orchid	Platanthera praeclara	H	1916-07-14	
Rock Polypody	Polypodium virginianum	B(p)	1968-05-27	
Finger Coreopsis	Coreopsis palmata	B(p)	1988-07-01	101N047W05
Compass Plant	Silphium laciniatum	B	1988-07-01	101N047W05
Compass Plant	Silphium laciniatum	B	1988-07-01	101N047W04
Whip-Poor-Will	Caprimulgus vociferus	B	1981-SUM	101N049W11
Black Buffalo	Ictiobus niger	B(p)		100N049W

STATUS CODES

FE	FEDERAL ENDANGERED	A	CRITICALLY RARE
FT	FEDERAL THREATENED	B	RARE
PE	PROPOSED FEDERAL ENDANGERED	C	UNCOMMON
FT	PROPOSED FEDERAL THREATENED	U	STATUS UNDETERMINED
CL	CANDIDATE FOR FEDERAL LISTING	H	HISTORICAL RECORD ONLY
SE	STATE ENDANGERED	X	PRESUMED EXTERPATED
ST	STATE THREATENED		

(p) PERIPHERAL (d) DISJUNCT (e) ENDEMIC

Pipestone County, Minnesota, in recent years (no date given) confirms their existence in the Missouri River drainage. Southwest Minnesota and southeast South Dakota are on the extreme western edge of the range for this turtle.

2.4.10. Surface Water Resources

2.4.10.1. General Description

The Big Sioux River meanders through the NSP property approximately 1000 feet North of the proposed CTG facility. The flow direction is from west to east. This river provides drainage for a large portion of eastern South Dakota and portions of southwest Minnesota and northwest Iowa. The headwaters are located about 30 miles north of Watertown in the Coteau des Prairies of northeastern South Dakota. The river flows southeast from the source to the town of Flandreau. The flow is then predominantly southerly to the confluence with the Missouri River near Sioux City, Iowa.

The structure of the Big Sioux consists of long riffles and pools with noticeable current. The river width ranges from about 20 feet at Watertown to about 200 feet at mouth. The average depth ranges from one to five feet. Numerous intermittent creeks and streams enter the Big Sioux River as it cuts through the Coteau. These tributaries have left an unmistakable imprint on the surface topography, particularly on the east side of the river.

The Big Sioux River basin watershed consists mainly of glacial till ranging from 50 to 400 feet thick interbedded with lenses of glacial outwash. The outwash deposits are most often associated with present tributaries to the Big Sioux River and the floodplain of the Big Sioux River. The river bed is generally composed of loose sand and small gravel. The area is extensively farmed, resulting in heavy silt loads to the river due to erosion from tilled and overgrazed lands. Silty deposits occur in back waters and rock outcrops form Dell Rapids and Sioux Falls (Sinning 1968).

Total drainage area of the Big Sioux River upstream of North Cliff Avenue in Sioux Falls is approximately 5,220 square miles. This area included 622 square miles contributed by the Skunk Creek watershed which flows into the Big Sioux River in west Sioux Falls (Lindgren and Niehus 1992).

2.4.10.2. River Discharge

River flow volume past the proposed CTG site is affected by natural runoff, ground water accretion and discharges from the City of Sioux Falls. The two major point source wastewater discharges upstream of the proposed CTG facility are the John Morrell Meat Packaging Company (Morrell), located 6.9 river miles upstream, and the Sioux Falls Water Reclamation Department wastewater treatment facility (WATREC) located approximately 2.2 river miles upstream of the proposed CTG site.

The U.S. Geological Survey (USGS) maintains a gauging station on the Big Sioux River at North Cliff Avenue in Sioux Falls, approximately 6.5 river miles upstream of the proposed CTG facility. This station is positioned between the Morrell discharge point and WATREC outfall. Monthly mean flows along with the daily maximum and minimum from the North Cliff gauging station for water years 1974 - 1990 are presented in Table 2-21. For the 19-year period, river flow in the Big Sioux has ranged from a minimum daily average of 0.8 cubic feet per second (cfs) in February 1990 to a maximum daily average of 20,700 cfs in June 1984. Monthly mean flow over the 19 year period has varied from 72 cfs in January (lowest monthly flow) to 1465.9 cfs in April (highest monthly flow). These flow ranges reflect the contrast between periods of no runoff during winter with ice cover, and high runoff during snowmelt and spring rainfall. Average annual flow in the Big Sioux River for the 19-year period was approximately 500 cfs. On the basis of flow records dating from 1948-1988, the average annual contribution from the Skunk River watershed is approximately 71 cfs (Lindgren and Niehus, 1992).

Table 2-22 lists the monthly flow exceedance values for the Big Sioux River at the North Cliff Avenue station in Sioux Falls based on nine years of data (SDDENR 1991). The one-in-ten year monthly low flow is 6.26 cfs and occurs in January. The lowest summer one-in-ten year monthly low flow is 19.77 cfs, occurring in July. The five-year seven-day low flow is 12.5 cfs and the 100-year flood flow is 26,500 cfs (SDDENR 1991)

It is important to note that, while the above data represent trends in Big Sioux River flow, the data do not completely represent the entire flow past the CTG site. While the Morrell plant has operated more or less continuously during the data period, in 1982 the WATREC discharge outfall was relocated from a point upstream of the gauging station to its present downstream location in 1982. The monthly average effluent flow from the WATREC averaged 18.6 to 24.8 cfs in 1991. This water is contributed to the flow of the stream but is not measured by the North Cliff gauging station.

Table 2-21. Monthly mean and range of flow in the Big Sioux River at Sioux Falls 1972-1990 (in cubic feet per second).

Month	Maximum	Minimum	Mean
October	3100	12	254.0
November	2070	13	221.2
December	1260	7.1	132.3
January	350	1.4	72.0
February	3790	0.8	133.6
March	8440	9.7	1098.8
April	9880	24	1465.9
May	7310	31	834.5
June	20700	14	872.4
July	4330	14	427.4
August	1300	11	221.1
September	9660	9.0	319.6

Table 2-22. Flow exceedence values for the Big Sioux River at North Cliff Avenue, Sioux Falls, SD (nine years of record).

Month	10%	30%	50%	70%	90%
October	1580.32	781.83	168.32	90.80	30.83
November	1008.90	601.43	317.66	105.33	41.26
December	476.38	302.64	185.80	98.25	36.32
January	289.25	172.42	118.54	32.25	6.26
February	798.17	199.78	179.60	75.67	32.25
March	3478.61	2295.48	1025.08	562.45	77.06
April	6543.00	2884.68	1524.10	477.03	106.73
May	4518.12	1600.03	499.51	223.42	55.00
June	6880.16	778.23	617.10	185.70	53.60
July	1729.96	888.12	470.45	236.38	19.77
August	912.22	217.61	141.74	114.38	33.03
September	3467.66	354.00	124.46	62.00	28.00

Source: South Dakota Department of Water and Natural Resources.

2.4.10.3. Floodplains

Figure 2-16 is a 100 year flood plain map which depicts areas of special flood hazard as indicated by the Flood Insurance Rate Maps developed by the Federal Emergency Management Agency (FEMA, 1979, 1982). The northern portion of the Pathfinder site containing the existing settling basins bordering the Big Sioux River is within the 100 year flood plain as classified by FEMA. However, the location of the proposed CTG is not within the 100-year flood plain. There are no areas along the preferred or alternative pipeline routes which are specifically designated as 100–year floodplain as classified by FEMA. However, a few areas along the southern portion of the preferred and alternative pipeline routes in Lincoln County are classified as special flood hazards. Lincoln County is not under the same flood insurance program as Minnehaha County and therefore does not further delineate flood plain areas into 100–year or 500–year floodplains.

2.4.10.4. River Water Quality

South Dakota has classified the waters of the State by beneficial use classes and has based water quality standards on those intended uses. The assigned beneficial use classes of the Big Sioux River at the Proposed CTG site are warm water semipermanent fish life propagation, immersion recreation, limited contact recreation, wildlife propagation, and irrigation. The applicable water quality criteria for these uses are listed in Table 2-23. According to State law "no person may discharge or cause to be discharged into any lake or stream pollutants which cause the receiving water to fail to meet the criteria for its beneficial use" (SDCL 34A-2 Chapter 74:03:02:02). Point discharges to surface water bodies are required to obtain a National Pollutant Discharge Elimination permit.

Big Sioux water quality data is collected by the SDDENR at monitoring stations located in Sioux Falls and Brandon. The station at Sioux Falls, (WQM B529) is 1.9 river miles down stream of Morrell, 2.8 miles upstream of the Sioux Falls wastewater outfall, and 5 miles upstream of the proposed CTG site. The station at Brandon (WQM 31) is 0.75 miles down stream of the Brandon wastewater treatment facility, and 3.3, 5.5, and 10.2 river miles down stream of the proposed CTG facility, the Sioux Falls wastewater outfall, and Morrell, respectively. Data are available for the period 1974 through 1990. Morrell was discharging wastewater prior to 1974; operations at the WATREC began in 1982 although the final phase of construction was not completed until 1986; the Brandon wastewater facility has been in operation since 1981.

Table 2-23. Water quality standards for the Big Sioux River near the proposed CTG facility[1]

Parameter	Concentration (mg/l unless noted)
Unionized ammonia (as N)	<0.04
Total cyanide	<0.02
Free cyanide	<0.005
Dissolved oxygen	>5.0
Undisassociated hydrogen sulfide	<0.002
pH (pH units)	6.5-8.3
Total residual chlorine	<0.02
Total Alkalinity (as $CaCO_3$)	<750
Nitrate (as N)	<50
Acids	cannot alter pH of receiving water >0.5 pH
Oil and grease	concentration < 10 mg/l and no visible sheen
PCBs	<0.000001
Temperature	<90
Total dissolved solids	<2500
Total suspended solids	<90
Conductivity (uS/cm)	<2500
Sodium Absorption Ratio	<10.0
Fecal coliforms (# org./100ml)	
mean of 5 samples	<200
daily maximum, applicable 5/1-9/30	<400

[1]Source: South Dakota Surface Water Quality Standards, SDCL 34A-2, Chapter 74:03:02

Table 2–24 compares the minimum, maximum and mean values for the parameters at the two SDDENR monitoring stations for the 17–year period. Although the minimum and maximum values for the two stations vary widely, the mean values are within 10 percent for most parameters. One parameter which exhibits a wide difference in mean values is fecal streptococcus counts. The mean values for this parameter obtained at the Brandon site are substantially higher than at the Sioux Falls station. This parameter is often an indication of contamination from animal feed lots and processing facilities. Mean fecal coliform counts at Brandon are also slightly higher than Sioux Falls but the overall ranges are similar. These fecal coliform values indicate that the water quality standards for that reach of the Big Sioux River are likely exceeded at times.

Many other parameters vary widely, reflecting the influence of groundwater accretion to the river during low flows and dilution from surface runoff. Such parameters as conductivity, residue, hardness, and chloride are relatively high during low flow periods. Dissolved oxygen mean values are adequate although the minimum values listed for the Brandon station are below state standards. Minimum field pH values recorded at both monitoring stations are below standards for the designated uses. However, lab pH values are within the specified ranges. Mean nonfilterable residue values are within the water quality standards but the maximum concentration are in excess of the water quality standards.

2.4.10.5. Other Water Bodies

Four existing wastewater settling basins at the Pathfinder site currently receive wastewater from the existing Pathfinder Power Plant. As shown in Figure 2-17, the basins are located northeast of the existing power plant and north of the proposed CTG facility. Two of the basins measure approximately 100 feet by 200 feet and two measure approximately 150 feet by 250 feet. The basins can operate to liquid depth of about seven feet. The infiltration rate from these basins is not known.

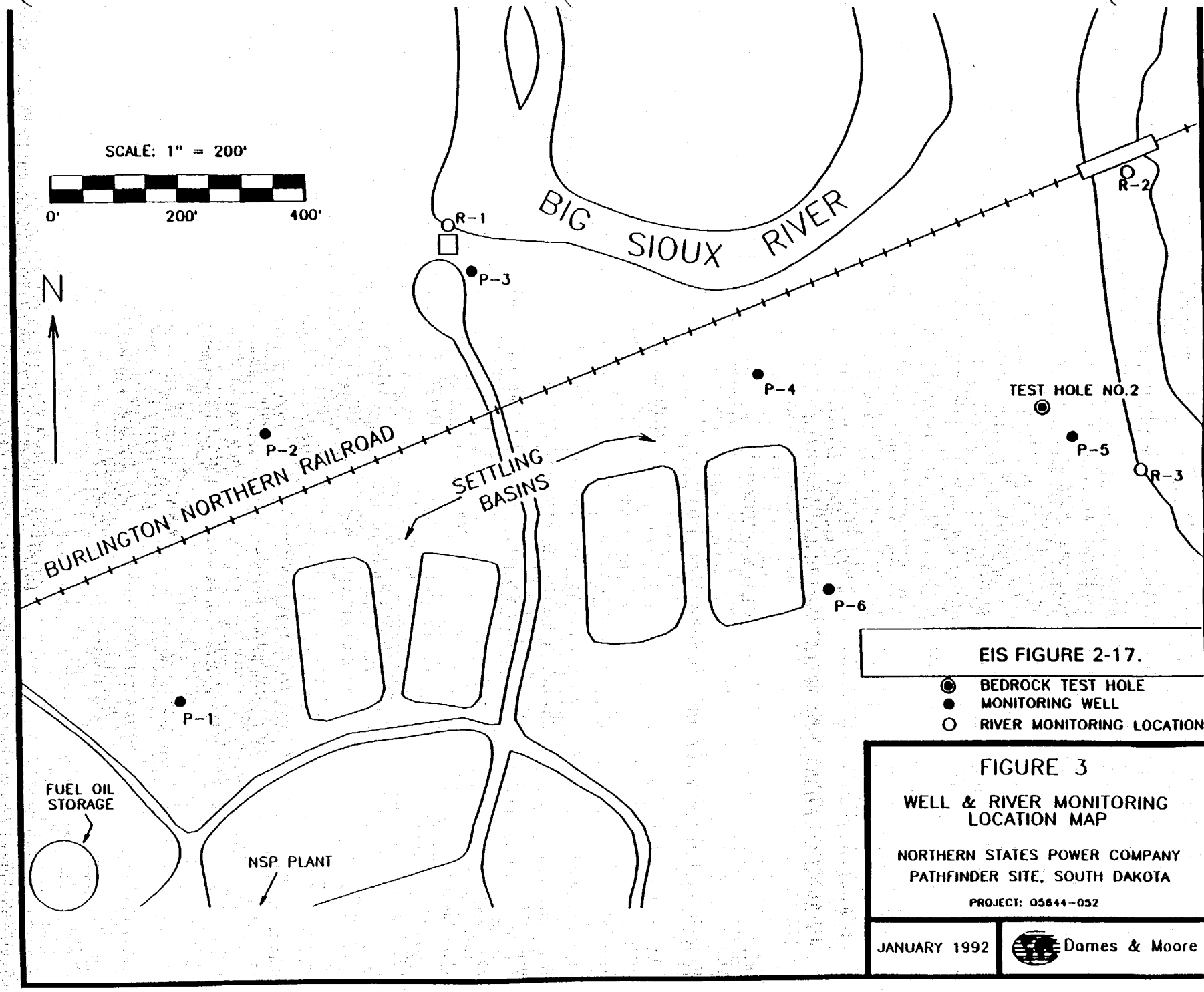
The discharge from the existing plant is primarily directed to the west basin. NSP personnel indicate that water discharged into the west basin seeps through the bottom of the basin before the water level reaches the overflow elevation. The western basin is partially filled with sediments from about 30 years of discharge.

The settling basins will receive wastewater from the proposed CTG facility. In the event the capacity of the settling basins is exceeded, overflow from the settling basins would

Table 2-24. Big Sioux River water quality data values 1974 to 1990 (all units in mg/l unless noted).

	Sioux Falls			Brandon			Percent Difference (mean)
	Maximum	Minimum	Mean	Maximum	Minimum	Mean	
Temperature C	34.4	0.0	12.7	33.9	0.6	11.6	4.5
Cond. @25 C umho	3350	280	1187	2700	290	1224	1.5
Dissolved Oxygen	19.0	4.0	10.5	15.6	1.8	9.5	5
BOD	13.0	4.0	8.0	11.0	3.4	8.2	1.2
pH field pH units	9.2	4.5	8.0	10.1	5.9	7.9	6.3
pH lab pH units	8.8	7.0	8.1	8.7	7.0	8.0	6.2
Alkalinity, total	560.0	0.4	218.5	352.0	0.0	209.6	2.1
HCO_3	318.0	223.0	271.7	346.0	129.0	266.3	1.0
Total Residue	2355.0	441.0	954.8	1773.0	383.0	955.4	0.03
Nonfilter Residue	420.0	1.0	65.7	710.0	1.0	63.4	1.8
$NH_3 + NH_4$-N Dissolved	18.2	0.6	5.4	25.9	0.2	7.9	18.8
$NH_3 + NH_4$-N Total	19.0	0.0	1.4	19.2	0.0	1.3	3.7
NO_2-N Dissolved	0.9	0.0	0.1	1.6	0.0	0.2	33
Kjeldl-N Total	7.6	7.4	7.5	21.0	0.8	8.7	7.4
NO_2 & NO_3-N Total	22.0	0.1	2.6	19.8	0.1	2.6	0
Hardness Total	630.0	180.0	426.0	490.0	190.0	398.8	3.2
Calcium Total	134.0	41.9	89.3	118.0	45.6	90.6	0.72
Magnesium Total	59.0	16.5	43.0	94.9	17.3	42.0	1.2
Sodium Total	326.0	7.1	81.1	403.0	5.6	127.5	22.2
Potassium Total	20.1	8.6	14.8	23.3	6.6	14.2	2.1
Chloride Total	814.0	7.9	237.2	590.0	7.5	232.5	1.0
Manganese μg/L	550.0	230.0	418.9	980.0	230.0	550.4	13.6
Fecal Coliform FCBR	220,000	3.0	3615.4	220,000	3.0	4253.6	8.1
Fecal Strep KFAGAR	290.0	5.0	77.8	7,000,000	4.0	164,000	2107.97
Phosphorus Total	4.0	0.1	0.7	3.8	0.1	1.1	22.2
PO_4 Ortho Total	10.4	0.0	1.7	11.8	0.0	2.5	19.0

Data from South Dakota Department of Environment and Natural Resources Storet Database


SCALE: 1" = 200'
0'
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N
BIG SIOUX RIVER
R-1
R-2
R-3
P-1
P-2
P-3
P-4
P-5
P-6
TEST HOLE NO.2
BURLINGTON NORTHERN RAILROAD
SETTLING BASINS
FUEL OIL STORAGE
NSP PLANT
EIS FIGURE 2-17.
BEDROCK TEST HOLE
MONITORING WELL
RIVER MONITORING LOCATION
FIGURE 3
WELL & RIVER MONITORING LOCATION MAP
NORTHERN STATES POWER COMPANY
PATHFINDER SITE, SOUTH DAKOTA
PROJECT: 05644-052
JANUARY 1992
Dames & Moore

be directed to the Big Sioux River through a diversion ditch which drains in an easterly direction along the north sides of the settling basins.

Since the settling basins penetrate the surficial alluvium on the property, additional discussion of pertinent site characteristics is presented in the section on Ground Water.

There are no other surface water bodies of significance in the affected areas.

2.4.10.6. Wetlands

Wetlands are common in the Prairie Pothole Region of north central North America. The area was formed when numerous depressions were left behind by the glaciers. This region is the single most important area for breeding waterfowl, especially dabbling ducks in North America (Bellrose 1979).

Wetlands are lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water. To be classified as a wetland, one or more of the following attributes must exist: (1) at least periodically, the land supports predominantly hydrophytes; (2) the substrate is predominantly undrained hydra soil; and (3) the substrate is nonsocial and is saturated with water or covered by shallow water at some time during the growing season of each year, (Cowardin *et al.* 1979).

Figure 2-14 indicates no wetlands on the site of the proposed CTG facility. As noted earlier, however, there is in fact a small wetland formed by seepage from the hillside which apparently will be leveled in construction of the CTG. The fact that this small wetland is not indicated on the National Wetlands Inventory Map is explainable by its rather small size and nondepressional nature which would make it difficult to detect using aerial photography.

It should be noted that the National Wetlands Inventory Map (Sioux Falls East) identified the existing wastewater settling basins at the Pathfinder Site as wetlands. There are several small potholes or closed depressions and intermittent streams identified on the National Wetlands Inventory Map in the vicinity of the Pathfinder Site. The majority of these wetlands are of the Palustrine System which includes all nontidal wetlands dominated by trees, shrubs, persistent emergents, emergent mosses or lichens. There are also numerous wetlands along both the preferred and alternate pipeline routes as shown in Figure 2-14.

The majority of the upland wetlands are perched above the groundwater. These wetlands exist because glacial till or lacustrine deposits at the surface limit percolation. Other wetlands are associated with outwash deposits along the Big Sioux River and its tributaries.

Prairie pothole wetlands are focal points in the hydrologic regime of the prairies. As noted by Hubbard (1988), wetlands store runoff water, thereby serving as potential floodwater storage reservoirs, and allow it to evapotranspire to the atmosphere or slowly seep into the groundwater. Leaving prairie pothole watersheds intact (i.e., not artificially draining them) will not prevent flooding in lower portions of the watersheds. However, artificially draining these watersheds may make flooding problems worse. Potholes can be either groundwater recharge sites, discharge sites, or groundwater flowthrough systems, and they can temporarily change from one type to another depending on fluctuations in the water table. The distribution of salts and degree of soil development indicate the long-term average direction of water movement between wetlands and groundwater. Recharge to the groundwater in the surficial glacial deposits of the area is important to the maintenance of high water tables. High water tables provide water for livestock via dugouts and may be vitally important to the long-term water balance of the prairies by providing significant recharge to the soil moisture. The artificial drainage of groundwater flow–through wetlands or discharge wetlands may lead to soil salination problems. Along with water, nutrients and sediments are detained, or trapped, in potholes. Valuations of the hydrological and nutrient/sediment entrapment functions of prairie potholes have not been done.

The emergent wetland plants found in temporary and seasonal wetlands can provide abundant forage for livestock (Hubbard 1988). Forage quality is variable depending on species and time of use. The value of wetland forage would be the same as comparable upland forage on a weight basis. However, yields are much higher in these wetlands than on native upland sites, or for domesticated or introduced cool-season grasses.

Wildlife support is the best known function of prairie wetlands, especially in terms of waterfowl. These wetlands are critical to the maintenance of waterfowl populations on the continent. They also provide habitat for furbearers, resident game species, and many species of non-game wildlife. Direct valuation of the wildlife supported by these wetlands has not been undertaken. However, the value of the hunting recreation supported by wetland wildlife, fur harvest, and live bait production is substantial (Hubbard 1988).

The expression of hydrologic and wildlife support functions is greatest when whole wetland complexes remain intact. It is the abundance of wetland basins distributed over the landscape that provides the most productive waterfowl breeding habitat, the most effective runoff water retention, and the best distribution of groundwater recharge.

2.4.11. Ground Water Resources

2.4.11.1. Glacial Aquifers

Glacial aquifers, in the form of unconsolidated sand and gravel deposited as outwash by meltwater from receding glaciers, underlie a significant part of the floodplain of the Big Sioux River and its tributaries. Outwash deposits can be at land surface or be buried by till or alluvium. Till has a very low hydraulic conductivity and therefore is a poor source of water. Locally, however, the till can contain thin, discontinuous sand and gravel lenses that can yield as much as five gal/min to wells. Depths to the top of the aquifers range from land surface up to several hundred feet. The average cumulative thickness of sand and gravel ranges from 10 to 35 ft (Lindgren and Niehus 1992).

The areal extent and thickness of glacial aquifers in the eastern half of Minnehaha County are shown in Figure 2-18. The Big Sioux aquifer is the predominant aquifer in the affected area. This aquifer follows the path of the Big Sioux River and has thicknesses of a few feet up to 40 feet in this area. The Brandon aquifer and the Beaver Creek aquifer are located east of the plant site and the pipeline corridor. Recharge to these glacial aquifers is from: (1) infiltration of precipitation in the flood plain of the stream channels, (2) seepage from the streams when the water level is higher than the potentiometric surface in the aquifer because of spring snowmelt or storm events, and (3) other glacial and bedrock aquifers. Discharge from the glacial aquifers is: (1) by evapotranspiration where the aquifer is at or near land surface, (2) by seepage to the Big Sioux River or other stream channel when the water stage is lower than the water table in the aquifer, which is generally the case except during spring snowmelt and storm events, and (3) by pumping from wells. Properly constructed wells completed in the Big Sioux aquifer may yield as much as 1,000 gal/min where the thickness exceeds 25 ft. (Lingren and Niehus 1992). The glacial aquifers generally have excellent connection with the surface water streams and are a significant source of water in the area.

Water–level fluctuations in observation wells completed in glacial aquifers are caused mainly by seasonal changes in recharge. Water levels in wells generally rise during the

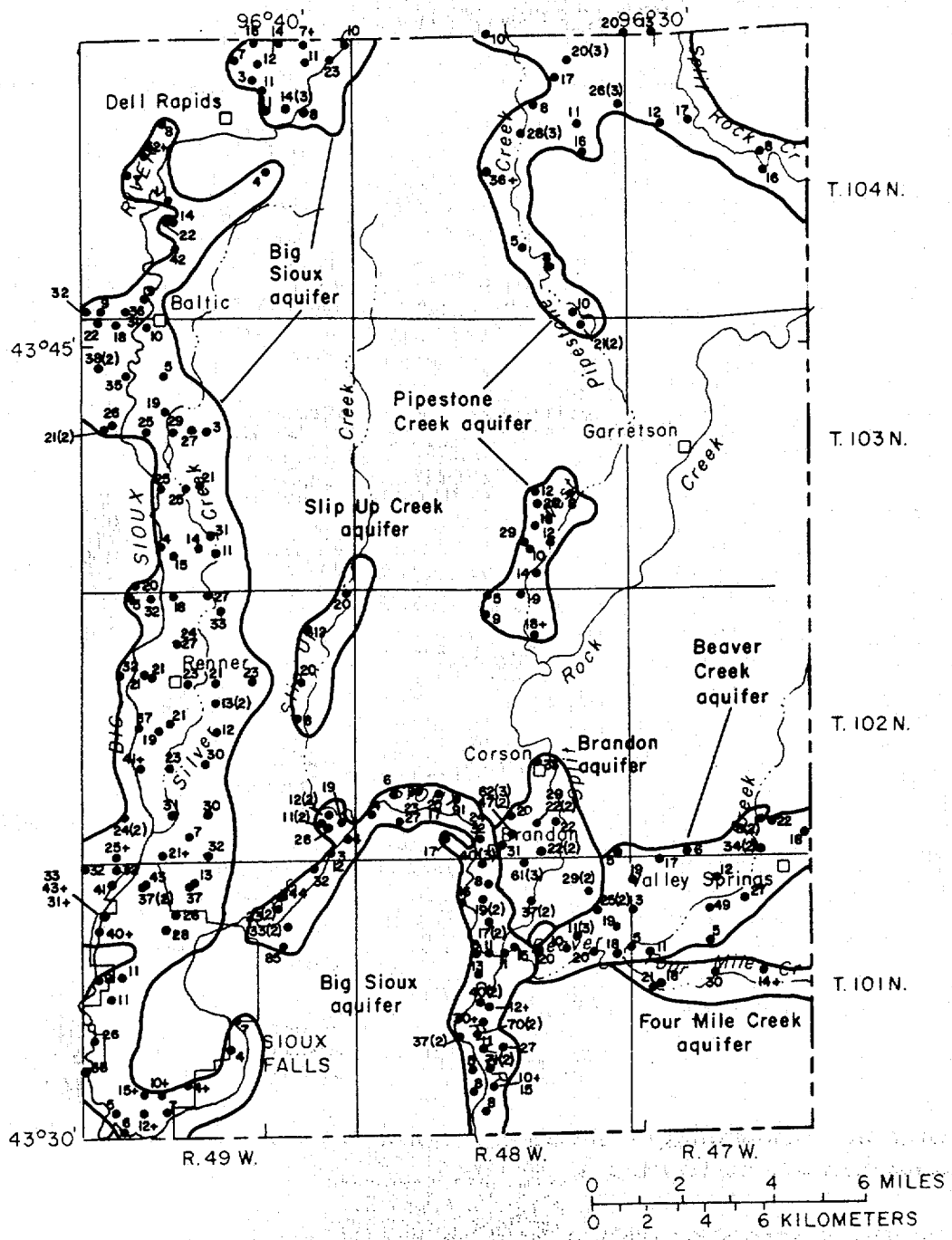


Figure 2–18. Areal extent and thickness of glacial aquifers in eastern Minnehaha County (from Lindgren and Niehus 1992).

spring and early summer months because of recharge from snowmelt and rainfall and decline during the late summer and fall months because of lower recharge from precipitation, increased evapotranspiration, and seepage losses to the Big Sioux River and other stream channels.

2.4.11.2. Bedrock Aquifers

There are two major bedrock aquifers present in the study area, the Split Rock Creek aquifer and Sioux Quartzite aquifer. The Split Rock Creek aquifer lies in valleys in the Sioux Quartzite surface and is composed of layers of predominately quartz sand interbedded with layers of siltstone, shale, and silty clays of the Split Rock Creek Formation.

The Split Rock Creek aquifer underlies about 140 square miles in Minnehaha County as shown in Figure 2-10. The geologic section of the aquifer is shown in Figure 2-9 in the description of geology. The cumulative thickness of the Split Rock Creek aquifer is between about 50 feet and slightly over 200 feet. The greater thicknesses occur in the eastern part of the aquifer, east of Brandon. Properly constructed wells may yield as much as 500 gal/min where the cumulative thickness exceeds 75 feet, but yields usually are much less because of the smaller thicknesses, interbedded layers of silt and clay, and cementation of the sand grains (Lindgren and Niehus 1992).

Recharge to the Split Rock Creek aquifer likely is from infiltration of precipitation that falls on Sioux Quartzite outcrops and subsequently moves along fractures in the quartzite and into the Split Rock Creek aquifer. The aquifer may also receive recharge from overlying glacial aquifers. The aquifer is under confined conditions over most of its extent. The direction of water movement in the Split Rock Creek aquifer generally is towards the southeast where water moves upward into the Big Sioux and Brandon aquifers.

The city of Sioux Falls is exploring the development of several municipal water supply wells in the Split Rock Creek aquifer. The city of Brandon has a municipal well completed in the aquifer, since 1984, but has only used it significantly since 1991.

The U. S. Geological Survey and the South Dakota Geological Survey presently are conducting a detailed study of the hydrologic characteristics of the Split Rock Creek aquifer.

The Sioux Quartzite aquifer underlies all of the study area. The Sioux Quartzite is a locally well-fractured and jointed crystalline rock that will yield water to wells in amount

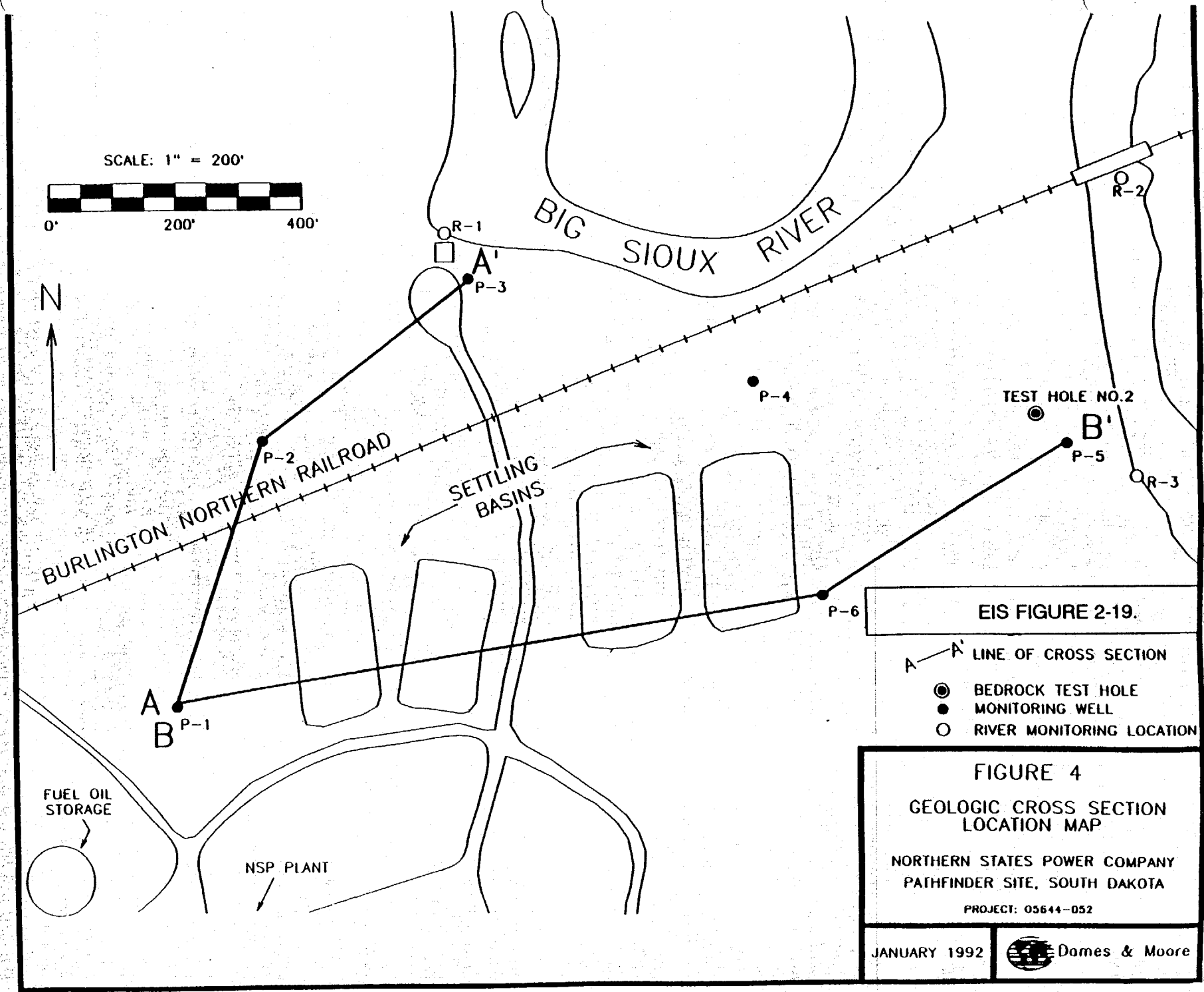
sufficient for domestic and municipal supplies. The depth and development of the fracture systems in the Quartzite is unknown, but water–supply wells commonly penetrate the quartzite to a depth of 200 feet or less. Depth to the top of the Sioux Quartzite ranges from at land surface to over 500 feet below the land surface, often with large changes in depth occurring in a short distance. The Sioux Quartzite is overlain by: (1) till, (2) Pierre Shale, (3) glacial sands and gravels, and (4) the Split Rock Creek aquifer. Reported yields from properly constructed wells completed in this aquifer are as high as 150 gal/min, but generally are much less than 50 gal/min. The yield to the wells depends on the extent of the local fracturing and interconnection of fractures in the quartzite.

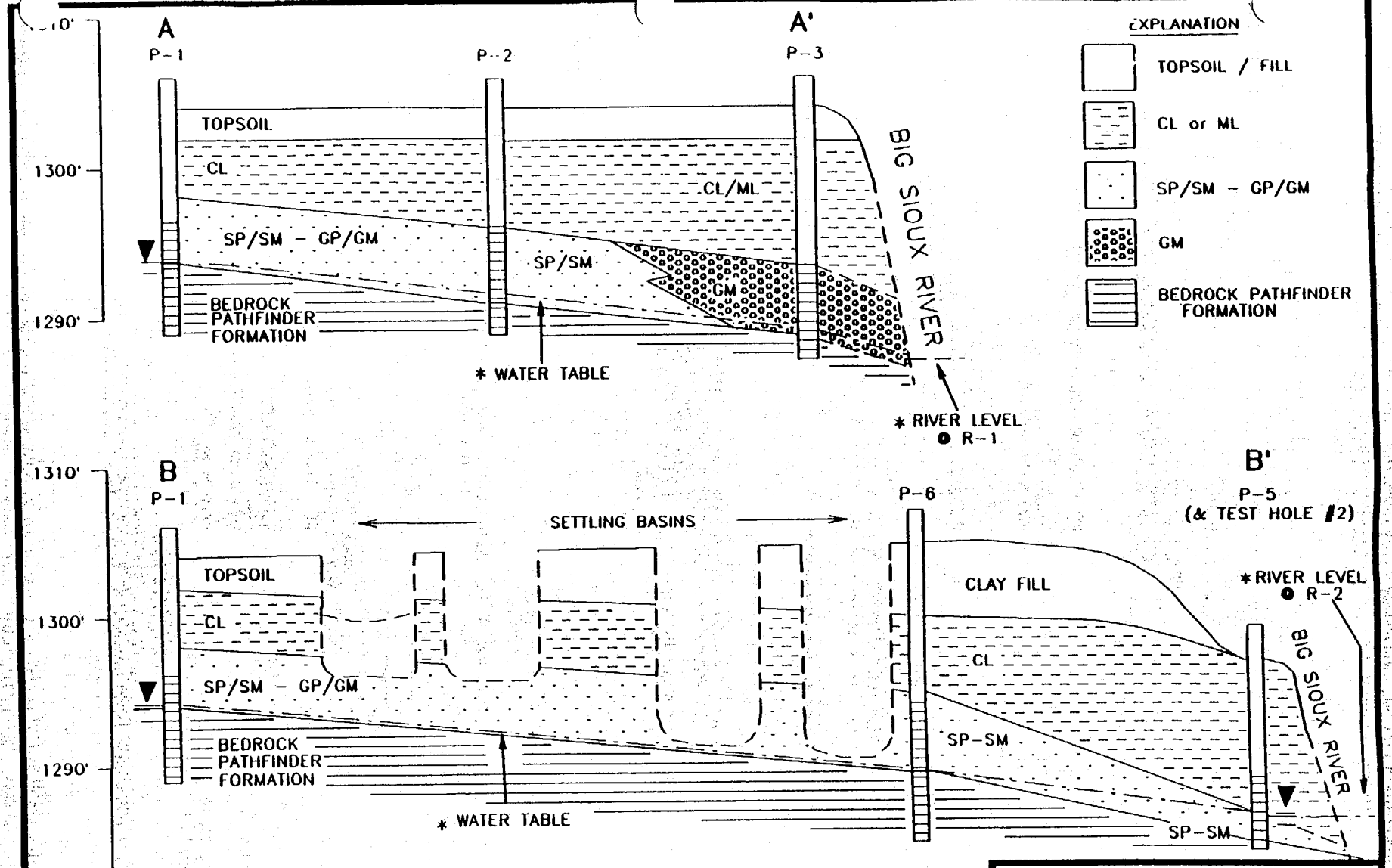
The Sioux Quartzite is under water–table conditions near the outcrop areas and generally is under confined conditions elsewhere. Water from the Sioux Quartzite aquifer is used for stock watering, domestic and municipal purposes.

2.4.11.3. Hydrogeology of the Pathfinder Site

The general geology at the Pathfinder site is shown in Figure 2-8, where it can be seen that the sands and gravels of the Big Sioux aquifer and the Split Rock Creek Formation are present at the site and are underlain by Sioux Quartzite. The Big Sioux aquifer thickness in the vicinity of the Pathfinder site generally are from zero to twenty feet (see Figure 2–19). The upper terrace sands were likely deposited by glacial meltwater during Wisconsin time. These deposits range in thickness from zero to twenty feet at the site. The Split Rock Creek Formation underlies the Big Sioux aquifer sands and gravels and the terrace sands. At the site, this formation consists of approximately 180 feet of interbedded shale, siltstone, and sandstone.

A hydrogeological investigation of the Pathfinder site was conducted in 1992 to define the alluvial stratigraphy, establish the alluvial water flow direction and water quality for the Groundwater Discharge Plan Application for the Proposed Combustion Turbine Generator Facility, (NSP GWDP 1992) submitted to SDDENR on March 31, 1992. The hydrologic investigation placed a series of monitoring wells and test holes at strategic locations surrounding the Pathfinder site settling basins. The test hole locations are shown in Figure 2-20, along with the series of wells used to establish geologic cross sections. Approximately two feet of clayey soil was encountered at the surface. The soil layer is underlain by four to ten feet of silty medium to coarse grained sandy brown clay. The clay unit is underlain by a two– to five–feet–thick sand layer which is part of the Big Sioux Aquifer. The sand unit grades into a silty gravel layer near monitoring well P-3 near the Big Sioux River. The


SCALE: 1" = 200'
0'
200'
400'
N
BIG SIOUX RIVER
R-1
R-2
R-3
A'
P-3
P-2
P-4
TEST HOLE NO.2
B'
P-5
BURLINGTON NORTHERN RAILROAD
SETTLING BASINS
P-6
A
B
P-1
FUEL OIL STORAGE
NSP PLANT
EIS FIGURE 2-19.
A—A' LINE OF CROSS SECTION
BEDROCK TEST HOLE
MONITORING WELL
RIVER MONITORING LOCATION
FIGURE 4
GEOLOGIC CROSS SECTION LOCATION MAP
NORTHERN STATES POWER COMPANY
PATHFINDER SITE, SOUTH DAKOTA
PROJECT: 05644-052
JANUARY 1992
Dames & Moore



VERTICAL SCALE: 1" = 10'
HORIZONTAL SCALE: 1" = 200'
VERTICAL EXAGGERATION: 1 : 20

• ALL GROUND & SURFACE WATER ELEVATIONS RECORDED ON 12/18/91

FIGURE 5

GEOLOGIC CROSS SECTIONS
A--A' & B--B'

NORTHERN STATES POWER COMPANY
PATHFINDER SITE, SOUTH DAKOTA

PROJECT: 05644-052

EIS FIGURE 2-20.

JANUARY 1992

Dames & Moore

geologic cross sections based on test hole logs are shown in Figure 2-20. The saturated thickness of the sand and gravels at the site is relatively small and the gradient of flow is towards the river and averages 0.005 ft/ft. (NSP GWDP 1992). Grain–size analysis results were used to estimate hydraulic conductivities of these aquifer materials with the estimated hydraulic conductivities ranging from about 125 ft/day to 740 ft/day (NSP GWDP 1992).

The sand and gravel units are underlain by a black shale which acts as a competent aquiclude beneath the sandy alluvium of the Big Sioux Aquifer and should prevent leakage of groundwater from the Big Sioux Aquifer sands and gravels to underlying materials.

Groundwater flow direction was established using water level measurements obtained from the six monitoring wells (P-1 through P-6). Water level data were used to plot the groundwater contours shown in Figure 2-21. Since the groundwater generally flows perpendicular to the water table contours, the apparent existing groundwater flow direction is northeast, toward the Big Sioux River. Outer flow lines from the westerly settling basin were projected by NSP's engineer. The groundwater flow appears to follow the slope of the bedrock surface which descends toward the river.

At the Pathfinder site two production wells are located in the water–bearing portions of the Split Rock Creek Formation. The location of these wells, identified as Pathfinder Well A and Pathfinder Well B, are shown in Figure 2–22. Also shown in this figure are thicknesses of the aquifer materials at various locations at and near the site. It can be seen that the thickness of the aquifer material is highly variable over a short distance. A pumping test was conducted at the Pathfinder site in 1958 at Well A at a flow rate of 626 gpm (Rothrock 1958). A large drawdown of 90 feet occurred at the pumping well with lower drawdowns of 60 feet and 32 feet occurring in wells 60 feet and 1650 feet away from the pumping well, respectively. Recovery of the wells following pumping was slow. NSP applied for a permit for water appropriate for Wells A and B in September 1991. The applications consisted of amending previous permits No. 561–3 and No. 742–3 for Wells A and B, respectively. NSP applied for 550 gpm for Well A and 150 gpm for Well B. These permits were approved on March 4, 1992.

Additional pump tests have been conducted in the Split Rock Creek aquifer recently. A summary of six pump tests conducted at various locations is shown in Table 2–25 (Pence 1992). The values of transmissivity range from a low of about 4,500 gallons per day per foot near Renner to a high of about 42,000 gallons per day per foot near Brandon. At the NSP

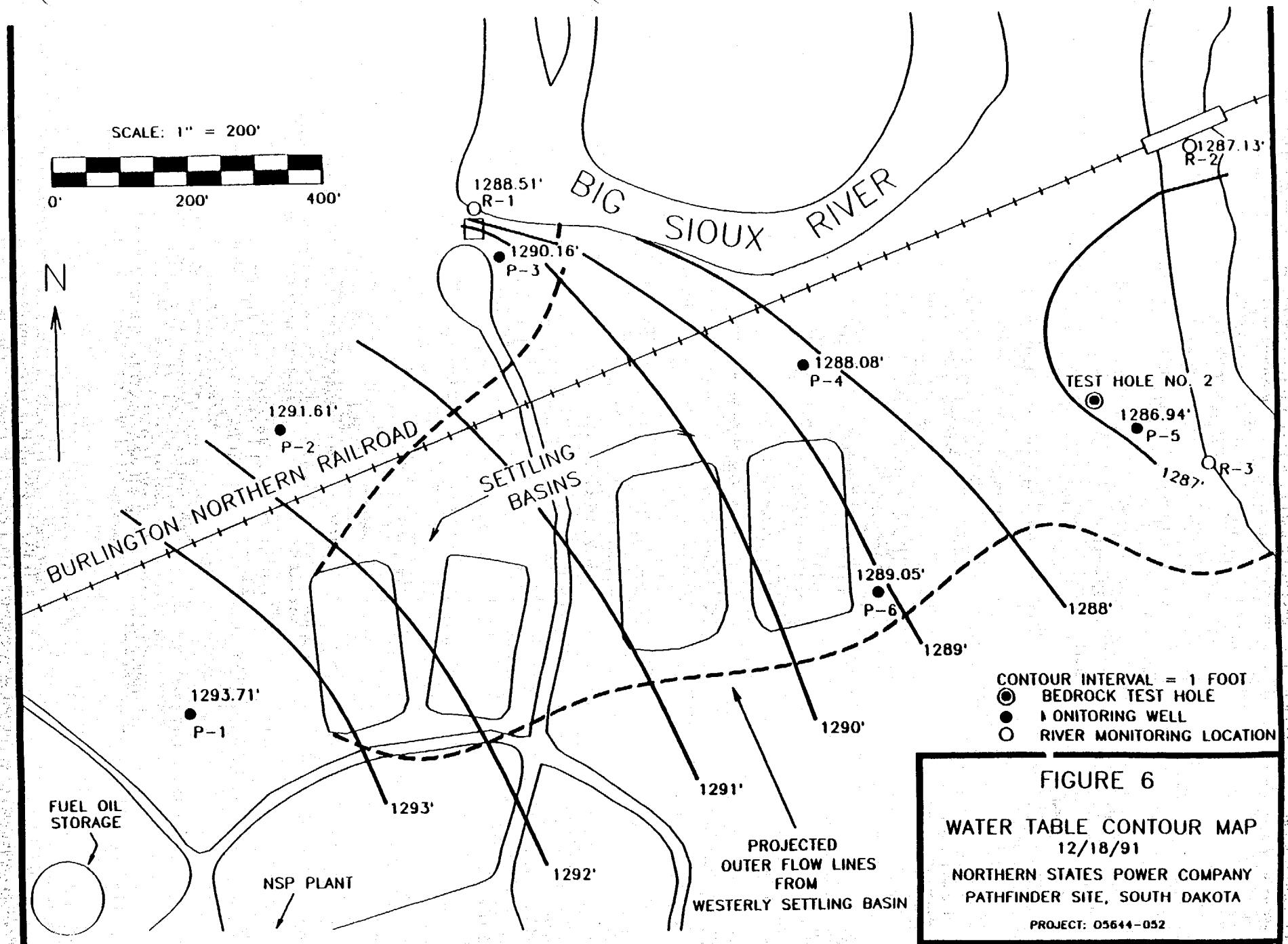


FIGURE 6

WATER TABLE CONTOUR MAP
12/18/91
NORTHERN STATES POWER COMPANY
PATHFINDER SITE, SOUTH DAKOTA

PROJECT: 05644-052

JANUARY 1992

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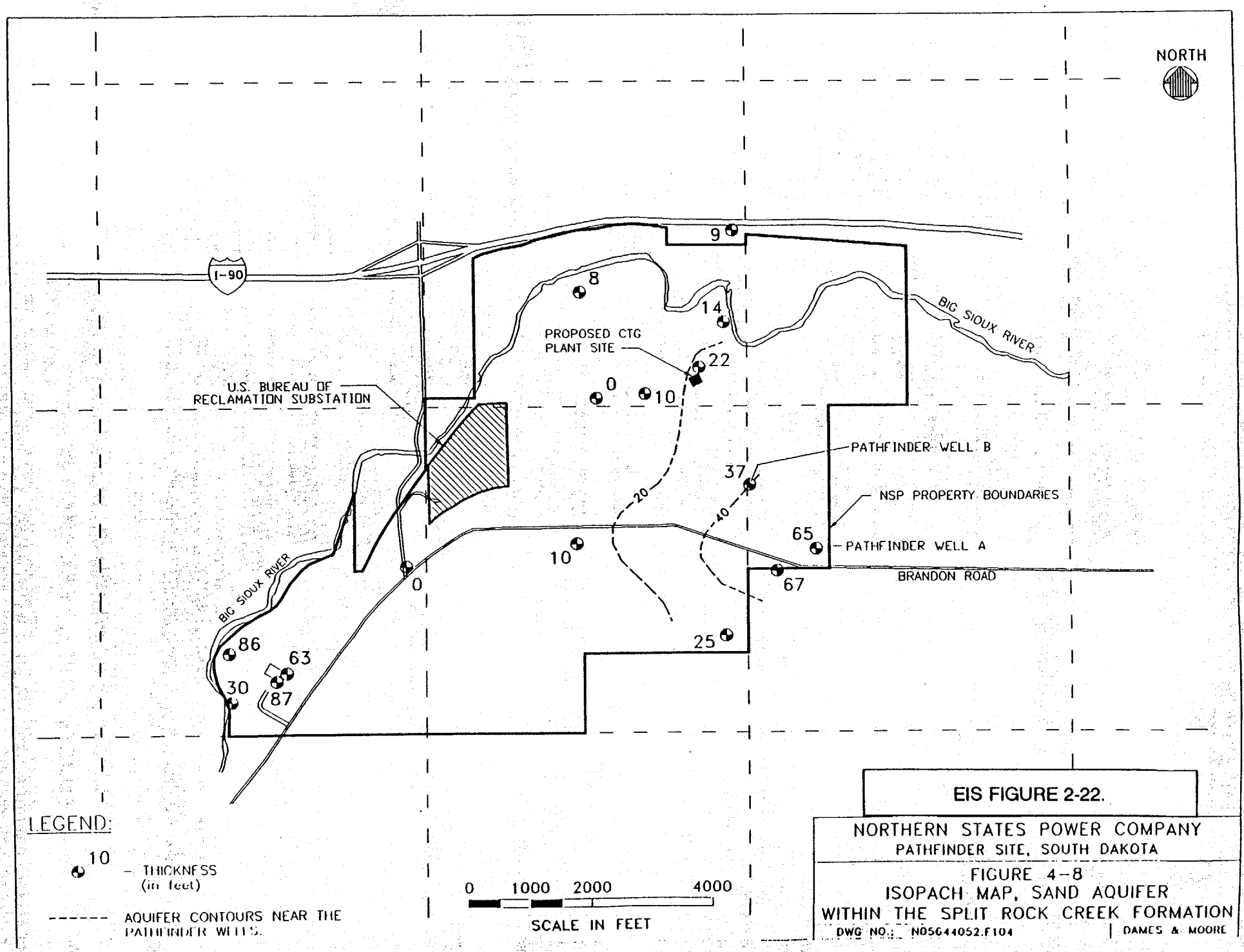
EIS FIGURE 2-21.



EIS FIGURE 2-22.

NORTHERN STATES POWER COMPANY
PATHFINDER SITE, SOUTH DAKOTA

FIGURE 4-8
ISOPACH MAP, SAND AQUIFER
WITHIN THE SPLIT ROCK CREEK FORMATION

DWG NO.: N05644052.F104 | DAMES & MOORE

Table 2-25.

SUMMARY OF SPLIT ROCK CREEK AQUIFER TESTS						
TEST SITE	DATE	WELL	DISTANCE FROM P.W.	TRANSMISSIVITY (GPD/FT)	STORATIVITY	SPECIFIC GRAVITY
NSP #1	4/27/88	NSP-2	756 ft.	24,039	1.3E-04	----
		NSP-3*	0 ft.	24,771	----	9.7 gpm/ft
		NSP-4	750 ft.	21,521	5.2E-04	----
		SRC-32	930 ft.	23,500	3.3E-04	----
NSP #2	5/10/88	NSP-2	810 ft.	20,316	4.2E-04	----
		NSP-3	750 ft.	19,121	3.6E-04	----
		NSP-4*	0 ft.	----	----	8.4 gpm/ft
		SRC-32	1,482 ft.	23,748	2.4E-04	
NSP # 3	6/21/90	NSP-3*	0 ft.	22,713	----	8.9 gpm/ft
		SRC-32	930 ft.	25,977	3.2E-04	----
BRANDON	6/26/89	CW#3*	0 ft.	11,771	----	10.2 gpm/ft
		SRC-23	2309 ft.	42,918	2.5E-04	----
		SRC-36	101 ft.	11,703	6.7E-04	----
		SRC-37	589 ft.	12,339	1.1E-04	----
RENNER	2/13/89	PW*	0 ft.	----	----	0.5 gpm/ft
		Banner S	546 ft.	7,390	1.1E-04	----
		Banner N	191 ft.	4,581	9.4E-05	----
WATREC	11/13/89	PW*	0 ft.	17,766	----	6.2 gpm/ft
		A	107 ft.	15,756	1.6E-04	----
		B	915 ft.	21,735	1.8E-04	----
		C	1,751 ft.	22,323	2.2E-04	----
		D	585 ft.	21,701	1.6E-04	----
		E	19 ft.	19,854	2.3E-04	----
		SRC-28	2,200 ft.	22,025	2.9E-04	----
		SRC-32	4,000 ft	19,388	2.1E-04	----

* Production Well

Lawrence site the transmissivity values average about 21,000 gallons per day per foot. At present three production wells are pumping from the Split Rock Creek aquifer: city of Brandon, NSP–Lawrence site, and Sioux Falls Water Reclamation (WATREC) facility. Brandon has had a well in the Split Rock Creek aquifer since about 1984, but only very small amounts of pumping occurred until about 1990. During 1991 Brandon relied heavily on the Split Rock Creek aquifer, pumping an average of 230 gpm from the aquifer during the year. The NSP–Lawrence site well has been pumped at a level of about 250 gpm since September 20, 1990. The WATREC facility well also began pumping on September 20, 1990 and an average of 300 gpm has been pumped from this well.

2.4.11.4. Water Quality

Aquifers near the proposed CTG site exhibit the widely variable quality typical of glacial and bedrock aquifers in eastern South Dakota. Data from the Big Sioux, Split Rock Creek and Brandon Aquifers are summarized in Tables 2–26, 2–27, and 2–28. These data were compiled from wells located in each aquifer in Minnehaha County and are included here to supply a signature of general water quality present in these aquifers.

The Split Rock Creek aquifer exhibits the most highly mineralized water with a mean TDS of 890 mg/l, whereas the Big Sioux and Brandon aquifers exhibited TDS of less than 500. All of the aquifers produce very hard water. The predominant cation in all three aquifers is calcium, whereas the predominant anions in the Brandon, Big Sioux, and Split Rock Creek aquifers are bicarbonate, bicarbonate and sulfate, and sulfate, respectively. Carbonate–dominant water is typical of relatively recent aged water in shallow aquifers. The transition to sulfate dominant water is typical of aged water, which occurs in deeper aquifers, exhibiting long travel times to the sampling location.

While the data presented above represent a regional sample of groundwater quality, data are also available which depict the surficial groundwater quality potentially affected by the proposed CTG construction. Samples from a network of monitoring wells on the existing Pathfinder site near the settling basins were analyzed and reported by NSP as part of the Groundwater Discharge Plan Application for the Proposed Combustion Turbine Generator Facility, submitted to SDDENR on March 31, 1992. Water samples were collected on December 18, 1991 from the six monitoring wells installed during the hydrogeological investigation. Results are tabulated in Table 2–29 along with applicable South Dakota groundwater quality standards.

Table 2-26. Summary of chemical analyses of water from the Big Sioux Aquifer[1] (after Lindgren and Niehus, 1992)

Constituent	# of Samples	Maximum	Minimum	Mean
Conductivity, lab (μS/cm)	22	1630	430	725
pH, lab (pH units)	22	8.2	7.4	8.0
Hardness, as $CaCO_3$	22	840	180	350
Alkalinity, lab, as $CaCO_3$	21	350	110	195
Dissolved solids	22	1540	260	490
Dissolved calcium	22	210	36	80
Dissolved magnesium	22	90	8	35
Dissolved sodium	22	76	10	22
Dissolved potassium	21	25	2	5
Dissolved sulfate	22	690	28	175
Dissolved chloride	22	52	2	16
Dissolved nitrate	16	6.5	0.01	1.3
Dissolved boron (μg/L)	19	220	10	110
Dissolved iron (μg/L)	4	4900	590	1900

[1]Summary includes analyses by both the U.S. Geological Survey Laboratory and the South Dakota Geological Survey Laboratory. Units reported in milligrams per liter (mg/L) except as indicated; μg/L, micrograms per liter; μS/cm, microsiemens per centimeter at 25°C.

Table 2-27. Summary of chemical analyses of water from the Split Rock Creek Aquifer[1] (after Lindgren and Niehus, 1992)

Constituent	# of Samples	Maximum	Minimum	Mean
Conductivity, lab (μS/cm)	19	2700	440	1170
pH, lab (pH units)	20	8.2	7.2	7.7
Hardness, as $CaCO_3$	20	1700	180	620
Alkalinity, lab, as $CaCO_3$	20	390	92	240
Dissolved solids	20	2300	230	890
Dissolved calcium	20	490	28	150
Dissolved magnesium	20	120	16	58
Dissolved sodium	20	80	9.6	39
Dissolved potassium	20	15	1	6
Dissolved sulfate	20	1500	26	440
Dissolved chloride	20	18	0.9	6.9
Dissolved nitrate	8	3.5	0.01	1.8
Dissolved boron (μg/L)	13	570	50	310
Dissolved iron (μg/L)	15	8000	5	2300

[1]Summary includes analyses by both the U.S. Geological Survey Laboratory and the South Dakota Geological Survey Laboratory. Units reported in milligrams per liter (mg/L) except as indicated; μg/L, micrograms per liter; μS/cm, microsiemens per centimeter at 25°C.

Table 2-28. Summary of chemical analyses of water from the Brandon Aquifer[1] (after Lindgren and Niehus, 1992).

Constituent	# of Samples	Maximum	Minimum	Mean
Conductivity, lab (μS/cm)	3	798	758	772
pH, lab (pH units)	3	8.0	7.4	7.6
Hardness, as $CaCO_3$	3	380	370	380
Alkalinity, lab, as $CaCO_3$	3	360	310	320
Dissolved solids	3	480	410	443
Dissolved calcium	3	100	92	96
Dissolved magnesium	3	34	32	33
Dissolved sodium	3	15	14	15
Dissolved potassium	3	3	1	2
Dissolved sulfate	3	110	30	72
Dissolved chloride	3	7.2	3.9	5.3
Dissolved nitrate	0	--	--	--
Dissolved boron (μg/L)	0	--	--	--
Dissolved iron (μg/L)	3	20	4	9

[1]Summary includes analyses by both the U.S. Geological Survey Laboratory and the South Dakota Geological Survey Laboratory. Units reported in milligrams per liter (mg/L) except as indicated; μg/L, micrograms per liter; μS/cm, microsiemens per centimeter at 25°C.

Table 2-29. Ground water quality from monitoring wells near settling basins, Pathfinder site, 12/18/91.

Constituent/ Characteristic	P-1	P-2	P-3	P-4	P-5	P-6	Mean	South Dakota Ground Water Quality Standard
Sodium	72	150	120	310	130	97	146.5	NS
Potassium	10	15	12	15	12	14	13.0	NS
Calcium	97	140	280	180	240	160	182.8	NS
Magnesium	30	33	89	51	63	47	52.2	NS
Chloride	46	180	240	230	170	120	164.3	250
Fluoride	0.7	0.7	0.5	0.6	0.5	0.7	0.62	2.4
Nitrate	2.6	0.6	5.2	2.6	<0.1	1.2	2.0	10
Sulfate	160	460	830	820	660	390	553.3	500
TDS	560	1000	1600	1600	1300	930	1165	1000
Specific Cond.	990	1600	2300	2400	2000	1500	1798	NS
pH	7.5	7.6	7.2	7.3	7.2	7.5	7.4	6.5 - 8.5
Alkalinity	270	230	280	290	290	320	280	NS

All ionic concentrations in parts per million (ppm), pH - Standard Units, Specific Conductance - umho/cm
NS = No standard exists for this constituent

Mean concentrations from the six wells indicate that the predominant cations in the water samples from the six wells are sodium and calcium, whereas major anions include chloride, sulfate and alkalinity (most likely bicarbonate). Three wells (P–3, P–4, and P–5) exhibit sulfate concentrations greater than the 500 mg/l South Dakota groundwater quality standard and four wells (P–2, P–3, P–4, and P–5) exceed the 1000 mg/l groundwater quality standard.

Concentrations of 9 of the 12 parameters measured in the study varied widely between wells. Only potassium, fluoride and pH were relatively constant between wells.

Trends in the areal effect on quality were presented in the Groundwater Discharge Plan Application using parameter concentration maps. Figure 2–23 illustrates the total dissolved solids concentrations for each well. Concentrations were higher in the wells closer to the Big Sioux River (P-3, P-4, and P-5). TDS concentrations in these wells were approximately three times the concentration of the upgradient well (P-1). While there are too few samples from the wells to infer the cause of water quality variability, the variability in concentration data over such a short distance is typical of areas with ground/surface water interactions.

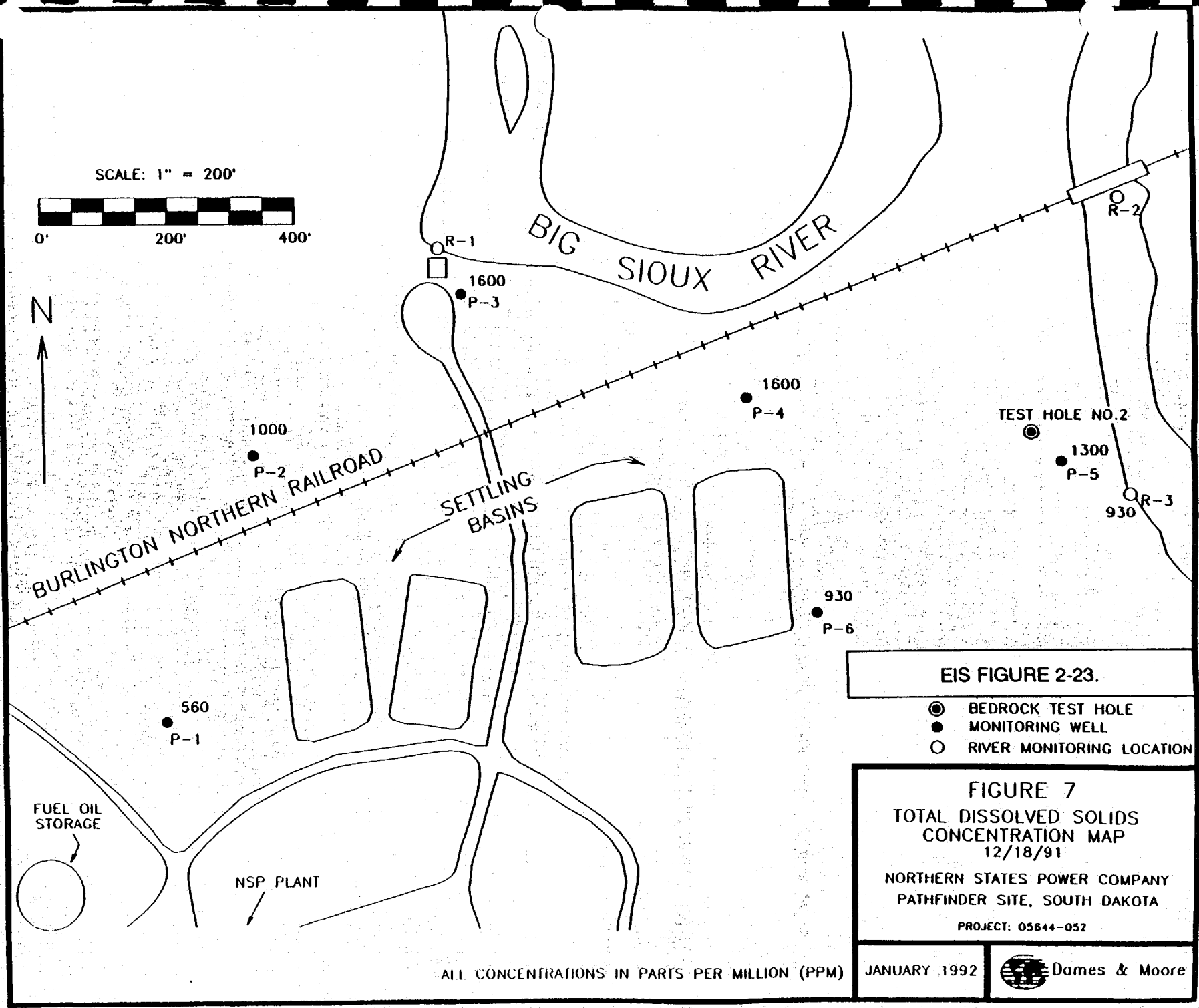
2.4.12. Airshed Conditions

Airshed conditions may be subdivided into climatic effects and air and sound quality. Climatic effects on airshed conditions have been previously described in Section 2.4.1.

2.4.12.1. Air Quality

Air quality in the vicinity of the proposed CTG site may be subjectively characterized as clean. However, ambient air quality measurements are typically compared to air quality standards to provide an objective air quality description.

Table 2–30 contains a summary of the primary and secondary National Ambient Air Quality Standards (NAAQS) developed by the USEPA as a result of the Clean Air Act Amendments of 1970. The primary NAAQS were promulgated to protect public health, whereas the secondary NAAQS were promulgated to protect public welfare, including vegetation, soil and animals. If measured contaminant concentrations of each constituent are less than the NAAQS concentrations found in Table 2–30, the area of interest is said to be an attainment area. When NAAQS are exceeded, the area is said to be a non-attainment area.


SCALE: 1" = 200'
0'
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400'
N
BIG SIOUX RIVER
R-1
1600
P-3
R-2
1600
P-4
TEST HOLE NO.2
1300
P-5
R-3
930
1000
P-2
BURLINGTON NORTHERN RAILROAD
SETTLING BASINS
930
P-6
560
P-1
FUEL OIL STORAGE
NSP PLANT
EIS FIGURE 2-23.
BEDROCK TEST HOLE
MONITORING WELL
RIVER MONITORING LOCATION
FIGURE 7
TOTAL DISSOLVED SOLIDS CONCENTRATION MAP
12/18/91
NORTHERN STATES POWER COMPANY
PATHFINDER SITE, SOUTH DAKOTA
PROJECT: 05644-052
ALL CONCENTRATIONS IN PARTS PER MILLION (PPM)
JANUARY 1992
Dames & Moore

Table 2-30. Comparison of Sioux Falls ambient air quality data with National Ambient Air Quality Standards (NAAQS)

Pollutant	Averaging Period	NAAQS ($\mu g/m^3$)		Top of KELO Building[d]		Gilbert Science Center, Augustana[d]		City Hall[d]	
		Primary	Secondary	2nd Half 1991	1st Half 1992	1990	1991	1985	1986
Particulate Matter Less than 10 μm (PM_{10})	Annual	50	b	28	28	19	20	--	--
	24-Hour	150[a]	b	58	64	52	87	--	--
Sulfur Dioxide	Annual	80	--	--	--	--	--	<5	<5
	24-Hour	365[a]	--	--	--	--	--	--	--
	3-Hour	--	1,300[a]	--	--	--	--	--	--
Nitrogen Dioxide	Annual	100	b	--	--	--	--	25.2	22.1
Ozone	1-Hour	235[c]	b	--	--	--	--	--	--
Carbon Monoxide	8-Hour	10,000[a]	b	--	--	--	--	--	--
	1-Hour	40,000[a]	b	--	--	--	--	--	--
Lead	Calendar Quarter	1.5[a]	b	--	--	--	--	--	--

[a]Concentration not to be exceed more than once per year
[b]Same as Primary NAAQS
[c]Expected number of days in which one or more hourly ozone concentrations exceed this value muse be greater than 1.
[d]Data obtained from the EPA Eerometric Information Retrieval System (AIRS) and South Dakota Department of Environment and Natural Resources.

A tabulation of measured concentrations for several of the contaminants are also listed in Table 2–30. These concentrations are summarized from data collected by SDDENR during their routine monitoring program. All characteristic concentrations are less than the NAAQS, allowing the Sioux Falls region to be classified as an attainment area.

The sampling locations noted in Table 2–30 are within the Sioux Falls city limits, five to six miles from the proposed CTG site. As such, the data do not precisely reflect air quality at the CTG site. In fact, the data likely reflect the domestic and industrial activities of the city, including effects of automobile exhaust fumes, industrial stacks, and local quarrying operations.

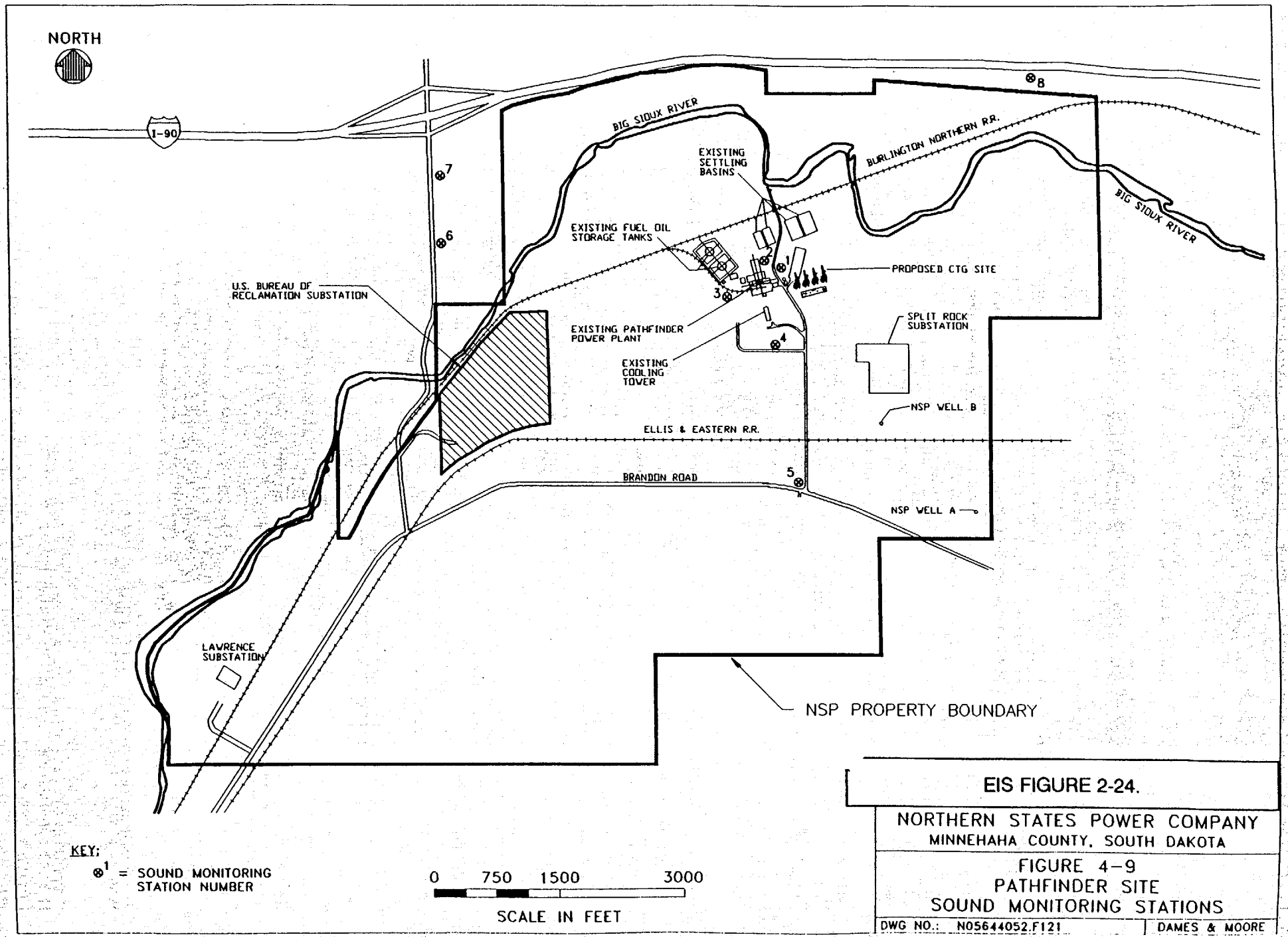
2.4.12.2. Sound Levels

The land surrounding the Pathfinder site is generally rural agricultural land. The Big Sioux River and Interstate 90 (I-90) border the north side of the site. A farmstead is located approximately 5,400 feet northeast of the proposed CTG facility. A campground is located approximately 5,200 feet northwest of the proposed CTG facility on the north side of I-90. Two residences are located approximately 4,240 feet west and 4,280 feet northwest of the proposed CTG facility. There is also a large substation operated by the U.S. Bureau of Reclamation approximately 3,000 feet west of the proposed CTG facility. There are no residences directly south or east of the proposed CTG facility.

On July 18, 1991, a field survey was conducted by NSP representatives to establish existing sound levels in the immediate vicinity of the Pathfinder site. Sound level measurements were recorded at eight stations selected on the basis of the sensitivity, proximity and typicality of the sound receptors in the area. Sound monitoring stations locations are shown in Figure 2-24, and described in Table 2–31. Procedures, data, and conclusions of the study were reported in the EIR submitted by NSP and are reproduced below with little modification.

To account for the intermittent operation of the existing power plant, sound level monitoring was performed between the hours of midnight and 0330 (while the plant was not running) and from noon to 1430 the same day (while the plant was running at full load).

Weather conditions during the midnight to 0330 survey were: clear skies; temperature 88°F; wind southeast at 8 to 10 miles per hour; relative humidity 59 percent; no precipitation. During the noon to 1430 survey, weather conditions were: clear but hazy skies; temperature



EIS FIGURE 2-24.

NORTHERN STATES POWER COMPANY
MINNEHAHA COUNTY, SOUTH DAKOTA

FIGURE 4-9
PATHFINDER SITE
SOUND MONITORING STATIONS

DWG NO.: N05644052.F121 | DAMES & MOORE

Table 2-31. Sound level monitoring stations - Pathfinder Site

Station	Description
1	Pathfinder site, approximately 250 feet northwest of the proposed CTG facility
2	Pathfinder site, approximately 500 feet northwest of proposed CTG facility
3	Pathfinder site, approximately 800 feet west of proposed CTG facility
4	Pathfinder site, approximately 800 feet southwest of proposed CTG facility
5	Pathfinder site, at entrance from Brandon road, approximately 2,400 feet south of proposed CTG facility
6	Residence, approximately 4,240 feet west of proposed CTG facility
7	Residence, approximately 4,280 feet northwest of proposed CTG facility
8	Gravel road parallel to I-90, approximately 3,500 feet northeast of proposed CTG facility

95 to 100°F; wind southwest at 8 miles per hour gusting to 15 miles per hour near the end of the survey; relative humidity 57 percent; and no precipitation.

The results of the sound level monitoring survey are presented in Table 2–32. Sound pressure levels are expressed in decibels using an A-weighted frequency scale (dBA). The A-weighted frequency scale uses the specific weighting of a sound pressure level for the purpose of determining the human response to sound.

The data obtained in the field survey were used to calculate day/night noise levels (L_{dn}), which represent a single number measure of community noise exposure over a 24-hour period. The L_{dn} is used to assess the quality of the habitable, 24-hour noise environment. Calculated L_{dn} levels for the existing sound level environment are based on an assumed worst-case scenario of the existing plant running 24 hours per day.

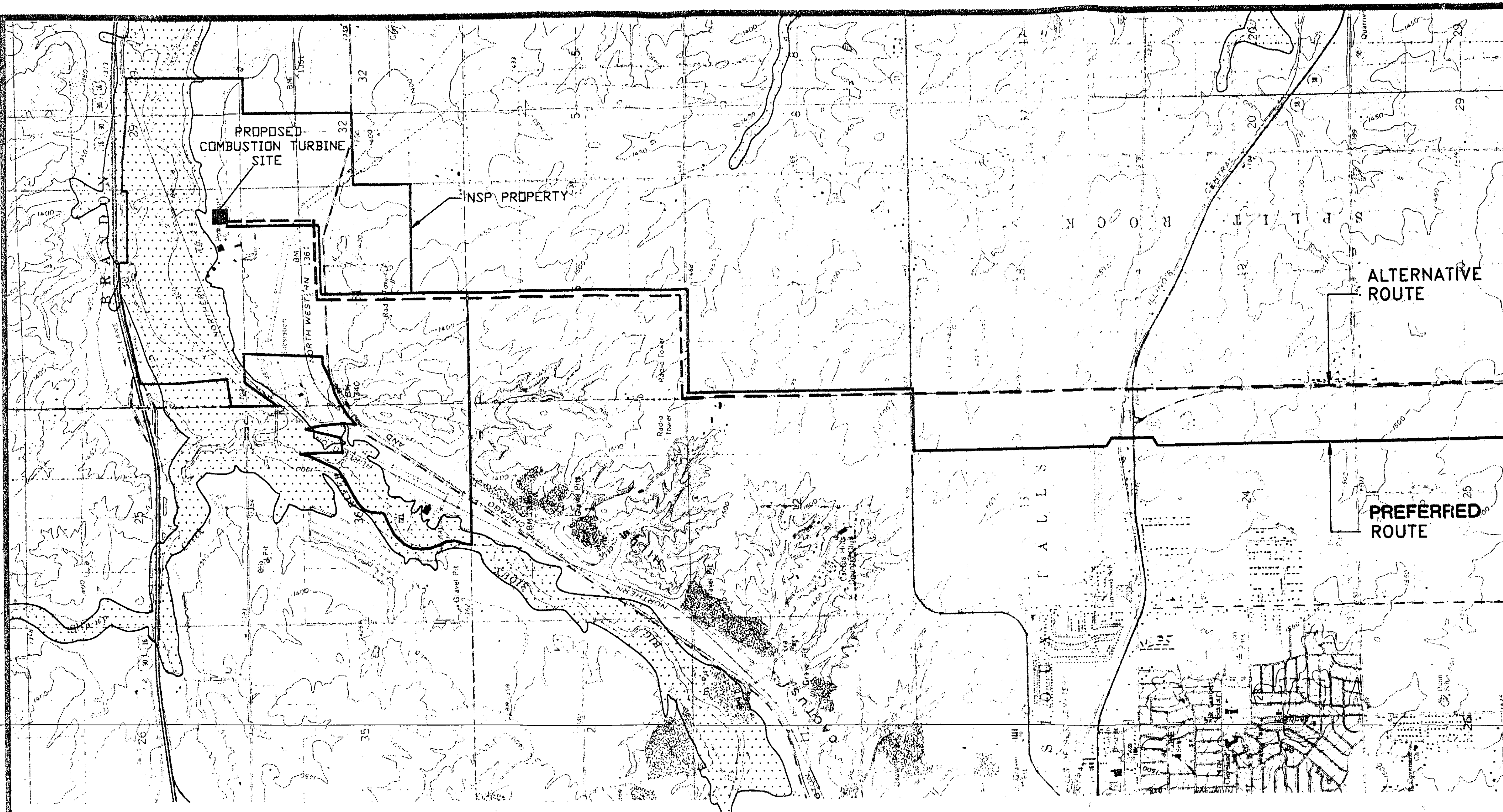
Calculated L_{dn} levels for each station are summarized in Table 2-33. Calculated L_{dn} levels ranged from 42 dBA at Stations 5 and 6 (west and south of the Pathfinder plant, to 54 dBA at Stations 2 and 3 (next to the Pathfinder plant). At the proposed CTG site, the largest background sound level (L_{dn}) calculated for a residence was 53 dBA at monitoring Station 7. Major non-plant sound sources included crickets, birds chirping, the freeway, and substation sounds.

Table 2–34 is a land use/sound compatibility matrix that is used by the U.S. Department of Housing and Urban Development (HUD). The matrix utilizes the day/night noise description to determine the relative acceptability of the sound environment for various land uses. According to the matrix, L_{dn} sound values below 65 dBA are "clearly" or "normally" acceptable for all land uses. Ambient sound levels measured at the nearest residences to the proposed CTG facility resulted in L_{dn} sound levels below the 65 dBA threshold.

2.5. Description of Social and Economic Characteristics

2.5.1. Land Use

Land use in the affected area is primarily agricultural, with some additional industrial and urban components. The land use around the immediate vicinity of the Pathfinder site and the proposed pipeline routes is shown in Figure 2–13. It can be seen that the primary land use is agriculture near the site and the pipeline routes. Along the proposed pipeline routes a second land use of importance is for rural residences or farmsteads. At the Pathfinder site the



LEGEND:

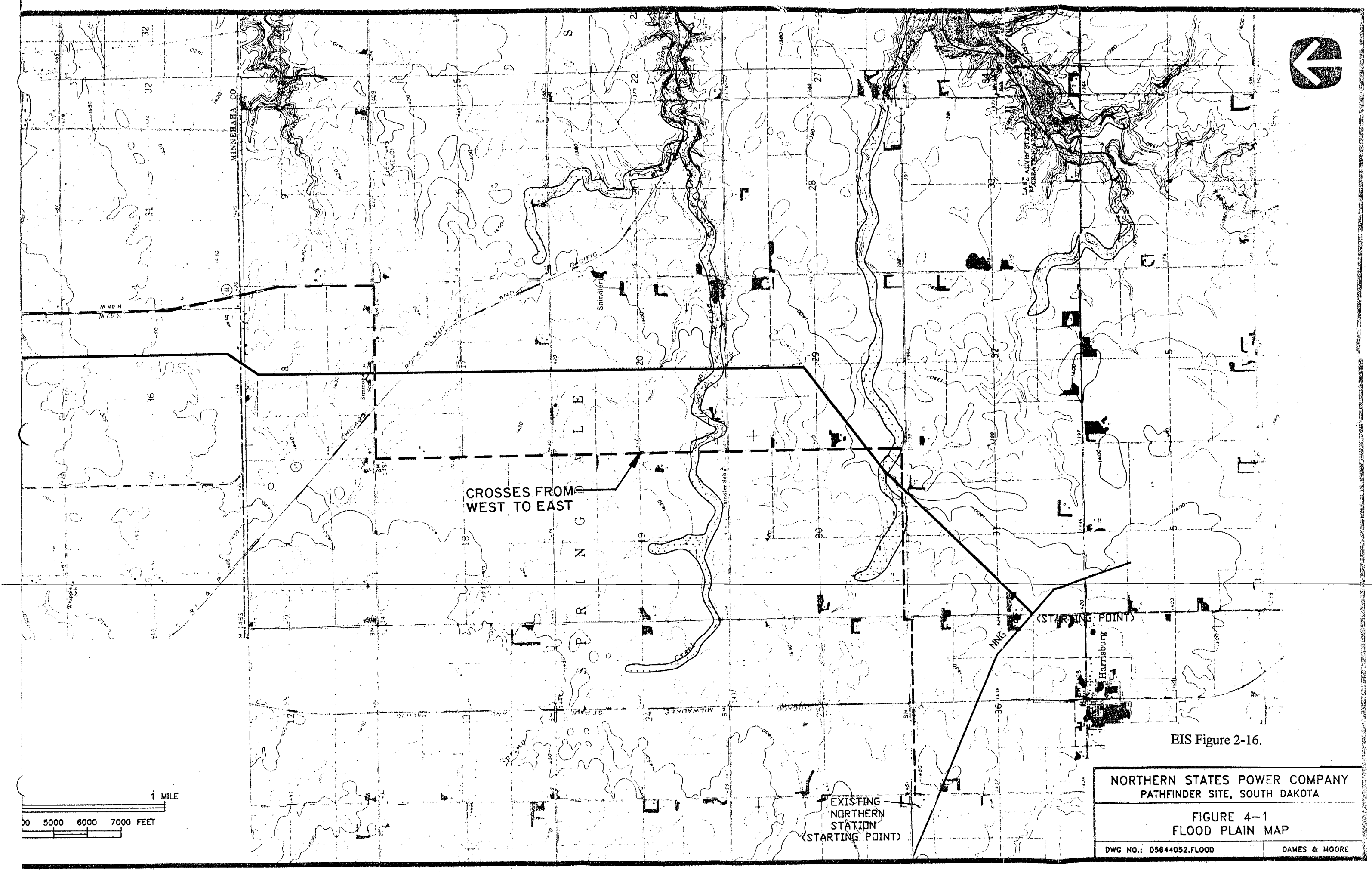
= SPECIAL FLOOD HAZARD AREA

NOTE:

THE SHADED "SPECIAL FLOOD HAZARD" AREAS IN MINNEHAHA COUNTY ARE SPECIFICALLY TERMED 100-YEAR FLOOD PLAINS. THOSE IN LINCOLN COUNTY HAVE NOT BEEN FURTHER DEFINED.

0 1/2 0

1000 0 1000 2000 3000



EIS Figure 2-16.

Table 2-32. Pathfinder ambient sound level monitoring data recorded July 18, 1991, sound pressure levels (dBA)

Monitoring Location	Time	Plant On/Off	L_{max}	L_{min}	L_{10}	L_{50}	L_{eq}	Prevalent Sources*
1	0029	Off	67	56	52	48	54	Crickets, Frogs
	1232	On	70	59	63	62	54	Plant
2	0054	Off	69	59	62	58	52	Crickets, Frogs
	1248	On	68	65	67	67	58	Plant
3	0112	Off	66	53	57	53	56	Crickets
	1313	On	70	59	65	62	54	Plant, Cooling Tower
4	0133	Off	68	54	51	46	58	Crickets
	1330	On	69	62	66	65	52	Cooling Tower
5	0152	Off	65	56	50	45	53	Substation, Crickets
	1422	On	75	48	68	63	47	Substation
6	0210	Off	60	47	42	39	49	Crickets, Substation
	1441	On	75	44	62	51	47	Substation, Birds
7	0252	Off	74	23	54	51	46	Crickets
	1502	On	70	50	63	57	49	Crickets, Birds
8	0228	Off	78	49	48	42	57	Freeway
	1523	On	79	56	71	65	56	Freeway

*Listed in generally decreasing order of observed prevalence

Note: dBA is a logarithmic unit for measuring the relative level of various acoustical quantities. 0 dBA represents the faintest sound; 130 dBA represents the threshold of pain.

L_{max} = Maximum noise level measured
L_{min} = Minimum noise level measured
L_{10} = Sound level exceeded 10 percent of the time
L_{50} = Sound level exceeded 50 percent of the time
L_{eq} = Equivalent or energy averaged mean sound level

Table 2-33. Calculated day-night sound levels (L_{dn}) based on background sound measurements

Monitoring Station	Background Sound Level (L_{dn})
1	53
2	54
3	54
4	52
5	42
6*	42
7*	53
8	52

*Station represents an existing residence

Table 2-34 . Land use/sound compatibility index.

Land Use	Decibel Levels (L_{dn})		
	Over 75	65-75	Under 65
Residential			
Mobile Homes	C.U.	N.A.	C.A.
Single family (a/c)	C.U.	N.A.	C.A.
Single family (w/o a/c)	C.U.	N.U.	N.A.
Multi-family	C.U.	N.A.	C.A.
Commercial			
Retail	N.U.	N.A.	C.A.
Wholesale	N.A.	C.A.	C.A.
Office	N.U.	N.A.	C.A.
Schools	C.U.	N.U.	N.A.
Institutional	N.U.	N.A.	C.A.
Industrial			
Light	N.A.	N.A	C.A.
Heavy	N.A.	C.A	C.A.
Transportation/Utilities	N.A.	C.A.	C.A.
Recreational			
Golf Courses	N.A.	C.A	C.A.
Parks	N.U.	N.A	C.A.
Open Land/Wildlife Habitat	N.A.	C.A.	C.A.
Agricultural	N.A.	C.A.	C.A.

Note: a/c = Air Conditioning
C.A. = Clearly Acceptable
C.U. = Clearly Unacceptable
N.A. = Normally Acceptable
N.U. = Normally Unacceptable

Source: U.S. Department of Housing and Urban Development

land use is industrial consisting of the existing gas-fired power plant and associated facilities. Much of the land NSP owns around the Pathfinder site is used for agricultural purposes.

A 60 MW natural gas-fired power plant currently operates at the Pathfinder site. The existing facility will continue to operate in addition to the proposed CTG facility. NSP owns approximately 1,020 acres of land surrounding the Pathfinder Plant. Approximately 60 acres of the site is occupied by existing plant facilities and associated electrical equipment such as substations and transmission lines. Approximately 550 acres are cultivated, and roughly 410 acres are unused grass land. It is anticipated that the proposed CTG facility will require approximately 2 acres. The U.S. Bureau of Reclamation Substation lies approximately 3,000 feet west of the proposed CTG site, encircled by NSP's property.

The five-mile affected zone encompasses the city of Brandon and a portions of the north and east parts of the city of Sioux Falls as well as Corson. Renner lies at the edge of the five-mile affected zone. The land use within these municipalities is primarily residential, although some light industry and commercial zones are also present. North of the Pathfinder site the land use is primarily agricultural, although several rural residential developments exist.

Land use within the affected zone of Sioux Falls includes low– and medium–density residential, general commercial, parks and recreation, public and semi–public, industrial and heavy commercial. The land along the Big Sioux River has been designated park and recreation areas. Additional park and recreation areas within the zone include the Cactus Hills Country Club and several city parks in east Sioux Falls. The majority of the low– and medium–density residential areas are located in east Sioux Falls with general commercial areas intermixed with these zones. North Sioux Falls, in particular along north Cliff Avenue, has land uses consisting of industrial and heavy commercial. The largest industrial use in this area is the John Morrell packing plant. The South Dakota State Penitentiary and the Sioux Falls Stockyards are also in this area. Some residential and general commercial areas are intermixed in the north Sioux Falls area. The primary public and semi-public use area identified is the Sioux Falls Regional Airport. Along Rice Street in northeast Sioux Falls, several gravel pits and associated industrial activities exist. The Sioux Falls Wastewater Treatment Plant lies on the Big Sioux River along the southwestern edge of NSP's property line. In addition, a campground lies approximately 5,200 feet northwest of the proposed CTG site on the north side of Interstate 90.

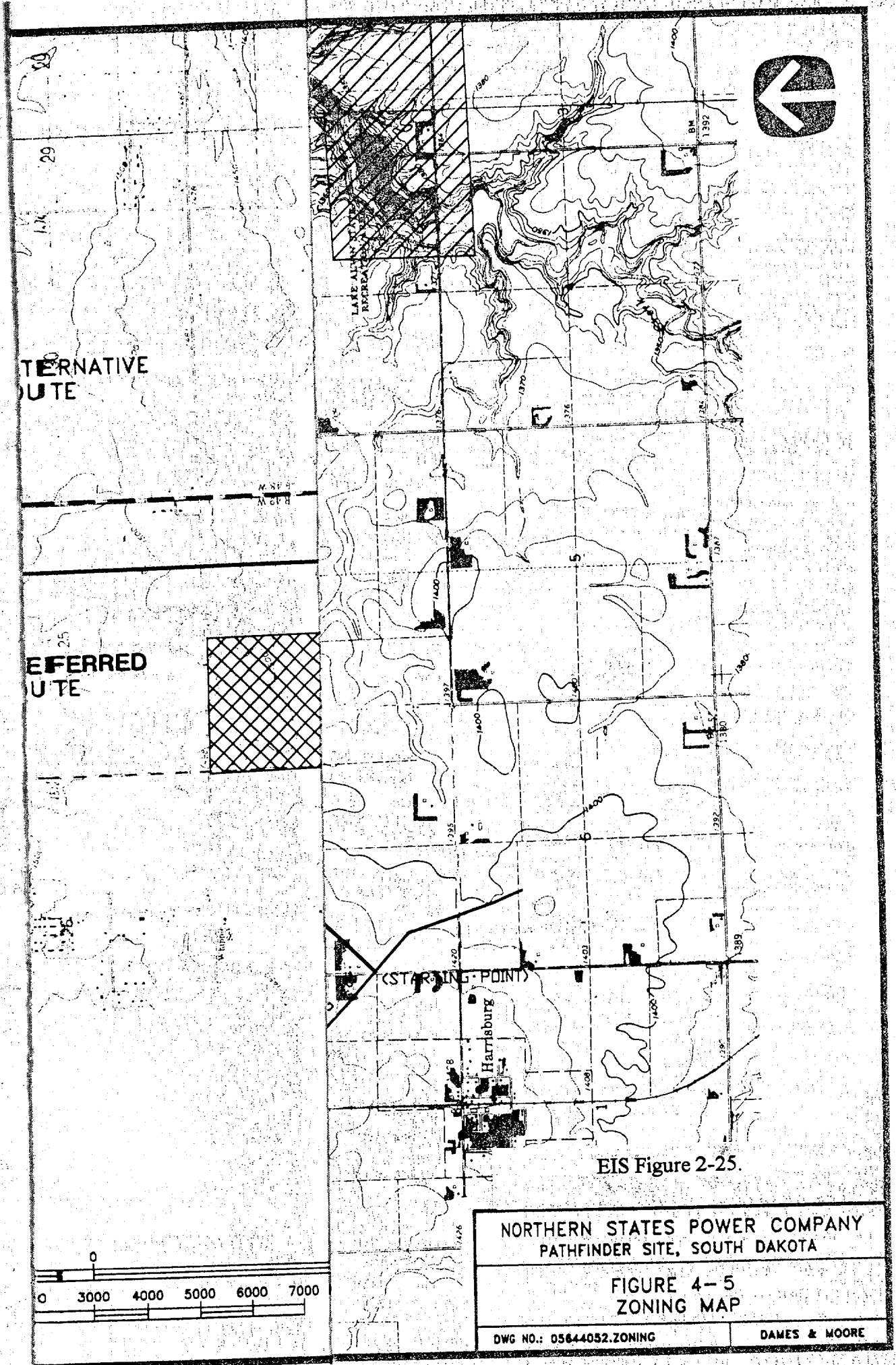
Within the urban areas of the affected area are numerous churches, schools and cemeteries. None of these are in the immediate vicinity of the proposed CTG units or the pipeline.

2.5.2. Zoning

Zoning designations around the immediate vicinity of the Pathfinder site and the proposed pipeline routes are shown in Figure 2-25. Zoning designations within the city limits of Sioux Falls are not shown on this map, but within the affected area consist primarily of residential and general commercial. It can be seen that the primary zoning designation is agricultural near the site and the pipeline routes. Along the proposed pipeline routes a second zoning designation of importance is rural residences. North of the Pathfinder site the predominate zoning designation is agricultural with a scattering of rural residential and general commercial designations. There are many rural residences north of the Pathfinder site and along the proposed pipeline routes that are still zoned as Agricultural Districts.

The NSP property is zoned General and Light Industrial around the Pathfinder Plant and the transmission substations. In an area zoned a General Industrial District, a public utility installation is listed as a permissive use. A Water Source Protection Overlay district is defined in and near NSP's property. Along the Big Sioux River a Recreation Conservation District zoning designation exists. Much of the land NSP owns around the Pathfinder site is zoned for agricultural purposes.

According to Minnehaha County zoning regulations, the purpose of the Water Source Protection Overlay District is "to preserve the quality and quantity of the area's water resources so as to ensure a safe and adequate supply of drinking water for present and future generations." In a Water Source Protection Overlay district a conditional use permit is required for any use which involves the storage and/or use of a regulated substance as designated by the Environmental Protection Agency. Storage of regulated chemicals on site includes two 2-million gallon fuel oil storage tanks which will be used to store No. 2 distillate fuel oil and two 3,000 to 10,000 gallon acid and caustic tanks used for water treatment. However, according to the Minnehaha County Zoning Office, since the oil storage tanks at the site are existing and the acid and caustic tanks are for an existing usage category, energy conversion, a conditional use permit will not be required. However, the tanks must meet all construction standards specified in the zoning codes (Queal 1991).



EIS Figure 2-25.

Immediately north and west of the proposed CTG facility site and adjacent to the Big Sioux River, the land is zoned as a Recreation Conservation District. This zoning-designation is intended "to protect natural drainage courses in their capacity to carry runoff water, to limit permanent structures and uses of land in areas subject to flooding, to prevent the pollution of underground water supplies, to provide open space and natural areas for recreation, and add to the aesthetic quality of the area".

East and west of the proposed CTG facility, the NSP-owned land is zoned as a Light Industrial District. With the exception of the portion of land in which the Lawrence substation is located, which is zoned General Industrial, the remaining land within NSP's property boundary is zoned as an Agricultural District. The land area outside of NSP's property boundary surrounding the Pathfinder site is generally undeveloped and is zoned as an Agricultural District.

2.5.3. Infrastructure

2.5.3.1. General

The proposed CTG facility site is located in a rural area in Minnehaha county, approximately 0.75 miles east of the Sioux Falls city limits, and approximately 2.8 miles west of the town of Brandon. The area surrounding the proposed site is undeveloped. The areas around the proposed pipeline routes are relatively undeveloped except for scattered rural residences and farmsteads. Within the affected areas the urban areas of Sioux Falls and Brandon are highly developed, with significant infrastructure development in place. Less development has occurred in Harrisburg, Corson, and Renner. The following is a brief discussion of the infrastructure known to be in place in the affected areas.

2.5.3.2. Electrical Utilities

Electrical utilities are provided in the affected area by several private and cooperative companies. Electrical utilities for the city of Sioux Falls are provided by the Sioux Falls Utilities Light Division and the Northern States Power Company (NSP). The Sioux Falls Utilities Light Division obtains its power from the Western Area Power Association and NSP. Electrical utilities in Brandon are provided by Sioux Valley Empire Electric Association, Inc. and in Harrisburg by Lincoln–Union Electric Company and NSP.

Several existing electrical transmission lines leading to and from the Split Rock Substation are part of the NSP transmission network which serves southeastern South Dakota

and southwestern Minnesota. The WAPNUS Bureau transmission lines and substation which serve east-central South Dakota and northwestern Iowa are located approximately 3,000 feet southwest of the proposed CTG site.

2.5.3.3. Telephone Service

Telephone service is provided in the affected area by several private and cooperative companies. Telephone service for the city of Sioux Falls is provided by the U.S. West Communications Company. Telephone service in the areas outside of Sioux Falls are provided by Splitrock Telecom Cooperative, Inc. and U.S. West Communications Company. Much of the telephone service is buried underground.

2.5.3.4. Water Supply Facilities

The city of Sioux Falls operates a municipal water supply system, obtaining its water from the Big Sioux River through an intake structure north of the Sioux Falls Regional Airport and from the Big Sioux aquifer (a surficial, glacial sand-gravel aquifer) from wells located along the Big Sioux River at the regional airport property and north of Sioux Falls. Brandon operates a municipal water supply system and obtains its water from the Brandon aquifer, a surficial, glacial sand–gravel aquifer and from the Split Rock Creek aquifer. Harrisburg obtains its municipal water from municipal wells, with the Lincoln County Rural Water System providing a backup supply. Most rural residences along the pipeline route are connected to either the Minnehaha Rural Water System or the Lincoln County Rural Water System or supplied by individual private wells.

The Pathfinder site is not served by a city water supply system. Sanitary and process water is provided by two existing on-site wells into the Split Rock Creek aquifer, which operate as needed. Cooling water for the existing gas-fired generating facility is provided by a river water intake in the Big Sioux River.

2.5.3.5. Sanitary Sewers

The municipalities discussed in the previous section provide sanitary sewage systems in their communities. There are no municipal sewers in the vicinity of the CTG facility site. The City of Sioux Falls Municipal Wastewater Treatment Plant is located approximately 1.9 miles to the southwest. Residences in the vicinity of the site are served by septic systems. Sanitary facilities for the existing Pathfinder Plant are provided by a septic system.

2.5.3.6. Stormwater Facilities

There are no underground stormwater sewers in the area of the proposed CTG facility site. Roof and parking lot drains at the existing Pathfinder Plant are directed to normal surface drainage.

2.5.3.7. Natural Gas Distribution

Natural gas distribution is provided in the affected area in urban areas by Minnegasco. Natural gas distribution in the rural areas is not yet in place.

The existing Pathfinder Plant is currently supplied by a 10-inch natural gas line from Sioux Falls which traverses the northwestern section of the site.

2.5.3.8. Roadways

Major highways providing access to the affected area are Interstates 90, 29, and 229, and state highways 11 and 38. Numerous county roads transect the proposed pipeline routes. Local access to the Pathfinder site is provided by the Brandon Road which bisects the southern portion of the NSP –owned property.

2.5.3.9. Rail Line

The Pathfinder site is served by a rail spur extension of an existing Burlington Northern rail line. The rail line crosses the site immediately north of the existing generating plant. An Ellis and Eastern rail line also crosses the Pathfinder site, south of the existing generating plant. The proposed CTG facility will be located approximately 800 feet south of the existing Burlington Northern rail line. Two abandoned rail lines are in the vicinity of the proposed pipeline routes, a Illinois Central rail grade in Minnehaha County and a Chicago, Rock Island and Pacific rail grade in Lincoln County.

2.5.4. Cultural Resources

Records surveys were conducted to identify archeological sites and surveys within the five–mile radius of the Pathfinder plant and along the corridor of the proposed pipeline routes. The records surveys included searches of the records at the South Dakota State Archaeological Research Center (SARC) and records and references on file at the Archeology Laboratory at Augustana College in Sioux Falls. The records searches revealed a high density of sites associated with major drainages in the project area, namely the Big Sioux River, Split Rock Creek, and Beaver Creek. Numerous surveys have been undertaken in the area, although the majority have been very small in scale. Previously recorded sites in

the five-mile radius area are shown in Figure 2–26, while the locations of previously recorded surveys are shown in Figure 2–27. A records survey was conducted of a four-mile wide corridor centered on the two proposed pipeline alternatives. No previously recorded (non-railroad) sites were found within the project area. Tables listing the previously recorded sites within and outside of the five-mile radius area and of the cultural resource surveys previously undertaken are provided in Appendix B.

An intensive pedestrian survey of the preferred and alternate pipeline routes and the proposed CTG facility location was conducted on April 14 and 15, 1992. The on–the–ground survey utilized single transects to examine both the preferred and alternate route. Visibility was good to excellent over the majority of the project area, with the exception of about 0.56 miles near the north end. Prehistoric artifacts were flagged when identified and the area was systematically examined in about three meter transects until the limits of the cultural material were identified. Insignificant historic material of recent origin (i.e., bottles and cans near roads) was not recorded. Complete legal descriptions, soils data, and vegetation/visibility descriptions by section for the proposed pipeline routes are contained in Gillen *et al.* (1992).

Two isolated prehistoric finds, both located on the preferred pipeline route, were identified. They are described below:

Isolated Find No. 1: This find consists of a tertiary flake produced on greyish-blue chalcedony and a retouched flake produced on brown, medium–grained quartzite. These items are located about 11 meters west of the existing centerline for the pipeline right–of–way, in the SE1/4, SE1/4, SW1/4, NE1/4 of Section 24, Township 101N, Range 49W. The soil identified for this location is a Moody–Nora silty clay loam, a deep soil formed in loess.

Isolated Find No. 2: This find consists of a bifacially retouched secondary flake produced on grey chert and a tertiary flake produced on dark grey chert located about 13 meters west of the existing centerline for the pipeline right–of–way, in the SE1/4, NE1/4, NW1/4, NE1/4 of Section 36, Township 101N, Range 49W. The soil identified for this locations is a Kranzburg silty clay loam, a soil formed in loess over glacial till.

A recent and active trash dump was found located at the outer margin of the project right–of–way in the NE1/4, NE1/4, NE1/4, NW1/4, of Section 36, Township 100N, Range

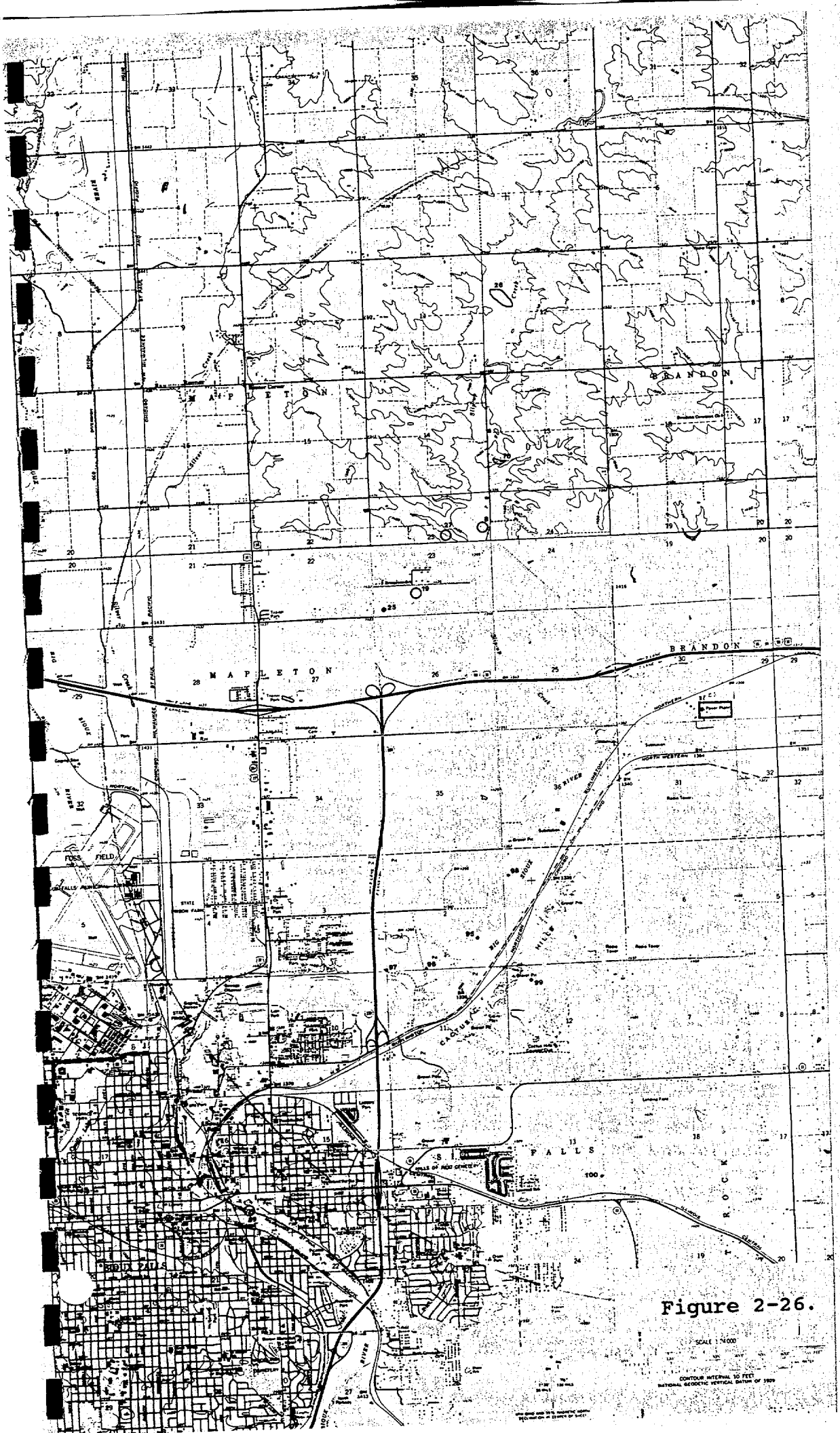

MAPLETON
BRANDON
MAPLETON
BRANDON
FOSS FIELD
FALLS
SCALE 1:24000
CONTOUR INTERVAL 10 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

Figure 2-26.

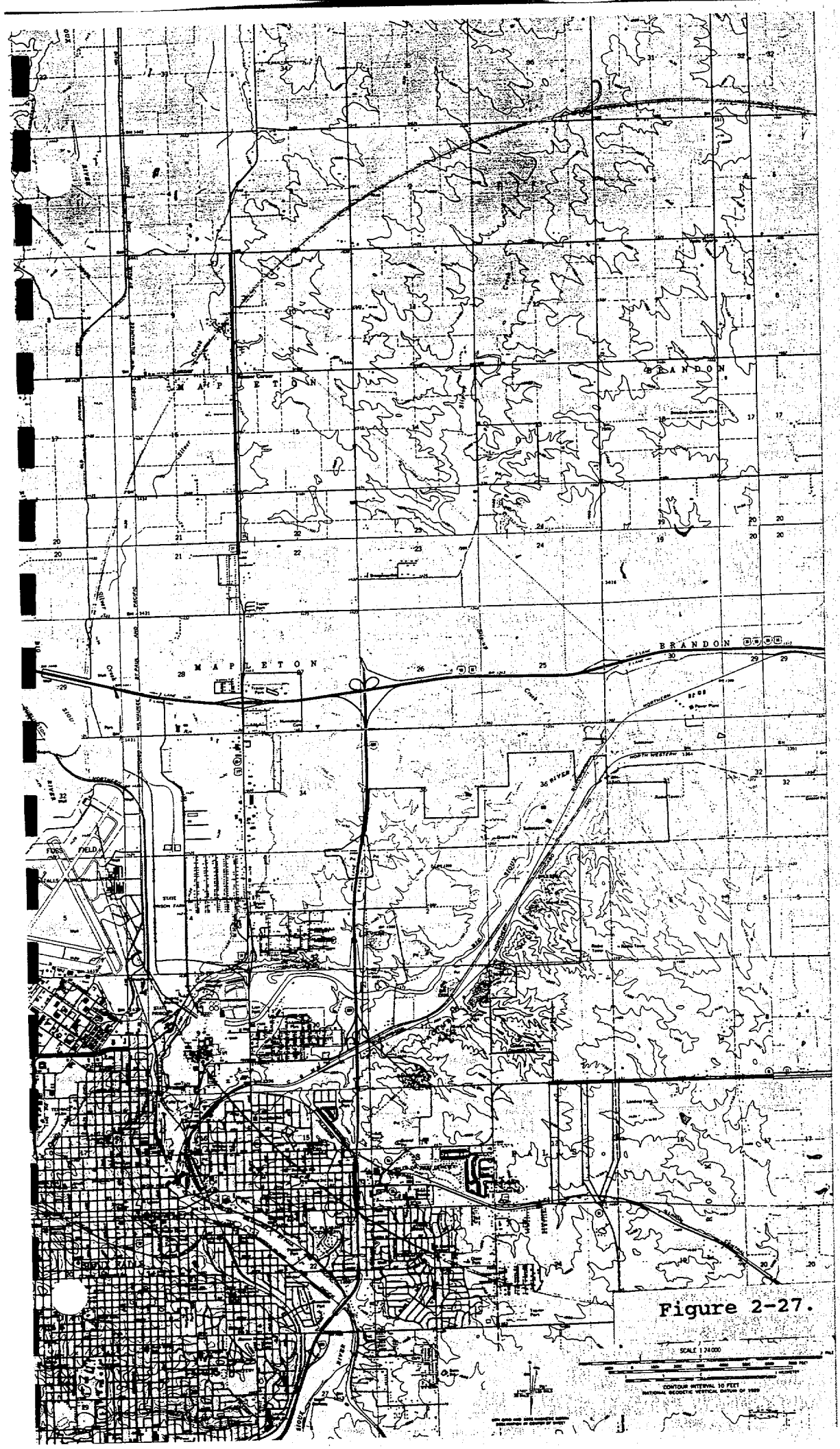

MAPLETON
BRANDON
MAPLETON
BRANDON
FOSS FIELD
SCALE 1:24000
CONTOUR INTERVAL 10 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

Figure 2-27.

50W. The debris was comprised primarily of construction, household and farm–related material.

Four railroad properties are crossed by the proposed route. Two of the rail lines, the Chicago Minneapolis, St. Paul and Pacific, and the Chicago and Northwestern, are currently in use. The remaining rail properties have been abandoned. Rails, ties, ballast, and in places, the entire grade have been removed from the Chicago, Rock Island and Pacific line. East of Sioux Falls, within the project area, rails and ties have been removed from the Illinois Central line and outside the project right–of –way the line has been trenched through at places.

The background records searches indicated that this region was extensively utilized during the prehistoric period, particularly during the Woodland period and later periods. Utilization of the area focused on the Big Sioux River and associated tributaries. Within the specific project area, little on–the–ground survey work had previously been undertaken and only one recorded site (39MH100) had been identified within the project area. This site was not relocated and is assumed to have been surficial, sparse and now destroyed.

The two isolated finds do not meet the necessary criteria of significance for National Register eligibility. No further work is recommended at these locations. A recent trash dump also does not meet the necessary criteria of significance for National Register eligibility. It was recorded only for future reference. It has been determined that all railroad properties are potentially eligible for Nomination to the National Register of Historic Places. However, impacts to the active railroad properties will be minimal. The abandoned lines have been significantly altered and minimally do not appear to possess the necessary criteria of integrity.

2.5.5. Demographics

The population for selected governmental units in and near the affected area are shown in Table 2–35. It can be seen that the population of Sioux Falls and Minnehaha County represent significant portions of the state's population. The population growth of all the units shown, with the exception of Brandon Township, has been tremendous and the rates are significantly higher than the growth rate for the state as a whole. This simply reflects the development of Sioux Falls and the surrounding area as a major regional business and trading center during the past two decades. The increases in population in Split Rock Township, Springdale Township and Lincoln County are a result of the development occurring in Sioux Falls and reflects the desire of people to live in a rural setting.

Table 2–35. Population and population change for selected governmental units, 1970 to 1990.

	1970	1980	1990	Percent Change	
				1970-1980	1980-1990
Brandon Township	1,960[1]	624	612	-68.4	-1.9
City of Brandon	1,431	2,589	3,543	80.9	36.9
City of Harrisburg	338	558	727	65.1	30.3
City of Sioux Falls	72,488	81,343	99,405	12.2	22.2
Split Rock Township	879	1,802	2,137	105.0	18.6
Springdale Township	534	919	1,061	72.1	15.5
Lincoln County	11,761	13,942	15,427	18.5	10.7
Minnehaha County	95,209	109,209	123,809	14.9	13.1
South Dakota	666,257	690,768	696,004	3.7	0.8

Source: U.S. Bureau of the Census, years cited. Business Research Bureau, University of South Dakota

[1]Prior to the 1980 census, the population of the City of Brandon was included in the census of Brandon Township.

Baseline population projections prepared by the Business Research Bureau at the University of South Dakota, and shown in Table 2–36, project continued growth in population for Minnehaha and Lincoln Counties. The increases are projected to be considerably larger in Minnehaha County than in Lincoln County.

2.5.6. Income Characterization

One demographic measure of the population is income. It establishes the standard of living in terms of the community's demand for certain types of goods, services, and facilities. Historically, the per capita personal income in Sioux Falls and Minnehaha County has been higher than the average per capita personal income for the State of South Dakota. This is not unusual for a state which is primarily rural with few urban centers and which tends to lack the overall income opportunities present in a more industrialized economy. As indicated in Table 2–37, the per capita personal income for Sioux Falls is considerably larger than that for the other governmental units. The per capita income generally is between about $10,000 and $13,000 in the area.

2.5.7. Economic Conditions

The areas around the proposed project are more industrialized and more affluent than South Dakota as a whole. Not only is per capita income higher than the state's average income, but Minnehaha and Lincoln Counties have also experienced lower annual unemployment rates during the past seven years, as shown in Table 2–38. It can be seen that generally the counties have experienced lower unemployment than the state as a whole.

Table 2–39 presents the number of employees and average weekly earnings per selected industry group in the county and state, for workers covered by unemployment insurance. Average weekly earnings for Minnehaha County exceeded South Dakota's average earnings in every disclosed industry group by as much as 30 percent during 1989. The services and retail trade industries represent the greatest number of employees at both the county and state levels. However, employees in these industries receive the lowest weekly salaries. The employment and earning extremes often reflect the large degree of part-time employees in these types of businesses. Overall, the relatively low unemployment rate in the county and the strong diversified manufacturing base in Sioux Falls point to a healthy economic outlook for the area.

Table 2–36. Population predictions for selected governmental units, 1980 to 2010.

	Actual	Actual	Projected	Projected	Percent Change
	1980	1990	2000	2010	1990-2010
Lincoln County	13,942	15,427	15,810	16,391	6.3
Minnehaha County	109,435	123,809	148,754	165,271	33.5
South Dakota	690,768	694,004	736,177	763,291	10.0

Source: Business Research Bureau, University of South Dakota

Table 2–37. Per capita personal incomes for selected governmental units, 1980 to 2010.

	1981	1983	1985	1987	1990
City of Brandon	$8,009	$8,494	$9,354	$9,810	$12,069
City of Harrisburg	$6,627	$6,678	$8,368	$8,498	$9,873
City of Sioux Falls	$9,101	$9,826	$11,508	$11,304	$20,919
Lincoln County	$7,130	$7,290	$8,553	$8,910	$12,246
Minnehaha County	$8,670	$9,343	$10,973	$10,838	$13,345
South Dakota	$6,749	$7,290	$8,553	$8,910	$10,661

Source: U.S. Department of Commerce, Bureau of Ecomonic Analysis and Business Research Bureau, University of South Dakota

Table 2–38. Average unemployment for selected governmental units, 1984-1990.

	1984	1985	1986	1987	1987	1989	1990
Lincoln County	4.0	5.4	4.5	4.4	4.4	3.4	2.6
Minnehaha County	3.6	4.6	4.1	3.8	4.0	3.6	2.7
South Dakota	4.4	5.2	4.6	4.2	3.9	4.2	3.7

Source: Business Research Bureau, University of South Dakota

Table 2-39.

1989 AVERAGE COVERED EMPLOYMENT AND EARNINGS MINNEHAHA COUNTY AND SOUTH DAKOTA

INDUSTRY	MINNEHAHA COUNTY		SOUTH DAKOTA	
	Covered Employment	Average Weekly Earnings	Covered Employment	Average Weekly Earnings
Agriculture, Forestry, Fisheries	*	*	1,758	$291.87
Mining and Quarrying	*	*	2,613	607.41
Contract Construction	3,053	$401.80	10,253	354.26
Manufacturing	8,498	394.30	32,143	353.84
Transportation, Communication, and Public Utilities	4,988	427.14	13,116	406.95
Wholesale Trade	5,732	435.56	18,516	363.91
Retail Trade	14,340	203.81	54,186	178.45
Finance, Insurance, and Real Estate	7,486	395.23	15,521	366.72
Services and Miscellaneous	17,875	352.33	59,723	272.11
Total Private Ownership	**62,279**	**$344.97**	**207,829**	**$292.52**
Federal Government	1,920	571.88	11,200	475.60
State Government	852	373.47	13,175	372.86
Local Government	4,102	365.91	28,980	289.59
Total Government	**6,874**	**$424.38**	**53,355**	**$349.20**

* Data was suppressed to prevent disclosure of confidential information.

Note: Individual column data may not sum to totals due to suppression of data.

Source: South Dakota Employment and Earnings Covered by Unemployment Insurance, 1989. South Dakota Department of Labor, Labor Market Information Center.

In the past 10 years, the City of Sioux Falls has experienced tremendous growth which has put an increasing burden on such things as housing, educational facilities, and other infrastructure items. The Local Review Committee, appointed by the Commission, has conducted a review of social and economic factors relating to the proposed project. Additional information concerning housing, education facilities, waste disposal, waste water treatment and collection, solid waste collection and disposal, law enforcement, transportation, fire protection, health, recreation, governmental units, and energy are contained in the Local Review Committees Report prepared by the Sioux Falls Development Foundation (Sioux Falls Development Foundation 1992).

2.5.8. Aesthetics

Existing Pathfinder facilities consist of a 60 MW natural gas-fired generating facility, an adjacent electric substation and associated electric transmission towers, an intake structure, fuel supply system including two 2-million gallon fuel oil storage tanks, a cooling tower, warehouses, and four wastewater settling basins. The facility is surrounded by a chain link fence.

The Big Sioux River flows across the northern portion of the site. Two railroad lines cross the site, one north of the existing generating facility and one south of the existing generating facility. The electric substation and transmission towers are easily visible from Brandon road to the south as well as from Interstate 90, located approximately 0.5 miles north of the proposed CTG site.

The Split Rock Substation and the Lawrence Substation are located adjacent to and 1.5 miles southwest of the Pathfinder site, respectively. The U.S. Bureau of Reclamation's Substation and Western Area Power Association (WAPA) transmission lines are located approximately 3,000 feet southwest of the proposed CTG site.

The nearest residences to the proposed facility are farmsteads which are approximately 4,240 feet west and 4,280 feet northwest of the proposed CTG facility. A farmstead is located approximately 5,400 feet northeast of the site. In addition, a campground is located approximately 5,200 feet northwest of the proposed CTG facility on the north side of I-90.

CHAPTER 3
THE ENVIRONMENTAL IMPACT OF THE PROPOSED ACTION INCLUDING SHORT-TERM AND LONG-TERM EFFECTS.

The construction and operation of the proposed CTG units and the pipeline will have some impact on the environment of the area, but the incorporation of pollution control devices and the implementation of plans to mitigate certain impacts will minimize any unavoidable loss of environmental quality. The discussion of the environmental impacts below are divided into impacts accruing to construction and operation of the CTG units and to construction and operation of the pipeline.

3.1. Impact on the Natural Environment

3.1.1. Construction Impacts

NSP has indicated that the CTG units at the Pathfinder site will utilize approximately two acres of area at the site. During the course of construction it would be expected that somewhat more area than this would become disturbed due to construction activities. The primary impacts during construction of the units will be due to site clearing, equipment operation, and general increased activity at the site. Below is a discussion of the impacts expected.

The construction of the pipeline will impact the corridor along which the pipeline is constructed through site clearing, equipment operation, and the general increased activity along the pipeline during the construction period.

3.1.1.1. Air Quality

The primary impacts on air quality during construction of the CTG units and the pipeline will be an increase in construction related noise and an increase in fugitive dust due to wind erosion.

The most prevalent sound sources during construction are anticipated to be from internal combustion engines used to provide mobility and operating power to construction equipment. The sound level impacts at sensitive sites from construction operations will depend on the type of equipment used, the equipment's mode of operation, the length of time equipment is in use, the amount of equipment used simultaneously, and the distance between

the sound source and sensitive site. All of these factors will be constantly changing throughout the construction period, making the quantification of impacts difficult.

Table 3–1 gives a sound level range for equipment commonly used in construction. For the noisier pieces of equipment listed in Table 3–1, a distance of approximately 1000 feet to 1200 feet between the sound sensitive site (residence) and sound source (construction equipment) would result in a sound level of 65 dBA or less. A 65 dBA sound level during daytime hours would not be considered a substantial sound impact. The nearest residences to the Pathfinder Site are located approximately 4,240 feet and 4,280 feet from the proposed CTG construction site. Along the pipeline route the disturbance to local residents will be somewhat greater than that from construction activity at the Pathfinder site. The preferred route minimizes the number of residences and farmsteads within about 1,000 feet of the pipeline. Noise from construction activities will be of short duration in any one area as the crew moves along the right–of–way.

The intermittent and short term nature of construction sounds and the distance between the sound sensitive sites and the proposed construction areas suggests that impacts from construction sounds will be minimal.

Temporary increases in fugitive dust resulting from site clearance and construction activities and exhaust emissions from heavy equipment and truck traffic will occur during the construction of the proposed CTG facility and the pipeline. This could cause some localized nuisance conditions within the plant property and along the pipeline, but should not affect homeowners around the site nor the general air quality in the area. Contractors will be required to utilize water wagons to periodically spray any unpaved access roads and haul roads to reduce fugitive dust emissions in the event that the emissions affect area residences. Potential impacts are expected to be localized and quickly dissipated.

No long–term effects on the air quality are expected to be generated by the construction activities along the pipeline and at the Pathfinder site.

3.1.1.2. Land and Water Characteristics

One of the major impacts of the construction activities will be the destabilization of surface soils at the plant site and along the pipeline resulting from ground preparation, excavation, and increased susceptibility of the soil to wind and water erosion. Several of the soils along the pipeline route have the potential for sustaining high erosion or for being

Table 3-1.

TYPICAL CONSTRUCTION EQUIPMENT NOISE RANGES

EQUIPMENT	NOISE LEVEL RANGE AT 50 FEET (dBA)	AVERAGE (dBA)
Front Loaders	72 - 84	81
Backhoes	72 - 93	90
Tractors	77 - 96	93
Graders	80 - 93	90
Pavers	86 - 88	87
Trucks	82 - 94	91
Concrete Mixers	75 - 88	85
Cranes	75 - 87	84
Pumps	69 - 71	70
Generators	71 - 82	79
Compressors	74 - 87	84

Source: EPA, 1971

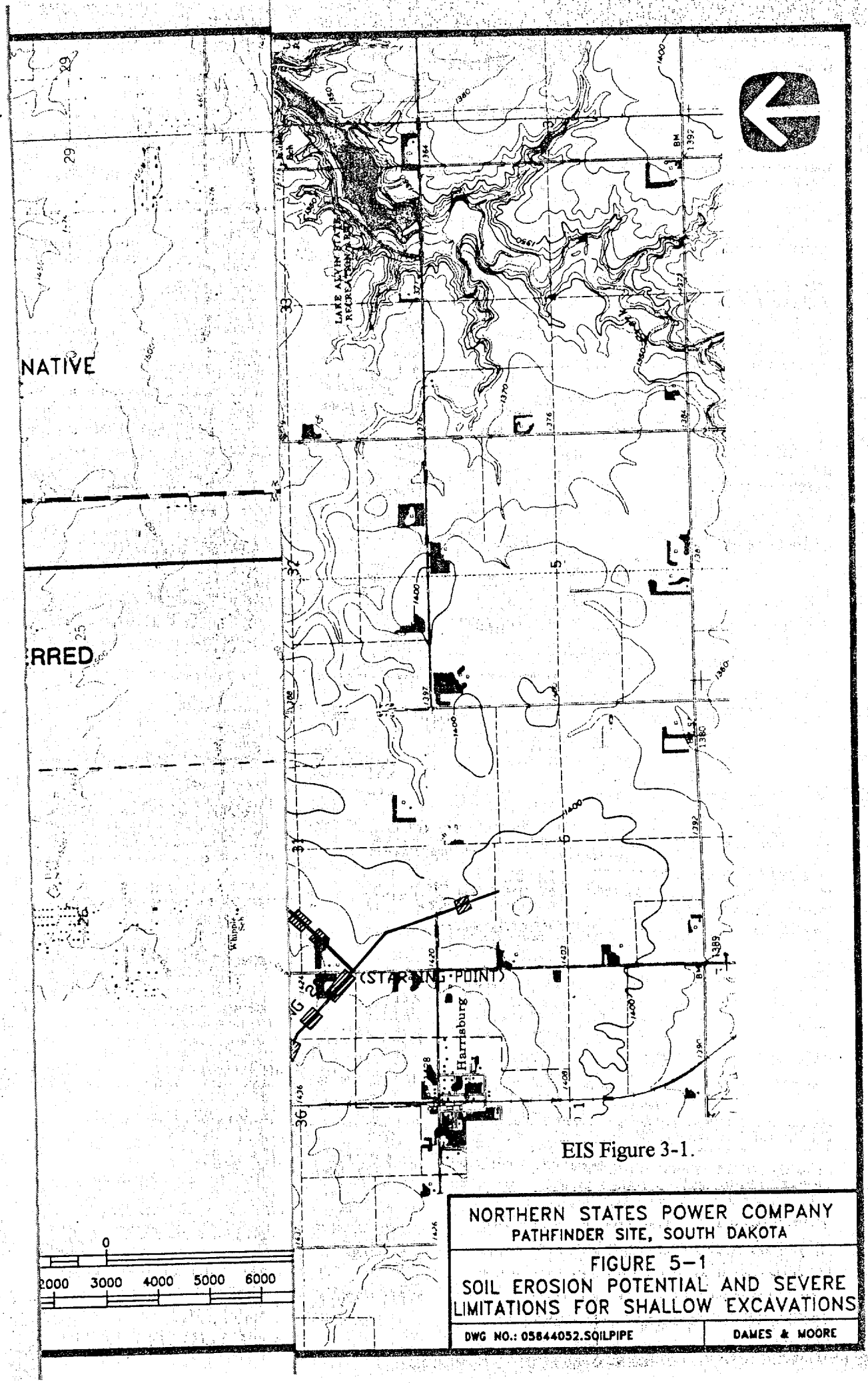
unstable in shallow excavations. NSP prepared Figure 3–1, based on the engineering interpretations of the soil characteristics outlined in the Lincoln and Minnehaha County Soil Surveys, to show the soil erosion potential and limitations for shallow excavations. The soils shown as highly erodible soils primarily are those which have loess as the parent material. These silt sized soils are highly erodible by both wind and water action. Disturbance to these soils can produce ideal conditions for soil erosion to occur. Proper construction techniques can overcome most of the expected problems. The soils identified as having severe limitations for shallow excavations primarily are soils in low lying areas which will be prone to flooding and caving during excavation.

Movement of heavy equipment along the pipeline right–of–way may compact soils, which could reduce crop production in the affected agricultural areas. Compaction can reduce crop production by restricting root growth and penetration, hindering seedling emergence, and reducing oxygen and carbon dioxide flow to and from the roots. A reduction in soil pore space affects infiltration of water resulting in ponding on the surface of the fields. The severity of this impact can vary. Compaction generally is greater on wet or exposed soils. Soils for growing crops are loose and 35 to 55 percent of the material is pore space. Slow plant emergence and shallow root systems are the most frequent symptoms of soil compaction.

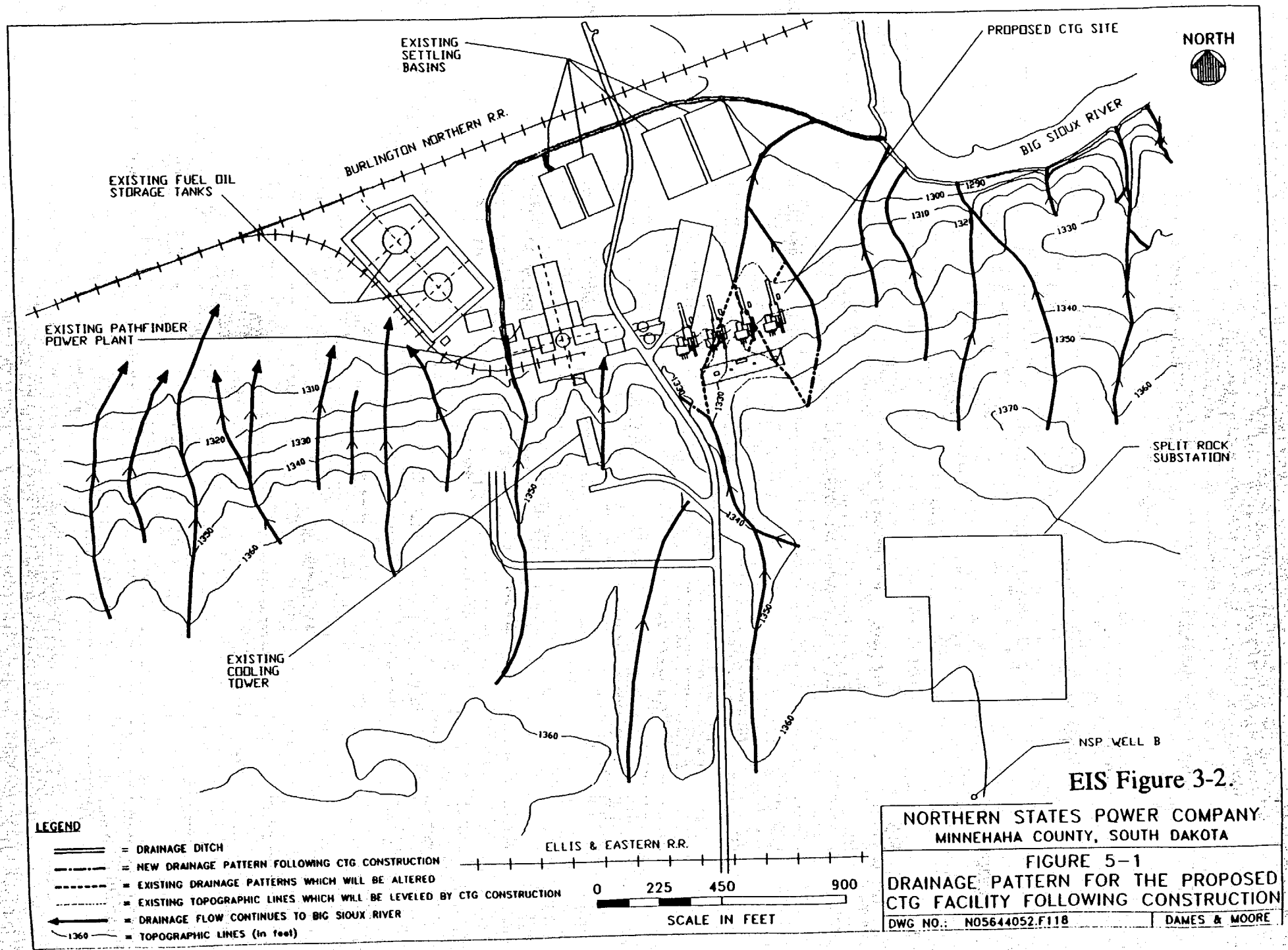
Figure 3-2 depicts the anticipated drainage patterns for the proposed CTG facility area following construction. Based on current information and facility layout, no significant change in drainage patterns is expected as a result of the construction of the proposed CTG facility. The proposed pipeline routes cross several drainage channels and several wetland areas. There is the potential for severe change in wetlands and stream channel characteristics along the pipeline routes. Excavation procedures through drainage channels will need to ensure that the natural grade of the channel is maintained. During a pedestrian survey of the preferred pipeline, several locations along the north part of the pipeline were noted where gully erosion was occurring in stream channels. Such gully erosion could continue headward in a drainageway and eventually expose the buried pipeline. Erosion control structures may need to be placed in such channels to prevent the spread of the gully.

Impacts on Wetlands

As shown on Figure 3-2, the hillside at the CTG site will be leveled. The leveling action will destroy the small seepage wetland thereby reducing habitat diversity on the site. The primary impact will be permanent loss of habitat for wetland dependent amphibians,



EIS Figure 3-1.



EIS Figure 3-2.

reptiles and small mammals that may inhabit the site. A 404 permit and EPA 401 water quality certification may be required.

Numerous temporary and seasonal wetlands are present along the preferred and alternate pipeline routes especially in the southern reach from Harrisburg to just north of the Minnehaha County line. Most of these wetlands lie in cultivated agricultural fields. Their value to wildlife is probably greatest to migrating waterfowl that return to the region in spring. Large semi-permanent wetland-dominated basins are typically still frozen. The first to thaw are small wetlands (temporary and seasonal wetland dominated basins). When ponded these wetlands are used by migrating waterfowl. In addition, isolated wetlands provide habitat for other avian species as well as resident game and non-game species. During the pedestrian survey of the preferred pipeline route on May 8 and 9, 1992, several of the small farmed wetlands and stream banks exhibited evidence of earlier wildlife use (waterfowl, shorebird and small mammal tracks) when surface water had still been present.

The largest potential impact to these wetlands would occur during construction of the pipeline through either surface or subsurface drainage of the small basins. Loss of ponding ability would essentially destroy these small wetlands with subsequent loss of their habitat value. Surface drainage could occur during backfilling and final grading of the trench area after pipe installation. This would be likely if the route crosses the natural outlet of the wetland and final grading leaves the outlet at a lower elevation. Many of the basins are quite shallow and would not require a large change in elevation to drain . Outlets of these wetlands should be surveyed before and after construction to insure there is no change in elevation. Loss of small wetlands could also occur if fill is deposited in the basin during grading.

Many small wetlands along the pipeline route exist because they lie in glacial till of low hydraulic conductivity. Subsurface drainage of wetlands may occur if the material used to cushion the pipe during backfilling is permeable (with high hydraulic conductivity). It is common practice to use sand and gravel to pad installed pipe, especially when the native material is stony. These materials can provide a conduit for water and increase the rate of movement of groundwater flowing away from the wetland. In Figure 2-7 "pad and backfill" is listed as one of the final steps in laying the pipeline (NSP EIR 1991). The material to be used for padding is not specified. In areas where the route intersects wetlands, pad and backfill should be of an impermeable nature to prevent subsurface drainage of the wetlands.

Loss of small wetlands from surface or subsurface drainage would result in the loss of habitat for migrating waterfowl and other wildlife that depend on them especially early in the spring.

The proposed CTG facility and pipeline routes will generate no impact to the area's geology or geological resources. Likewise there will be no temporary or long-term irreversible impacts on the local physiography from the construction activities.

3.1.1.3. Impacts on Terrestrial and Aquatic Resources

The vast majority of land to be affected by construction of the CTG facility and the natural gas pipeline is previously disturbed or actively farmed land; thus, natural vegetation is absent from almost the entire area. The CTG construction site is primarily vegetated with smooth brome except for the small seepage wetland on the hillside occupying the southern portion of the construction area. Leveling of the hillside will eliminate the wetland and its hydrophytic vegetation, principally young willows, cottonwoods and an abundance of scouring rush. Although the vegetation of this wetland is not unique, its loss would represent a reduction in habitat diversity for the Pathfinder Site.

The preferred pipeline route passes through only one small area of prairie vegetation located near the south end of NSP property, south of the Brandon Road. Some native prairie species are present, but much of the vegetative cover is Kentucky bluegrass. Overall plant diversity is low relative to other relict prairies. Hence, the quality of this prairie is poor. Disturbance involved in constructing the pipeline will endanger no unique plant communities or species at this location; however, reclamation procedures following pipeline construction, i.e., reseeding with native grasses, could be used to enhance the site.

Other uncultivated areas crossed by the preferred pipeline route include small stretches of pasture land, road rights-of-way, and one shelter belt. Vegetation on these areas is typical of grazed, revegetated, or otherwise disturbed terrestrial sites, with smooth brome and Kentucky bluegrass being dominant. The only vegetated wetland areas crossed by the pipeline route have a dominant cover of reed canarygrass, which was likely planted for hay or forage. Most wetlands on the route are farmed and have no natural vegetation.

No plants on the federal or state lists of threatened or endangered species were detected in the immediate project area, nor are there any habitats where the listed species would be expected to occur.

3.1.2. Operational Impacts

3.1.2.1. Airshed Impacts

The primary impacts on airshed quality during operation of the proposed CTGs will be an increase in noise levels near the site and emissions of pollutants to the atmosphere resulting from natural gas and/or distillate oil combustion.

Sound Impacts

According to documentation provided by NSP (NSP 1991) during operation CTGs emit a sound that would generally be described as smooth and continuous. Undoubtedly, variations in sound levels would occur during startup and shutdown, causing a temporary disturbance in ambient sound levels. Additionally, the sound impact of the proposed CTG operation will depend primarily on the proximity of the sound receptor to the CTG site.

Using data provided by the CTG manufacturer, NSP predicted that CTG operation would cause a L_{dn} increase of 0 to 23 dBA at the sound monitoring stations located at the Pathfinder site. At the off-site monitoring station 6, there would be an expected L_{dn} increase of 3 dBA. There would be no expected increase in L_{dn} values at monitoring stations 7 or 8. The expected sound levels at the three off-site monitoring stations would in the range typical of a quiet to normal suburban residential area. Thus, while audible sound will emanate from the proposed CTG, the sound levels would be in a range that is acceptable for the land uses in the proposed CTG vicinity.

Impacts of sound on wildlife near the proposed CTG facility are discussed in Section 3.1.2.5.

Air Quality Impacts

Combustion of natural gas and distillate fuel in the proposed CTG will cause air pollutant emissions. The major air pollutants that will be emitted from the proposed CTG facility include nitrogen oxides (NO_x), sulfur dioxide (SO_2), carbon monoxide (CO), volatile organic compounds (VOCs), total suspended particulate matter (TSP), particulate matter less than 10 microns (PM_{10}), and beryllium (Be).

Effects of Air Pollutants

The Primary and Secondary National Ambient Air Quality Standards (NAAQS) were developed by the USEPA to protect public health and welfare, including vegetation, soil and animals. The NAAQS development process incorporated years of toxicological studies on potentially effected species.

Effects of gaseous pollutants may be classified into three rather broad categories: acute, chronic, and long term. Acute effects are those that result from relatively short (less than one month) exposures to high concentrations of pollutants. Chronic effects occur when organisms are exposed for months or even years to certain threshold levels of pollutants. Long-term effects include abnormal changes in ecosystems and subtle physiological alterations in organisms. Acute and chronic effects are caused by the gaseous pollutant acting directly on the organism, whereas long-term effects may be indirectly caused by secondary agents.

Major forms, primary and secondary adverse effects of each contaminant are summarized in Table 3-2. Not surprisingly, the predominant primary impacts impair the respiratory systems and oxygen carrying capability of the blood. Predominant secondary impacts on vegetation occur on leaf surfaces or impair photosynthesis in some way. Aesthetic impacts of stack emissions are commonly attributable to particulate emissions.

Characteristics of Proposed CTG Emissions

Guaranteed levels of emissions for three ambient air temperature values (-40°F, 59°F, and 100°F) and for both potential fuels (natural gas and distillate oil) were obtained by NSP from Westinghouse, the CTG manufacturer. The emission rates shown in Table 3-3 are for CTGs running 100% capacity continuously throughout the year at the 59°F. The right-hand column lists the emissions from 4 CTGs burning the worst-case fuel.

CTG emission rates generally depend on the operation temperature and the percent of full load that the generator is running at. For example, the Westinghouse data for natural gas fuel indicate that CO and VOC emission rates increase and the SO_2, NO_2 and TSP emission rates decrease when the generator is operating at less than full load as compared to when running at 100% load. At a constant load, emission rates of all tabulated pollutants increase with decreasing temperature.

Table 3-2. Adverse impacts of air pollutants.

Pollutant	Form	Adverse Impacts	
		Primary	Secondary
Nitrogen Dioxide, NO_2	gas	respiratory tract damage to humans and animals	damage vegetation either by direct contact with leaf or by solution in water drops - causes surface spotting (necrosis)
Sulfur Dioxide, SO_2	heavy, colorless gas, odor of struck match, combines with water to form corrosive liquid (acid)	acute - bronchial constriction and increased mucous flow, chronic - impairs respiratory system defenses against foreign particles and bacteria, enhances harmful effects of ozone	prolonged exposure injures sensitive plants including; commercial valuable pines, legumes, red and black oaks, white ash, alfalfa and blackberry - causes necrosis
Carbon Monoxide, CO	colorless, odorless, tasteless gas	combines with hemoglobin to reduce blood's oxygen carrying capacity, CO laden blood can weaken heart contractions, lowering blood volume distribution	--
Volatile Organic Compounds, VOC	reactive organic gases - react with NO_x and oxygen to produce ozone	acute - irritation of eyes and respiratory tract, skin dermatitis, dizziness, nausea, vomiting; chronic - central nervous system depression and liver damage	--
Ozone, O_3	gas, photochemical oxidant	high levels can irritate mucous membranes of nose and throat, significant levels impair normal lung functions and reduces physical exercise ability	injures palisade cells under upper epidermal cells in leaves, ultimately causing white spots on leaf surface
Total Suspended Particulate Matter, including PM_{10}, TSP/PM_{10}	airborne particles or aerosols, sizes range <1 to >100 μm, PM_{10} = particles $<10\mu$m formed in atmosphere from other gaseous pollutants	slows down exchange of oxygen for CO_2 in the blood, causing shortness of breath; chronic - respiratory distress, PM_{10} are especially able to penetrate to sensitive lung areas	on leaf surfaces may inhibit growth through reduced photosynthesis, visibility and solar radiation impaired, particulate haze affects crop productivity by reducing solar radiation, may affect property values, aesthetics in urban areas
Beryllium, Be	in particulate dust	suspected human carcinogen	--

Sources: NSP Environment Impact Report, 1991; Davis and Cornwell, 1991

Table 3-3. Estimated pollutant emission rates for proposed CTGs at the Pathfinder Site (NSP, 1991).

Pollutant	Natural Gas (1 Turbine)		Distillate Oil (1 Turbine)		Worst-Case Fuel - 4 CTGs[5] (TPY[2])
	Stack Concentration (ppmdv @ 15% O_2)	TPY[2]	Stack Concentration (ppmdv @ 15% O_2)	TPY[2]	
TSP/PM_{10}[1]	-	52.6	-	394.2	1576.8
SO_2[1]	12	311.0	76	1839.6	7358.4
NO_X[1]	24	521.2	41	862.9	3451.6
CO[1]	50	556.3	50	569.4	2277.6
VOCs[1]	6	38.1	35	227.8	911.2
Be[3]	-	-	-	0.013	0.051
Hg[3]	-	-	-	0.015	0.061
Pb[3]	-	-	-	0.045	0.182
Fluoride(F)[4]	-	-	-	0.149	0.595

[1]Based on Westinghouse Emission guarantee at 59°F, base load operation, base elevation of 1000 feet above mean sea level, water injection.
[2]Tons per year, assuming 365 days per year, 24-hour per day operation.
[3]Emission factor from: USEPA, Toxic Air Pollutant Emission Factors - A Compilation for Selected Air Toxic Compounds and Sources, 1988. Specifically, Be = 25 lbs/10^{12} Btu, Hg = 3 lbs/10^{12} Btu, Pb = 8.9 lbs/10^{12} Btu. Assuming a maximum heat input rate of 1163.8 MMBtu/hr.
[4]Emission factor from: Radian Corp., Estimated Toxic Air Emissions from Coal and Oil Sources, 1989. Specifically, 29.2 lbs/10^{12} Btu. Assuming a maximum heat input rate of 1163.8 MMBtu/hr.
[5]CTGs are identical.

Applicable Air Quality Regulations

Major modifications to existing emission sources or construction of new emission sources are subject to Prevention of Significant Deterioration (PSD) regulations and must satisfy requirements specified in Standards of Performance for New Stationary Sources for emissions of SO_2 and NO_x. Contaminant levels and concentration increments pertaining to emission sources subject to these regulations are summarized in Table 3-4. Values in this table will be referred to in subsequent sections along with additional information provided by NSP to establish conformance of the CTG emissions with air quality regulations.

Prevention of Significant Deterioration Regulations

The PSD regulations, amended by the U.S. Environmental Protection Agency (USEPA) on August 7, 1980 (45 CFR 52675), specify that any major new stationary source or major modification to an existing source within an air quality attainment area (such as the Sioux Falls area) must undergo a PSD review prior to commencement of construction. For new sources, the regulations apply to:

1) Any source type in any of 28 designated industrial source categories having potential emissions of 100 tons per year or more; and

2) Any other source having potential emissions of 250 tons per year or more of any pollutant regulated under the Clean Air Act.

"Potential emissions" are defined as emissions of any pollutant at maximum design capacity (or less than maximum design capacity if specified as a permit condition) including the control efficiency of air pollution control equipment. For modifications of existing sources, the regulations apply if the existing source is major (as defined above) for any criteria pollutant and the modification results in increased emissions of any criteria pollutant exceeding the significant emission rates presented in Table 3-4.

The emission rates summarized in Table 3-3 classify the proposed CTG project as a major modification to an existing source, thus requiring a Prevention of Significant Deterioration (PSD) review. The PSD review encompasses emissions of TSP/PM_{10}, NO_x, SO_2, CO, VOCs, and Be, since the maximum potential project emissions for these substances exceed the significant emission rates listed in Table 3-4. The supporting data for the PSD review was supplied by NSP in their permit application to EPA entitled: Technical Support Document, Revision 1, PSD Permit Application for a Proposed Modification of the Pathfinder Generating Station, March 11, 1992 (herinafter referred to as the PSD Permit Application).

Table 3-4. National Ambient Air Quality Standards (NAAQS), PSD Increments, Significant Emission Rates, Significant Impact Increments, and Monitoring de minimis Concentrations.

Pollutant	Averaging Period	NAAQS ($\mu g/m^3$)		PSD Increments ($\mu g/m^3$)			Significant Emission Rates (tons/year)	Significant Impact Increments ($\mu g/m^3$)	Monitoring de minimis Concentrations ($\mu g/m^3$)
		Primary	Secondary	Class I	Class II	Class III			
Total Suspended Particulate Matter (TSP)	Annual	--	--	5[a]	19[a]	37[a]	25	1	--
	24-Hour	--	--	10[a,b]	37[a,b]	75[a,b]		5	10
Particulate Matter Less than 10 μm, (PM_{10})	Annual	50	c	--	--	--	15	1	--
	24-Hour	150[b]	c	--	--	--		5	10
Sulfur Dioxide	Annual	80	--	2	20	40	40	1	--
	24-Hour	365[b]	--	5[b]	91[b]	182[b]		5	13
	3-Hour	--	1,300[b]	25[b]	512[b]	700[b]		25	--
Nitrogen Dioxide	Annual	100	c	2.5	25	50	40	1	14
Ozone	1-Hour	235[d]	c	--	--	--	40[e]	--	f
Carbon Monoxide	8-Hour	10,000[b]	c	--	--	--	100	500	575
	1-Hour	40,000[b]	c	--	--	--		2,000	--
Lead	Calendar Quarter	1.5[b]	c	--	--	--	0.6	--	0.1
Total Reduced Sulfur (TRS) Reduced Sulfur Compounds	1-Hour	--	--	--	--	--	10	--	10
Asbestos	--	--	--	--	--	--	0.007	--	--
Mercury	24-Hour	--	--	--	--	--	0.1	--	0.25
Beryllium	24-Hour	--	--	--	--	--	0.0004	--	0.001
Fluorides	24-Hour	--	--	--	--	--	3	--	0.25
Vinyl Chloride	24-Hour	--	--	--	--	--	1	--	15
Sulfuric Acid Mist	--	--	--	--	--	--	7	--	--
Hydrogen Sulfide	1-Hour	--	--	--	--	--	10	--	0.2

[a] TSP increment to be replaced by PM_{10} increment.
[b] Concentration not to be exceeded more than once per year.
[c] Same as Primary NAAQS
[d] Expected number of days in which one or more hourly ozone concentrations exceed this value must be greater than 1.
[e] Emissions of volatile organic compounds.
[f] Increase in volatile organic compounds of more than 100 tons/year

A PSD review generally consists of:

1) A case-by-case Best Available Control Technology (BACT) demonstration, taking into account energy, environmental, and economic impacts, as well as technical feasibility;

2) An ambient air quality impact analysis to determine whether the allowable emissions from the proposed CTGs, in conjunction with all other applicable emission increases or reductions, would cause or contribute to a violation of the applicable PSD increments and NAAQS;

3) An assessment of the direct and indirect effects of the proposed CTGs on general growth, soil, vegetation, and visibility; and

4) Preconstruction ambient air quality monitoring for up to a one-year period may be required for each pollutant subject to PSD review. An applicant may be exempt from this requirement, however, if there are existing air quality monitoring data representative of the station site, or if the impact from the proposed facility is less than the monitoring de minimis concentrations listed in Table 3-4.

BACT Analysis

The BACT analyses conducted by NSP considered various control technologies applicable to stationary simple-cycle CTGs. Various candidate actions for best available control technologies were compared with respect to energy, environmental and economic impacts. The exhaustive review was presented in Section 2.3 of the PSD Permit Application. The recommended control technology for each pollutant is listed in Table 3-5.

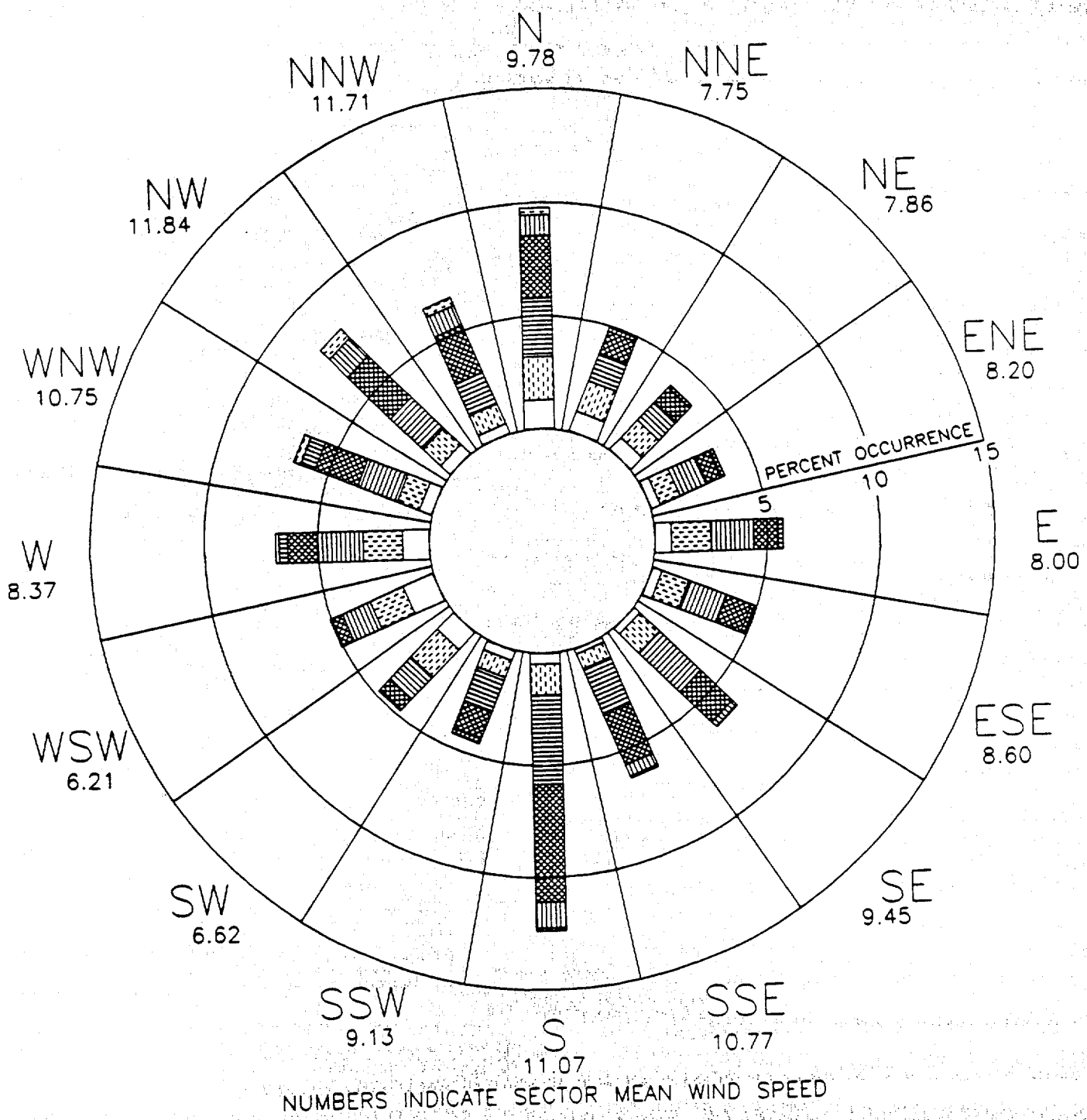
The selected fuel, operational characteristics, and design of the proposed CTG provides BACT for the PSD reviewed emissions. Water injection into the CTG combustion area reduces formation of thermal NO_x by reducing peak flame temperatures. Good combustion control maximizes fuel burning efficiency which provides minimum CO, VOC and TSP/PM_{10} emissions. Burning natural gas as primary fuel and low sulfur distillate oil reduces SO_2 and Be emissions.

Air Quality Impact Analyses

NSP conducted dispersion modeling studies to determine the ambient air quality impact of proposed CTG emissions. USEPA's Industrial Source Complex Short-Term (ISCST) model and COMPLEX I dispersion models were utilized in these studies. The ISCST model is recommended as a guideline model for assessing impacts of aerodynamic downwash,

Table 3-5. BACT control technologies for the proposed CTGs.

Pollutant	Recommended Control Technology
Natural Gas (Primary Fuel)	
NO_x	Water injection
CO	Good combustion control
VOCs	Good combustion control
TSP/PM_{10}	Use natural gas as primary fuel
SO_2	Use natural gas as primary fuel
Distillate Oil (Back up Fuel)	
NO_x	Water injection
CO	Good combustion control
VOCs	Good combustion control
TSP/PM_{10}	Good combustion control
SO_2	Use 0.37% Sulfur fuel oil as backup fuel
Be	Use natural gas as primary fuel



EIS Figure 3-3.

WIND SPEED RANGE

- 0–3 KNOTS
- 4–6
- 7–10
- 11–16
- 17–21
- >21

Figure 3–6
Wind Frequency Distribution
Wind Rose for 1985–1989

National Weather Service Station
Joe Foss Field
Sioux Falls, South Dakota

Table 3-6. Comparison of maximum predicted pollutant concentrations with Significant Impact Increments and de minimus Concentrations.

Pollutant	Averaging Period	Data Period			Maximum Predicted Concentration ($\mu g/m^3$)	Significant Impact Increment ($\mu g/m^3$)	de minimis Concentration ($\mu g/m^3$)
		Data Year	Julian Day	Period Ending			
SO_2	Annual	1985			0.9	1	a
		1986			0.5		
		1987			0.6		
		1988			0.6		
		1989			0.6		
	3-Hour Highest	1985	224	8	53.5	25	a
		1986	26	7	46.9		
		1987	252	7	54.5		
		1988	229	5	54.1		
		1989	110	1	51.8		
	24-Hour Highest	1985	12		12.0	5	13
		1986	291		9.6		
		1987	252		13.4		
		1988	332		15.6		
		1989	112		16.2		
NO_2	Annual	1985			0.5	1	14
		1986			0.6		
		1987			0.6		
		1988			0.6		
		1989			0.7		

Table 3-6. - Continued.

Pollutant	Averaging Period	Data Period			Maximum Predicted Concentration ($\mu g/m^3$)	Significant Impact Increment ($\mu g/m^3$)	de minimis Concentration ($\mu g/m^3$)
		Data Year	Julian Day	Period Ending			
CO	1-Hour Highest	1985	184	18	701.0	2,000	a
		1986	191	23	411.2		
		1987	40	13	511.8		
		1988	229	15	2343.0		
		1989	112	12	598.4		
	8-Hour Highest	1985	124	2	134.1	500	575
		1986	167	2	96.3		
		1987	79	3	115.0		
		1988	229	2	348.7		
		1989	112	2	209.4		
TSP/PM_{10}	Annual	1985			0.2	1	a
		1986			0.3		
		1987			0.3		
		1988			0.3		
		1989			0.3		
	24-Hour Highest	1985	69		5.1	5	10
		1986	6		4.9		
		1987	284		3.9		
		1988	229		6.3		
		1989	112		5.1		
Be	24-Hour Highest	1985	12		0.00007	a	0.001
		1986	291		0.00006		
		1987	252		0.00008		
		1988	332		0.00009		
		1989	112		0.00009		

[a] Not Defined

increments tabulated in Table 3-4. The Class categories are defined as: Class I - pristine areas subject to tightest control; Class II - moderate growth areas; Class III - areas of major industrialization. Since the proposed CTG facility is in a Class II area, dispersion modeling results would be compared with the Class II PSD increments in Table 3-4.

The load which produced the maximum impact for each pollutant was again used by NSP in the dispersion models for comparison to PSD increments. The results of dispersion modeling analyses tabulated in Table 3-7 demonstrate that PSD increments will not be exceeded for either SO_2 or TSP.

NSP modeled emissions from the proposed CTGs in conjunction with emissions from SO_2, PM_{10}, and CO from other sources within 50 kilometers of the CTG site to determine compliance with NAAQS. Other sources included in this dispersion model included the existing Pathfinder gas fired steam generator and the gas/oil fired boilers at the Morrell Packing Plant. To calculate the total ambient concentration, maximum predicted concentrations at receptor sites were added to background concentrations (data obtained from the South Dakota Bureau of Air Management). The total concentration was then compared with the NAAQS to determine compliance with NAAQS. Results of these calculations conducted by NSP are shown in Table 3-8. The results demonstrate that the proposed CTGs should not cause the ambient air quality to violate NAAQS.

It should be noted that the dispersion modeling analyses incorporated assumed worst-case emission scenarios. In most cases, actual emissions, and consequently, pollutant impacts, are anticipated to be much lower than those used in the modeling analyses.

Effects on Soil and Vegetation

The secondary NAAQS are intended to protect the public welfare (including soil and vegetation) from adverse effects of pollutant emissions. The effects of the pollutants emitted from the proposed CTGs were assessed by NSP in terms of demonstrating compliance with the secondary NAAQS. Since the maximum potential impact of the proposed CTGs is below the secondary NAAQS, it is anticipated that there will be no significant adverse effects on either soil or vegetation.

Effects on Nonattainment Areas, Class I Areas and Visibility

The PSD regulations require that an assessment on the effects on nonattainment areas and visibility be conducted. Since the area within 100 kilometers (km) of the proposed CTG

Table 3-7. Comparison of maximum predicted pollutant concentrations with PSD Increments.

Pollutant	Averaging Period	Data Period			Maximum Predicted Concentration ($\mu g/m^3$)	PSD Increment ($\mu g/m^3$)
		Data Year	Julian Day	Period Ending		
SO_2	Annual	1985			0.9	20
		1986			0.5	
		1987			0.6	
		1988			0.6	
		1989			0.6	
	3-Hour Highest	1985	139	2	37.6	512
	Second Highest	1986	291	2	39.6	
		1987	199	8	41.1	
		1988	68	8	37.9	
		1989	213	1	36.2	
	24-Hour Highest	1985	347		8.7	91
	Second Highest	1986	125		7.0	
		1987	136		8.4	
		1988	136		9.2	
		1989	131		6.9	
TSP	Annual	1985			0.2	19
		1986			0.3	
		1987			0.3	
		1988			0.3	
		1989			0.3	
	24-Hour Highest	1985	12		3.3	37
	Second Highest	1986	138		4.6	
		1987	96		3.2	
		1988	132		3.2	
		1989	351		3.5	

Table 3-8. Comparison of maximum predicted pollutant concentrations with NAAQS.

Pollutant	Averaging Period	Data Period			Maximum Predicted Concentration ($\mu g/m^3$)	Background Concentration ($\mu g/m^3$)	Total Concentration ($\mu g/m^3$)	NAAQS ($\mu g/m^3$)
		Data Year	Julian Day	Period Ending				
SO_2	Annual	1985			15.0	5.0	20.0	80
		1986			12.9	5.0	17.9	
		1987			13.4	5.0	18.4	
		1988			12.7	5.0	17.7	
		1989			13.2	5.0	18.2	
	3-Hour Highest	1985	136	1	451.0	11.2	462.2	1,300
	Second Highest	1986	285	3	344.7	11.2	355.9	
		1987	282	4	356.4	11.2	367.6	
		1988	297	6	402.0	11.2	413.2	
		1989	125	6	414.8	11.2	426.0	
	24-Hour Highest	1985	41		122.3	7.4	129.7	365
	Second Highest	1986	162		143.6	7.4	151.0	
		1987	334		152.0	7.4	159.4	
		1988	332		196.0	7.4	203.4	
		1989	34		128.5	7.4	135.9	

Table 3-8. Continued.

Pollutant	Averaging Period	Data Period			Maximum Predicted Concentration ($\mu g/m^3$)	Background Concentration ($\mu g/m^3$)	Total Concentration ($\mu g/m^3$)	NAAQS ($\mu g/m^3$)
		Data Year	Julian Day	Period Ending				
CO	1-Hour Highest Second Highest	1985	298	15	533.1	9732.5	10265.6	40,000
		1986	83	9	250.4	9732.5	9982.9	
		1987	80	14	384.7	9732.5	10117.2	
		1988	357	17	856.0	9732.5	10588.5	
		1989	116	13	480.3	9732.5	10212.8	
	8-Hour Highest Second Highest	1985	184	3	87.8	4122.0	4209.8	10,000
		1986	259	3	76.5	4122.0	4198.5	
		1987	252	3	74.6	4122.0	4196.6	
		1988	127	2	128.0	4122.0	4250.0	
		1989	363	1	123.2	4122.0	4245.2	
PM_{10}	Annual	1985			2.1	23.4	25.5	50
		1986			1.8	23.4	25.2	
		1987			1.9	23.4	25.3	
		1988			1.8	23.4	25.2	
		1989			1.9	23.4	25.3	
	24-Hour Highest Second Highest	1985	41		16.8	54.3	71.1	150
		1986	162		19.9	54.3	74.2	
		1987	334		20.9	54.3	75.2	
		1988	332		27.0	54.3	81.3	
		1989	34		17.7	54.3	72.0	

facility does not contain a nonattainment area for any pollutant, significant nonattainment area impacts are not expected and have not been calculated. Further, the nearest PSD Class I area (Badlands National Park, South Dakota) is greater than 400 km from the proposed CTG facility site. Thus, the impact of emissions from the proposed CTGs on visibility and other parameters at Class I areas is anticipated to be negligible.

Preconstruction Monitoring

The PSD regulations require preconstruction ambient air quality monitoring for each pollutant subject to PSD review. An applicant may be exempt from this requirement, however, if there are existing air quality monitoring data representative of the station site, or if the impact of the proposed modification is below the monitoring de minimis concentrations found in Table 3-4. Because the existing Pathfinder site is located in an area which lacks representative NO_2, TSP/PM_{10}, CO, and Be ambient air quality monitors, it was necessary to demonstrate the exemption through dispersion modeling.

The maximum impacts of NO_2, TSP/PM_{10}, CO, and beryllium determined through dispersion modeling, are below respective de minimis concentrations, exempting NSP from monitoring requirements for these pollutants. Dispersion modeling analyses predicted a maximum SO_2 concentration slightly higher than the SO_2 de minimis concentration. However, background SO_2 concentrations measured in Sioux Falls have all been below the de minimis concentration. Thus, USEPA - Region VIII granted NSP a waiver for SO_2 ambient air quality monitoring. A copy of the SO_2 ambient air quality monitoring waiver is contained in the PSD Permit Application.

Because annual potential emissions of VOCs are in excess of 100 tons per year, USEPA-Region VIII requested an assessment of the additional ozone formation due to VOC emissions from the proposed CTGs. The Reactive Plume Model lookup tables were used by NSP in the following manner to determine the worst-case ozone formation increment due to the proposed CTGs (PSD Permit Application).

The one-hour NAAQS for ozone is 235 micrograms per liter, which is equivalent to 0.12 ppm. The worst case background ozone concentration was documented by NSP to be 0.08 ppm (PSD Permit Application) which, when subtracted from the NAAQS, leaves a maximum possible ozone emission of 0.04 ppm which, from the lookup tables, translates to an emission rate of 2,500 tons per year. Since the CTGs emit ozone at greater rates when operating at less than 100 percent of full load, NSP determined that the 0.04 ppm ozone

emission would not be exceeded if the CTGs are operated a maximum of 48 unit hours during a given day at less than 50 percent load. Based on a commitment by NSP to operate the CTGs a maximum of 48 unit hours during a given day at less than 50 percent load, USEPA-Region VII has waived the ozone preconstruction monitoring requirement of PSD.

New Source Performance Standards

The USEPA has promulgated New Source Performance Standards (NSPS) for gas turbines which were designed to control emissions of NO_x and SO_2. The proposed CTGs will incorporate water injection to control NO_x emissions. SO_2 emissions will be controlled by using natural gas as a primary fuel and 0.37 percent sulfur (low sulfur) distillate fuel oil as the back-up fuel. The control levels of NO_x and SO_2 will meet gas turbine NSPS (PSD Permit Application).

NSP submitted the PSD Permit Application to EPA Region 8 on March 11, 1991. On September 2, 1992, EPA issued a "Conditional Permit to Commence Construction and Operate" the proposed CTG facility. The permit contained several conditions regarding construction, operation, and monitoring of the proposed CTG facility to assure compliance with the requirements of the Clean Air Act.

3.1.2.2. Ground Water Quality

Two potential ground water quality impact sources from the proposed CTG facility exist: (1) the two existing 2-million-gallon fuel oil tanks and (2) seepage occurring from the four settling basins.

Leakage or spillage of fuel from the storage tanks is a potential threat to ground water quality unless it is properly contained and disposed of. Existing separate containment dikes designed to contain over 110 percent of the volume of each tank provide protection against catastrophic spills or tank ruptures. Precipitation normally evaporates from the containment dike. However, if the containment areas become full due to large amounts of rain or spring snow melt, NSP will test the precipitation for the presence of No. 2 distillate fuel oil (NSP EIR 1991). If fuel oil is found to be present above the NPDES permit limits, then steps will need to be taken to treat the precipitation to remove the fuel oil. The treated water will then be discharged to the existing wastewater settling basins. If the testing of the precipitation indicates that no fuel oil is present or is present at levels below the NPDES permit limits, then the precipitation will be discharged to the settling basins.

There is no sump pump, oil skimmer, or oil water separator associated with the fuel oil basins. Minor oil spills and drips will need to be cleaned up by NSP maintenance personnel.

The settling basins serving the existing Pathfinder steam plant would also receive the wastewater from two demineralization units associated with proposed CTG facilities. The combined instantaneous wastewater discharge is estimated to be a maximum of 268,650 gallons per day, 60 percent of which would derived from processes serving the proposed CTG facilities (NSP NPDES Application 1991). NSP estimates that the maximum total annual discharge to the settling basins would be in excess of 33 million gallons per year, based upon 2 CTG demineralizer systems operating 280 days per year (equivalent to four CTG units operating 2,000 hours per year each) and the existing Pathfinder steam plant operating 100 days per year.

NSP personnel have indicated that significant seepage currently occurs from the west basin into which process wastewater from the existing steam plant are discharged. Since the bottoms of the remaining three settling basins penetrate the same formation (see Figure 2.22), infiltration from these basins is also expected to occur. Seepage losses from the settling basins would enter the alluvial (Big Sioux) Aquifer which is in the current flood plain of the Big Sioux River.

As indicated by monitoring well water level measurements, the predominant flow direction of water in the formation intersecting the settling basins is toward the Big Sioux River (see Figure 2–21). The impermeable soil underlying the sandy gravel formation intersected by the pond bottoms forms an effective barrier to vertical flow. Thus, water seeping from the basins would be expected to flow through the buried permeable layer toward the river, assisted by the gradient imposed by this additional source of water. The subsoil formations under the ponds essentially form a natural conduit between the ponds and the river.

NSP has estimated the annual average concentrations for chemical parameters discharged into the aquifer (NSP EIR 1991 and NSP NPDES Application 1991). These estimated concentration are presented in Table 3–9 along with source water qualities and the South Dakota Ground Water Quality Standards (SDGWDS). Estimated discharge water quality was based upon the following conservative assumptions:

- Two CTG demineralized systems operating 280 days per year;
- The existing steam plant operating 100 days per year;

Table 3-9. Comparison between estimated concentration of seepage to the Big Sioux Aquifer and the South Dakota Ground Water Quality Standards.

Parameter	Concentration (mg/l)			
	Influent River Water Concentration	Influent Ground Water Concentration	Estimated Concentration of Discharge to Big Sioux Aquifer[1]	South Dakota Ground Water Quality Standards
Fluoride	0.4	0.51	1.0	2.4
Nitrate-N	16.6	4.3	20	10
Chloride	348.7	60	342	250
Sulfate	243.1	382	1690	500
TDS	1313	1038	3083	1000
pH (units)	8.0	7.4	6.5-8.5	6.5-8.5

[1]The values listed are estimated annual average concentrations for these parameters in the discharge to the settling basins. These values do not take into account potential attenuation resulting from seepage into the Big Sioux aquifer.

Note: Section 74:03:15, Groundwater Quality Standards, of the South Dakota State Code of Regulations lists several additional parameters for which standards exist. However, since none of these constituents are expected to be present in the combined discharge from the Pathfinder facility, they have not been listed in this table.

- No evaporation losses from the settling basins, and no direct discharge from the settling basins to the Big Sioux River;
- A seepage rate equivalent to the rate at which wastewater enters the settling basins;
- No attenuation of chemical constituents from seepage to the alluvial aquifer;
- No dilution of wastewater in the settling basins from other sources (i.e., storm water).

As indicated in Table 3–9, it appears that the estimated seepage composition will exceed the SDGWDS for nitrate-N, chloride, sulfate, and total dissolved solids (TDS). The nitrate-N, chloride and TDS concentrations in the influent river (source) water samples and the TDS concentration in the influent well (source) water used for this analysis also exceed the SDGWDS.

Of the parameters anticipated to exceed the SDGWDS, nitrate-N is the only parameter which is listed as a criteria for human health. The primary reasons this parameter is estimated to exceed the SDGWDS in the effluent wastewater are (1) the high concentration of nitrate-N in the influent river water at 16.6 mg/1 and (2) the concentrating effect of facility processes on nitrate-N. No additions of nitrate-N or any chemical parameter of concern are anticipated as a result of facility operations.

Even though local elevated levels of these constituents may occur in the groundwater system between the ponds and the river, the impact on the local and regional groundwater quality is not expected to be significant because:

1) seepage water is expected to move toward and enter the Big Sioux River,
2) impermeable formations beneath the pond prevent vertical movement toward deeper aquifers, and
3) no water supply wells exist between the settling ponds and the Big Sioux River.

Due to the nature of the settling pond/groundwater interaction, NSP submitted a Groundwater Discharge Plan Application to SDDENR on March 31, 1992. On October 1, 1992, NSP received a Construction Permit and Water Quality Variance from SDDENR. The Water Quality Variance became effective on October 1, 1992 and is subject to biennial review on or before September 30, 1994. The construction permit requires NSP to monitor at least six wells on a quarterly basis and submit analytical results to SDDENR within 30 days of receiving sampling results. Ambient water quality will be established prior to the Water Quality Variance renewal on the basis of these results.

3.1.2.3. Surface Water Quality

Water quality in the Big Sioux River may potentially be impacted by both surface and subsurface discharges from the settling basins at the NSP site. In the event of extended operating periods in which settling basin capacities are exceeded, water from the settling basins may overflow to the Big Sioux River. As discussed in Section 3.1.2.2, Ground Water Quality, subsurface discharges from the settling basins are likely to move toward the river, with release into the river through the river bed.

Under the assumed worst case scenario, flow to the river resulting from settling basin overflow is estimated by NSP to be equivalent to the total discharge from the proposed CTG and existing Pathfinder facility treatment systems, which is in excess of 33,000,000 gallons per year. Thus, the assumed worst case scenario assumes full settling basins, no seepage from the settling basins, no evaporation loss from the settling basins, operation of two CTG demineralized systems for 280 days per year, and operation of 100 days/year for the existing Pathfinder Plant.

Discharge water chemistry was estimated by NSP (NSP NPDES Application 1991) based on the composition of source water supplies and treatment provided in the water treatment process. Actual analysis of wastewater discharge is not available because water has never been discharged to the river from the settling basins. Estimated discharge water composition is compared to applicable Surface Water Quality Standards in Table 3–10.

Based on the above-mentioned conservative assumptions, it appears that the estimated wastewater discharge from the Pathfinder and proposed CTG facilities may exceed the SDSWQS for pH. Since the water treatment facility contains pH adjustment equipment, operators will be able to control discharge pH to meet the SDSWQS in the event discharges occur.

The SDSWQS for TDS in stream segments classified as "wildlife propagation and stock watering" beneficial use class is 2,500 mg/1, while the estimated worst-case TDS discharge concentration for the proposed CTG facility and existing plant is 3,091 mg/1 (see Table 3–10). While the discharge itself is expected to contain a TDS concentration greater than the SDSWQS, when the discharge is mixed in the river, the water quality impact is expected to be greatly diminished by dilution, allowing the river to remain within the SDSWQS.

Table 3-10. Comparison of estimated discharge into the Big Sioux River with South Dakota Surface Water Quality Standards.

Parameter	Concentration (mg/l)	
	Estimated Discharge into Big Sioux River (Maximum Daily)[1]	SDSWQS Limit
Ammonia-N (unionized)	<0.04	0.04
Dissolved Oxygen	>5.0	>5.0
Total Residual Chlorine	<0.02	0.02
Oil and Grease	<10	<10
Total Suspended Solids	<30	90
Total Dissolved Solids	3091	2500
Total Alkalinity (as $CaCO_3$)	157	750
Nitrate-N	21.2	50
Temperature	<90°F	<90°F
pH	6.0-8.5	6.5-8.3
Sodium Adsorption Ratio	3.63	10.0

[1]From: Pathfinder Combustion Turbine NPDES Permit Application (NSP, 1991)

The effect of dilution on river water quality is demonstrated by the TDS concentrations tabulated in Table 3–11. River flows and water qualities at various flow conditions were combined with the maximum projected discharge flow and TDS concentration to estimate the TDS concentration in the Big Sioux River downstream of the discharge point. River flows for these calculations were obtained from the North Cliff Avenue station historical flow data presented in Table 2–22 and the associated text. Average and maximum river TDS concentrations were obtained from the North Cliff Avenue data presented in Table 2–24. While average river flows and concentrations are expected to be typical on an annual basis, critical conditions would occur in the river at low flows, during which the TDS concentrations are typically greater. As a conservative measure, the maximum measured river TDS concentration was assumed to exist at the low flow conditions.

Under the three conditions presented in Table 3–11, the estimated in-stream TDS concentration remains far below the 2500 mg/l stream standard. In the average flow/concentration, the NSP discharge was estimated to raise the stream TDS by less than 2 mg/l, to approximately 820 mg/l. Under the low flow, maximum concentration condition, the river concentration was estimated to increase by 105 mg/l to 1524 mg/l. These concentrations would be expected to occur in the river within a short distance downstream of the NSP discharge point. Higher concentrations may be expected in the river between the discharge point and the point where the river and discharge become completely mixed. Given the meandering nature of the stream downstream of the NSP outfall, complete mixing of the NSP discharge with the river is expected to occur within a quarter mile of the outfall.

Impacts of the subsurface flow from the settling basins to the River are expected to be similar to those from the surface discharge, but less noticeable due to dilution of the subsurface discharge by groundwater flow. In both cases, the impacts of the discharges on Big Sioux River water quality after the waters are completely mixed are expected to be minimal and the SDSWQS limits should not be exceeded.

For the reach of the Big Sioux where the river and projected NSP discharge are incompletely mixed, TDS concentrations in excess of 2500 mg/l may exist. Potential impacts of high TDS concentrations on terrestrial and aquatic resources are discussed in following sections.

The proposed discharge of wastewater into the settling basins would contain a variety of other inorganic plant nutrients that may affect water quality. High concentrations of

Table 3-11. Estimated TDS concentrations in the Big Sioux River at various river stages after mixing with the maximum day NSP discharge.

	Big Sioux River Flow/Water Quality Condition[1]		
	Average Flow, Average Concentration	5 yr - 7 day Low Flow, Maximum Concentration	10 yr Low Flow, Maximum Concentration
River Flow, cfs	500	12.5	6.26
Upstream River Concentration, mg/l	818.3	1419	1419
NSP Discharge Flow, cfs	0.42	0.42	0.42
NSP Discharge Concentration, mg/l	3091	3091	3091
Mixed Flow, cfs	500.42	12.92	6.68
Mixed Concentration in Big Sioux River, mg/l	820	1473	1524

[1]Flow and TDS concentrations for the stated conditions are extracted from the North Cliff Avenue monitoring station data presented in Table 2.21 (flow) and Table 2.24 (TDS at 105°C).

inorganic nitrogen and phosphates are likely to result in large algae populations in the settling basins. Under these conditions dissolved oxygen concentrations would be high during the day and reach lowest concentrations at dawn. The night time oxygen demand caused by the algae in the effluent could affect dissolved oxygen concentrations in the Big Sioux River down stream of the discharge point, especially during low flows. This effect could be mitigated through restrictions on timing of discharges through the NPDES permitting process.

3.1.2.4. Impacts to Aquatic Resources

Small aquatic organisms (microinvertebrates) are generally the most sensitive to changes in water quality resulting form the discharge of toxic pollutants. In some cases macroinvertebrates or fish may be more sensitive than small species to water quality changes. If effluent limits are set to prevent adverse impacts (short or long term) to the most sensitive species in the aquatic environment regardless of species, all of the aquatic biota in the community would be afforded protection.

The constituents in the settling basin overflow contributing to the dissolved solids concentration include a mixture of fluorides, chlorides, sulfates, nitrates, bicarbonates, and phosphates of sodium, potassium, calcium, magnesium, iron and manganese. A thoughtful evaluation of the potential effects of the proposed discharge of settling pond water to the Big Sioux River focusing on effects of TDS and associated constituents is included in NSP's Environmental Impact Report (1991) and is inserted here with little modification.

Fish Species

All species of fish and other aquatic life must tolerate a range of dissolved solids concentrations in order to survive under natural conditions. However, the presence of the major ions at relatively high concentrations or in combinations not usually encountered by fishes may cause direct toxemia or subtle changes resulting in reduction of fish populations, (USEPA, 1976).

Specifically, TDS fish toxicity is dependent upon the TDS concentration in the water and combination of ions which make up TDS. Carbonate (or bicarbonate) salts of calcium, magnesium, and sodium are more toxic to fishes if they occur singly than if the water contains chloride or sulfate salts of these cations. Sulfate salts are less toxic to freshwater fishes than carbonate (bicarbonate) salts, and chloride salts are the least toxic. However,

tolerance to higher concentrations of either sulfates or chlorides by freshwater fishes appears to be enhanced if there is a well balanced mixture of all major cations and anions (Post 1983).

In addition, fish can become acclimated slowly to higher salinities than those to which they are accustomed, but fish in waters of low salinity cannot survive sudden exposure to high salinities (Post 1983).

A study of TDS effects on fish species was conducted in over 60 lakes in Saskatchewan, which ranged in dissolved solids concentration from 300 to 118,000 mg/l. Twenty-six species of fish inhabit the series of lakes with the common sucker, northern pike, yellow perch, and pickerel as dominant species. Only one fish, the nine-spined stickleback, inhabited a lake with a TDS concentration as high as 20,000 mg/l. The study concluded that lakes with TDS in excess of 15,000 mg/l were unsuitable for most freshwater fishes, and that TDS concentrations between 5,000 and 10,000 mg/l may be limiting to freshwater fishes, depending on ionic complement in the water, fish species, and previous acclimation of the fishes to higher concentrations (Rawson and Moore 1944).

A study of the limnological characteristics of prairie lakes and their influence on wetland biota and use by waterfowl in south-central North Dakota found that lakes that supported game fish within the study area had specific conductances ranging from 770 to 4,150 microsiemmens per centimeter (µS/cm) [conductivity measured in µS/cm is roughly equivalent to TDS in mg/l], (Swanson, no date).

A study of fathead minnows in the alkaline lakes of Nebraska's Sandhill region and some South Dakota lakes, found that fathead minnows were found in lakes with an average TDS concentration greater than 7,000 mg/l. Moreover, adult minnows could overwinter in a lake where TDS level approached 12,000 mg/l and spawn successfully in spring where TDS levels ranged from 6,000-7,000 mg/l (Held and Peterka 1974).

A study was conducted in an Illinois river to determine the acute toxicity of chlorides, sulfates, and TDS on certain fish species. Test specimens were exposed to a given concentration TDS principally made up of chloride (TDS-CL water) in one case, and sulfate (TDS-SO_4 water) in the other, for 14 days. Test specimens used were largemouth bass fingerlings, bluegill fry, and channel catfish fingerlings.

A median tolerance limit (TL_{50}) (i.e., the concentration at which 50 percent of the test specimens survive), was used to determine acute toxicity. In the TDS-CL water, the TL_{50} concentrations for the species used ranged from 13,000 to 15,000 mg/l TDS. In the TDS-SO_4 water, the TL_{50} concentrations ranged from 14,000 to 17,500 mg/l. In both cases catfish were the most sensitive (Reed and Evans 1981).

Juveniles of three endangered Colorado River fishes were subjected to a gradient of TDS to determine the concentrations they preferred or avoided. The results of the study indicated that Colorado squawfish, Plychocheitus lucius, preferred TDS concentrations of 560 to 1,150 mg/l and avoided TDS concentrations at 4,400 mg/l. Humpback chub, Gila cypha, preferred TDS concentrations of 1,000 to 2,500 mg/l and avoided TDS concentrations above 5,100 mg/l. Bonytail, Gila elegans, preferred TDS concentrations between 4,100 and 4,700 mg/l and avoided TDS concentrations less than 560 mg/l or greater than 6,600 mg/l (Pimental and Buckley 1985).

In summary, based on the results of the fish studies presented herein, limiting concentrations of dissolved solids for fresh-water fish appear to range from 5,000 to 10.000 mg/l, according to dissolved ion make-up, fish species, and prior acclimation of the fish.

The potential impact of the wastewater discharge from the proposed CTG facility on fish species in the Big Sioux River is expected to be minimal primarily due to dilution of the discharge by river water. Other factors which tend to minimize the impact include:

- The estimated discharge is comprised of a mixture of all the major cations and anions, reportedly the least toxic form of TDS to fish.
- Dominant fish species in the Big Sioux River near the proposed CTG facility are hardy, disturbance tolerant species such as carp, white sucker, black bullhead, and fathead minnow which were all shown to be more TDS tolerant in the studies presented above.
- The only threatened species that may be present would be the trout-perch which is a temperature sensitive species. The temperature of the discharge from the settling basins is anticipated to be similar to ambient river temperature due to the residence time in the settling basins.

Wildlife and Livestock Species

According to the Livestock Water Quality Handbook, developed by the Great Plains States Cooperative Extension Service, waters containing up to 3,000 mg/l TDS are satisfactory for all classes of livestock including poultry, and waters containing 3,000 to 5,000 mg/l TDS are satisfactory for livestock but poor to unsatisfactory for poultry. Adverse health effects to poultry resulting from ingestion of water with TDS concentration in the range of 3,000 to 5,000 mg/l include watery feces, and possible immortality and decreased growth, especially near the upper limit, and especially to turkeys (Olson and Fox 1973).

Waterfowl contain salt glands that increase their tolerance of elevated salt levels (Ellis *et al.* 1963; Cooch 1964; Riggert 1969, 1977; Swanson *et al.* 1984). Salt glands become functional with age and length of exposure to elevated salt levels. Birds with flight capability can feed on saline lakes and fly to fresh water in spring seeps or adjacent fresh lakes (Swanson *et al.* 1984). However, recently hatched ducklings require fresh water for survival (Riggert 1969; Swanson *et al.* 1984) because their salt glands are not fully functional until about 6 days posthatch (Ellis *et al.* 1963and Riggert 1969).

Some recently hatched mallard and blue-winged teal ducklings exposed to lake water under controlled conditions (Swanson *et al.* 1984) experienced mortality in water that had a conductivity of 16,000 µS/cm, and none could tolerate water exceeding 23,000 µS/cm. All water with a specific conductivity equal to or greater than 17,000 µS/cm significantly reduced duckling growth rates when compared with control groups. Conductivity levels below 17,000 µS/cm were not tested. Thus, a maximum limit of salinity that allows normal growth was not established.

About 150 waterfowl died and another 250 became weak and lethargic from suspected salt poisoning after using White Lake, a highly saline lake in Mountrail County, North Dakota. Frigid temperatures made fresh water unavailable, forcing the birds to ingest the saline waters with resultant toxic effects. Average sodium concentrations were greater than 17,000 mg/l when measured in July, 1986. Sixty percent of the affected waterfowl were Canadian geese, 30 percent were snow geese. Also affected were common merganser, the lesser scaup, and the Ross goose (Windingstad 1987).

Migrating wildlife are likely to be attracted to the settling basins, especially if warm water is discharged to them providing open water habitat, not otherwise available due to ice cover, during late fall migrations. Often waterfowl are under stress from long flights and will

drink large quantities of water if they are dehydrated. A number of geese died at Bitter Lake in Day County, South Dakota in 1991. SDGF&P personnel appearing on the evening news attributed the loss to salt poisoning. Bitter Lake exhibited TDS concentrations of 14,472 to 24,240 from 1969 to 1971 (Leap 1988).

The proximity of the ponds to uncultivated grassland and trees along the Big Sioux River is likely to attract nesting waterfowl which increases the likelihood that young birds may be exposed to the toxic effects of water high in TDS. The overall carrying capacity of the area for nesting waterfowl should not be significantly affected.

Other than waterfowl, no information was available regarding the effects of water elevated in TDS on wildlife. However, it is assumed that the effects of drinking water elevated in TDS on other types of wildlife in the area (i.e., beavers, white-tailed deer, etc.) would be similar to the effects on livestock mentioned previously.

Invertebrate Species

Limited data is available which addresses the potential effects of TDS on invertebrates. However, the data which is available suggests that invertebrate species present in a water body may change in composition with changes in dissolved solids concentration (Swanson, *et al.* 1974). The data also suggests that the changes are most pronounced when the dissolved solids levels exceed 5,000 µS/cm. Gastropods, (i. e., pond snails) such as Lymnaea stagnalis prefer water bodies low in dissolved solids (less than 5,000 µS/cm). As dissolved solids concentrations increase (up to 10,000 µS/cm), Stagnicola species tend to dominate over the Lymnaea stagnalis. Crustaceans (i.e., crayfish, crabs, and shrimp) such as amphipods are replaced by Anostraca as salt concentrations increase and eventually brine shrimp dominate the crustaceans at dissolved solids concentrations greater than 35,000 µS/cm. Insecta (i.e., insect species) decrease in numbers as dissolved solids concentration increases. Eventually brine flies, (Ephydra spp.) and water boatmen (Corixidae) predominate (Swanson, no date).

In summary, based on the limited information available, it appears that estimated TDS concentration in the discharge from the existing and proposed CTG facility is likely not high enough to affect livestock or wildlife utilizing the river downstream of the mixing zone. Poultry may be marginally affected if they ingest the discharged water before it is completely mixed with the river.

3.1.2.5. Impacts to Terrestrial Resources

Since the proposed CTG facility site is adjacent to an existing power plant, and operation of the CTG facility is expected to be intermittent (during high energy demand periods), anticipated operational impacts on plant and animal resources in the vicinity of the proposed CTG facility will be minimal. No rare, threatened or endangered species are known to inhabit the area on which the proposed CTG facility and pipeline will be constructed.

Impacts to Wildlife

Impacts to wildlife in the vicinity of the CTG facility would result mainly from the noise of operation. The principal reaction to transient and unexpected noise by wildlife is startle or fright. Wildlife generally flee from the noise source temporarily or for long periods if the noise persists. Some wildlife have a tendency to adapt to noise that is predictable and unchanging. For example, the reactions of birds to high noise levels include fright reactions, altered behavior, and in some cases, attraction to noisy areas.

Some animals would tolerate increased noise levels whereas others would temporarily avoid such areas. During periods of noise generating activity at the Pathfinder Site (e.g., periods of heavy equipment use during construction), wildlife may avoid the area where the activity is occurring. Any noise effect should be localized around the area of activity with impacts decreasing as the distance from the noise source increases.

3.1.2.6. Water Use Impacts

The proposed operation of the CTG units is based on the use of water from on–site wells and NSP presently does not have any plans to appropriate Big Sioux River water for use in the proposed system. From a water use standpoint this relieves the proposed facility of a negative impact on the flows in the river resulting from operation of the facility.

NSP has proposed to use ground water taken from two existing on-site wells (wells A and B), screened in the Split Rock Creek aquifer, as a source of process and sanitary water for the proposed CTG facility. NSP submitted Appropriation Permit Applications for these wells to the SDDENR and received approval for these permits on March 4, 1992.

A discussion of the hydrogeology of the Pathfinder site was made in Section 2.4.8.3. In this section the current usage of the Split Rock Creek aquifer was discussed as well as the hydraulic characteristics of this aquifer. In addition, NSP contacted the South Dakota Division of Water Rights (SDDWR) to obtain a listing of wells on record at the state which

were completed into the Split Rock Creek Aquifer and located within 3 miles of the proposed CTG facility, and NSP conducted a door-to-door field inventory to locate any additional undocumented wells within the above-mentioned area. The door-to-door inventory revealed a few additional wells located in the Split Rock Creek aquifer, but all were producing at less than 20 gpm. Recent studies have shown that the Split Rock Creek aquifer may contain as much as 850,000 acre-ft of water in storage. This compares to an estimated 725,000 acre-ft of storage in the glacial aquifers in Minnehaha County (Lindgren and Niehus 1992). Consequently, Sioux Falls and Brandon have recently began additional exploration of the potential of the Split Rock Creek aquifer as a municipal water source. At present the Split Rock Creek aquifer is considered more than capable of handling the proposed withdrawals without significant impact on the aquifer and affecting other users of the aquifer. The interest in using water from the Split Rock Creek aquifer shown by Brandon and Sioux Falls may, in the future, impact the water levels in the Split Rock Creek aquifer. Presently the South Dakota Geological Survey and the U.S. Geological Survey are conducting a study of the Split Rock Creek aquifer to better define its extent and its sustainable capacity as a source of water for users.

3.1.2.7. Transmission Line Electric and Magnetic Fields

There is considerable controversy over whether electric and magnetic fields pose a significant health risk to the general public. The new transmission line proposed in this project simply connects the CTG units to an on–site substation. Given the remoteness of the site the risk to the general public is slight.

3.2. Impact on the Socio–Economic Environment

3.2.1. Land Acquisition

The CTG units will be constructed on NSP property and will not require the purchase of additional land. The natural gas pipeline placement will require the acquisition of easements from property owners along the selected pipeline route. It is expected that landowners would be compensated by NSP for the easement purchased and for damages to crops or other features resulting from the pipeline placement. It is not anticipated that the zoning of the land along the pipeline route would change as a result of the easement. The easement would place certain restrictions on the land use and zoning of the property. This would likely not affect farming operations. However, much of the land along the pipeline routes is anticipated to be residential areas as Sioux Falls grows eastward. The largest impact

on the acquisition of easements would be to reduce the amount of land available for future development in the area.

3.2.2. Property Values

A gas pipeline is much less visually obtrusive than an electric transmission line. Farming is affected less over a gas pipeline than under and around the poles of an electric transmission tower. The majority of the pipeline is proposed to be located in an existing electric transmission line easement and land uses in the easement are limited in both cases. Effects on property values near electric transmission lines have been slight. In view of the more hidden nature of a gas pipeline, property value effects should be slight.

3.2.3. Tax Payments

The economic book life of the proposed combustion turbine is 25 years. However, the facility will continue to operate as long as it is economically viable to do so. The impact on sales taxes and property taxes will be dependent on the number of CTG's installed at the Pathfinder site, as indicated in Table 3–12.

Effects on property taxes as a result of new easements secured for the proposed pipelines will be determined by the local tax assessor. The pipeline itself is expected to cost approximately $4 million and would generate approximately $80,000 per year in property taxes. Approximately $25,000 would go to the taxing authorities in Lincoln County with approximately $55,000 going to the taxing authorities in Minnehaha County.

3.2.4. Construction Workforce

NSP has estimated that the construction workforce required for the proposed CTG facility will be begin at about 10 and rise to about 60 during the peak construction efforts, and dwindle back to about 10. The construction is anticipated to take about 14 months to complete. The construction of the pipeline is anticipated to take about four months and will require about 100 workers with about fifty percent of these from the local workforce. It is anticipated that the majority of these workers will be drawn from the local or area workforce. Some positive benefits to the local community would be expected; however, due to the relative small number of workers required and the short time of employment, the benefits are anticipated to be minimal.

Table 3–12. Anticipated sales and property tax payments.

Number of Units	Estimated Project Cost ($1000)	Sales Tax[1]		Property Tax	
		Rate	Amount ($1000)	Rate	Amount per year ($1000)
1	$ 48,000	1.33 %	$ 640	2.15%	$ 1,030
2	79,000	0	0	2.15%	1,680
3	112,000	0	0	2.15%	2,410
4	145,000	0	0	2.15%	3,120

[1]The sales tax rate and amount include the refund for large projects.

3.2.5. Economic Impacts

Construction of the proposed CTG units and the pipeline will provide some additional employment and purchase of local materials. However, the increases will be temporary and therefore will likely not result in significant economic impacts on the local economy. The property tax payments associated with the project will provide substantial increases in monies available to school districts, which will have significant long-term impacts to the Brandon and Sioux Falls school districts.

3.2.6. Traffic

During construction of the CTG facilities and the pipeline, construction-related activities will increase local traffic levels due to the influx of construction crews, increased numbers of trucks and movement of heavy equipment. These impacts will be temporary as construction activities progress.

Most of the heavy equipment associated with the CTG facility will be transported to the site by rail. This would include the main CTG components and large transformers. For a two unit installation, this would require about 5 rail cars. The remaining equipment would be delivered by truck. Approximately 200 truck deliveries would be required for the installation of two CTG units. It is estimated that approximately 4,000 cubic yards of concrete would be required for two CTG units. This would require approximately 500 truck deliveries. Delivery would be spread over a two- to three-month period averaging 10 to 12 trucks per day. Much of this material would likely come from the eastern Sioux Falls area, minimizing the impacts on areas other than Rice Street and Brandon Road.

Initial filling of fuel oil storage tanks will be by rail, truck, or a combination of both depending on market conditions. If all the fuel oil for two CTG units is delivered by rail, approximately 90 rail cars will be required at 20,000 gallon capacity each. If all the fuel oil for two CTG units is delivered by truck, approximately 230 tankers will be required at a capacity of 7,500 gallons each.

The impact of these activities on local traffic patterns is expected to be minimal.

Once the CTG units are in operation, the only regular deliveries required will be for No. 2 distillate fuel oil. Fuel oil will be delivered by rail car or truck depending on market conditions. The CTG units will be remotely controlled requiring only security personnel and

a small maintenance workforce at the site. The traffic levels due to these operations are not considered to have an impact on the study area.

3.2.7. Health and Safety

It is not anticipated that construction of the CTG facility will impose any unusual or unique health or safety hazards to construction workers, NSP employees or the general public. The proposed project will be undertaken with the health and safety of all construction workers and the general public in mind. Contract safety requirements will require all contractors to comply with applicable federal, state and local safety statutes, orders, rules and regulations pertaining to the protection of workers, frequenters and the public from injury or damages.

3.2.8. Solid Waste

Refuse and construction debris generated during construction of the proposed facility and the pipeline will be recycled or disposed in a licensed sanitary landfill. The amount of construction debris is anticipated to be minimal. The impact to existing solid waste disposal facilities is expected to be negligible.

3.2.9. Farming Operations

There would be some interference with farming and cattle operations during pipeline construction. Cattle would have to be moved to other pastures while the pipeline construction was in progress, or if that were not possible, temporary fencing would have to be erected to keep cattle away from the construction. Crops growing in the construction easement at the time construction starts would be destroyed.

To accommodate pipeline construction, fences would be opened, access roads could be damaged, and drainage could be disrupted during construction. Arrangements will have to be made with farm operators to minimize the impacts to farming operations. Inconveniences would be temporary and all operations should be able to return to normal once construction is completed.

3.2.10. Energy

The main energy consumption during construction activities would be from construction equipment fuel use. Once the CTG units are brought on line the primary fuel usage will be natural gas. The facility is designed to operate to meet peak capacity needs, most often occurring during the hottest days of the year. There could be occasions when the

peaking facility would operate during peak natural gas usage during the winter months, for example, if another plant has unexpected down time. The gas received by NSP for this project is on an "interruptible" basis meaning that other users, such as Minnegasco customers for heating purposes, would continue to receive their supply. The backup No. 2 fuel oil would be used to operate the CTG units in this case.

3.2.11. Cultural Resources

As discussed in Chapter 2, a pedestrian survey was conducted along the proposed pipeline routes and at the CTG facility. Little cultural material was found. A portion of the area visited was heavily vegetated at the time of the survey. Visibility in this area (E1/4, E1/4, SW1/4 and S1/2, SE1/4, SE1/4, NW1/4, Section 31, Township 102N, Range 48W) was essentially zero. Two shovel tests were excavated to depths of about 30 cm below the surface. The results of these tests were negative. The topographic position of this area, on an upper terrace of the Big Sioux River, holds perhaps the greatest potential for prehistoric occupation in the project area. There is also the potential that a site, if present, is buried in the deep loessic soils below the depth of shovel testing. Therefore, it is recommended that in conjunction with a monitoring program, this area be mechanically stripped of vegetation and the upper soil horizons be removed in shallow layers to a depth sufficient to reasonably preclude the existence of cultural occupation. This method would be most effective in terms of generating visibility and providing an opportunity to identify any cultural resources present.

If conducted prior to actual construction, this process would allow for several options in the event that significant cultural material is identified (trenching with the right–of–way around sensitive areas, shifting of the right–of–way, mitigation, etc.).

Providing no significant cultural remains are identified during monitoring in Section 31, Township 102N, Range 48W, cultural resources clearance is recommended for the project as planned along either the preferred or alternative route.

3.2.12. Aesthetics

The Pathfinder site and the general area of the proposed plant are visually dominated by the existing generating facility, substations, associated support facilities and numerous electrical transmission towers. The proposed CTG facility will be similar in appearance to the existing facilities. There are few close neighbors to the site and the primary visual impact

will be to vehicle traffic along Brandon Road or Interstate 90. The visual impact of the plant facilities will be negligible.

As the pipeline will be buried the visual impact of the pipeline will be negligible.

CHAPTER 4

ANY ADVERSE ENVIRONMENTAL EFFECTS WHICH CANNOT BE AVOIDED SHOULD THE PROPOSED ACTION BE IMPLEMENTED

4.1. Impacts to Water Quality

During construction of the proposed facility there may be an unavoidable increase in stream turbidity both at the CTG construction site and in places where the pipeline crosses intermittent streams and lesser drainages. Turbidity and siltation should be minimized, but cannot be avoided by using erosion control practices during construction. Some localized violations of water quality standards for suspended solids is to be expected, but the adverse effects should be localized and not permanent.

Wastewater seepage into the permeable formation intersected by the settling pond bottom will result in unavoidable degradation of groundwater quality in the approximately 1000 foot segment between the ponds and the Big Sioux River. While dilution by existing groundwater may decrease the impact somewhat, the degraded water will be propelled to the river by the existing gradient. Thus, the impact will be restricted to the segment of the aquifer between the settling ponds and the river. Since there are no existing or planned water supply wells in the aquifer between the ponds and the river, the impact will not restrict development of the aquifer as a water resource.

Discharge to the Big Sioux River by the subsurface seepage described above, or potential discharges from the wastewater settling ponds through the surface drainage ditch to the Big Sioux River would have negative unavoidable impacts on river water quality. The discharged wastewater may contain total dissolved solids greater TDS than 3,000 mg/l, which is greater than the South Dakota Surface Water Quality Standard of 2,500 mg/l for the Big Sioux River. As discussed in Section 3.1.2.3, river dilution will reduce TDS concentrations to less than 2,500 mg/l. The actual TDS value obtained in the river will depend on river flow. TDS concentrations in the stream may violate the Standard in the stream segment between the outfall and the point where the stream and the discharge are completely mixed. Minor negative impacts on the aquatic life in this segment may occur. These impacts are discussed at length in Section 3.1.2.3.

The increase in TDS in the Big Sioux River resulting from surface or subsurface discharge is unavoidable, but will not impair the beneficial uses of the stream downstream of the mixing zone.

4.2. Impacts to Vegetation and Terrestrial Habitat

An unavoidable impact of the proposed action will be the loss of a small seepage wetland at the Pathfinder Site. The primary effect will be the loss of hydrophytic vegetation. Although the vegetation of this wetland is not unique, its loss would represent a reduction in habitat diversity for the Pathfinder Site. The wetland increases habitat diversity in the brome dominated grassland and probably serves as an oasis for amphibians, reptiles and other animals that require moist conditions for survival. Long–term effects on wildlife habitat should be minimal.

The preferred pipeline route passes through only one small area of prairie vegetation located near the south end of NSP property, south of the Brandon Road, as described in Chapter 2. Disturbance involved in constructing the pipeline will endanger no unique plant communities or species at this location. Disturbance is likely to adversely affect the number of native plants present. Reclamation procedures following pipeline construction, if they include reseeding with native grasses, could be used to mitigate the effect and may actually enhance the site.

Other uncultivated areas crossed by the preferred pipeline route include small stretches of pasture land, road rights-of-way, and one shelter belt. Vegetation on these areas is typical of grazed, revegetated, or otherwise disturbed terrestrial sites, with smooth brome and Kentucky bluegrass being dominant. The only vegetated wetland areas crossed by the pipeline route have a dominant cover of reed canarygrass which was likely planted for hay or forage. Disturbance of vegetation in these areas during construction is an unavoidable effect which will temporarily impact habitat for small animals and birds but is not expected to cause a permanent change in the carrying capacity of the area.

No plants on the federal or state lists of threatened or endangered species were detected in the immediate project area, nor are there any habitats where the listed species would be expected to occur. Construction is not expected to adversely affect any threatened or endangered species.

4.3. Impacts to Impacts to Fish and Aquatic Organisms

If significant rainfall occurs during construction of the proposed facility there will be an unavoidable increase in stream turbidity both at the CTG construction site and in places where the pipeline crosses intermittent streams and lesser drainages. Turbidity and siltation

should be minimized but cannot be avoided by using erosion control practices during construction. Increased sedimentation may adversely affect streambed fauna and flora as well as fish populations, but the adverse effects should be localized and not permanent.

The operational impact of the wastewater discharge from the proposed CTG facility on fish species in the Big Sioux River is expected to be minimal.

4.4. Impacts to Mammals and Birds

The proximity of the wastewater settling ponds to uncultivated grassland and trees along the Big Sioux River is likely to attract nesting waterfowl, which increases the likelihood that young birds may be exposed to the toxic effects of water high in TDS. The overall carrying capacity of the area for nesting waterfowl should not be significantly affected. There may be some unavoidable negative impact to individual waterfowl broods attracted to the ponds and to migrating waterfowl. The severity of these effects will depend on the quality of the wastewater. Other wildlife using the ponds may be impacted but the overall carrying capacity of the area should not be significantly affected.

Other unavoidable adverse impacts to wildlife in the vicinity of the CTG facility would result mainly from the noise of operation. The principal reaction to transient and unexpected noise by wildlife is startle or fright. Wildlife generally flee from the noise source temporarily or for long periods if the noise persists. Nesting birds may be adversely affected if operational noise from the CTG frightens the adults away from their nests for extended periods of time. The Pathfinder Site provides good quality habitat for white-tailed deer because of the wooded areas along the Big Sioux River and in the draws that extend into adjacent prairie cropland. The intermittent nature of the noise during CTG operation may reduce the use of the area by deer.

4.5. Impacts to Wetlands

Direct wetland impacts by CTG facility and pipeline construction would be small. As mentioned previously one small seepage wetland at the Pathfinder Site will be adversely affected. Leveling of the hillside to accommodate the CTG facility will permanently eliminate the wetland.

The pipeline corridor would disturb wetlands as they are being installed but wetlands should recover if construction methods are correctly implemented. The preferred route

crosses two small intermittent streams and some lesser drainages, and it passes through or nearby several small wetlands.

The largest potential impact to these wetlands would occur during construction of the pipeline through either surface or subsurface drainage of the small basins. Loss of ponding ability would essentially destroy these small wetlands with subsequent loss of their habitat value.

Surface drainage could occur if wetland outlet elevations are not returned to preconstruction condition or the basin is filled during backfilling and final grading. Subsurface drainage of wetlands may occur if the material used to cushion the pipe during backfilling is both permeable and has high hydraulic conductivity.

Loss of small wetlands from surface or subsurface drainage would result in the loss of habitat for migrating waterfowl and other wildlife that depend on them especially early in the spring. The adverse impacts to these wetlands would be minimized if construction techniques are used that prevent surface or subsurface drainage from occurring.

4.6. Impacts on Farming Operations

There will be some unavoidable impacts on farming operations and the productivity of farmland through which the pipeline will be trenched. The impacts were discussed in Section 3.2.9. The impacts should all be of a temporary nature and not permanently impact the productivity of farm lands or impact the agricultural uses of these lands.

There may be some adverse impacts to productivity of soils along the pipeline corridor from disturbance in areas of thin top soils. Top soil will be mixed with less productive subsoil which may result in lower productivity of the disturbed areas.

4.7. Impacts to Ground Water Supplies

The use of water from the Split Rock Creek aquifer represents an impact to the aquifer which cannot be avoided. However, natural recharge to the aquifer will mitigate the long–term effects of the use of the Split Rock Creek aquifer.

4.8. Impacts to Air Quality

The proposed CTGs will emit pollutants resulting from the combustion of natural gas or distillate fuel. Worst-case maximum pollutant emission rates with four CTGs in continuous

operation are: TSP/PM_{10} = 1577 tons per year (TPY), SO_2 = 7358 TPY, NO_x = 3452 TPY, CO = 2278 TPY, VOCs = 911 TPY, and Be = 0.051 TPY. Even though these emissions represent an unavoidable additional pollutant load, dispersion analysis conducted by NSP using these worst-case emission rates indicate that the Primary and Secondary National Ambient Air Quality Standards (NAAQS) will not be violated as a consequence of the CTG emissions. Due to the fact that the proposed CTGs are not likely to operate 24 hours per day throughout the year, total emissions and the resulting ambient concentrations will likely be less than those predicted by the worst-case modeling. Since conformance with the primary standards has been demonstrated, there should be no significant impairment of public health or welfare as a result of the CTG emissions.

4.9. Impacts to Cultural Resources

Although little cultural material was found during this study, the excavation and trenching activities may uncover some cultural materials that were unable to be viewed during a pedestrian survey. In the event that such material is encountered, there may be adverse consequences to the cultural material if proper mitigation measures are not followed.

CHAPTER 5

ALTERNATIVES TO THE PROPOSED ACTION

5.1. NSP's Long–Term Resource Needs

A discussion of the alternatives to a proposed electrical power generating facility must take place in the context of projected energy demand. As part of its application for the proposed CTG facility NSP included discussions of its forecasted energy demands. In addition, ARSD 20:10:21:02 and 20:10:21:20 requires that electric utilities develop a 10–year plan for energy facility plans and file such with the Commission by July 1 of each even–numbered year. The contents of this filing must include projected forecasts and efforts relative to load management. NSP's 1992 Ten–Year Plan for Major Generation and Transmission Facilities to the South Dakota Public Utilities Commission has been filed. The following discussion is a summary of NSP's forecasts of its energy needs.

NSP's forecast of its energy demand is shown in Figure 5–1. This figure represents a net forecast of energy demand, which is a forecast demand adjusted for conservation and load management programs. The net forecast of energy requirement for NSP's service territory has a median average annual growth rate of 2.3 percent over the forecast horizon for years' 1991–2005. This represents a substantial decline from the 3.4 percent growth NSP experienced from 1985–1990. The median line on Figure 5–1 represents the net forecast of energy demand.

To account for uncertainty, NSP has prepared additional forecast scenarios: semi–low and semi–high forecasts to reflect a narrow range of alternative paths for the economy, and low and high forecasts to reflect broader risk. The median native energy requirement growth rates for the semi–low and semi–high scenarios are 1.8 and 3.0 percent per year while the growth rates for the low and high scenarios are 1.2 and 3.5 percent per year. The semi–high and semi–low rates are shown in Figure 5–1 for the period 1991 to 2005. These rates are also lower than the 3.4 percent growth NSP experienced from 1985–1990.

NSP uses the semi–low to semi–high bandwidth most frequently for long–range planning purposes (NSP 1992) and estimates that this bandwidth captures the middle 30% of probability for future peak demand and energy requirements. NSP's future requirements include (1) forecast summer peak demand, after incorporation of demand side management resources; (2) a 15 percent Mid Continent Area Power Pool (MAPP) reserve requirement; and (3) contracted obligations to sell to other utilities.

Figure 5-1.

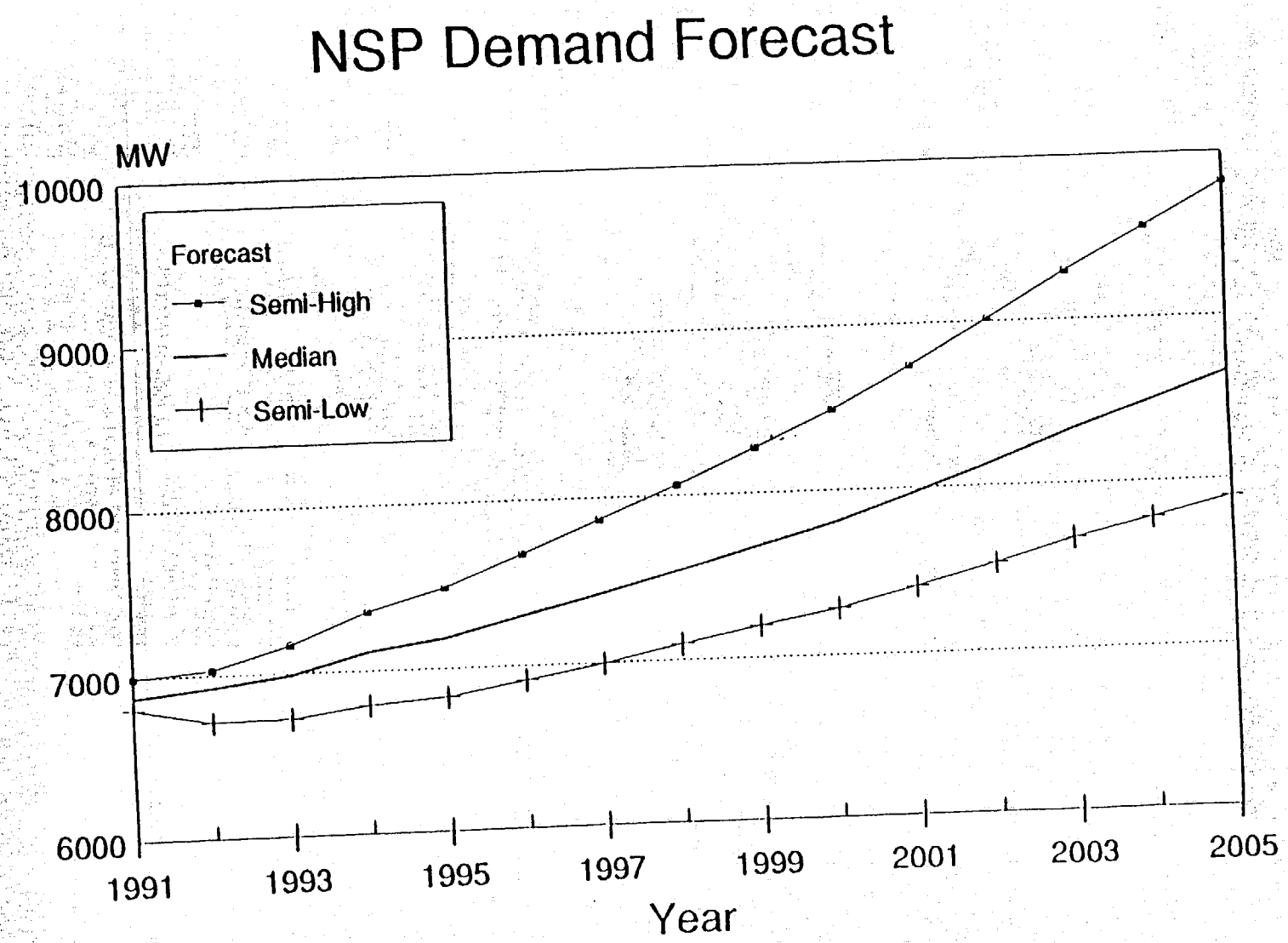

NSP Demand Forecast
MW
10000
9000
8000
7000
6000
Forecast
Semi-High
Median
Semi-Low
1991
1993
1995
1997
1999
2001
2003
2005
Year

Figure 5–2 shows how NSP's obligations, based on the semi–low to semi–high forecasts, compare to NSP's existing and committed resources. This figure shows that, based on NSP's forecasts, the demand for electricity is forecasted to exceed NSP's available resources by as much as 200 MW in 1994 and up to 700 MW by 1997. The forecasts include a component for summer peak demand and NSP believes that the appropriate means to meet the expected shortfall of available resources in through the addition of peaking capacity.

In addition to its forecast of energy demand, NSP's 1992 Ten–Year Plan for Major Generation and Transmission Facilities to the South Dakota Public Utilities Commission includes a discussion of NSP's efforts related to energy conservation and the use of alternative and renewable energy resources.

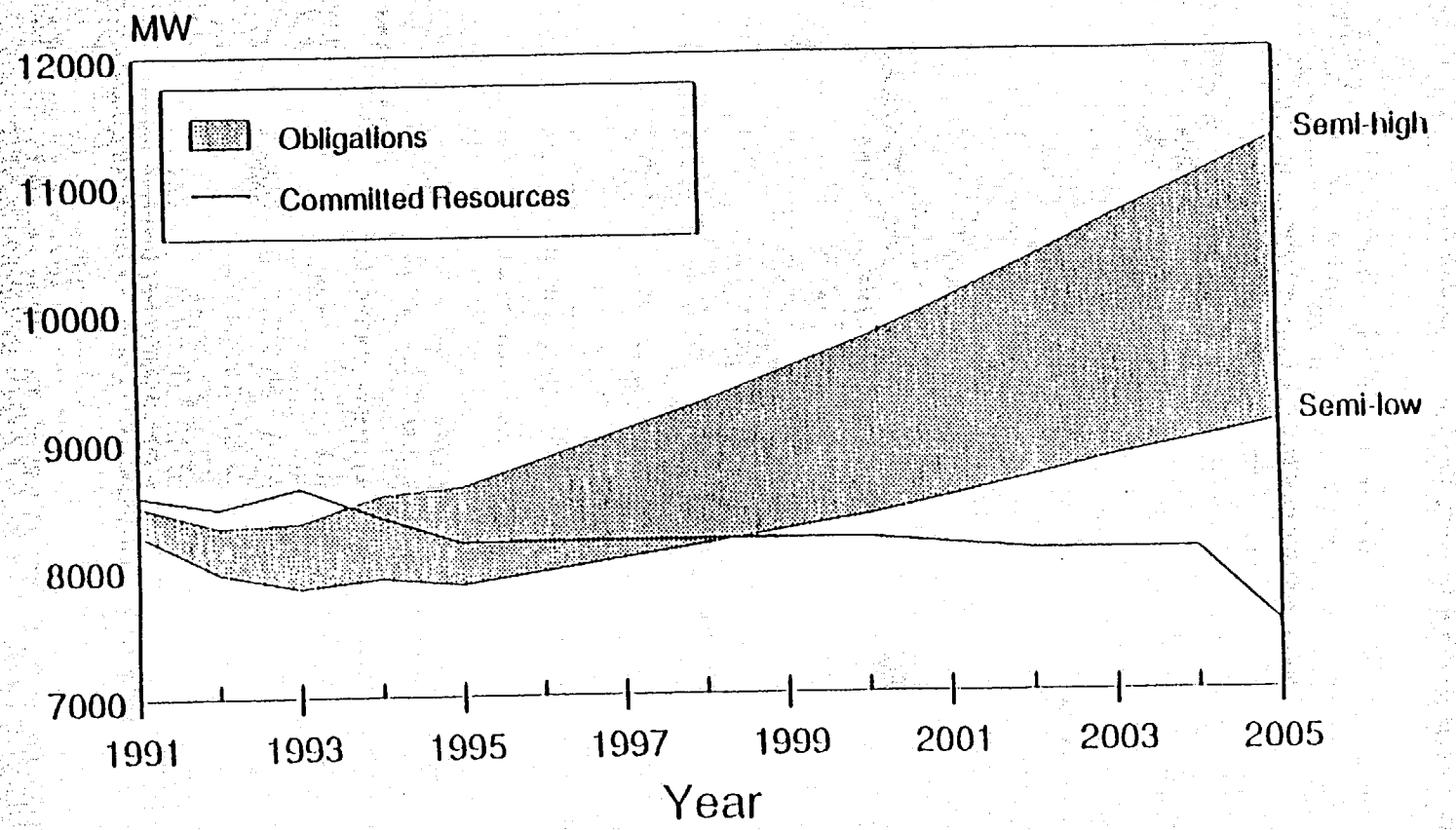
5.2. Alternative Power Plant Sites

NSP conducted a detailed site identification and screening process to choose its preferred site for this combustion turbine generating facility. NSP initially used the criteria of proximity to an existing NSP generating plant or substation to identify twenty–one sites within its service territory for additional consideration.

As a basis for screening and comparing potential sites, NSP developed a conceptual base model two-unit CTG installation. Complete details of the assumptions made for the base model site are given in the NSP report Combustion Turbine Generator Site Screening Study Final Report, November 15, 1990. Site-specific capital additions or deletions from the base model site were used to develop the site-specific capital costs for each of the potential sites. Operational and maintenance costs (total or differential) were developed for each potential site. A net present value cost was determined for each site. Potential sites were then compared and rated based on net present value cost. Environmental and licensing aspects such as air quality, land use, and permitting time were also considered and incorporated into the screening process. The items investigated for each site are listed in Table 5–1.

Figure 5-2.

NSP Obligations and Committed Resources



Updated 7/29/91
4/91 Demand Forecast
Committed Resources as of 6/17/91

Table 5–1. Cost items investigated for each candidate site.

Cost Item	Description
Base Capital Cost	Base model facility estimate used as a base capital cost for each site
Transmission Line Adjustment	The need for new transmission line construction to increase transmission line capacity, as well as upgrading and increasing substation capabilities and wheeling charges, was evaluated for each site, as appropriate.
Fuel Source Adjustments	Natural Gas Pipeline access was evaluated for each site. The cost for construction of the gas line and regulating station, as needed, was also evaluated.
Site Equipment Adjustments	Fuel oil storage capacity, waste pond capacity, railroad access, security fence coverage, well capacity, fire protection equipment, and road/parking were evaluated and appropriately credited for each site.
Environmental/Site Conditions Adjustments	Credit was given to sites at lower elevations (CTG capacity decreases with an increase in elevation), sites with an adequate buffer zone, sit with adequately cleared areas, and sites which required less time to permit (those in North Dakota and South Dakota). Sites were penalized which contained poor soil conditions for foundations, as well as sites in close proximity to residential areas or other sensitive receptors, and sites classified as non–attainment with regard to air quality regulations.
Staffing Differentials	Estimates were made for each site regarding the number of personnel required, distance to travel and cost.
Natural Gas	Total gas consumption per year was estimated, and costs were calculated and added to all sites.
Fuel Oil	Annual fuel consumption was estimated, and costs were calculated and added to each site.
Property Tax	Property taxes were estimated and added to each site.
Transmission Wheeling Charges	Credits and additions were added based on current or estimated wheeling charges for each site.

The net present value of capital costs in 1994 dollars (including depreciation) and annual operating and maintenance expenses were calculated for each site based on the items listed in Table 5–1. This value was used to compare the economics of siting the CTG facility at the individual sites. As a result, the 21 potential sites were classified into three groups — five low cost sites, nine middle cost sites, and seven high cost sites — on the basis of the calculated net present value of each site.

The five low cost or preferred sites were then further evaluated. These preferred sites were:

Ashland (Wisconsin)
Wheaton (Wisconsin)
French Island (Wisconsin)
Hurley (Wisconsin) and
Pathfinder (South Dakota).

The French Island site was eliminated due to insufficient space availability at the site. From a transmission standpoint, Ashland and Hurley were viewed as the same site. That is, the transmission capacity would be based on the total number of units at both sites. The existing transmission capacity would be based on the total number of units at both sites. The existing transmission system in the area may support up to 200 MW of CTGs. Significant transmission improvements would be needed more for than 200 MW of CTGs, making it uneconomical to add more than two units to the area. Since the Ashland site was deemed more cost effective than the Hurley site, the Hurley site was eliminated from further consideration.

Three sites remained as most appropriate for combustion turbine development. These sites are the Pathfinder Power Plant site near Sioux Falls, South Dakota; a site near Ashland, Wisconsin; and the Wheaton Combustion Turbine site near Eau Claire, Wisconsin. NSP is pursuing licensing approval at all three sites. Further discussion of the site selection process is contained in the Combustion Turbine Generator Site Screening Study Final Report.

5.3. No Action Alternative

The alternative to the Pathfinder CTG facility with the highest risk to the consumer is to do nothing. In this case, the projected demand for energy discussed in Section 5.1 will expand beyond the available capacity without any accompanying ability on the part of NSP to fulfill their obligation to meet the increased requirements for service. NSP is obligated to

provide a reliable supply of electrical energy to ensure the safety and welfare of its customers. Failure to build the Pathfinder CTG facility or an equivalent capacity will compromise the ability of NSP to meet this commitment. By 1995 and beyond, the combined peak–load demand of NSP may not be met without an additional generating unit. Without sufficient available resource, installed capacity will be operating at near–full load much of the time, and periods of peak demand will be accompanied by brownouts and blackouts at an increasing frequency.

If this project does not proceed, there would be a significantly higher risk that forecasted electrical energy needs in the NSP service area could not be met.

5.4. Purchase Power from Other Systems

NSP currently purchases power from other utilities and through these purchases is able to minimize the need to build additional generation of its own. Presently, these purchases are from Manitoba Hydro, a variety of non–utility generators and other U.S. utilities. In its 1992 Ten–Year Plan for Major Generation and Transmission Facilities to the South Dakota Public Utilities Commission, NSP forecast its planned capacity purchase between 1992 and 2006 as shown in Table 5–2.

Table 5–2. NSP's planned capacity purchases during summer months in MW.

	1992	1994	1998	2002	2006
Manitoba Hydro	900	1100	850	850	350
Non–Utility Generation	95	95	95	95	95
Other U.S. Utilities	715	283	333	233	159
Total Purchases	1710	1478	1278	1178	604

Other utilities in the Midwest region likely can expect a similar increase in demand for electrical energy within their respective service areas as NSP; consequently, surplus power may not be readily available. To supply NSP with power, other utilities would have to install additional generating capacity in the Midwest region with similar or greater environmental impact. Should the generating capacity be supplied by others, new transmission lines would have to be constructed to carry the power. NSP forecasts a significant decline in surplus generating capacity among the Mid Continent Area Power Pool (MAPP) region utilities and in the larger Midwest region, becoming a deficit in the 1990's.

NSP's ability to purchase additional generating capability from other utilities depends upon two main factors: the future capacity needs of other utilities and the price and quality of available capacity. As the availability of utility generating capacity in the Mid Continent Area Power Pool (MAPP) region declines through the 1990s, NSP's opportunities for additional purchases will also diminish. Additionally, if prices other utilities are willing to accept are not economical compared to other available capacity options, purchases may not be made.

NSP has indicated that it will continue to examine purchase options for the future, and will purchase to defer construction of new facilities if economically feasible.

5.5. Alternative Methods of Generation

Alternative methods of generation include the use of renewable energy resources such as wind, solar, water or biomass to generate electricity and traditional methods such as coal and nuclear energy.

NSP has embarked on the use of renewable energy resources having installed in 1986 and continuing to operate three 65 KW wind turbines near Holland, Minnesota. NSP currently plans to install 10 MW of wind generation by 1996. At this time wind generation is not cost effective and cannot produce large amounts of power. However, NSP has committed to additional efforts to research power generation from wind. NSP recently has established a goal of 100 MW of wind generation by the year 2000.

NSP currently purchases substantial hydroelectric power from Canada. The company is evaluating the feasibility of redeveloping the capacity at St. Anthony Falls and other small hydro projects in Wisconsin. Due to environmental and other regulatory concerns, little potential exists for developing significant new hydro power in the United States.

NSP currently is one of the largest utility users of biomass fuel in the nation. In 1991, NSP utilized over 270,000 tons of waste wood for power generation at five generating units.

Traditional power fuels are typically used to supply base power supply, not peaking capacity.

One alternative to the simple cycle design of the proposed CTGs would be a combined cycle unit. A combined cycle unit consists of a combustion turbine, a heat recovery steam

generator (HRSG), and a steam turbine generator. The hot gases exhausted from the combustion turbine are used to produce steam that, in turn, spins a steam turbine. A combined cycle unit typically obtains two-thirds of its electricity output from the combustion turbine and one-third from the steam turbine. Adding a steam turbine to combustion turbine improves the overall energy conversion efficiency by about 30 percent, making the efficiency of combined cycle gas-fired generation comparable or greater than coal-fired steam generation.

A combined cycle facility has lower fuel costs than a simple cycle combustion turbine due to the higher efficiency, but higher installation, operating (non-fuel), and maintenance costs. Combined cycle units are usually operated 20 to 60 percent of the time, a pattern intermediate between peaking units and base load units.

If a simple cycle combustion turbine plant is operated for short periods of time when peaking energy requirements are needed, the fuel cost savings of operating a combined cycle facility will not compensate under some circumstances for its higher installation costs.

The alternative methods of generation discussed are not likely to provide the needed power capacity NSP needs to provide peaking capacity to its customers.

5.6. Conservation and Load Management

NSP has developed a "demand side management" or DSM program to promote conservation and load management among its customers. NSP has set goals of DSM of 1100 MW of coincident reduction by 1995 and 1700 MW of coincident reduction by 2000. Conservation reduces the overall demand and energy use, because customers take steps to reduce electricity use. Load management measures either clip demand peaks or shift electric demand from high–use (peak) periods to low use periods (off–peak). NSP has implemented a DSM program called "Playing to Win" to encourage its customers to conserve power. The reduction in power needs due to future DSM conservation programs have been factored into NSP's net forecasts of power generation discussed in Section 5.1. and therefore are likely to have minimal effect on alleviating the need for additional generating facilities.

5.7. Alternate Pipeline Routes

NSP has proposed two pipeline routes, a preferred route running primarily along an existing WAPA transmission line and an alternative route primarily running along Highway

11 and other public roadway right–of–ways. NSP established several criteria in evaluating the potential impacts and desirability of the preferred and alternative routes. These included:

- the number of homes within 500 and 100 feet of each route, respectively;
- the number of wetlands areas crossed by each route;
- the number of intermittent streams crossed by each route;
- the linear footage of soils classified as having severe limitations for shallow excavations along each route; and
- the linear footage of soils classified as highly erodible along each route.

The results of the survey of the two proposed routes indicate that the preferred route should have less of an impact than the alternative route. Additional advantages of the preferred pipeline route include its shorter total length (13 miles versus 14 miles) and the fact that the majority of the route (8.4 miles) will be partially located in an existing transmission line right–of–way, thus minimizing the easement requirements for the portion of the route.

In addition to the two routes proposed by NSP, a survey of the wider corridor between Sioux Falls and the Big Sioux River to the east was made. Although numbers of each of the criteria discussed above were not collected because a large number of potential alternatives could be considered, locating the pipeline to either the west or east of the proposed routes presents considerably more impact. To the west of the preferred route any proposed route would quickly impinge on the city limits of Sioux Falls and be extremely close to residential areas. This would clearly be undesirable. To the east of the alternative route any proposed route would encounter considerably more housing and rural residential sites than either of NSP's proposed routes. In addition, the drainage pattern to the east is such to require many more stream crossings causing construction problems. A further concern would be the increased likelihood of encountering cultural resources as one approaches the Big Sioux River. The tributaries to the Big Sioux River are much more abundant in cultural material than the upland areas. In addition, any route to the east of the alternative route would entail a considerably longer pipeline to connect to the NNG pipeline.

The proposed preferred and alternative routes are the least impact routes in the corridor between Sioux Falls and the Big Sioux River and another alternative route is not considered viable within this corridor.

CHAPTER 6

ANY IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES WHICH WOULD BE INVOLVED IN THE PROPOSED ACTION SHOULD IT BE IMPLEMENTED

The construction, operation, and maintenance of the Pathfinder Combustion Generator Facility will involve some irretrievable commitments of natural and human resources. Some of the major resources to be consumed include sand, gravel, fuel oil, natural gas, water, chemicals, and lubricants for the operation of the facility.

Construction and operation of the major facilities will disrupt some vegetation and wildlife. None of the species are considered rare or endangered so there will not be an irreversible loss of biological organisms.

The land on which the CTG facility is to be constructed will be permanently converted to industrial use. Leveling of the hillside to accommodate the CTG facility will permanently eliminate a small seepage wetland and surrounding grassland dominated by smooth brome grass. This effectively commits the wildlife habitat which the area now provides to an industrial use. This represents a small portion of the habitat that is now available to support wildlife populations in the surrounding area.

The land use restrictions imposed by the placement of the pipeline within a 100–foot easement represent an irreversible change in land use for the pipeline.

The water consumed by the plant operations is a renewable resource in that it is either recycled through the atmosphere or returned to the watershed through the discharge ponds. A commitment of ground water resources is being made for this project. Aquifers can naturally replenish provided sufficient natural recharge to the aquifer occurs. Presently not enough information is available to quantify the natural recharge to the Split Rock Creek aquifer and thus the degree of irretrievable resources being committed is unknown.

CHAPTER 7

MITIGATION MEASURES PROPOSED TO MINIMIZE THE ENVIRONMENTAL IMPACT

The construction and operation of the proposed CTG units and the pipeline will have some impact on the environment of the area, but the incorporation of pollution control devices and the implementation of plans to mitigate certain impacts will minimize any unavoidable loss of environmental quality. A discussion of mitigation measures which can be used to minimize the environmental impacts is divided into mitigation measures for construction and operation of the pipeline and for construction and operation of the CTG facility.

7.1. Mitigation of Construction Impacts

The primary impacts during construction of the CTG units and the pipeline will be due to site clearing, equipment operation, and general increased activity at the site. Below is a discussion of the impacts expected.

7.1.1. Soil Erosion

Site clearing for the CTG units and the pipeline and trenching for the pipeline will expose significant amount of surficial soils to potential erosion from wind and air. These impacts can be mitigated by careful construction methods in which topsoil is properly stockpiled to prevent soil erosion by covering, watering, etc. Restoration of the right–of–way areas to as nearly its original grade as possible and subsequent revegetation of the areas will dramatically reduce the potential impacts.

The proposed pipeline routes cross several drainage channels and several wetland areas. There is the potential for severe change in wetlands and stream channel characteristics along the pipeline routes. Excavation procedures through drainage channels will need to ensure that the natural grade of the channel is maintained. During a pedestrian survey of the preferred pipeline, several locations along the north part of the pipeline were noted where gully erosion was occurring in stream channels. Such gully erosion could continue headward in a drainageway and eventually expose the buried pipeline. Erosion control structures may need to be placed in such channels to prevent the advance of the gully.

The following list of basic soil conservation principles will reduce soil erosion and sedimentation:

1. Reduce unnecessary destruction of vegetative cover.
2. Conserve and utilize existing vegetative cover to the fullest extent possible.
3. Reduce bare soil exposure time to a minimum.
4. Limit clearing, grading and slope modifications to that consistent with good land use.
5. Make permanent vegetative plantings that are compatible with specific soil and site conditions.
6. Protect surface and subsurface waters from sedimentation by employing silt fences, hay bales, etc. to slow the movement of soil and sediment.
7. Control dust on disturbed areas by watering or other means.
8. Protect adjoining property from damage or hazard from land–disturbing operations.
9. Avoid wetlands to the maximum extent practical along the temporary access points into the pipeline right–of–way.

7.1.2. Soil Compaction

Movement of heavy equipment along the pipeline right–of–way may compact soils, which could reduce crop production in the affected agricultural areas. Compaction can reduce crop production by restricting root growth and penetration, hindering seedling emergence and reducing oxygen and carbon dioxide flow to and from the roots. A reduction in soil pore space affects infiltration of water resulting in ponding con the surface of the fields. The severity of this impact can vary. Compaction generally is greater on wet or exposed soils. Soils for growing crops are loose and 35 to 55 percent of the material is pore space. Slow plant emergence and shallow root systems are the most frequent symptoms of soil compaction.

Where soil compaction occurs in agricultural fields, one's years ploughing and cultivation can correct the problem. In natural grassland areas the restoration of the vegetation should include a step to loosen surface soils which have become compacted under equipment loadings.

7.1.3. Fugitive Dust

Water wagons used to periodically spray unpaved access and haul roads can reduce fugitive dust emissions.

7.1.4. Wetlands

Surface drainage or filling of basins could occur during backfilling and final grading of the trench area after pipe installation. This would be likely if the route crosses the natural outlet of the wetland and final grading leaves the outlet at a lower elevation or fills the basin. Many of the basins are quite shallow and would not require a large change in elevation to drain or fill them. Outlets of these wetlands should be surveyed before and after construction to insure there is no significant change in elevation.

Many small wetlands along the pipeline route exist because they lie in glacial till of low hydraulic conductivity. Subsurface drainage of wetlands may occur if the material used to cushion the pipe during backfilling is permeable (with high hydraulic conductivity). It is common practice to use sand and gravel to pad installed pipe, especially when the native material is stony. These materials can provide a conduit for water and increase the rate of movement of groundwater flowing away from the wetland. In Figure 2-7, "pad and backfill" is listed as one of the final steps in laying the pipeline. The material to be used for padding is not specified. In areas where the route intersects wetlands, pad and backfill should be of an impermeable nature to prevent subsurface drainage of the wetlands

7.1.5. Vegetation

The preferred pipeline route passes through only one small area of prairie vegetation located near the south end of NSP property, south of the Brandon Road. Some native prairie species are present, but much of the vegetative cover is Kentucky bluegrass. If reclamation procedures following pipeline construction include reseeding with native grasses, and other native species adverse impacts can be mitigated.

Other uncultivated areas crossed by the preferred pipeline route include small stretches of pasture land, road rights-of-way, and one shelter belt. Vegetation on these areas is typical of disturbed terrestrial sites, with smooth brome and Kentucky bluegrass being dominant. The only vegetated wetland areas crossed by the pipeline route have a dominant cover of reed canarygrass which was likely planted for hay or forage. Reseeding of these areas following construction will minimize the long term adverse impacts related to clearing operations.

7.1.6. Restoration of the Right–of–Way

Excess soil from excavation should be spread over fields or removed from the site according to the wishes of the land owner. Care should be taken to separate topsoil from the

underlying soil, with the topsoil being stockpiled to provide a ready source for the soil upon restoration of the area.

Large ruts and other areas of excessive soil disturbance should be restored to a reasonable approximation of pre–construction conditions agreeable to the land owner.

Pasture lands should be regraded and seeded with vegetation similar to that which existed at the site prior to construction or in a manner acceptable to the land owner.

7.1.7. Land Acquisition

The CTG units will be constructed on NSP property and will not require the purchase of additional land. The natural gas pipeline placement will require the acquisition of easements from property owners along the selected pipeline route. It is expected that landowners would be compensated by NSP for the easement purchased and for damages to crops or other features resulting from the pipeline placement.

7.1.8. Farming Operations

There could be some interference with farming and cattle operations during pipeline construction. Cattle may have to be moved to other pastures while the pipeline construction was in progress, or if that is not possible, temporary fencing will have to be erected to keep cattle away from the construction. Crops growing in the construction easement at the time construction starts would be destroyed.

To accommodate pipeline construction, fences would be opened, access roads could be damaged, and drainage could be disrupted during construction. Arrangements will have to be made with farm operators to minimize the impacts to farming operations. Inconveniences would be temporary and all operations should be able to return to normal once construction is completed.

7.1.9. Cultural Resources

Although little cultural material was found during the pedestrian survey conducted along the proposed pipeline routes and at the CTG facility, it is recommended that a monitoring program be established to ensure that cultural resources are not inadvertently destroyed. There is the potential that a site, if present, is buried in the deep loessial soils below the depth of shovel testing. A two–pass stripping operation can be instituted which will allow a better investigation of the upper surface soils. Visibility in a heavily vegetated

area (E1/4, E1/4, SW1/4 and S1/2, SE1/4, SE1/4, NW1/4, Section 31, Township 102N, Range 48W) was essentially zero during the pedestrian survey. Although two shovel tests excavated to depths of about 30 cm below the surface produced negative results, the topographic position of this area, on an upper terrace of the Big Sioux River, holds perhaps the greatest potential for prehistoric occupation in the project area. It is recommended that in conjunction with a monitoring program, this area be mechanically stripped of vegetation and the upper soil horizons be removed in shallow layers to a depth sufficient to reasonably preclude the existence of cultural occupation. This method would be most effective in terms of generating visibility and providing an opportunity to identify any cultural resources present.

If conducted prior to actual construction, this process would allow for several options in the event that significant cultural material is identified (trenching with the right–of–way around sensitive areas, shifting of the right–of–way, mitigation, etc.).

7.2. Mitigation of Operational Impacts

7.2.1. Air Quality

The selected fuel, operational characteristics, and design of the proposed CTG units minimizes the air quality impacts. Water injection into the CTG combustion area reduces formation of thermal NO_x by reducing peak flame temperatures. Good combustion control maximizes fuel burning efficiency which provides minimum CO, VOC and TSP/PM_{10} emissions. Burning natural gas as primary fuel and low sulfur distillate oil reduces SO_2 and Be emissions. Since using disstillate oil for combustion increases the emission rates as compared to natural gas, air quality impacts can be mitigated by using natural gas as much as possible.

Emissions of VOC's may occur from the 2–million gallon fuel storage tanks. Emissions of VOC's from these tanks may occur during filling and emptying, and from vapor expansion due to temperature increases. The tanks are of a fixed roof design with above ground fill pipes. Vapor losses from these tanks can be mitigated by proper maintenance of tank access openings and corrosion prevention.

7.2.2. Water Quality

Leakage or spillage of fuel from the storage tanks is a potential threat to ground water quality unless it is properly mitigated. Separate containment dikes designed to contain over

110 percent of the volume of each tank provide protection against catastrophic spills or tank ruptures. Precipitation normally evaporates from the containment dike. However, if the containment areas become full due to large amounts of rain or spring snow melt, NSP will test the precipitation for the presence of No. 2 distillate fuel oil (NSP EIR 1991). If fuel oil is found to be present above the NPDES permit limits, then steps will need to be taken to treat the precipitation to remove the fuel oil. The treated water will then be discharged to the existing wastewater settling basins. If the testing of the precipitation indicates that no fuel oil is present or is present at levels below the NPDES permit limits, then the precipitation will be discharged to the settling basins.

There is no sump pump, oil skimmer, or oil water separator associated with the fuel oil basins. Minor oil spills and drips will need to be cleaned up by NSP maintenance personnel.

Aquatic organisms in the Big Sioux River may be sensitive to pH changes caused by potential discharges from the CTG facility. Since pH adjustment is provided as a water treatment process, pH impacts on the river should be mitigated by controlling the wastewater pH at a constant level, preferably near pH 7. In its NPDES Permit application, NSP has agreed to maintain the pH levels at a range of 6 to 8.5.

CHAPTER 8

THE GROWTH-INDUCING ASPECTS OF THE PROPOSED ACTION

The growth–inducing aspects of the proposed action consist of short–term increases in economic activity due to construction of the facilities and long–term benefits from increases in tax payments and a more stable power supply. The local economy will receive some additional economic activity due to construction of the facilities . However, the increase due to the construction activities is expected to be relatively slight.

Additional tax revenue for local governmental units, without additional demand for governmental services, will have a positive effect on the local school districts and counties. These additional tax dollars will allow additional services to be offered to local residents without raising taxes to those residents, an action which will induce growth to the area.

By constructing this facility, NSP will be increasing its ability to meet its customers electrical power demands. Such an action has growth–inducing benefits in that it provides for an expanding customer demand. The lack of adequate electrical power availability is often cited as an inhibitor to growth.

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APPENDIX A

List of NSP Documents Filed Related to Application

- Application for a Construction Permit For An Energy Conversion Facility in Minnehaha County, South Dakota, September 16, 1991.
- Combustion Turbine Generator, Site Screening Study Final Report, November 15, 1990
- Technical Support Document PSD Permit Application for a Proposed Modification of the Pathfinder Generating Station, September 12, 1991
- Water Appropriations Permit Application for Proposed Combustion Turbine Generator Facility Pathfinder Site Minnehaha County, South Dakota, September 16, 1991
- Environmental Impact Report for Proposed Combustion Turbine Generator Facility Pathfinder Site Minnehaha County, South Dakota, September 16, 1991
- Addendum to Environmental Impact Report for Proposed Combustion Turbine Generator Facility Pathfinder Site Minnehaha County, South Dakota, November 21, 1991
- Addendum to Application for a Construction Permit for an Energy Conversion Facility in Minnehaha County, South Dakota, Direct Testimony, November 21, 1991.
- Application for Resource Plan Approval 1992-2006, Two Volumes,
- Pathfinder Combustion Turbines NPDES Permit Application, dated November 4, 1991.
- Letter to Dickstein, EPA Region 8, from Alders, RE PSD Review-Change in emission estimates, dated February 18, 1992.
- Technical Support Document, Revision 1, PSD Permit Application for a Proposed Modification of the Pathfinder Generating Station, March 11, 1992.
- Addendum to Environmental Impact Report for Proposed Combustion Turbine Generator Facility Pathfinder Site Minnehaha County, South Dakota, Natural Gas Pipeline, March 23, 1992.
- Groundwater Discharge Plan Application for Proposed Combustion Turbine Generator Facility Pathfinder Site Minnehaha County, South Dakota, March 31, 1992.

Appendix B

Tables of Previously Recorded Cultural Sites and Surveys

Table 1. Previously Recorded Sites Located Within A Five-Mile Radius of the Pathfinder Power Plant.

Site Number	Site Type	T (N)	R (W)	S
39MH1	Brandon Village; Initial Middle Missouri.	101	48	9
39MH2	East Sioux Falls Mound Group. A group of five mounds reported by W. H. Over (Sigstad and Sigstad 1973:182-183).	101	48	21
39MH4	Erickson Mound Group. A group of 29 mounds recorded by W. H. Over (Sigstad and Sigstad 1973:183).	101	48	10
39MH6	Split Rock Creek Mound Group. A group of at least 38 Woodland mounds.	101	48	4/9
39MH8	Prehistoric artifact scatter.	102	49	23
39MH10	Burial and Great Oasis pottery recovered from cutbank.	102	48	35
39MH11	Beaver Creek Mound Group. A group of at least 7 mounds. May be a continuation of the 39MH4 group.	101	48	10
39MH19	Historic rock-lined depression.	102	49	23
39MH25	Historic ruts, possibly relating to the Yankton Trail.	102	49	23
39MH26	Prehistoric artifact scatter.	102	49	12
39MH27	Possible mound.	102	49	23
39MH29	Possible mound.	102	48	35
39MH31	Prehistoric artifact scatter/habitation - stemmed points and cordmarked sherds reported by Gant. Site now destroyed.	102	48	35
39MH32	Woodland artifact scatter - habitation or plowed down mound(s).	101	48	4
39MH33	Great Oasis artifact scatter.	101	48	15
39MH34	Extensive artifact scatter with bundle burials.	102	48	35
39MH35	Prehistoric artifact scatter including a grooved maul and catlinite fragment.	101	48	15
39MH36	Historic depression and parallel ruts.	101	48	15

Table 1 (cont.)

Site Number	Site Type	T (N)	R (W)	S
39MH37	Artifact scatter with Besant corner-notched projectile point.	101	48	15
39MH38	Sparse lithic scatter.	101	48	15
39MH39	Sparse lithic scatter.	101	48	15
39MH40	Extensive, light lithic scatter.	101	48	15
39MH41	Prehistoric and historic artifact scatters.	101	48	15
39MH42	Depression with mounded dirt around perimeter enclosing area 7 m in diameter.	101	48	15
39MH43	Prehistoric and historic artifact scatters.	101	48	15
39MH44	Two prehistoric lithic scatter areas and a historic quarry.	101	48	15
39MH45	Sparse lithic scatter.	101	48	15
39MH46	Sparse lithic scatter.	101	48	15
39MH47	Three flakes buried in cutbank.	101	48	14
39MH48	Historic debris scatter.	101	48	15
39MH50	Small lithic and bone scatter.	101	48	14
39MH52	Extensive lithic scatter.	102	48	35
39MH53	Five flakes located on ridge slope.	102	48	36
39MH54	Sparse lithic scatter recorded near the reported location of a catlinite pipe.	102	48	36
39MH55	Two flakes.	102	48	36
39MH56	Sparse lithic and bone scatter.	101	48	14
39MH57	Two historic depressions.	101	48	14
39MH59	Extensive and dense lithic scatter.	101	48	14
39MH60	Diffuse lithic scatter.	101	48	14
39MH61	Lithic scatter recorded where "ax heads" were reportedly located and where tipis were observed by early homesteaders.	102	48	26
39MH62	Historic depression.	102	48	26
39MH63	Reported trapper's dugout.	102	48	26
39MH64	Sparse lithic scatter.	102	48	26
39MH65	Reported Indian camp site (not verified).	102	48	26

Table 1 (cont.)

Site Number	Site Type	T (N)	R (W)	S
39MH66	Location where arrowheads reportedly were collected (not verified).	102	48	26
39MH70	Extensive lithic scatter with Besant corner-notched projectile point.	102	49	13
39MH74	Late Woodland mound or mounds.	101	48	3
39MH75	Prehistoric artifact scatter.	101	48	3
39MH78	Prehistoric artifact scatter.	102	48	35
39MH79	Four flakes and fire-cracked cobble fragments.	101	48	10
39MH80	Small lithic scatter with mid-late Archaic side-notched projectile point.	101	48	10
39MH81	Sparse historic artifact scatter.	101	48	10
39MH82	Artifact scatter which included a small Late Prehistoric corner-notched projectile point and thin-walled, smoothed-over, cordmarked pottery.	101	48	10
39MH90	Extensive prehistoric artifact scatter.	102	48	33
39MH91	Extensive prehistoric artifact scatter.	102	48	33
39MH94	A notched projectile point midsection.	102	48	24
39MH95	Sparse lithic scatter.	101	49	2
39MH96	Sparse lithic scatter.	101	49	2
39MH97	Sparse lithic scatter.	101	49	2
39MH98	Sparse lithic scatter.	101	49	1
39MH99	Sparse lithic scatter.	101	49	12
39MH100	Sparse lithic scatter.	101	49	13
39MH101	Prehistoric artifact scatter.	101	48	16
39MH102	Great Oasis artifact scatter.	101	48	16
39MH105	Late Prehistoric and Euro-American artifact scatters.	101	48	16
39MH116	Sparse prehistoric artifact scatter.	101	48	4
39MH201	Mound group - may be same as 39MH4.	101	48	10
39MH202	Great Oasis village.	101	48	10

Table 2. Previously Recorded Sites Located Adjacent to the 5-Mile Radius Project Area.

Site Number	Site Type	T (N)	R (W)	S
39MH13	Sparse artifact scatter.	101	48	23
39MH17	Prehistoric artifact scatter.	101	48	11
39MH22	Lithic and shell fragment scatter.	101	48	12
39MH28	Emineja Site. Artifact scatter dated at A.D. 900-1700.	101	48	14
39MH49	Extensive artifact scatter with probable Late Prehistoric side-notched projectile point.	101	48	14
39MH51	Extensive lithic scatter.	101	48	14
39MH58	Extensive prehistoric artifact scatter.	101	48	14
39MH76	Deposit of bottles and broken bottle glass.	101	50	16
39MH89	Railroad refuse dump.	101	50	16

In addition to the sites listed above, the following railroads are located within the project area:

Burlington Northern Railroad;
Chicago and Northwestern Railroad;
Great Northern Railroad;
Illinois Central Railroad; and the
Chicago, Milwaukee, St. Paul and Pacific Railroad.

Table 3. Previous Cultural Resource Surveys Accomplished Within a 5-Mile Radius of the Project Area.

Archive Number (AMH-)*	Author	Date	Sites Recorded in Project Area	T (N)	R (W)	S
-	Alex, Ruple and Hoffman	1981	39MH32	101	48	4
0058	Brodnicki	1986	None	102 & 101	49 & 49	28, 32 & 4, 5, 9
0006	Buechler	1976	39MH29, 31	102	48	35
0005	Emerson and Emerson	1978	None	101	48	3
0057	Fosha	1990	None	102 101	48 48	24 1
0012	Haberman	1983	None	101	48	10
0013 0026	Haberman Haberman	1985 1986	39MH6, 74, 75	102 101	48 48	34 3, 9
0031	Haberman	1987a	None	102	48	24
Highway 77	Haberman	1987b	None	102	49	10, 15, 16, 21
0034	Haberman	1988	39MH101, 102, 105	101 & 101	48 & 49	7, 8, 9, 16, 17, 18 & 13
-	Hannus	1973a	39MH11	101	48	10
-	Hannus	1973b	39MH26	102	49	12
0063	Keller	1990	None	102	48	35
-	Lewis	n.d (1884)	39MH2	101	48	21
-	Lewis	n.d. (1889)	None	101	49	3
-	Lewis	n.d. (1884)	None	101	49	3, 4
0020	Lueck	1986	None	102 101	48 48	35 2
0037	Lueck	1988	None	102	48	35
ESD-0102	Lueck	1989	None	102	48	25, 26, 35

Table 3 (cont.)

Archive Number (AMH-)*	Author	Date	Sites Recorded in Project Area	T (N)	R (W)	S
0036	Lueck and Winham	1988	39MH100	101 & 101	48 & 49	16 & 13
0047	Lueck, Winham and Hannus	1987	39MH95, 96, 97, 99	102 & 101	49 & 49	35, 36 & 1, 2, 12
0008	Sigstad and Hannus	1973a	None	101	49	3, 4, 9
ESD-0001	Sigstad	1973	None	102 & 101 & 101	48 & 48 & 49	24, 25, 36 & 11, 14 & 3, 4
0009	Sigstad and Hannus	1973b	39MH8, 19, 25, 27	102	49	23
0045	Wardlow	1988	None	102 & 101	49 & 49	34, 35 & 2, 3
0054	Wardlow	1991	None	102	48	33
0016 0017	Winham Winham	1986a 1986b	39MH78	102	48	35
0018	Winham	1986c	None	102	48	14
-	Winham	1986d	None	101	48	3
0028 0030	Winham Winham	1987a 1987b	39MH90, 91	102	48	33
0040	Winham	1988a	39MH1	101	48	9
0043	Winham	1988b	39MH1	101	48	9
0061	Winham	1990a	None	102	48	31
0060	Winham	1990b	None	102	48	35
ESD-0092	Winham and Lueck	1989	39MH98	101	49	1
0003 0001	Winham et al. Over and Meleen	1983 1941	39MH6 39MH6 39MH1	101	48	9
-	Winham et al.	1992	39MH202	101	48	10

Table 3 (cont.)

Archive Number (AMH-)*	Author	Date	Sites Recorded in Project Area	T (N)	R (W)	S
0015	Winham, Lueck and Hannus	1985	39MH33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 50, 52, 53, 54, 55, 56, 57, 59, 60, 61, 62, 63, 64, 65, 66, 70	102 & 101 & 102	48 & 48 & 49	31, 35, 36 & 2, 14, 15 & 13, 27
0019	Winham, Lueck and Ritter	1986	39MH79, 80, 81, 82	101	48	3, 10, 15, 16
0007(?)	Zimmerman	1975	39MH28	101	48	14

* SARC archive number.

The above sites and areas surveyed are shown on Figures 1 and 2.

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Pathfinder Project - Records Search Part II

As a supplement to the records search conducted for a 5-mile radius of the Pathfinder Plant itself (Winham and Hannus 1991 - see Appendix A, this report), a records search request was submitted to the South Dakota Archaeological Research Center in Rapid City for the following sections relating to the proposed pipeline routes that extend further than 5 miles from the plant:

SIOUX FALLS EAST QUAD
T101N, R49W, SECTIONS 23, 24, 25, 26, 35, 36.
T101N, R48W, SECTIONS 19, 20, 29. 30, 31, 32.

BRANDON QUAD
T101N, R48W, SECTIONS 20, 29, 32

HARRISBURG QUAD
T100N, R49W, SECTIONS 7, 8, 9, 10, 15, 16, 17, 18, 19, 20, 21, 22, 27, 28, 29, 30, 31, 32, 33
T100N, R50W, SECTIONS 12, 13, 24, 25, 26, 27, 34, 35, 36
T99N, R50W, SECTIONS 1, 2, 3, 11, 12
T99N, R49W, SECTIONS 5, 6, 7, 8.

KLONDIKE QUAD
T100N, R49W, SECTIONS 10, 15, 22, 27

Pat Hofer of SARC completed this records search for, essentially, a 4-mile wide corridor which was centered on the two proposed alternative pipeline routes. The results of this search are presented below and in Attachment 1. No previously recorded (non-railroad) sites are present within the project area.

Previously Recorded Sites:
Chicago, Rock Island & Pacific Railroad
Chicago, Milwaukee, St. Paul and Pacific Railroad.
Illinois Central Railroad
T. H. Lewis recorded a site in the SW1/4 of Section 23 (7-27-1889).

Previous Surveys:
Sigstad (1973), Watertown to Moville Survey
Emerson and Emerson (1978).
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Appendix C

Comments Received and Responses

Appendix C

Comments Received and Responses

Written comments on the Draft Environmental Impact Statement were received from Northern States Power Co., the South Dakota Department of Environment and Natural Resources, and the South Dakota Department of Game, Fish and Parks. The comments received are attached on the following pages. The response to the comments follows below.

Northern States Power Company Comments

1. Page #4, section 2-1, second paragraph
   Comment provides corrected dates for construction schedule. Corrections made.
2. Page #5, section 2.2.1, last paragraph
   Comment regarding nuclear equipment. Sentence added to section.
3. Page #8, section 2.2.4.2, first paragraph
   Typo "one" to "once". Correction made.
4. Page 63, Impacts on Wetlands
   Comment on wetland classification and need for permits. Correction made to wetland type to be PEMB type wetland. NSP indicates it will file for necessary permits.
5. Page 75, Ground Water Quality
   Comment regarding semantics. Correction made.
6. Page 85, Construction workforce 3.2.4.
   Comment provides adjusted workforce numbers. Corrections made.
7. Page 86, Traffic 3.2.6.
   Comment provides adjusted rail car and truck numbers. Corrections made.
8. Page 88, Cultural resources 3.2.11.
   NSP indicates that it will work with an archeologist during construction, as recommended. Comment is noted.
9. Page 100, Alternative Methods of Generation, second paragraph.
   Comment regards new NSP goals related to wind generation. Small addition to paragraph to indicate new goals added.

10. Page 109, Water Quality, 7.2.2., last paragraph.

Comment regards NSP agreement to maintain pH levels at a range of 6 to 8.5 in its NPDES permit application. Sentence to reflect this added.

South Dakota Department of Environment and Natural Resources Comments

1. Comment related to Air Quality.

   The EIS section 7.1.3. suggested water wagons be used to periodically spray unpaved access and haul roads to reduce fugitive dust. Comment is noted.

2. Comment related to Ground Water Quality.

   According to communication with NSP on 1/6/93, EPA's regulation of oil pollution prevention requires inspection and containment of stormwater in the diked area. The stormwater can only be released to the basin after it is inspected to be clean or has been cleaned, which implies that NSP would not release stormwater runoff to the basin that violates either the Surface or Ground Water discharge limits.

3. Comment related to Surface Water Quality.

   According to communication with NSP on 1/6/93, NSP has determined that they are required to submit, to the appropriate regulatory agency, a notice of intent to discharge stormwater associated with construction activity, along with a stormwater prevention plan. Other comments are noted.

4. Comment related to On-site systems.

   NSP has stated that staffing of the facility will not increase over the existing staff level which consists of an operations and maintenance person and the security staff. Thus, there will not be an additional load to the existing septic system, which is deemed adequate to dispose of waste from the facility.

5. Comment related to Water Usage.

   Informative comment. NSP has applied for and received appropriate water rights.

South Dakota Department of Game, Fish and Parks Comments

The comments received from the SD Department of Game, Fish and Parks generally are recommendations for construction of the pipeline to minimize affects to wetlands and streams. These recommendations are similar to those in the Draft EIS and noted. The EIS notes the need to obtain appropriate permits for disturbing wetland and areas, and this comment provides the address of the contact in South Dakota. The comment related to the small wetland indicates that the SDGF&P wishes to cooperate in the construction process related to wetlands. This comment is noted.

Northern States Power Company

414 Nicollet Mall
Minneapolis, Minnesota 55401-1927
Telephone (612) 330-5500

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NORTHERN GREAT PLAINS WATER RESOURCES RESEARCH CENTER

December 16, 1992

Martin C. Bettman
Staff Engineer
South Dakota Public Utilities Commissioner
State Capitol
Pierre, South Dakota 57501-5070

Dear Mr. Bettman:

Northern States Power would like to thank The Commission for the opportunity to comment on the Draft EIS report. Our comments provide up-to-date information on the Pathfinder project, and also clarify some technical points.

The comments are presented by page, section, heading, and in some cases by paragraph. Where language changes are requested, the original version is included using a strike out to highlight it, and the changes are in bold type font.

The Northern States Power Pathfinder project group would also like to comment that the Draft EIS was comprehensive, and of excellent quality.

Comments

Page #4, section 2-1, second paragraph

> The proposed CTG facility presently is scheduled for a January 1, 1995 in-service date. Subject to receipt of all necessary permits, construction of the CTG facility ~~and the pipeline~~ **at Pathfinder** ~~are~~ **is** scheduled to begin during ~~the summer~~ **May of** 1993. ~~The CTG facility construction would begin in June 1993~~. At present NSP is planning to construct two

CTG units at the site with an additional two units planned in the future. The pipeline construction is scheduled to begin in ~~July 1993~~ **March 1994** with construction completed by ~~November 1993~~ **July 1994.**

Page #5, section 2.2.1, last paragraph

All nuclear equipment has been removed from the Pathfinder site. This information should be included in the last paragraph.

Page #8, section 2.2.4.2 first paragraph

6th line typo change "one to once".

Page 63 <u>Impacts on Wetlands</u>

NSP recognizes that there is an unmapped seepage wetlands on the Pathfinder site where the CTG's will be located. After discussions with the Gary Larson SDSU, it was agreed that it is a PEMB type wetland, which covers less than an acre. It is expected that the filling of this wetland will have no major impact on wildlife, and water flows will be maintained via a drainage ditch. For the gas pipeline NSP will follow federal guidelines for wetland construction activities and the areas will be returned to as close as practical to their original state. NSP plans to file for a 404 and 401 wetland permits, under 33CFR§330 to cover all impacted wetlands.

Page 75 <u>Ground Water Quality</u>

Last paragraph 5th sentence should read "The construction permit requires NSP to monitor at least six wells on a quarterly basis and submit analytical results of SDDENR within 30 days of each **receiving** sampling ~~efforts~~ **results.**"

Page 85 Construction workforce 3.2.4

Third sentence should be adjusted to read "The construction of the pipeline is anticipated to take about ~~six~~ **four** months and will require about ~~50~~ **100** workers with ~~two-thirds~~ about **fifty percent** of these from the local workforce."

Page 86 Traffic 3.2.6

Second paragraph, second sentence should read "For a two unit installation, this would require about ~~24~~ **5** rail cars." The fourth sentence should read "approximately ~~100~~ **200** truck deliveries would be required for the two CTG units"

Page 88 Cultural resource 3.2.11

NSP will work with an archeologist, and have the described area stripped and analyzed before construction.

Page 100 Alternative Methods of generation, second paragraph

NSP has established a new goal of 100 MW of wind generation by the year 2000. This MW goal coincides with Minnesota's PUC order to have a minimum of 50 MW by the year 1997.
The goal has been broken down into three stages. In stage 1 NSP will build and operate the first 25 MW, which are to be online schedule by mid 1994. Stage 2 will cover 25-35 MW with scheduled online date of 1995. Stage 3 will handle the remaining 40-50 MW with scheduled online date of 1997 or 1998. NSP has decided to increase their wind generating goal because the current wind technology has improved technically, and brought down the cost of installing wind generation is declining

Page 109 Water Quality 7.2.2, last paragraph

In the NPDES permit application NSP has agreed to maintain the pH levels at a range of 6 to 8.5. Plant wastewater discharges will initially go to the 4 settling basins, where they will mix with the water in the ponds. Given the size of the settling Basin, under worst case conditions (maximum daily flow - no evaporation, no seepage), the water will be held for 2 weeks. If there is a discharge to the river, the pH should be relatively constant due to the mixing and retention in the settling basins

.

If you have any questions, please contact Manny Castillo at (612) 330-6506

Sincerely,

James Alders

James A. Alders
Manager, New Facility Permitting
Northern States Power Company

cc: V. Schaefer, SDSU
D. Pierce
J. Richardson
A. Anson
J. Wilcox
M. Castillo
R. O'Brien
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DEPARTMENT of ENVIRONMENT
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SOUTH DAKOTA PUBLIC
UTILITIES COMMISSION

18 December 1992

Marshall Damgaard
Executive Director
South Dakota Public Utilities Commission
State Capitol
500 East Capitol Avenue
Pierre, South Dakota 57501-5070

DOCKET NUMBER EL 91-001

Dear Mr. Damgaard:

The Department of Environment and Natural Resources has reviewed the draft environmental impact statement submitted by Northern States Power Company for its proposed Pathfinder Site combustion turbine project. The Department has the following comments:

1. Air quality. Activities associated with the construction of the combustion turbines and the pipeline will generate fugitive dust emissions. Unpaved haul roads and access roads should be watered periodically to minimize emissions. Disturbed areas should be revegetated as soon as practical to minimize wind erosion.

The combustion turbines shall be constructed and operated within the restrictions imposed by the Prevention of Significant Deterioration permit issued to Northern States Power company by the Environmental Protection Agency. Contact Keith Gestring if there are any questions on air quality at (605) 773-3351.

2. Ground Water Quality. The draft EIS states that precipitation runoff that contains fuel oil from the aboveground storage tank containment system will be discharged into the on-site settling basins. The EIS states that the surface water discharge will be conducted in accordance with limits set in the NPDES permit. However, because the settling basins also discharge into the Big Sioux aquifer, the ground water discharge must meet the limits established in the State's Ground Water Discharge Plan. Contact Doug Miller if there are questions on aboveground storage tanks at (605) 773-3296.

3. Surface Water Quality. From the information present in the draft EIS, it is unclear whether NSP has determined if the facility is subject to the new NPDES regulations for discharges associated with construction activity or discharges associated with industrial activity. This determination should be made.

Even if the facility is not subject to the requirements for storm water associated with construction activity, to the extent possible during construction, care should be taken to minimize potential impacts to the two small creeks, lesser drainages, and the Big Sioux River. Due to the beneficial use classifications of the Big Sioux River, which include being a warm water fishery, care should be taken to insure the water quality standard for total suspended solids of 90 mg/L is not violated.

Information on the storm water regulation and copies of the general permits can be obtained by contacting Glenn Pieritz or Kent Woodmansey at (605) 773-3351.

4. On-site systems. The proposed combustion turbine facility will be using Pathfinder's existing septic system. A study should be conducted to determine if the existing septic system can accommodate the additional sanitary waste generated by the proposed facility. Contact Bill Baer if there are any questions on on-site systems at (605) 773-3351.

5. Water Usage. Northern States Power holds water rights totalling 9.67 cubic feet per second from the Big Sioux River for cooling purposes at their existing facility. However, all or any part of this appropriated water which has not been used beneficially for the appropriated purpose, for a period of three years, may subject the water rights to forfeiture for nonuse. Contact Eric Gronlund if there are questions on water rights or water appropriations at (605) 773-3352.

Thank you for allowing the Department the opportunity to comment on the draft EIS.

Sincerely,

Robert E. Roberts
Secretary

GREAT FACES. GREAT PLACES.

DEPARTMENT OF GAME, FISH AND PARKS
Foss Building
523 East Capitol
Pierre, South Dakota 57501-3182

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NORTHERN GREAT PLAINS WATER RESOURCES RESEARCH CENTER

December 16, 1992

DOCKET NUMBER EL 91-001

Mr. Marshall Damgaard, Executive Director
South Dakota Public Utilities Commission
50 East Capitol Avenue
Pierre, SD 57501-5070

Dear Mr. Damgaard:

We have reviewed the Draft Environmental Impact Statement for the proposed "Combustion Turbine Generator Facility, Northern States Power Company Pathfinder Site Minnehaha County, South Dakota", and our comments are as follows:

A review of the project area reveals that there are few wetlands and stream crossings along the pipe line proposed routes. The following recommendations should be implemented in the construction plans for the placement of pipe line.

1. Crossing of wetland basins should be done when dry conditions exist whenever possible.

2. Stream bottoms and wetlands impacted by construction activities should be restored to original lines and grades. In cases where wetland basins to be crossed are formed because of impermeable soils, the soil area around the pipes should be packed to reestablish the impermeability of the basin's floor.

3. Where streams support fish spawning these crossings should not be undertaken during fish spawning periods. Most spawning occurs in April, May and June.

4. Streams should be crossed perpendicular to flow.

5. Removal of vegetation and soil should be accomplished in a manner to reduce soil erosion and to disturb as little vegetation as possible. Particular care should be taken to prevent soil from entering the watercourse.

6. Grading operations and reseeding of indigenous species should begin immediately following trench backfilling.

Work involving the alteration or disturbance of wetlands or streams may require a Section 10/404 permit from the U.S. Army Corps of Engineers (Corps). Accordingly, contact the Corps' Regulatory Office, Federal Building, Room 317, Pierre, South Dakota 57501, Telephone (605) 224-8531.

It is noted that a small wetland (less than one acre) is located on the CTG facility site and will be lost to project construction. It is our opinion this wetland can be replaced on NSP property with minimal effort. We request NSP to contact the Game, Fish and Parks Regional Office at 517 West 10th Street, Sioux Falls, South Dakota, 57104-3619, Telephone 339-6621. Allen Knapp, Assistant Regional Supervisor for fisheries, or Arden Peterson, Assistant Regional Supervisor for land will be happy to visit the site and cooperate in this effort.

If these suggestions are adhered to, we have no adverse comment of objection to the project.

Sincerely,

John C. Kirk
Chief, Environmental Review & Management

JCK/mm

cc: Arden Peterson, GF&P, Sioux Falls
Allen Knapp, GF&P, Sioux Falls
Angus Anson, Northern States Power